Creating Markets, Creating Opportunities

Moldova Investment Climate Reform Project #600467

Feasibility Study

for an animal by-products processing facility

in the Republic of Moldova

FINAL REPORT

June 2022

PROJECT'S DATA

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CONTENTS

ANNEXES

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

ABPs	Animal By-Products
AD	Anaerobic Digestion
AF	Alternative Fuels
AISI	American Iron and Steel Institute
ANCP	Annual national control plan
ANSA	Agenția Națională pentru Siguranța Alimentelor National Agency for Food Safety
BAT	Best Available Techniques
BOD	Biochemical Oxygen Demand
BSE	Bovine Spongiform Encephalopathy
CA	Competent Authority
CAP	Common Agricultural Policy
CAPEX	Capital Expenditures
CAPMU	Consolidated Agricultural Projects Management Unit
CCP	Critical Control Point
COD	Chemical Oxygen Demand
COSMAN	Consortium for the disposal of dead animals
DAF	Dissolved Air Flotation
DAFF	Department of Agriculture, Fisheries and Food
DCFTA	Association Agreement/ Deep and Comprehensive Free Trade Agreement
DG SANTE	DG for Health and Food Safety
DP	Derived Products
EBB	European Biodiesel Board
EBIT	Earnings Before Interest and Tax
EBDTA	Earnings Before Taxes, Depreciation and Amortization
EBITDA	Earnings Before Interest, Tax, Depreciation and Amortization
EBT	Earnings Before Tax
EC	European Commission
EFPRA	European Fat Processors and Renderers Association
EU	European Union
FAC	Fat Analysis Committee
FAME	Fatty Acid Methyl Ester
FBO	Food Business Operator
FFA	Free Fatty Acids
FIDIC	Fédération Internationale Des Ingénieurs-Conseils
FOG	Fats, Oils and Grease
HACCP	Hazard Analysis Critical Control Points

IEA	International Energy Agency
IFC	International Finance Corporation
IPPC	Integrated Pollution and Prevention Control
IRR	Internal Rate of Return
LBG	Liquified biogas
MADRM	Minister of Agriculture and Food Industry (former name)
MANCP	MultiAnnual National Control Plan
MBBR	Moving Bed Biofilm Reactor
MBM	Meat and Bone Meal
MIU	M - Moisture and Volatiles, I - Insoluble Impurities, U - Unsaponifiables
MS	Member State
MSM	Mechanically Separated Meat
MW	Megawatt
NPV	Net Present Value
OECD	Organisation for Economic Co-operation and Development
OEF	Odour Emission Factor
OER	Odour Emission Rate
OPEX	Operating Expenditure
OUE	European Odorimetric Unit
PAP	Processed Animal Protein
PBP	Pay Back Period
PP	Processing Plant
PPP	Public Private Partnership
PQQ	Pre Qualification Questionnaire
ROI	Return of Investment
SBR	Sequential Batch Reactor
SOP	Standard Operating Procedure
SRM	Specified Risk Material
SWOT	Strengths, Weaknesses, Opportunities, and Threats
TCO	Total Cost of Ownership
TOC	Total Organic Carbon
ToR	Term of Reference
TSE	Transmissible Spongiform Encephalopathies
VIS	Veterinary Information System
VOC	Volatile Organic Compounds
WB	World Bank
WtE	Waste-to- Energy

TECHNICAL TERMS

Animal by-products	Entire bodies or parts of animals, products of animal origin or other products obtained from animals, which are not intended for human consumption, including oocytes, embryos and semen
Authorised landfill	A landfill for which a permit has been issued in accordance with Directive 1999/31/EC
Category 1 (Cat 1)	Animal by-products referred to in Article 8 of Regulation1069/2009 (e.g. animals infected with TSE and specified risk material)
Category 2 (Cat 2)	Animal by-products referred to in Article 9 of Regulation 1069/2009 (e.g. death animals other than referred in article 8 and article 10, manure/tract content)
Category 3 (Cat 3)	Low or non-risk animal by-products referred to in Article 10 of Regulation 1069/2009 (e.g. safe ABPs from animals " fit for human consumption")
Co-incineration	The recovery or disposal of animal by-products or derived products, if they are waste, in a co-incineration plant
Co-incineration plant	Any stationary or mobile plant whose main purpose is the generation of energy or the production of material products as defined in point 5 of Article 3 of Directive 2000/76/EC
Collection centres	Premises other than processing plants in which the animal by-products referred to in Article 18(1) of Regulation (EC) No 1069/2009 are collected with the intention to be used for feeding to the animals referred to in the same Article
Combustion	A process involving the oxidisation of fuel in order to use the energy value of the animal by-products or derived products, if they are not waste
Derived products	Products obtained from one or more treatments, transformations or steps of processing of animal by-products
Digestive tract content	The content of the digestive tract of mammals and ratites
Incineration	The disposal of animal by-products or derived products as waste, in an incineration plant, as defined in point 4 of Article 3 of Directive 2000/76/EC
Incineration plant	*For waste in general*: Any stationary or mobile technical unit and equipment dedicated to the thermal treatment of waste as defined in point 4 of Article 3 of Directive 2000/76/EC (Definition included in Reg. 142/2011) *For ABPs only*: Premises or facilities for the disposal as waste by incineration of animal by-products as referred to in Article 24(1)(b) of Regulation (EC) No. 1069/2009, in which animal by-products are disposed of in accordance with Annex III of Regulation (EU) No. 142/2011 (these plants have a permit to operate in accordance with Directive 2000/76/EC)
Intra-species recycling (cannibalism)	Feeding of a species with processed animal protein derived from the bodies or parts of bodies of animals of the same species (e.g. pig protein given to pig)
Manure	Any excrement and/or urine of farmed animals other than farmed fish, with or without litter
Meat-and-Bone Meal	Animal protein derived from the processing of Category 1 or Category 2 materials in accordance with one of the processing methods set out in Chapter III of Annex IV of Regulation 142/2011
Petfood plant	Premises or facilities for the production of petfood or flavouring innards, as referred to in Article 24(1)(e) of Regulation (EC) No 1069/2009

Pressure sterilisation	The processing of animal by-products, after reduction in particle size to not more than 50 mm, to a core temperature of more than 133 °C for at least 20 minutes without interruption at an absolute pressure of at least 3 bar
Processed Animal Protein	Animal protein derived entirely from Category 3 material, which have been treated in accordance with Section 1 of Chapter II of Annex X of Regulation 142/2011 (including blood meal and fishmeal) so as to render them suitable for direct use as feed material or for any other use in feedingstuffs, including petfood, or for use in organic fertilisers or soil improvers; however, it does not include blood products, milk, milk-based products, milk-derived products, colostrum, colostrum products, centrifuge or separator sludge, gelatine, hydrolysed proteins and dicalcium phosphate, eggs and egg-products, including eggshells, tricalcium phosphate and collagen
Processing plant	Premises or facilities for the processing of animal by-products as referred to in Article 24(1)(a) of Regulation (EC) No 1069/2009, in which animal by-products are processed in accordance with Annex IV and/or Annex X of Regulation 142/2011
Remote area	An area where the animal population is so small, and where disposal establishments or plants are so far away that the arrangements necessary for the collection and transport of animal by-products would be unacceptably onerous compared to local disposal
Rendered fats	Either fats derived from the processing of animal by-products, or products for human consumption, which an operator has destined for purposes other than human consumption
Specified Risk Material	Specified risk material as defined in Article 3(1)(g) of Regulation (EC) No 999/2001
Transmissible Spongiform Encephalopathies (TSEs)	All transmissible spongiform encephalopathies as defined in Article 3(1)(a) of Regulation (EC) No 999/2001
Waste	Waste as defined in point 1 of Article 3 of Directive 2008/98/EC

EXECUTIVE SUMMARY

Moldova Investment Climate Reform Project (MD ICR Project) is part of the IFC advisory services portfolio in Europe and Central Asia. The objective of the Project is to increase Moldova's private sector market competitiveness and agriculture exports by improving business enabling environment and institutional capabilities thus taking full advantage of the Association Agreement/ Deep and Comprehensive Free Trade Agreement (DCFTA) with the EU (2014).

In the current Moldovan food production context, one of the biggest challenge - both for the public and the private actors - is the safe management and/or disposal of animal waste, particularly ABPs. The current methods and patterns of disposal of animal waste are not compliant with international best practice, resulting in high public health and environmental risks. To this end, safe management of ABPs is one of the key priorities identified by sector authorities in relation to required institutional and technical enhancements of the country's food safety management system.

Over the past several years Moldova's Government has been examining various possibilities to tackle the ABP management agenda. Following the recent adoption of the ABPs Law in 2019, the Government has reached an agreement with the World Bank over a project to establish a comprehensive, EU-compliant system for the management of ABPs unintended for human consumption.

In the framework of the Moldova Investment Climate Reform Project, a contract has been signed between International Finance Corporation and the company Opera srl, for the development of a feasibility study that will support the Government of Moldova decisions with respect to the investment in a EU-compliant system of ABP management in Moldova.

Activities carried out in the first phase of the project

In the first phase of the project, the following activities have been accomplished, and relevant reports delivered:

- Task 1 report: Data collection and critical assessment
  - ✓ Collection of the most recent detailed data in order to produce estimates for the volumes and flows of animal by-products not intended for human consumption;
  - ✓ Overall assessment of the pre-feasibility study carried out under the EU-funded ENPARD technical assistance;
  - ✓ Review of the relevant legislation affecting the ABPs sector;
  - ✓ Identification of the present organization concerning collection, transport, processing, etc. of animal by-products;
  - ✓ Identification of the critical areas that influence (or may influence in the future) proper collection of ABPs in the country;
  - ✓ Assessment of future developments: projected volumes of ABPs, analysis of the growth trends;
  - ✓ Preparation of a catalogue of recommendations and/or suggestions for actions to be taken.
- Task 2 report: Operational/Technical model
  - ✓ Options available to the Moldovan Government in terms of the type of ABP processing facility to build;
  - ✓ Comparative table presenting the strengths and weaknesses of each option (SWOT analysis);
  - ✓ Workshop for the key stakeholders (31st May 2021), presenting the first report;
  - ✓ Second workshop for the key stakeholders (26th July 2021), presenting the options available in terms of the type of ABPs processing facility to be built, including a SWOT analysis.

- Task 3 report: Assessing locations
  - ✓ Main criteria for ABPs processing location;
  - ✓ Assessment of locations proposed with letter 06-04-2487 of 20.04.2021;
  - ✓ Assessment of the location proposed with letter 20-07/3313 of 5th October 2021;
  - ✓ Advantages /disadvantages: SWOT analysis for each proposed site;
  - ✓ Recommendations on environmental and social aspects.
- Task 4 report: Logistic plan including a Traffic study
  - ✓ ABPs sources and relevant requirements;
  - ✓ Frequency of ABPs collection from each ABPs source;
  - ✓ Need for storage establishment(s);
  - ✓ Traffic study and collection optimized routes;
  - ✓ Requirements for ABPs transportation;
  - ✓ Cost estimation for the logistic.
- Task 5 report: Financial Plan
  - ✓ Estimation of the investments required;
  - ✓ Forecast of ABPs processing costs;
  - ✓ Structure and value of the investment project;
  - ✓ Sources of financing.
- Task 6 report: Technical Specifications of the selected option.
- Task 7 report: Implementation plan

Technical option selected in the first phase of the project

In the first phase of the project, five (5) technical options were presented, based on the quantities of ABPs to be processed in Moldova:

1. Option 1: Incineration of all categories (1,2,3);
2. Option 2: Incineration of Cat.1 and 2, processing of Cat.3;
3. Option 3: Installation of N. 3 plants for processing separately the 3 different Categories
4. Option 4: Processing of all categories (Cat. 1, 2 and 3) in one plant; final products to be sold as Cat.1;
5. Option 5: Processing of Cat. 1-2 in one plant and Cat.3 in a separated one; final products to be sold separately (cat. 1-2 and cat 3).

The third option (Installation of 3 plants for processing separately the 3 different Categories) was discarded because of the very limited amount of raw material, especially Cat. 2 ABPs.

Available options, incorporating the SWOT analysis, were submitted to the Government for the validation of the preferred option. A mission in Chisinau was organized and carried out from 15 to 18 November 2021, and a meeting was organized on 16 November 2021 with the State Secretary of Ministry of Agriculture and Food Industry, the Director of the National Food Safety Agency, staff from the National Food Safety Agency, IFC, CAPMU. During the meeting, the available options were presented.

On 19 November 2021, the Minister of Agriculture and Food Industry confirmed with letter n. 08-07/3804 that preferred option for ABPs management in Moldova is the processing of all categories (Cat. 1, 2 and 3) in one plant; final products to be sold as Cat.1.

As a subsequent step, the technical description of the selected option was prepared (Task 6 report), covering all technical characteristics and showing suggested equipment, layout schemes, the technological flow recommended for implementation, and the operational model covering the organization of operational processes by key functions, detailed estimation of the number and qualifications of personnel.

Task 1. Data collection and critical assessment

As a preliminary activity, flow charts have been prepared, describing the entire ABPs chain, including a specific description for each section from production to collection, transport, storage, processing, use and disposal. Details on procedures/processes adopted along the entire ABPs chain have been provided.

In the framework of Task 1, a comprehensive assessment of the situation has been accomplished, as far as ABPs management system in Moldova is concerned. This analysis has been focused on:

- Assessment of the pre-feasibility study carried out under the EU-funded ENPARD technical assistance;
- Review of the relevant legislation affecting the ABPs sector;
- Identification of the present organization concerning collection, transport, processing, etc. of ABPs;
- Collection of the most recent detailed data and estimation of the volumes and flows of ABPs;
- Identification of the critical areas that influence (or may influence in the future) proper collection of ABPs;
- Assessment of future developments: projected volumes of ABPs, analysis of the growth trends;
- Preparation of a catalogue of recommendations and/or suggestions for actions to be taken.

Assessment of the pre-feasibility study carried out under the EU-funded ENPARD technical assistance

Main outcomes of the overall assessment of the pre-feasibility study carried out under the EU-funded ENPARD technical assistance (project reference EuropeAid/137050/DH/SER/MD) in 2017-2018, in view of the current situation, can be summarised as follows:

- In the prefeasibility study, the estimated amount of cat. 1 ABPs to be disposed of is very small; we consider that such amount should be increased;
- the prefeasibility study estimates a significant increase in the ABPs production for the next 20 years; according to our estimations, such an increase will not happen;
- the prefeasibility study suggests incineration as the preferable mode for disposal of cat. 1 ABPs, using an emergency incineration system; for reasons that are further explained, we do not recommend the adoption of such a solution;
- the opportunity to establish a cat. 2 plant should be carefully evaluated; rather, we suggest to process together cat. 1 and 2 ABPs, in a dedicated establishment;
- on the basis of the data provided in the prefeasibility study, it is very difficult to assess properly the financial calculations; however, we have included in this report several comments relevant to this issue.

Review of the relevant legislation affecting the ABPs sector

No major problem concerning the Moldovan legal framework on ABPs has been detected, as it appears to be partially harmonized with the EU legal framework. A new Law has been published on 25 October 2019 in the Official Gazette no. 315-319 art. 459: Law 129/2019 on animal by-products and derived products not intended for human consumption. This Law transposes into national legislation the provisions of Regulation (EC) no 1069/2009. Regulation (EU) No 142/2011 implementing Regulation (EC) No 1069 has been transposed into the Sanitary-veterinary Norm on ABPs not intended for human consumption, approved by Government Decree no.11/2022.

Collection of the most recent detailed data and estimation of the volumes and flows of ABPs

The total amount of ABPs produced in Moldova has been estimated, on the basis of information for the last 5 years provided by the Competent Authorities (ANSA) and of documents collected by the experts. The total amount of ABPs can be estimated in 26,678 tons/year (estimation related to 2020), divided as follows:

- Cat. 1: 4,392 tons/year;
- Cat. 2: 2,895 tons/year;
- Cat. 3: 19,391 tons/year.

Amount of ABPs estimated according to the production points, has been as follows:

- ABPs produced in slaughterhouses (including deboning): 20,958 tons/year;
- ABPs deriving from dead animals: 5,311 tons/year;
- ABPs from other sources: 409 tons/year.

An analysis of current situation in production, separation, collection, transport, processing and management of ABPs has been carried out.

A certain amount of ABPs is already collected and processed in Moldova, in four rendering plants already in activity in the Country, that have the capacity to process nearly the total amount of ABPs produced in poultry slaughterhouses (cat. 3) and a certain amount of other cat. 3 ABPs. Subtracting the amount of ABPs already processed in existing establishments, ABPs to be disposed yearly in Moldova have been estimated as follows:

- Cat. 1: 4,392 tons/year;
- Cat. 2: 2,895 tons/year;
- Cat. 3: 8,000 tons/year.

Yet, none of the existing rendering plants is authorised to process cat. 1 ABPs, therefore a solution has to be found for the entire amount of cat. 1 ABPs. However, more accurate data are needed in relation to the type, category and amount of ABPs currently processed in the existing rendering plants, and in relation to future developments. These data are to be considered crucial for the elaboration of a proposal for the establishment of a comprehensive ABPs management system.

Concerning ABPs flows, more than 50% of the bovines are slaughtered in the north area of the country, almost 30% in the center and a very small percentage in the south. More than half ovicaprines are slaughtered in the north, 25 % in the center and around 20% in the south. As far as pigs are concerned, nearly 70% are slaughtered in the center, and also for poultry the vast majority are slaughtered in the center. Considering that the existing rendering plants seems to be able to collect and process all ABPs from poultry and a certain amount from pigs' slaughterhouses, the main logistic effort should be the ABPs collection from the north, and partially from the center of the country.

The majority of food establishments are located in the north of the country: 211 out of 373. In the center there is quite a significant number of food plants (135) while in south area the number of establishments is very small. However, it should be noticed that the high number of food plants in the northern area is strictly related with the presence of several "dairy plants" (175 dairy plants out of 211 food establishments) that actually are milk collection points, where usually no ABPs is produced. As additional comment, the number of food establishments in the south of the country is very limited. Therefore, the most significant effort for ABPs collection in food establishment should probably be concentrated in the central area of the country.

Concerning live animals, bovines are concentrated in the northern area, where we can find nearly 50% of the heads; a significant percentage of bovines lives in the center (33-38% according to the source), while in the south the number is very limited (10-12%). Pigs are mainly concentrated in the central area of the Country (62%), while in the northern area (23%) and in the south (11%) the number is quite limited. Ovicaprines are distributed equally in the three areas of the Country. Poultry and palmipeds farming is concentrated in the central area (45%), however a significant number of heads can be found also in the northern area (22%) and in the south (26%). The logistic plan will have to consider that the major effort is usually required to collect dead bovines, and that the majority of bovine heads and farms are in the north.

Identification of the critical areas that influence (or may influence in the future) proper collection of ABPs

Main problems affecting the ABPs management system in Moldova have been identified, as follows:

- current methods and patterns of disposal of animal waste are not compliant with international best practice, resulting in high public health and environmental risks;
- in Moldova it is not a current practice dividing ABPs into categories and keep the categories separated;
- an effective official control system for ABPs is currently not in place in Moldova.

Critical areas that may influence the ABPs management system have been identified, as further summarized:

- stakeholders awareness, education and training will play a crucial role in the implementation of the ABPs management system;
- animal identification and registration system shall be in place and fully functioning;
- official control on the whole ABPs chain shall be implemented effectively;
- an adequate support for financing the system should be provided by the State.

Assessment of future developments: projected volumes of ABPs, analysis of the growth trends;

Future developments, in terms of projected volumes of ABPs and analysis of the growth trends, have been assessed. Concerning the amount of ABPs to be processed we deem improbable a significant increase and therefore it would be prudent, when establishing specifications for the construction of rendering plants, to stick to the volume of ABPs to be processed as currently estimated.

A market analysis has been carried out, analyzing the possible uses of derived products and estimating market prices according to available information.

The potential on future trade flows and patterns has been investigated, and possible clients have been identified, in relation the derived products that will be obtained from the rendering process.

As far as the possible uses of derived products are concerned, co-incineration in cement kiln systems is the most common way for MBM destruction. MBM's value is subject to market fluctuations, a prudent estimation of the value of MBM is around € 50/ton, however, we should consider that, in some periods, rendering companies have to pay for the disposal of MBM (around € 50/ton). A list of existing cement factories located in neighbouring countries has been prepared, with available details. In most of the case these cement factories are part of large international groups, often reporting that they have increased the ratio of alternative fuels in cement production, or that they plan to increase. It can be expected that the use of MBM in cement factories will increase especially in the factories where has not been used yet.

Rendered fats may be used in two primary ways as sources of biofuel. First as a direct substitute for fossil fuel sources such as oil and gas used in steam raising boilers or oxidisers. Second as the main ingredient in Fatty Acid Methyl Ester (FAME) types of biodiesel. A wide variation in the price of animal fats can be observed over time. Market value of fats obtained in rendering plants is usually associated with the heavy oil price.

On these basis, further recommendations for the establishment of an ABPs management system in Moldova have been elaborated and presented in the form of an action plan.

A first workshop for the key stakeholders has been organised and carried out on 31st May 2021, with the purpose to present the first report of the activities carried out under this assignment. The workshop has been organized online, considering the pandemic situation and the travel restrictions, and was attended by staff from IFC, World Bank, CAPMU, MADRM and ANSA, for a total of 19 participants beside Opera's staff.

Task 2. Operational /technical model

Afterward, an Operational/Technical model has been developed, including options available to the Moldovan Government in terms of the type of ABP processing facility to build. The proposed solution will cover all categories of ABPs, representing the optimal capacity of the processing facility. The comparative analysis of available options incorporates a SWOT analysis.

A second workshop for the key stakeholders has been organised and carried out on 26th July 2021, with the purpose to present the options available to the Moldovan Government in terms of the type of ABPs processing facility to be built, including a comparative table presenting the strengths and weaknesses of each proposed solution (SWOT analysis).

The workshop has been organized online, considering the pandemic situation and the travel restrictions, and was attended by staff from IFC, CAPMU, MADRM and ANSA, for a total of 12 participants beside Opera's staff.

Five (5) technical options were presented, based on the quantities of ABPs to be processed in Moldova:

1. Option 1: Incineration of all categories (1,2,3);
2. Option 2: Incineration of Cat.1 and 2, processing of Cat.3;
3. Option 3: Installation of N. 3 plants for processing separately the 3 different Categories
4. Option 4: Processing of all categories (Cat. 1, 2 and 3) in one plant; final products to be sold as Cat.1;
5. Option 5: Processing of Cat. 1-2 in one plant and Cat.3 in a separated one; final products to be sold separately (cat. 1-2 and cat 3).

The third option (Installation of 3 plants for processing separately the 3 different Categories) was discarded because of the very limited amount of raw material, especially Cat. 2 ABPs.

Available options, incorporating the SWOT analysis, have been submitted to the Government for the validation of the preferred option. Considering the changes that occurred following the Parliamentary elections in Moldova (July 2021), and since the pandemic situation temporarily allowed traveling to Moldova, a mission in Chisinau was organized and carried out from 15 to 18 November 2021. During the mission, a meeting was organized on 16 November 2021 with the State Secretary of Ministry of Agriculture and Food Industry, the Director of the National Food Safety Agency, staff from the National Food Safety Agency, IFC, CAPMU. During the meeting, main outcomes of activities already carried out were summarised, and the available options were presented.

On 19 November 2021, the Minister of Agriculture and Food Industry confirmed with letter n. 08-07/3804 that preferred option for ABPs management in Moldova is the processing of all categories (Cat. 1, 2 and 3) in one plant; final products to be sold as Cat.1.

It was therefore recommended to build a plant for processing all categories of ABPs, with a capacity of 15.000 tons/year of ABPs. Costs for construction and management would be optimised, Moldova would be self-sufficient concerning ABPs management, the capacity of the establishment would be adequate also to manage emergency situations.

Task 3. Assessing locations

In parallel, an assessment of the potential locations for ABPs processing facility has been carried out. The first attempt to select the location for the ABPs processing plant was carried out in April and it failed. Five locations were proposed by the Agency for Public Property, but they didn’t meet the requirements set by legislation of the Republic of Moldova from the point of view of environmental, social aspects and destination use of the land, neither to main construction criteria: dimensions and design of the proposed establishment.

An additional plot of land was proposed by the Agency for Public Property in September, taking in consideration the previous project expert‘s opinion/ comments. This plot complies with all the criteria that have been defined for the assessment of the locations, in relation to construction site and operation of the ABPs processing plant. During the process of selecting the final plot, the Agency communicated and consulted with CAPMU staff, and got consultation of the environmental officer and the lawyer, that the proposed location is not in a protected zone and does not hold specific value such as biodiversity or proximity to residential areas.

CAPMU got the approval from the Ministry of Agriculture (Letter from the Minister of Agriculture and Food Industry of the Republic of Moldova N20-07/3313 of 05.10.2021) for a 2.5 ha plot of land, cadaster number 31011010138, which will be shortened/ shaped from the size of 96.82 ha according to the design of the plant. This plot is suitable for the construction of an ABPs processing establishment and is compliant with the main criteria defined for ABPs processing plant location. A field visit to the proposed location has been carried out, and it was possible to verify that the plot is located in a flat area, close to communication routes.

ABPs processing would involve certain environmental impact, that has to be reduced through corrective actions, related to waste water, odour and exhaust gases, noise, soil. Odour emissions from ABPs plants are of particular relevance and emission factors characteristic of rendering plants have been briefly analysed, together with the possibility for measurement. An overview of relevant preventive measures that should be adopted is provided, related to the different phases of Animal By-Products processing.

An example of corrective actions adopted in Croatia by the ABPs processing plant Agroproteinka has been included in the report, and this will help in the preparation of recommendations on environmental and social aspects to be considered in the initial public consultations to be held while considering location options.

Task 4. Logistic plan including a Traffic study

A logistic plan including a traffic study has been carried out. Starting from the list of ABPs sources specifying locations, quantities and types of ABPs, the distribution of ABPs sources and how this impacts on the amount of ABPs produced in the 3 identified geographical areas (north, center and south of the Country), has been assessed. Maps have been drafted for each type of ABPs source (slaughterhouses and number of slaughtered animals, food processing establishments, bovines and ovicaprines farms), reporting the number and location of ABPs sources. A frequency of collection adapted according to the typology of ABPs source has been proposed.

An assessment of the need to build one or more storage establishment(s) has been carried out. Evaluating the geographical characteristics of the Country, the amount of ABPs produced in the different areas of the country, distances and travel times, it is not recommended to build storage establishments.

A traffic study has been carried out and optimized routes have been defined, separately for ABPs collection from slaughterhouse and for the collection of dead animals. The routes for collection and transport of ABPs were planned in accordance with the number of slaughterhouses, livestock population figures and geographical distance from the location planned for the construction of the processing establishment. Three geographical areas have been identified (north, center and south), and time needed for each route has been calculated on the basis of round trip. Calculations have been done assuming that all ABPs (cat. 1, 2 and 3) will be collected and transported together, but transportation of ABPs from slaughterhouses and food processing plants will be done separately from the transportation of dead animals. A total of 22 routes are proposed for the collection in slaughterhouses and food processing plants; a total of 14 routes are proposed for dead animals’ collection. To simulate a realistic situation, an hypothesis of collection along the week (from Monday to Friday) has been prepared for each truck.

The minimum number of trucks and drivers needed has been estimated respectively for ABPs collection from slaughterhouses and food processing plants (6 trucks and 7 drivers) and for dead animals’ collection (2 trucks and 2 drivers). Requirements for vehicles and containers have been described, together with the technical specification for trucks with appropriate equipment. A market research has been carried out for trucks as well as for the additional equipment separately, relevant average prices have been collected and this has allowed to prepare a budget cost estimation. Concerning the transportation of derived products, a cost estimation has been done, considering the two options: buying dedicated vehicles and outsourcing the service. The conclusion is that, for fats transportation, the option of outsourcing the service is suggested. For MBM transportation, a decision should be taken on the basis of the final destination of MBM and therefore on the number of Km to be traveled.

A cost estimation for the logistic has been prepared, starting from the assumption that no storage establishment will be built, considering the costs related to fuel, salaries, vehicles maintenance and depreciation. Different hypotheses are presented: a first hypothesis that consider the costs estimated in Moldova and not considering the depreciation costs of the trucks; a second hypothesis based on the average transportation costs in some EU countries; a third hypothesis that considers the costs estimated in Moldova including the depreciation costs of the trucks. Finally, we prudentially estimate that the total cost for the logistic should be around Eur 400,000 – 450,000 /year.

Task 5. Financial plan

Detailed financial estimates and projections have been developed, based on the technical and operational model option validated by the Government, including the following:

- Estimation of ABP processing capacity;
- Estimating of production volume of derived products;
- Forecasted derived products intended for sales;
- Forecast of ABPs processing costs;
- Cost of goods sold;
- Amortization & Depreciations, Maintenance cost;
- General and administrative expenses.

An analysis of the structure and value of the investment project has been done, and two scenarios were compared:

(i) Recovering investment from the proceeds from the sale of derivatives,

(ii) Covering the negative cash flow from the disposal fee, which will be paid by the producers of ABPs. The deducted amount of the ABPs disposal fee is EUR 0.11.

The investment project shall be considered feasible, if the internal rate of return (IRR) of the project is higher than 12.5% and the net present value is positive. The IRR of the project must be equal to or greater than the value of the country risk of the Republic of Moldova. According to the Moody's rating agency, the country rating is currently B3, which would correspond to the risk of investment and return on investment requiring a minimum IRR of 12.5%.

Scenario two states the feasibility of the investment project financed from the World Bank's resources.

Task 6. Conceptual design of the facilities

The conceptual design of the facilities and technological plan have been developed, including a description of necessary parts of the rendering plant facilities of new construction for Category 1 by-products and recommendations for the design with description of their functions and spatial arrangements. The raw material plant capacity is estimated to be 15,000 Tons per year without manure and without gastrointestinal contents, 5 tons/h. approx. (3,000 Kg/h approx. of evaporate) composed of bone and fat. Considering a batch process of 16 hours per day, the production capacity in terms of raw material is 80 tons/day. Cost for the construction of an establishment applying method 1 has been estimated around € 6,700,000.

The report contains an analytical evaluation of the necessary financial resources to complete the construction of the facilities, a preliminary subdivision of the supplies into lots to be tendered or contracted by the Beneficiary, including Final Design and Work Supervision. The documentation is completed with the full preliminary technical description of all supplies.

The design of the rendering plant is composed of the following chapters:

1. Production flow diagram and process description;
2. Basic design data for the construction of the ABPs processing plant, raw material supply quality and capacity, final product capacity and quality;
3. Construction works. Splitting the construction works into commercial lots: analytical evaluation of the required financial resources (CAPEX);
4. Full technical description of the supply split into lots;
5. Analytical list of energy and water consumption;
6. Classification of production areas;
7. GANTT diagram covering the erection phase;
8. List of required staff for running the ABP plant;
9. Drawings;

Task 7. Implementation plan

Objectives and scope of the ABPs system in Moldova have been defined, together with expected target results. Main constraints that could influence a proper implementation of the ABPs management plan have been identified, as follows: stakeholders awareness, education and training; proper functioning of the Animal Identification and Registration System; effective Official Control implementation; adequate financing of the system.

Roles of the national players involved in the animal by-products system have been briefly analysed, particularly on the specific tasks and role covered by the Central Competent authority and by local authorities (inspectors).

Afterward, the report has focused on the operational plan for establishment of Animal By-Products system, that is articulated in the following chapters:

- Establishment the system of ABPs management and raising awareness;
- Establishing the system of collection and transport of ABPs;
- Establishing the system of by-products treatment/processing;
- Capacity building of competent authorities in the ABPs sector;
- Traceability;
- Facilitation of HACCP principles implementation in the ABPs processing plant.

For each of these chapters, specific activities have been foreseen and a relevant description has been provided, a detailed plan outlining actions needed has been drafted, together with a timetable. The action plan includes details on activities, responsibilities, target dates, expected results.

In relation to the needs for official control, the Multiannual National Control Plan (MANCP) should be integrated with an official control plan specifically dedicated to the animal by-products sector. The Official Control Plan should be risk based and therefore appropriate tools for risk classification will have to be developed.

An average controls' frequency has been proposed, and relevant time to be dedicated for different types of official control has been calculated. Needs for official veterinarians has therefore been established on the basis of the number of establishments/operators and according to the relevant typology.

On these bases, it has been established that 7 veterinarians will be needed to carry out official control activities in the ABPs sector. These are not to be considered as staff dedicated only to official controls on ABPs, rather, the workload for the Moldovan veterinarian staff will be increased and therefore 7 additional veterinarians could be needed.

The above conclusions have been elaborated by the experts on the basis of practical experience, data and information included in the document. This will allow Competent authorities to adopt decisions based on these conclusions and other considerations related to availability of resources, environmental concerns, public health issues, etc.

Due to the pandemic, the possibility to carry out field visits was very limited, because of travel restrictions. However, activities were not negatively affected, meetings have been organized remotely whenever needed and activities have been carried out according to the schedule (as amended), with full commitment and availability of beneficiaries.

Second phase of the project

Following the delivery of the key outputs under this assignment, the Government has requested IFC to produce a second set of deliverables covering a technical option different (additional) from the one initially recommended by the Consultant. Particularly, the Government showed interest in the feasibility of processing Category 3 ABPs separately from Category 1 &2; additionally, the Government showed interest in the feasibility of constructing a biogas generation installation to complement the ABPs processing facility for more sustainable operation.

Therefore, Opera was requested to update tasks and deliverables following the additional request by the Government, as follows:

- Task 2: Operational /technical model. To develop an Operational/Technical model reflecting the second technical option as requested by the government. Additionally, to perform a preliminary analysis on the possibility to construct a biogas plant.
- Task 3: Assessing location. To provide any upgrades that may be necessary to reflect the additional technical option requested by the Government.
- Task 4: Traffic study. To update the Traffic study to reflect the changes caused by the second technical option requested by the government.
- Task 5: Financial plan. To develop a Financial plan reflecting the second technical option as requested by the government.

Concerning Task 2, an Operational/Technical model reflecting the second technical option as requested by the government has been developed (Section A), including Technical Specifications for the construction of Cat. 1 and Cat. 3 Animal By-Products processing facilities.

A preliminary analysis on the possibility to construct a biogas plant has been carried out and is presented in Section B.

In relation to Task 3 – Assessing location, the plot identified by the Ministry of Agriculture and Food Industry of the Republic of Moldova (plot number 31011010.138, letter n. 20-07/3313 of 5th October 2021) is adequate for the construction of two separated ABPs processing establishments, one for cat. 1-2 ABPs and one for cat. 3 ABPs. Indeed, the identified plot has a surface of 96.82 ha, while for the construction of the two ABPs processing plants an area of 158 x 143 meters will be needed. Relevant details are included in Section C.

Concerning Task 4 – Traffic study, it has been estimated that the separated collection of Cat. 1 and 2 ABPs from one side, and Cat. 3 ABPs on the other side, would not have an impact on the traffic study and on the cost estimation for the logistic prepared in the first phase of the project. This is due to the fact that, providing that adequate separation of different categories of ABPs when collected and transported is guaranteed, all ABPs can be transported in the same truck. This separation can be guaranteed using different containers. Relevant details are included in Section D.

In relation to task 5, a Financial plan reflecting the second technical option, as requested by the government, has been prepared and it is included in Section E.

On the basis of the analysis carried out, the investment project shall be considered feasible, if the internal rate of return (IRR) of the project is higher than 12.5% and the net present value is positive. Three distinct scenarios have been analysed, and the most favourable scenario resulted where a disposal fee of 0.18 Eur is established per one kilogram of ABPs collected and transported. In this case, the project will achieve the following results: IRR 16%, NPV (10%) of 5.8 million euro, with a payback period of 6 years. Under the conditions of this scenario three, the investment project can be considered feasible for finance from the World Bank's resources.

An analysis of potential needs for governmental financial support has been carried out, and some examples of financial support in the Member States have been included in the report.

When it comes to farmers, sustainability can be achieved by introducing an appropriate insurance scheme. In the long term, this might be a very good option for dealing with the permanent problem of fallen animals. It could take the form of a mutual fund into which all livestock farmers make contributions and which pays for the collection and disposal of fallen animals. This approach would require intensive public awareness campaign about importance of insurance in agriculture and its benefits.

Options for involvement of the private sector have been analysed. Indeed, concerning the management of the system, different models can be applied. When choosing the appropriate model, it should be considered that the ABPs processing plant is run for the benefit of the animal and public health and as such the broader national economy, preventing outbreaks of serious diseases. Its objective is to facilitate an efficient nationwide service for the collection and disposal of ABPs and fallen stock.

Having in mind all the specifics of the project (primarily, the prioritization of the ecological benefits against financial performance of the project company), the following is recommended:

- Funds from the State budget should be allocated for co-financing of by-product producers and for full financing of collection and disposal of dead animals. Direct co-financing of the ABP management (collection, transport, processing) is preferable. Co-financing of relevant FBO would create an administrative burden.
- Local or central government should also subsidize all farmers (for example financing the purchasing of animals to replace those animals that died) since they already have a loss of future revenues, due to the loss of live animals .

In addition:

- An insurance scheme could be drawn up in consultation with all major stakeholders and private insurance companies, as an approach to gradually replace the direct subsidies for the farmers.
- An incentive system, that should not be limited to a minimization of the costs for ABPs collection and disposal, should be established, for example conditionality mechanism for the granting of funds foreseen according to CAP-like measures, and/or reduction of taxation.

A. INTRODUCTION

International Finance Corporation (IFC), part of the World Bank Group, is the largest global development institution focused on the private sector in developing countries. IFC leverages its products and services—as well as products and services of other institutions across the World Bank Group—to create markets that address the biggest development challenges of countries it operates in. IFC applies its financial resources, technical expertise, global experience, and innovative thinking to help its clients and partners overcome financial, operational, and other challenges.

Moldova Investment Climate Reform Project (MD ICR Project) is part of the IFC advisory services portfolio in Europe and Central Asia. The objective of the Project is to increase Moldova's private sector market competitiveness and agriculture exports by improving business enabling environment and institutional capabilities thus taking full advantage of the Association Agreement/ Deep and Comprehensive Free Trade Agreement (DCFTA) with the EU (2014).

The agribusiness component of the project aims at supporting Moldovan producers of food products (both plant origin and animal origin products) to access the highly demanding European markets. In order to achieve market authorization for the export to EU of products of animal origin Moldova must be able to demonstrate that it complies with EU requirements in various areas, including in the area of waste management/handling on animal by-products (ABPs) not intended for human consumption.

In the framework of the Moldova Investment Climate Reform Project, a contract has been signed between International Finance Corporation and the company Opera srl, for the development of a feasibility study that will support the Government of Moldova decisions with respect to the investment in a EU-compliant system of ABP management in Moldova.

Due to the pandemic, the possibility to carry out field visits was quite limited because of travel restrictions. However, activities were not negatively affected, meetings have been organized remotely whenever needed and activities have been carried out according to the schedule (as amended), with full commitment and availability of beneficiaries.

The Final Report

The first part of the final report includes the introduction, background information, objectives of the project, milestones and reporting. Afterward, the report has been split in the 2 phases of the project. For each phase, blocks of activities have been included, as further summarised.

Phase 1

- Section 1.A. - Task 1. Data collection and critical assessment
- Section 1.B. - Task 2. Operational /technical model
- Section 1.C. - Task 3. Assessing locations
- Section 1.D. - Task 4. Logistic plan including a Traffic study
- Section 1.E. - Task 5. Financial plan
- Section 1.F. - Task 6. Conceptual design of the facilities
- Section 1.G. - Task 7. Implementation plan

Phase 2

- Section 2.A. - Task 2. Operational /technical model
- Section 2.B. - Analysis on the possibility to construct a biogas plant
- Section 2.C. - Task 3: Assessing location

- Section 2.D. - Task 4: Logistic plan including a Traffic study
- Section 2.E. - Task 5: Financial plan
- Section 2.F. – Financing the system and management models

Annexes have been numbered in such a way to refer to the relevant phase and section (for example, an annex referring to “Phase 1, Section 1.A. - Task 1. Data collection and critical assessment” is numbered as “Annex 1.A.1…”).

A list of tables and figures is included, and in this case also they are numbered according to the section and following the same criteria.

B. BACKGROUND

Animal by-Products (ABPs) are materials of animal origin that are not intended for human consumption. ABPs arise mainly during the slaughter of animals for human consumption, during the production of products of animal origin such as dairy products, and in the course of the disposal of dead animals and during disease control measures. Regardless of their source, they pose a potential risk to public and animal health and the environment, which needs to be adequately controlled, either by directing such products towards safe means of disposal or by using them for different purposes, provided that strict conditions are applied which minimize the health risks involved.

In the past years there have been several food crises in the EU caused by feed or food (BSE, dioxin, foot-and-mouth disease, etc.), which seriously undermined the consumer confidence in food and feed safety and the ability of Governments to manage these crises. To regain consumer confidence, strengthen the rules on food and feed and ensure adequate crisis management capacity, EU institutions have adopted a series of provisions that include strict rules on the collection, processing and disposal of ABPs together with testing for TSE the animals belonging to certain risk categories.

Moreover, one of the most common irregular uses of certain material of ABPs is represented by the transformation of certain categories of ABPs into animal feed. This practice, known as swill feeding and feeding MBM, represents a very high risk factor not only for transmission of zoonotic diseases to human consumers (e.g. BSE) but also as a transmission vehicle of important animal diseases such as Classical Swine Fever and African Swine Fever that both represent top priority animal health issues addressed in Moldova and in all other Western Balkan countries.

In the EU, Regulation 999/2001 established specific rules for the prevention, control and eradication of certain transmissible spongiform encephalopathies, including specific provisions on the Specified Risk Material. This regulation was followed by a more structured and detailed Regulation (Reg. 1774/2002) that extended requirements and controls to all uses of ABPs, thus covering the animal feed sector, the food safety sector and other complementary areas. The above regulations had a huge impact on the sector of animal by-products.

Regulation (EC) 1069/2009 and Commission Regulation (EU) 142/2011 replaced the old one (Regulation (EC) 1774/2002) consolidating several related acts into one. The current legislation allows for:

- Clear requirements based on ABPs' technical standards;
- Enforcement measures for the new risk-proportionate approach;
- End point in the manufacturing chain for processed and packaged pet food, biodiesel, tanned hides and skins and other products;
- Less red tape for producers of medicines and diagnostics from ABPs;
- Smoother official controls of laboratories of processing and biogas plants handling ABPs;
- Better traceability from food production;
- Risk-proportionate solutions for transport, processing, use and imports.

Introduction of the above regulations generated a significant increase in production costs of farmers triggering extensive elusive practices targeted towards avoiding the expensive requirements laid down by the EU acquis. Notwithstanding the time elapsed since approval of the above regulations, in many Member States, irregular handling and disposal of ABPs remains a seriously common phenomenon. For this reason, the sector has developed new technologies through which ABPs can be marketed after specific treatment (according to ABP categories).

C. OBJECTIVES

The aim of the project is to develop a feasibility study that will support the Government of Moldova decisions with respect to the investment in a EU-compliant system of ABP management in Moldova.

More specifically, the feasibility study shall:

- analyze and propose options on the technical solution and on the operational/business model for an ABPs management system;
- provide a comprehensive solution for processing all 3 categories of ABPs, either separately or combined, and cover all related substantial complementary infrastructure for collecting, transporting, storage and disposal of all 3 categories of ABPs;
- analyze options for private sector participation in the ABPs management system and recommend the most sustainable solution to the Government;
- help assess potential locations for ABP processing facility as proposed by the Government;
- prepare draft technical specifications for the procurement of design and construction works;
- develop the Terms of Reference for design and construction works supervision services to be hired by the government separately.

D. MILESTONES AND DELIVERABLES

LIST OF MILESTONES

The table below summarizes the milestones, the relevant tasks, the name of the documents provided, the date of delivery and the date of finalisation.

Table 1. List of milestones

Milestone	Milestone name	Task	Name of the documents	Date of delivery	Date of finalisation
M1	Data and critical assessment	1	Moldova IFC ABPs report task 1 rev 3	14/5/21	21/5/21
M2	Operational/ technical model	2	Moldova ABP report task 2	1/12/21	3/12/21
M3	Locations assessment	3	Moldova ABP report task 3	21/12/21	20/1/22
M4	Traffic Study	4	Moldova ABP report task 4	11/1/22	9/3/22
M5	Financial plan	5	Report Financial results forecast &Investment Plan_fin	11/3/22	29/3/22
M6	Technical Plan	6	Moldova ABP report task 6	11/1/22	11/1/22
M7	Implementation Plan	7	Included in this Final Report	June 2022	June 2022
M8	Final Report- FS	-	Moldova ABPs Final Report	June 2022	June 2022

DELIVERABLES

The table below summarises the deliverables provided, their date of delivery and the name of the documents.

Table 2. Reporting

Deliverable	*Finalisation*	*Name of documents*
1. Draft report covering data and critical assumptions, Traffic study, Operational – technical model	21/5/21 3/12/21 11/1/22	"Moldova IFC ABPs report task 1 rev 3" "Moldova ABP report task 2" "Moldova ABP report task 4"
2. Workshop to present the recommendations of the draft report in #1 above.	31/5/21	Report of the workshop included in "Moldova ABP report task 2"
3. Second draft Report incorporating #1 above addressing the comments from stakeholders and Financial Plan.	29/3/22	Report Financial results forecast &Investment Plan_fin
4. Workshop to present the recommendations of the second draft report in #3 above	26/7/21 16/11/21	Report of the workshop included in "Moldova ABP report task 2"
5. Location Assessment Report	21/12/21	"Moldova ABP report task 3"
6. Technical Specifications for design & construction works and Terms of reference for the supervision of design & construction works	11/1/22	"Moldova ABP report task 6"
7. Final feasibility study (final report)	June 2022	Moldova ABPs Final Report

PHASE 1

SECTION 1.A

TASK 1.

DATA COLLECTION AND CRITICAL ASSESSMENT

1.A.1. FLOW CHART DESCRIBING THE ENTIRE ABP CHAIN

As a preliminary activity, the preparation of a flow chart describing the entire ABPs chain has been considered useful. This will help better understanding of the following chapters. ABPs chain involves several steps, from production to collection, transport, storage, processing, use and disposal, and a general flow diagram representing the ABPs chain as a whole is presented at figure 1.A.1. In the flow diagram, ABPs of categories 1, 2 and 3 are considered aggregately, however it should be intended that along the whole ABP chain cat 1-2 from one side and cat 3 on the other side are transported, stored and processed separately. In figure 1.A.2, possible uses of different categories of ABPs are summarized.

Figure 1.A.1. General flow diagram representing the ABPs chain (where all ABPs are considered as cat. 1)

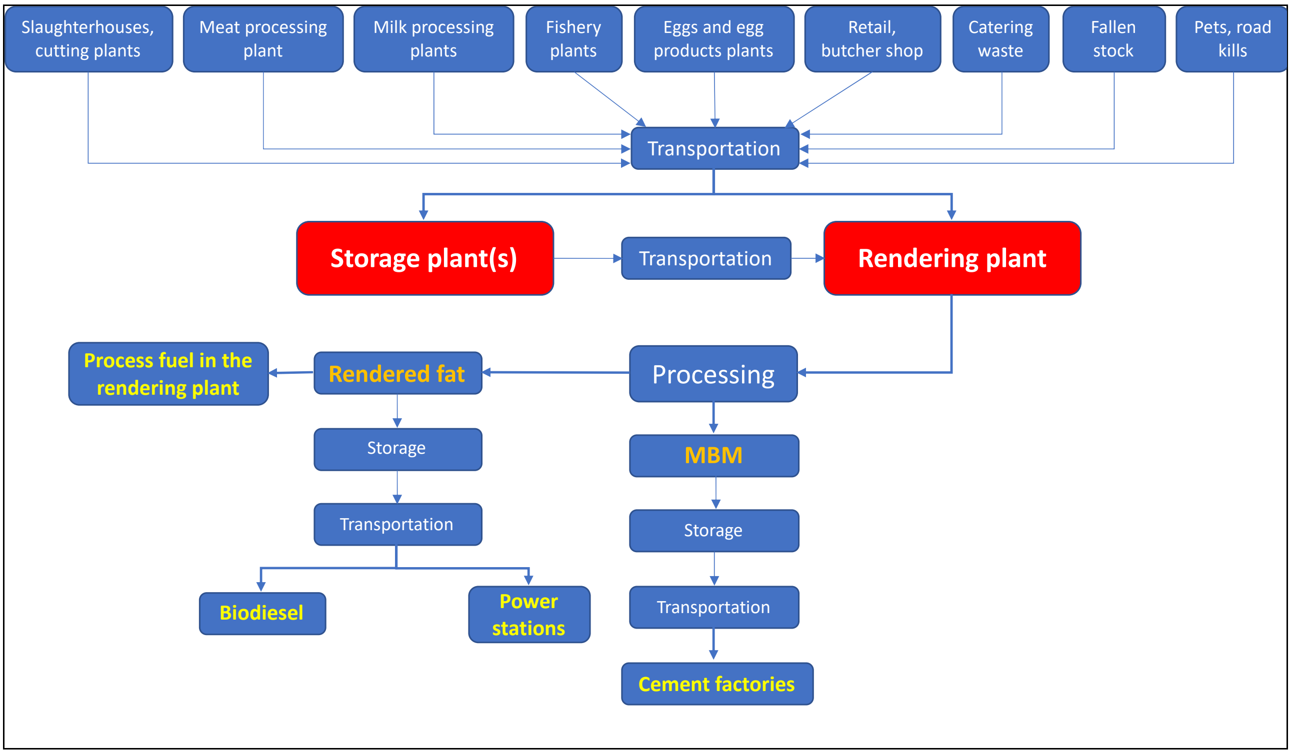
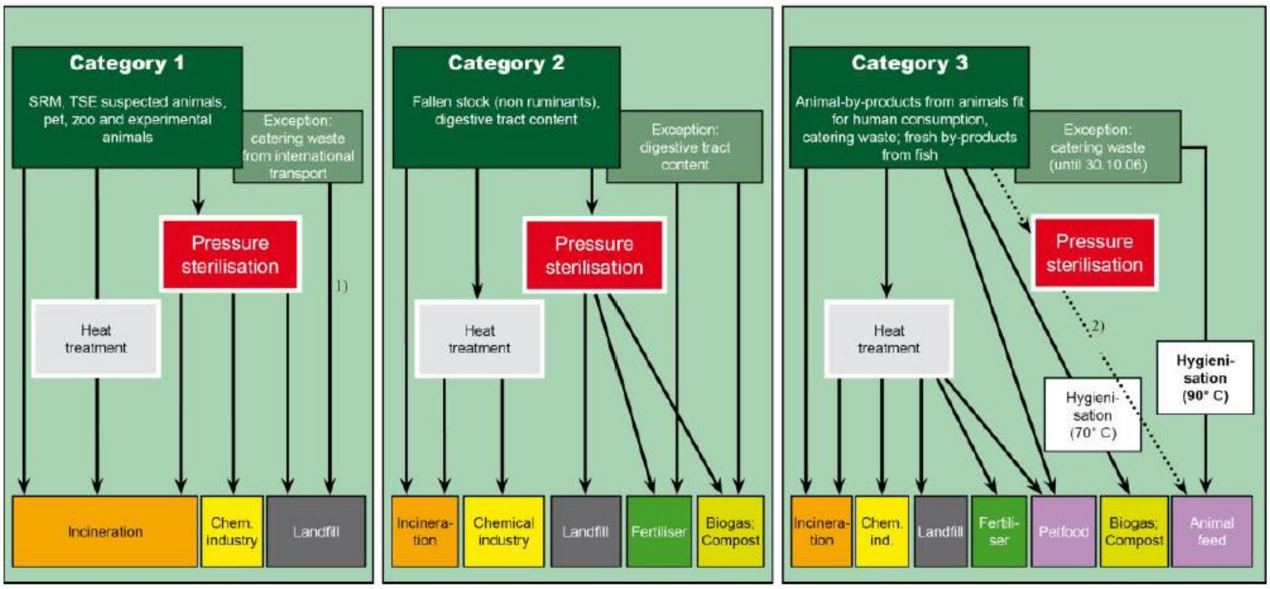


Figure 1.A.2. Possible use of ABPs



Categories and processing methods for animal by-products; Source EFPRA internal paper (2014)

1.A.1.1. POINTS TO BE PRELIMINARILY CONSIDERED

In the following chapters, separate flow diagrams are presented, for each of the steps of the general flow diagram of figure 1.A.1. Furthermore, a specific description for each section is provided, from production to collection, transport, storage, processing, use and disposal.

Before analysing the different steps, some point of Regulation 1069/2009 should be taken in consideration.

- According to art. 21 of the Regulation, operators shall collect, identify and transport ABPs without undue delay under conditions which prevent risks arising to public and animal health. There is no obligation for the operator to categorise ABPs, providing that, once ABPs of different categories are mixed, the mixture is handled in accordance with the standards laid down for the highest risk category.
- Regulation does not apply to raw pet food originating from retail shops, where the cutting and storage are performed solely for the purpose of supplying the consumer directly on the spot.
- Burial and burning of ABPs, in particular of dead animals may be justified in specific situations, for example in remote areas, or in disease control situations requiring the emergency disposal of the animals killed as a measure to control an outbreak of a serious transmissible disease. In particular, disposal on site should be allowed under special circumstances, since the available rendering or incinerator capacity within a region or a Member State could otherwise be a limiting factor in the control of a disease. Burial of dead pet animals and horses is a possibility by derogation (art.19).
- Regulation (EC) No 1069/2009 does not apply to raw pet food derived from animals which are slaughtered on the farm of origin for private domestic consumption.

1.A.1.2. PRODUCTION

Animal by-products (ABPs) include:

1. *Butcher and slaughterhouse waste*:

   animal by-products consisting of parts of slaughtered animals, or any material containing such by-products which are:

   a. fit for human consumption, but not intended for human consumption for commercial reasons,
   b. rejected as unfit for human consumption but not affected by any signs of diseases communicable to humans or animals and derive from carcasses that are fit for human consumption.

   Source: slaughterhouses, butcher shops, meat processing facilities.

2. *Fallen stock:*

   livestock that dies of natural causes or disease, or killed on a farm for purposes other than human consumption.

   Source: farms, individual households.

3. *Pet animals, zoo and circus animals, hunt trophies, road kills.*

4. *Former foodstuffs*:

   products of animal origin or foodstuffs containing products of animal origin that are no longer intended for human consumption for commercial reasons or due to problems of manufacturing or packaging defects or other defects which do not present any risk to humans or animals; this category includes also expired foods.

   Source: independent food retailers, supermarkets, distributors, manufacturers.

5. *Catering waste:*

   waste food originating in restaurants, catering facilities and commercial kitchens.

   Source: restaurants, caterers, canteens, commercial kitchens, international transport.

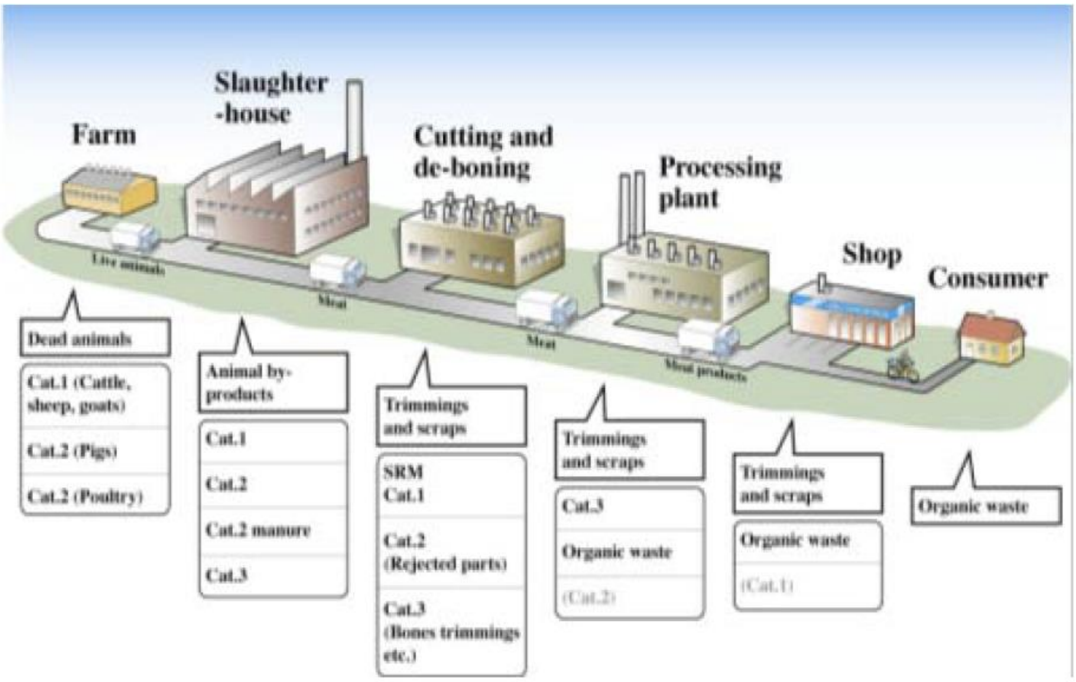
The main sources of ABPs are fallen stock, slaughterhouses and the meat processing sector, however a certain amount of ABPs is produced also in the milk and dairy sector, in the fishery products sector, eggs and eggs products production. In few words, all the sectors where foods of animal origin are processed generate a certain amount of animal by-products. Table 1.A.1 summarises where ABPs of each category are produced along the meat chain. Annex 1.A.1 provides details on the categorisation, disposal and use of animal by-products (from Regulation 1069/2009).

Table 1.A.1. ABPs production in the meat chain

Place	*Species*	*Cat. 1*	*Cat. 2 (manure)*	*Cat. 2*	*Cat. 3*
Farm (Fallen stock)	Cattle, sheep, goats	X			
	Pigs, poultry			X	
Slaughterhouse	Cattle, sheep, goats	X	X	X	X
	Pigs, poultry		X	X	X
Cutting, deboning	Cattle, sheep, goats	X		X*	X
	Pigs, poultry			X*	X
Meat processing	All				X
Butcher shop	All				X

** Rejected parts from reinspection*

Figure 1.A.3. ABPs production in the meat sector



Source: MIDAS - Preparation of a Feasibility Study for the disposal of animal by-products. Final Report, 26/7/2012. Revised

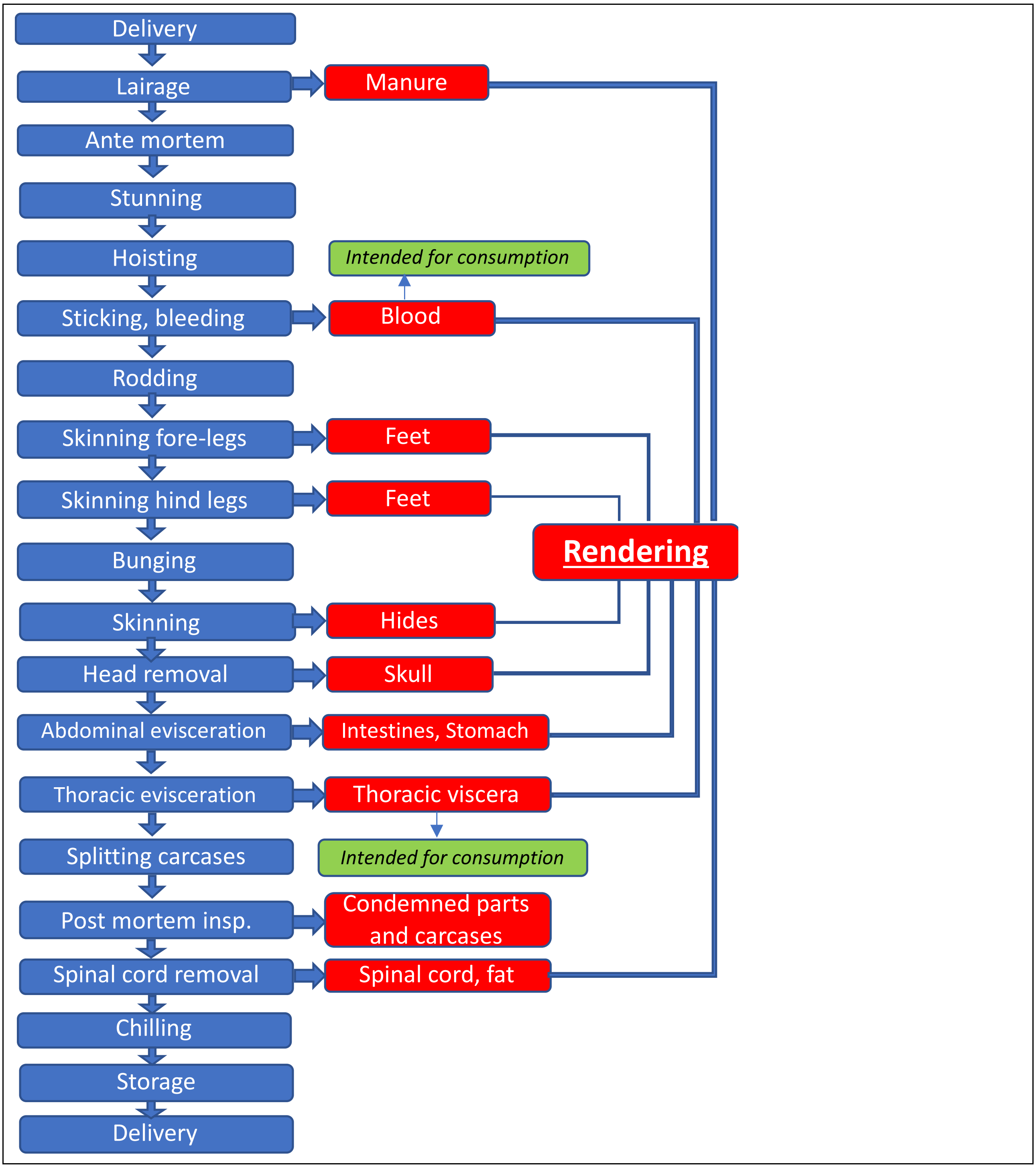
1.A.1.2.1. CATTLE SLAUGHTERING

In the slaughterhouse, cattle are usually held in lairage for a few hours after the delivery. The animal delivery vehicles are washed in the slaughterhouse, which generates wastewater. Excrement and urine produced in lairage is then taken to composting (Fig. 1.A.4). From lairage cattle are driven to stunning, which usually takes place with a captive bolt pistol. Subsequently, the cattle are hung by the back legs on an overhead rail which carries the carcasses through the following slaughtering and processing operations and into the chilling. The bleeding then takes place (around 10 Kg/head of blood).

After the bleeding, hide removal takes place. The hides (about 30 -40 kg/head) are washed and salted to improve preservation and further supplied to tanneries for the production of leather goods.

In the slaughtering, forelegs, tail, udder or testicles, and head are then removed and in the following evisceration stomach, intestines, and pluck are removed. Materials such as heart, liver, and kidneys may be recovered in human food, whereas materials such as udder, lungs, and washed stomach usually are treated as ABPs. The stomach contents (about 50 to 80 kg/head) removed are taken to composting. Materials such as horns and feet are taken to rendering, about 20 kg/head.

Figure 1.A.4. Typical flow diagram of cattle slaughtering



The SRM includes the tonsils, the last four meters of the small intestine, the caecum and the mesentery (cattle of all ages); the skull and the spinal cord in bovine animals over 12 months of age. Details on the definition of SRM according to Regulation (EU) NO. 999/2001, as amended, are provided in Annex 1.A.2.

After slaughtering, the carcasses are split and subsequently chilled to 7 °C to control microbiological growth. Further processing produces trimmings and bones in varying amounts, depending on practices and processes and the degree of processing. These materials are taken to rendering, altogether about 50 to 100 kg/head.

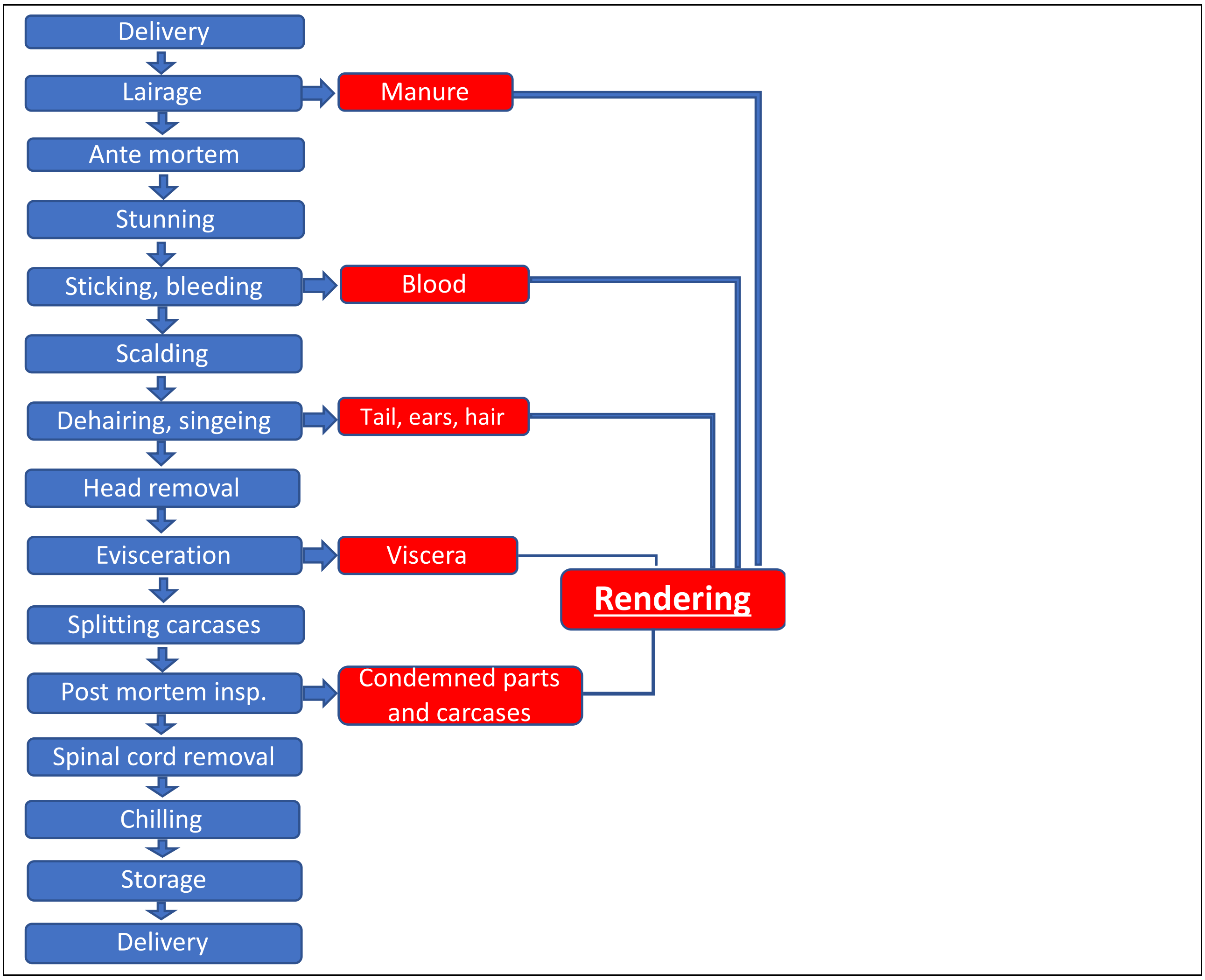
1.A.1.2.2. PIG SLAUGHTERING

On arrival at the slaughterhouse, the pigs are held in lairage for a few hours. The animal delivery vehicles are washed in the slaughterhouse, which generates wastewater.

In lairage excrement and urine are being generated, which are then taken to composting (Fig. 1.A.5). The pigs are then driven to stunning, which usually takes place with carbon dioxide or in some cases with electricity.

Subsequently, the stunned pigs are hung by the back legs on an overhead rail, which carries the carcasses through the following slaughtering and processing operations. The bleeding then takes place.

Figure 1.A.5. Typical flow diagram of pig slaughtering



Following the bleeding, the pigs are scalded to loosen the hair. The scalding usually takes place either in a scald tank filled with hot water or by steam (vertical scalding). The following de-hairing may be performed by rubbing the scalded carcass with rotating rubber fingers and using pressurised water jets. About 1.0 kg/pig of hair produced ends up in rendering. The singeing, usually with propane gas burners, then takes place to remove residual hair.

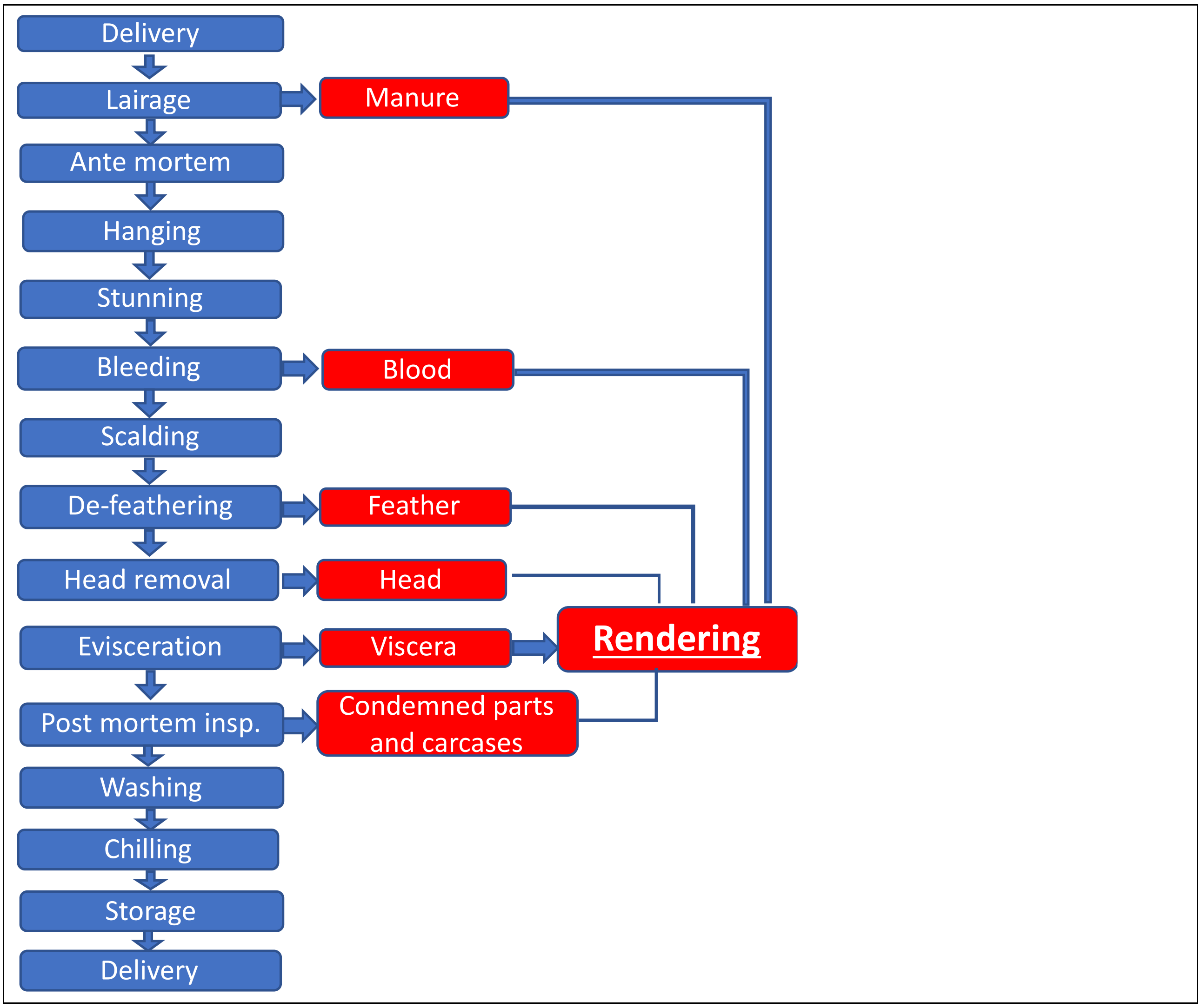
Tails and ears are also removed for further recovery (about 0.5 kg/pig). The following evisceration takes place involving the removal of the respiratory, pulmonary, and digestive organs (stomach, intestines, and pluck set i.e. heart, liver, and lungs). Materials, such as heart, liver, and kidneys as well as washed intestines may be sold for human consumption. Materials such as trimmings, lungs, and washed stomachs are usually considered as ABPs, whereas the contents of the stomach and intestines are removed and can be send to composting.

The carcasses are then split and subsequently chilled to below 7 °C to control microbiological growth. Further processing produces trimmings and bones in varying amounts, depending on practices and processes and the degree of processing. These materials are taken to rendering.

1.A.1.2.3. POULTRY SLAUGHTERING

After the delivery of poultry to the plant, they are first removed from crates and cages and hung on the slaughter conveyor (Fig. 1.A.6). Manure produced in the delivery is washed down into drainage. The poultry are then electrically stunned, and subsequently bleeding takes place. Blood about 40 g/ broiler is further recovered.

Figure 1.A.6. Typical flow diagram of poultry slaughtering



After the bleeding, and to ease feather removal, birds are scalded by immersing them in hot water. De-feathering may be performed by rubbing the scalded carcass with rotating rubber fingers and using pressurised water jets. Feather about 180 g/ broiler is produced.

Subsequent operations produce heads (about 80 g/ broiler), feet (about 120 g/ broiler), and viscera (about 170 to 180 g/ broiler). After slaughtering, carcasses are chilled to below 4 °C upon evisceration to control microbiological growth. Further processing produces trimmings and bones in varying amounts, depending on practices and processes and the degree of processing.

1.A.1.2.4. FOOD OF ANIMAL ORIGIN PROCESSING PLANTS

Beside slaughterhouses, ABPs shall be collected also from establishments processing food of animal origin, first of all cutting plants.

Other establishments producing food of animal origin are:

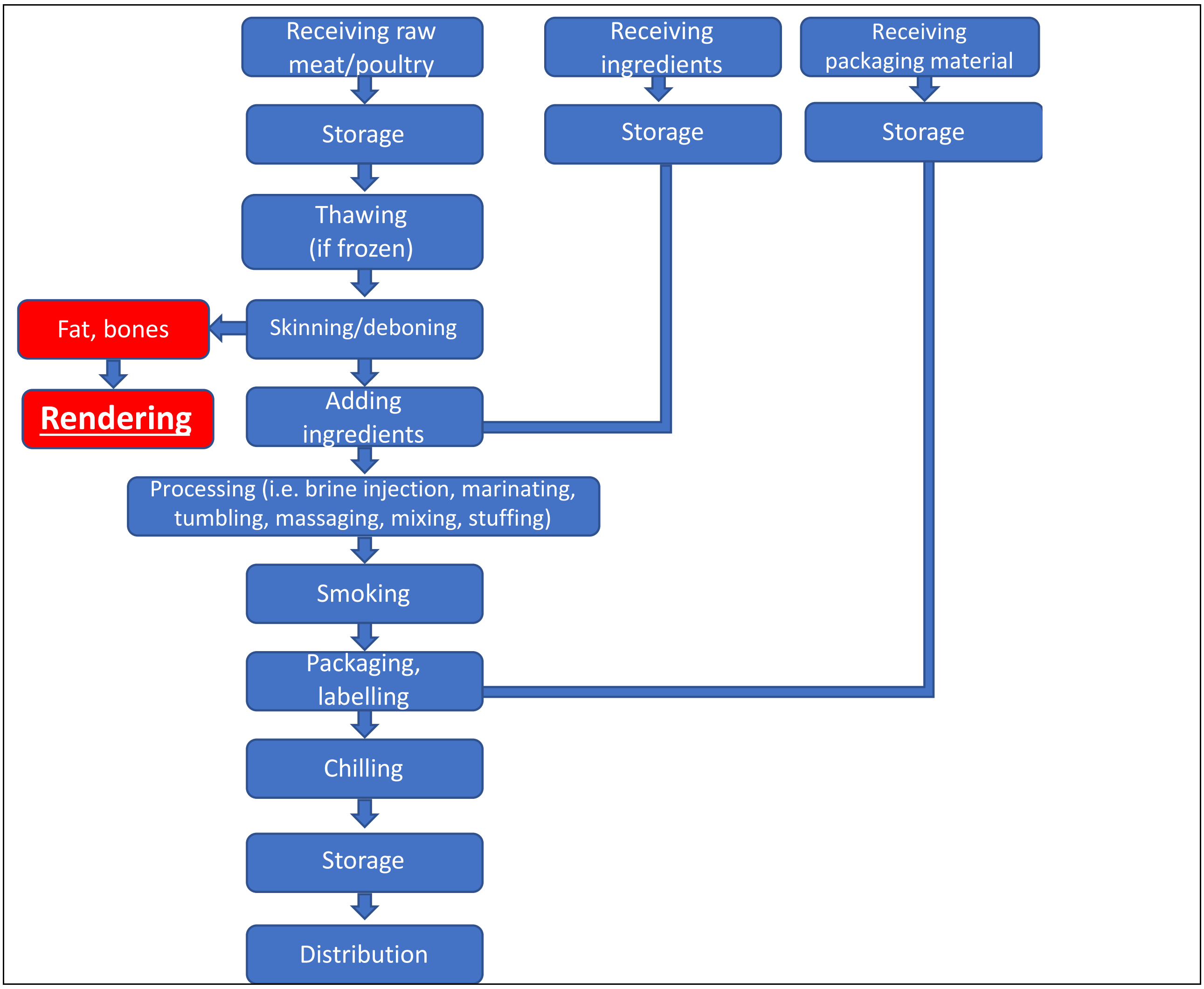
- meat processing plants,
- fish processing plants,
- dairy establishments,
- eggs and egg products plants.

It is extremely difficult to estimate the amount of ABPs (category 3) produced on average in these establishments, however in general we can assume that it is a limited quantity. Nevertheless, ABPs collection shall be organised also in these plants.

Meat products production, minced meat and meat preparation

An example of a flow diagram for a typical meat processing plant is reported at figure 1.A.7.

Figure 1.A.7. Typical flow diagram of a meat processing plant

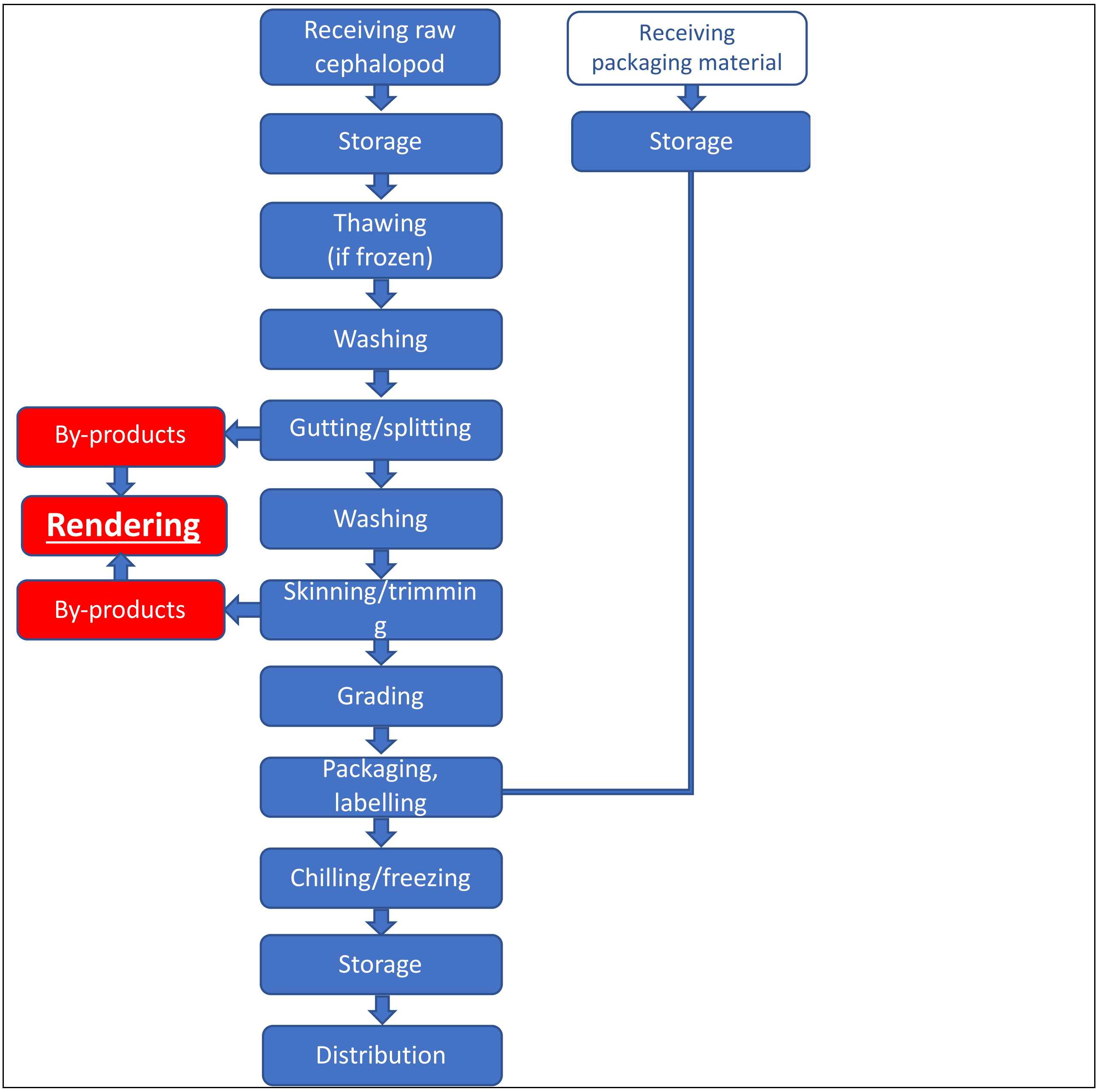


A certain amount of ABPs could derive from activities like deboning, when this is not carried out in the cutting plant. Even in case the meat is delivered already deboned, a limited amount of ABPs is generally obtained in meat processing plants and in establishments producing minced meat and meat preparation. These ABPs are usually resulting from the trimming and are cat. 3 materials.

Fishery products production

In the fish sector, ABPs are deriving from gutting, skinning, and trimming. The relevant amount is generally quite limited, however this is strictly connected with the type of production that is carried out in the plant. Some fishery plants are only washing and freezing fresh fish, and in this case ABPs are related to discarded product. Other fishery plants carry out gutting, skinning and trimming, and in these establishment ABPs amount can be significant, depending on the dimension of the activity. An example of a flow diagram for a fishery establishment is reported at figure 1.A.8.

Figure 1.A.8. Flow diagram: example of a fishery processing plant



Dairy products production (cheese as an example)

While the amount of by-products deriving from milk processing is quite significant, ABPs produced in the dairy sector that are delivered to the rendering plants are usually in a small amount.

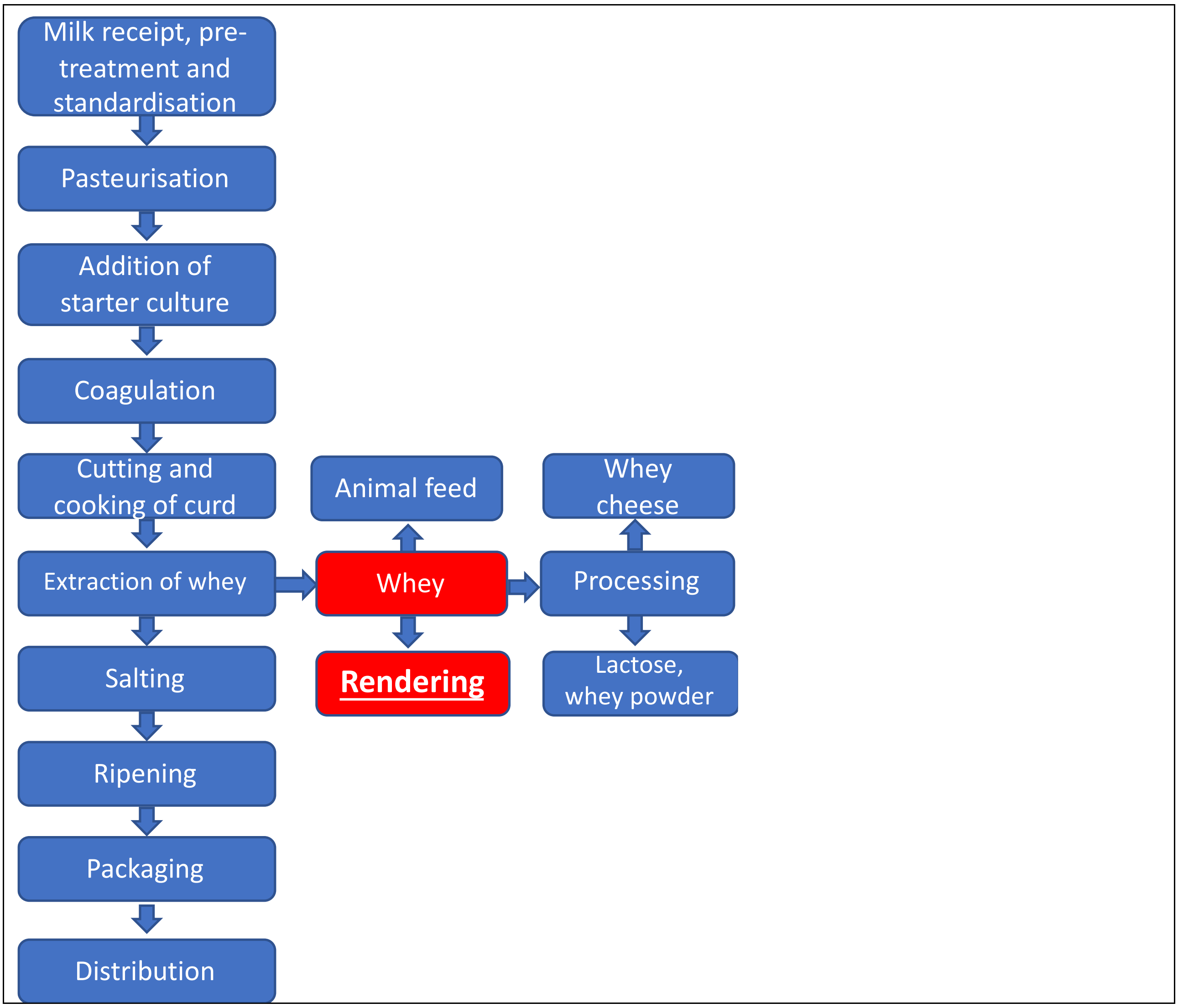
The most important ABP in the dairy sector is whey. As it was reported by the Italian Agency for Environment Protection, it can be estimated that for each ton of cheese produced, 5.9 tons of whey are obtained. A rough estimation of the destination of whey in Italy has been done, as follows:

- Around 30-33% is processed to obtain lactose and whey powder;
- 6-7% is used for the production of whey cheese (ricotta cheese);
- Around 30-33% is disposed of;
- Around 28% is used as animal feed, especially in the swine sector.

A recent trend in the dairy sector is the use of whey for human consumption, as a raw material for the production of low-fat whey-based drinks. The production of whey cheese (ricotta) or of low-fat whey-based drinks is strongly connected with the traditions of the country, the technologies available, etc.

An example of a flow diagram for a typical dairy plant is reported at figure 1.A.9.

Figure 1.A.9. Typical flow diagram of a dairy plant



Commercial returns, for example expired products, are often reused in specialised food industry. This should be further investigated, as maybe that in Moldova such sector is not well developed, and therefore maybe that expired products are to be disposed of and therefore could be a significant source of ABPs.

However, at this stage, it is impossible to estimate the quantities of ABPs that could be delivered by the dairy plants to the rendering plant, considering that basic data on the type and amount of dairy products produced in Moldova are lacking.

Eggs and egg products production

According to the codification of the “Technical specifications in relation to the master list and the lists of EU approved food establishments and certain other specified food establishments”, three types of food establishments can be classified in chapter X:

- Packing centre,
- Liquid egg plant,
- Processing plant.

Clearly, the flow diagrams of these activities are significantly different.

The flow diagram of the packing centres is quite simple, and it is showed in figure 1.A.10. The flow diagram of a processing plant is more complex, and a typical example is reported at figure 1.A.11.

In general, the amount of ABPs deriving from these activities is quite limited and consists essentially in cracked eggs, shells, discarded eggs.

Figure 1.A.10. Flow diagram of an eggs packing centre

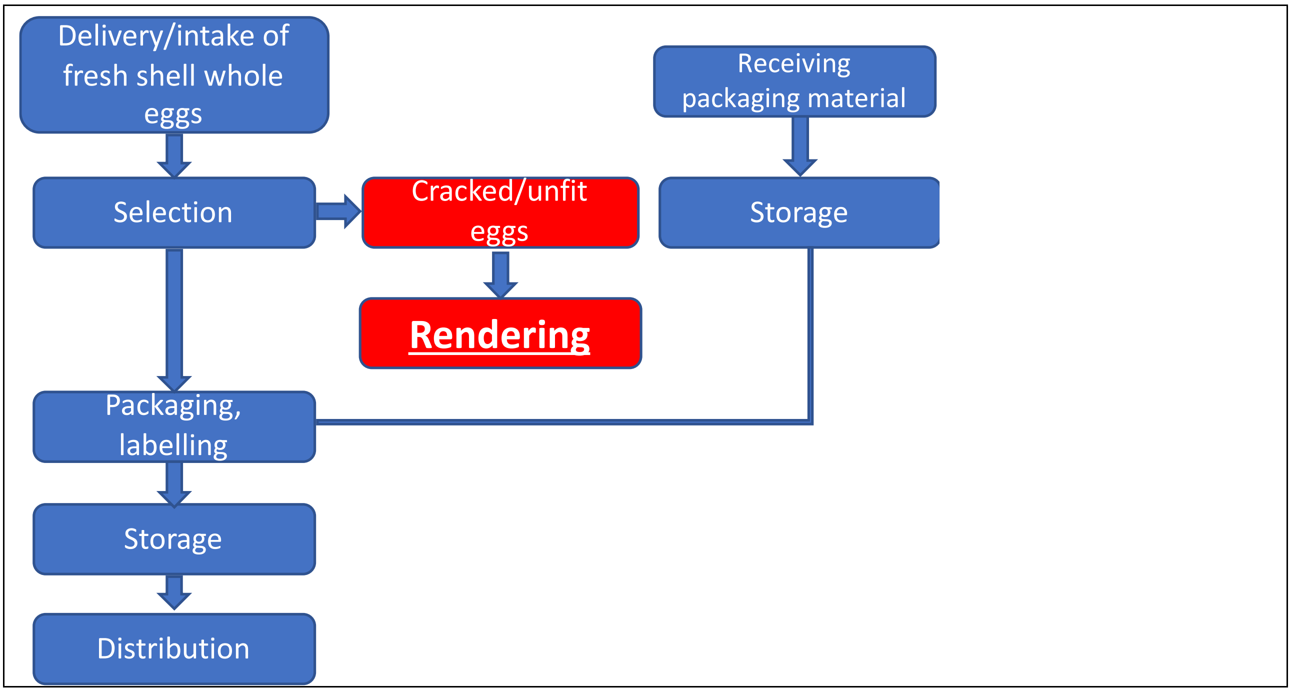
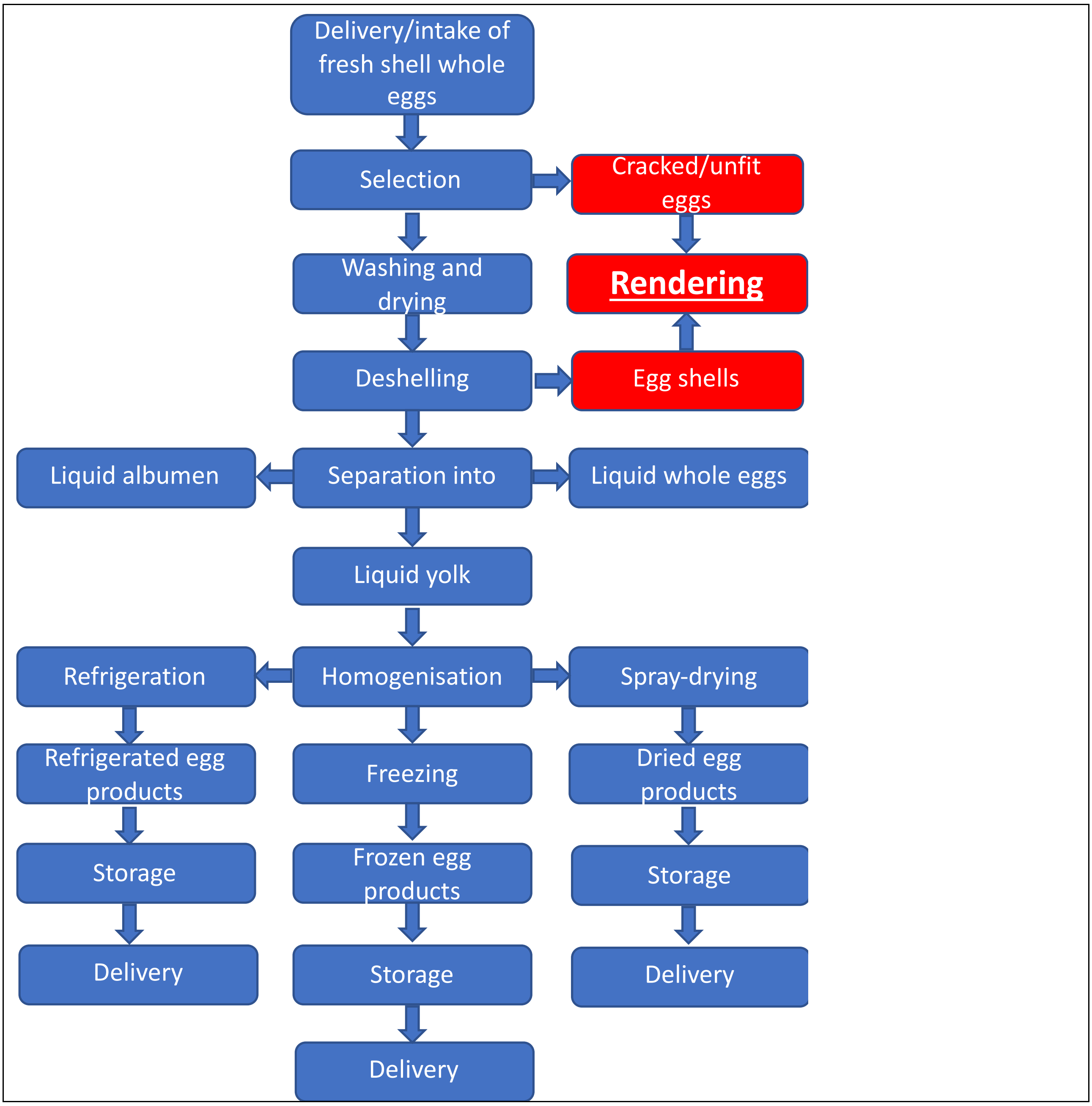


Figure 1.A.11. Flow diagram example of an egg products processing plant

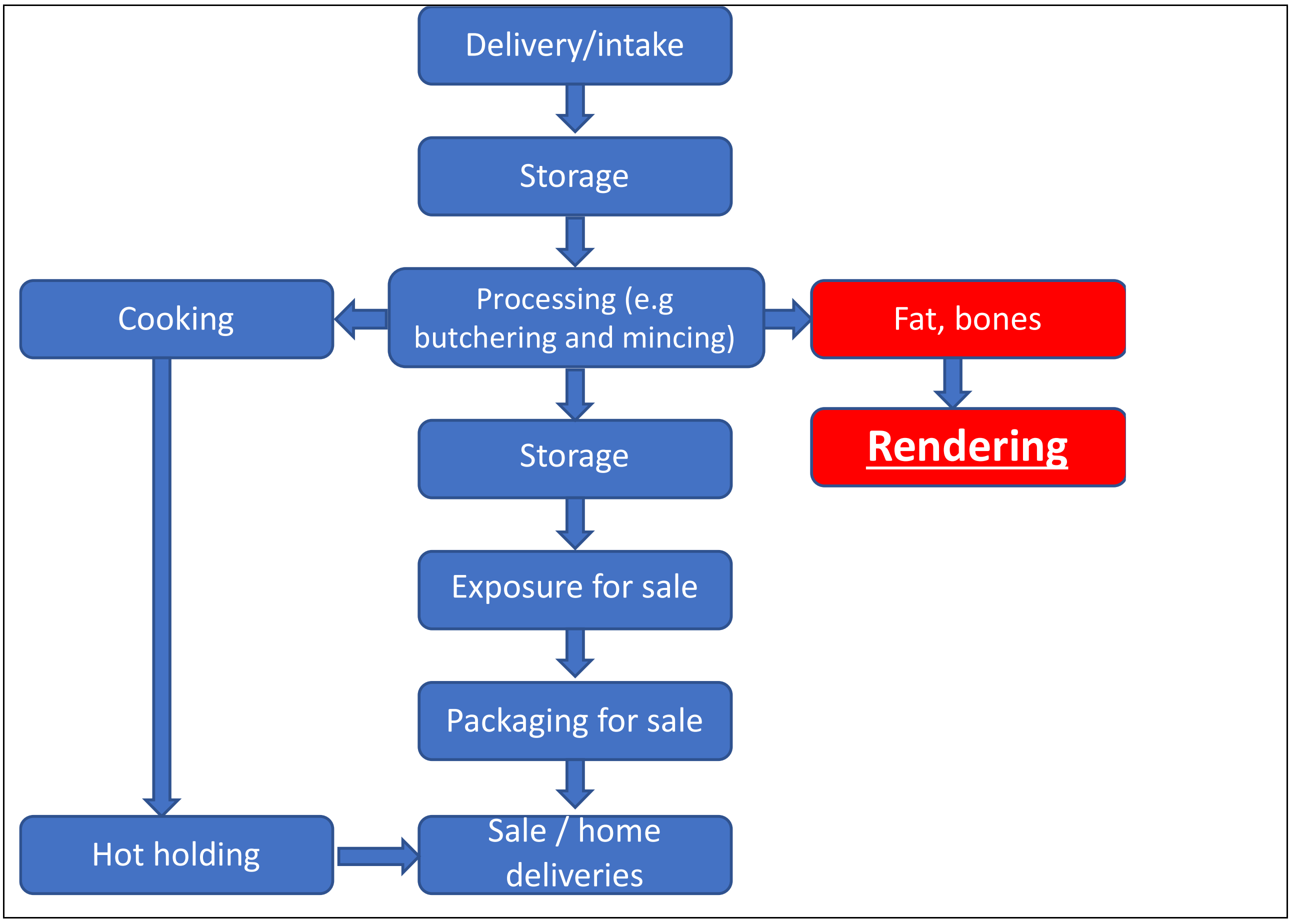


1.A.1.2.5. RETAIL (BUTCHER SHOP, SUPERMARKETS, CATERING)

According to the type of commercial activity, a butcher shop (or butchery departments attached to other retail activities, like the supermarkets) could receive meat in bone or already deboned. In the first case, deboning activity will take place in the processing room of the butcher shop or in the butcher department of the large retail, and in this case a certain amount of ABPs, namely fat and bones, will be obtained. These ABPs of cat. 3 have to be disposed of according to the legal requirements. The same situation could occur in some catering activities. In case meat is received already deboned, the ABPs obtained are in negligible amount (deriving from trimming), or no ABP is produced.

It should be considered that Regulation (EC) No 1069/2009 does not apply to raw pet food originating from retail shops, where the cutting and storage are performed solely for the purpose of supplying the consumer directly on the spot. A flow diagram describing activities in the retail sector is reported at figure 1.A.12.

Figure 1.A.12. Flow diagram related to retail activities (butcher shops, supermarkets, catering)



1.A.1.2.6. DEAD ANIMALS

Beside slaughterhouses and establishments processing food of animal origin, an important source of ABPs is deriving from livestock that dies of natural causes or disease, or killed on a farm for purposes other than human consumption. Dead animals of bovine, ovine and caprine have to be classified under category 1, while pigs and poultry fall under category 2. Dead animals to be considered include also pet animals, zoo and circus animals, road kills.

Clearly, in all the cases described above no flow diagram for the ABPs "production" can be elaborated. A flow diagram is included in chapter 1.A.1.3.2. in relation to collection and transportation of dead animals.

1.A.1.3. COLLECTION AND TRANSPORTATION

According to EU Regulations, FBOs are responsible for proper separation and storage of ABPs and have to provide for their transport to the nearest collecting facility or the nearest establishment where they are processed or safely disposed of.

1.A.1.3.1. ABPS COLLECTION FROM FOOD PROCESSING ESTABLISHMENTS

Usually, slaughterhouses are collecting ABPs on the production line using cleanable containers, easy to disinfect; these containers can be made in different materials (plastic, stainless steel, etc.). Afterward, there can be different solutions, as further summarised.

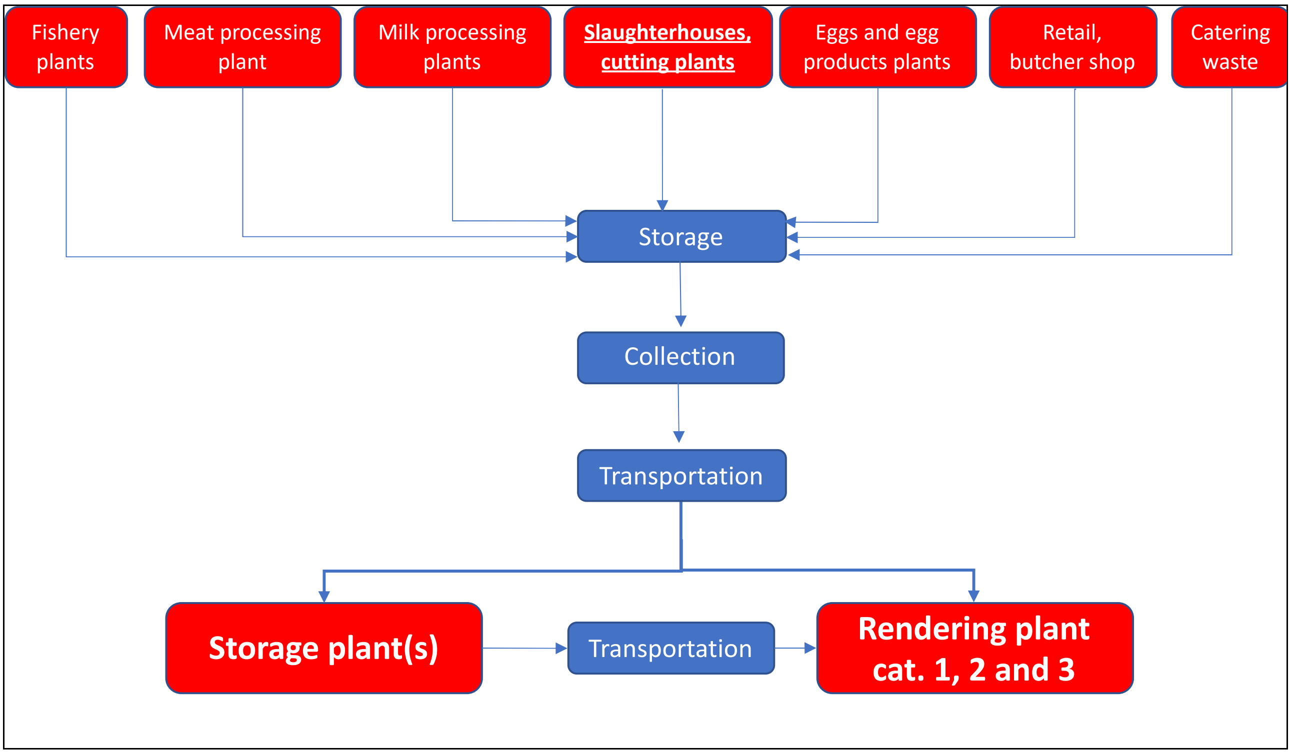
- Small slaughterhouses usually store the containers (adequately covered) in the chilling room, in such a way to avoid cross contamination with fresh meat. ABPs collection frequency is decided in agreement with the ABPs processing plant, containers are equipped with a lifting and tilting mechanism by crane, usually with a capacity of 0.5 tons.

- In medium-large slaughterhouses, two solutions can be adopted:
  - ✓ when ABPs are not collected on daily basis, ABPs are stored in rear and top loading watertight and detachable refrigerated containers, with a capacity of 10 tons;
  - ✓ when ABPs are collected on daily basis, ABPs are stored in watertight and detachable aluminium containers with top cover, with a capacity of 10-15 tons.

When ABPs are collected, containers are emptied in the truck container and therefore transported in bulk. Containers can be owned by the slaughterhouse or by the ABPs processing plant, loaned for use to the ABPs producers. In other cases, ABPs at the slaughterhouse are kept in large silos and then emptied into the container on the transport vehicle upon collection.

In food of animal origin processing plants, ABPs are usually not collected on daily basis, rather on weekly basis or every 2-3 days. In these establishment, ABPs are collected in cleanable containers, easy to disinfect, made in different materials (plastic, stainless steel, etc.). Once they are filled with ABPs, containers are stored at temperature of refrigeration (0-4°C) before being collected. Also in this case, they are emptied in the truck container when ABPs are collected. A flow diagram for collection and transportation of ABPs from food processing establishments is reported at figure 1.A.13.

Figure 1.A.13. Flow diagram for collection and transportation of ABPs from food processing establishments



ABPs collection and transportation can be organised in different ways:

a) collection and transportation to the storage plant or to the rendering establishment carried out directly by the FBO; in general, this solution is not adopted;

b) ABPs collected under the responsibility of the FBOs and transportation of ABPs from food processing plants carried out by the rendering plant; this is the most frequent situation;

c) ABPs collected under the responsibility of the FBOs and transportation of ABPs from producers carried out by local public utility services. This possibility should be evaluated: public utility services could collect ABPs from retail activities (butcher shops, fishery shops, large retail, supermarket, etc.) and from small establishments, being equipped with small vehicles with a capacity of 3-4 tons. They could transport ABPs to the storage establishment or to the processing plant, according to the option that will be chosen.

1.A.1.3.2. FALLEN STOCK COLLECTION

Dead animals shall be transported to the rendering plant as soon as possible. Dead bodies should be kept in chilled or at least shaded conditions until collection.

Pending consignment, dead bodies must be stored in such a way that animals and birds (including wild animals and birds) do not have access to it. Bins can be used for the temporary storage of certain fallen stock especially during times of high mortality, such as the lambing season. They must be:

- clean, disinfected and intact before they are left on holdings;
- sited so that they are not accessible to livestock and in a place where the collection vehicle has sufficient room to enter the site, collect and exit the site without encroaching on livestock areas;
- leak-proof and lidded.

Fallen stock could be placed along the public road, but well covered. The truck used to collect fallen stock should not enter the farmyard for biosecurity reasons.

Dead animals' collection from the farms should be optimized in a way to reduce as much as possible the time between animals' death and collection of the dead bodies. For this purpose, a call center could be established, where animals' owner should call in case of animals' death. The call center could be established directly in the rendering plant, in the offices of the Competent Authority or in another public service in charge for payments in the agriculture sector. The system could work as follows:

1. one or more animals die on the farm,
2. the farmer calls the call center,
3. the call center queries the livestock database,
4. if the animal (s) are present on the farm, have registered ear tags, there are no veterinary restrictive measures in the farm or in the area where it operates, the Call Center asks for the intervention of the rendering plant that is in charge for collecting and transportation of dead animals,
5. the rendering plant collects the dead animals, process the dead animals and returns the notification of the treatment to the Call Center,
6. the Call Center deletes the animal(s) from the national database.

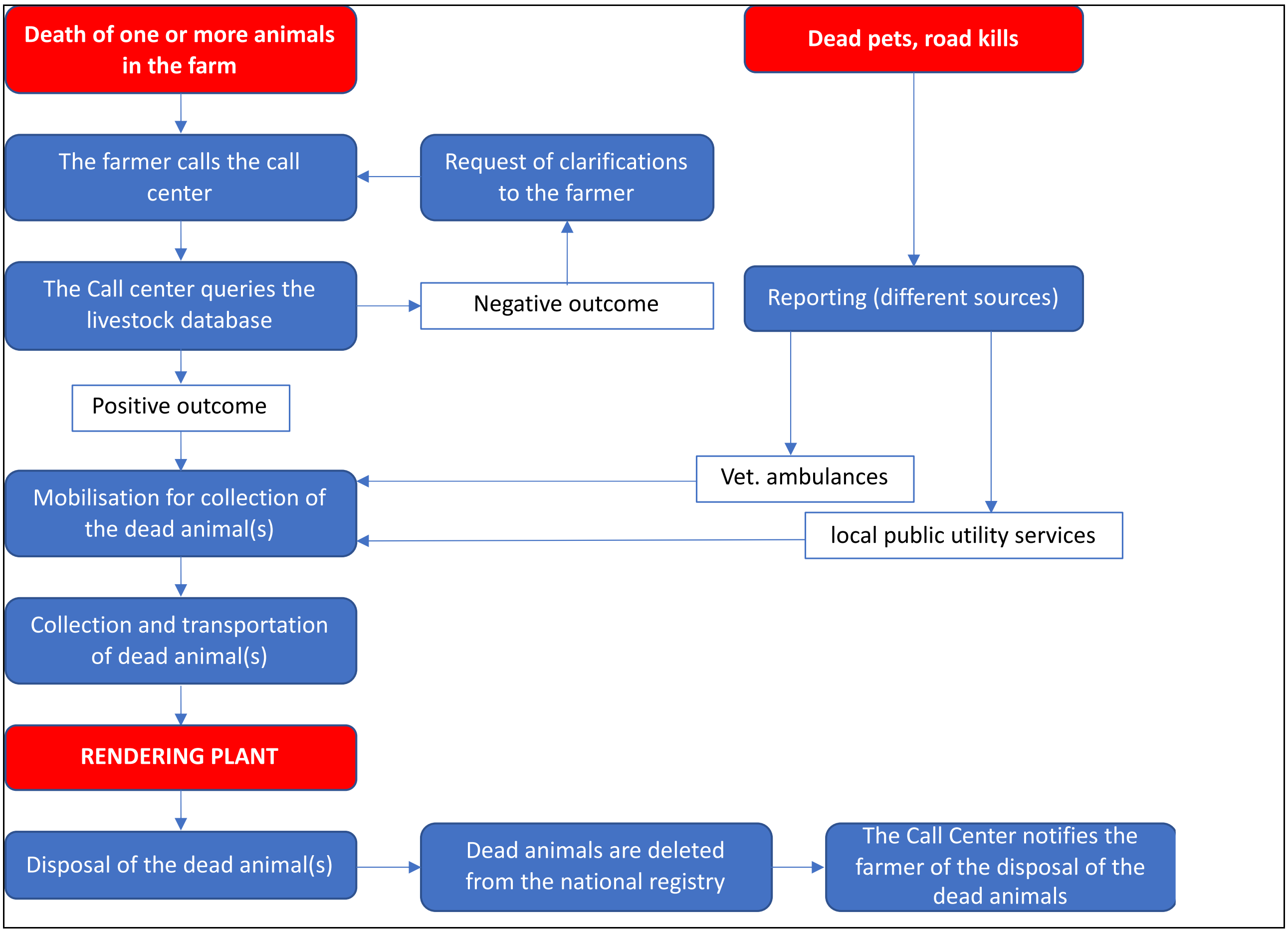
With this system, the risk of fraud would be significantly reduced, and the national database would be permanently updated.

A flow diagram for collection and transportation of dead animals is reported at figure 1.A.14.

Few considerations can be made:

- the average weight of bovines requires the use of specialised vehicles (even if in some cases calves, that are not so heavy, have to be collected);
- the most significant effort will be needed for collecting dead bovines and the logistic for collection of dead bodies should be organised on the basis of the distribution in the country of live bovines; indeed, the collection of dead ovicaprines and pigs is simplified by the average weight of these animals;
- cattle farms are concentrated in the northern area of Moldova (around 50% of live animals), a certain number is located in the central area (around 30%) and only a very small number of bovines are reared in the south area;
- pigs and poultry are concentrated mostly in the central area.

Figure 1.A.14. Flow diagram for collection and transportation of dead animals



1.A.1.3.3. ABPs TRANSPORTATION

According to EU Regulations, Operators that transport ABPs shall be registered so as to permit official control over the flow of materials and ensure their traceability. According to article 21 of Regulation 1069/2009, ABPs and derived products must be collected and transported without undue delay in sealed new packaging or covered leak-proof containers or vehicles.

Annex VIII, Chapter I, Section I of Regulation 142/2011 defines the requirements for vehicles and containers used for ABPs transportation. Vehicles and reusable containers, and all reusable items of equipment or appliances that come into contact with animal by-products or derived products, must be maintained in a clean condition. In particular, unless they are dedicated to the carriage of particular animal by-products or derived products in a way which avoids cross-contamination, they must be:

(a) clean and dry before use; and

(b) cleaned, washed and/or disinfected after each use to the extent necessary to avoid cross-contamination.

Reusable containers must be dedicated to the carriage of a particular animal by-product or derived product to the extent necessary to avoid cross-contamination. However, reusable containers may be used, provided the competent authority has authorised such use:

(a) for the carriage of different animal by-products or derived products provided that they are cleaned and disinfected between the different uses in a manner which prevents cross-contamination;

(b) for the carriage of animal by-products or derived products, following their use for the carriage of products intended for human consumption, under conditions which prevent cross-contamination.

Packaging material must be disposed of, by incineration or by other means in accordance with EU legislation.

Temperature requirements

According to Reg. 1069/2009, ABPs shall be collected, identified and transported without "undue delay". Undue delay is not defined in the EU Regulation but is taken to mean as soon as reasonably practicable taking account of individual circumstances for example the availability of a collection service, the storage temperature of the fallen stock (for example dead bodies stored at ambient temperatures should be disposed of more quickly that those kept chilled or frozen) and any specific circumstances such as poor weather or health risks. Consequently, a pragmatic approach particularly in winter and poor weather conditions should be adopted.

Annex VIII, Chapter I, Section II of Regulation 142/2011 defines the rules concerning the temperature conditions for ABPs transportation. The transport of ABPs destined for the production of feed material or raw petfood must take place at an appropriate temperature, in the case of animal by-products from meat and meat products which have been destined for purposes other than human consumption, at a maximum of 7 °C, unless they are used for feeding purposes in accordance with Chapter I of Annex II, in order to avoid any risk to animal or public health.

Unprocessed Category 3 material destined for the production of feed material or petfood must be stored and transported chilled, frozen or ensiled, unless it is processed within 24 hours after collection or after the end of storage in chilled or frozen form, if the subsequent transport takes place in means of transport in which the storage temperature is maintained.

The design of vehicles used for refrigerated transport must ensure the maintenance of an appropriate temperature throughout transport, and allow that temperature to be monitored.

It is suggested that the transportation of dead bodies from farms is carried out by the rendering plant, that should be obliged to organize the transport of dead bodies no later than 24 hours after receiving the notification of the death of the animal. In the period from June 1 to September 15 (or when the outside air temperature is higher than 25 ° C), the transportation should be done within 12 hours of receipt of the notification. This is because ABPs entering into the processing plant must be in such a condition that it is suitable for processing - should not be putrid, rotten or decomposed.

1.A.1.4. STORAGE

A storage establishment is a plant, where animal by-products are stored temporarily before processing or disposal. Storage establishments must be adequately separated from thoroughfares through which contamination may be spread and from other premises such as slaughterhouses. The layout shall ensure the total separation of Category 1 and Category 2 material from Category 3 material respectively, from reception until dispatch, unless in a completely separate building. Storage establishments must:

- have a covered space to receive and dispatch ABPs, unless the ABPs are being discharged through installations which prevent the spreading of risks to public and animal health;
- be constructed in such a way that it is easy to clean and disinfect; floors must be laid down in such a way as to facilitate the draining of liquids;
- have adequate facilities including lavatories, changing rooms, washbasins for staff and, if appropriate, office space which can be made available to the staff performing official controls;
- have appropriate arrangements for protection against pests, such as insects, rodents and birds;
- where it is necessary for the purpose of achieving the objectives of the Regulation, plants must have suitable temperature-controlled storage facilities of sufficient capacity for maintaining ABPs at appropriate temperatures and designed to allow the monitoring and recording of those temperatures;
- be equipped with adequate facilities for cleaning and disinfecting the containers and for the vehicles in which they are transported. Adequate facilities shall be available for the disinfecting of vehicle wheels.

When storage is carried out in plants approved or registered in accordance with Art. 4 of Reg. (EC) No 853/04 or in accordance with Art. 6 of Reg. (EC) No 852/04, no specific registration is required for ABPs storage.

1.A.1.4.1. FLOW DIAGRAM: ONE OR MORE STORAGE ESTABLISHMENT(S)

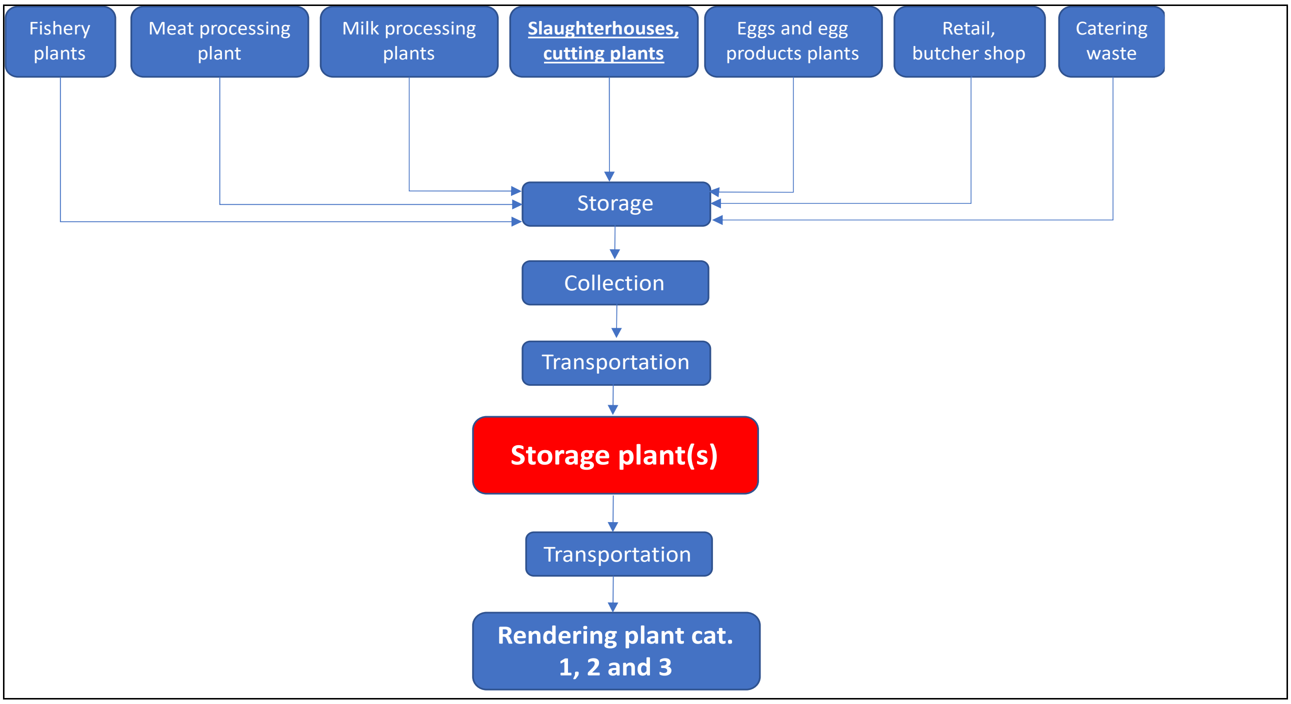
The opportunity to build one or more storage plant in the Country is strictly connected with the solution that will be adopted concerning the processing plants and with the outcomes of the traffic study. According to the location that will be chosen for the establishment of the rendering plant(s), considering the location of the main ABPs producers (large slaughterhouses and meat processing plants), routes for ABPs transportation will be proposed, with relevant time needed. This will allow to decide on the opportunity to include one or more storage plant(s) in the ABPs management system of the Country. Basically, these plants could be intermediate point of storage where ABPs gathered from the “peripheral” areas (usually in small quantities), will be temporarily stored and after a short time shipped with one big truck to the processing plant.

In general, if it will be decided to establish one or more of these storage plants, it is suggested that the storage plant(s) will be refrigerated whichever is the category of ABPs to be stored.

Concerning dead animals, the construction of large storage plant(s) is not suggested, for public health reasons. It could be evaluated the opportunity to establish collecting points (especially for pigs and poultry) in correspondence of large farms, if existing. Dedicated vehicles could periodically collect ABPs from these collecting points, transferring directly dead animals to the processing plant. Therefore, the storage plant eventually built would be dedicated only to ABPs collected from slaughterhouses, cutting plants, food of animal origin processing establishments, butcher shops.

The ABPs flow at the level of the storage establishment(s) is quite simple, as it is reported at figure 1.A.15. ABPs collected from slaughterhouses, cutting plants, food of animal origin processing plants, butcher shops and catering sector are transferred to the storage plant where they are stored for a limited time. Afterward, ABPs are transported to the rendering plant.

Figure 1.A.15. Flow diagram: ABPs storage



1.A.1.4.2. FLOW DIAGRAM: NO STORAGE ESTABLISHMENT

Another option is to avoid building storage plant(s) and organise the logistic in a way that ABPs would be collected and delivered directly to the processing plant. In this case, the general flow diagram representing the ABPs chain does not include the storage, and ABPs are transported directly from the place of collection to the processing establishment.

1.A.1.5. PROCESSING

Processing methods are described in Commission Regulation (EU) No 142/2011, Annex IV, Chapter III. Method 1 is suggested in the prefeasibility study; among the others, method 4 is quite common in the animal by-products plants in the Member States, and therefore these two methods are further taken in consideration.

- Processing method 1 (pressure sterilisation) is the method where the animal by-products with the particle size up to 50 millimetres must be heated to a core temperature of more than 133 °C for at least 20 minutes without interruption at a pressure (absolute) of at least 3 bars. The pressure must be produced by the evacuation of all air in the sterilisation chamber and the replacement of the air by steam ('saturated steam'); the heat treatment may be applied as the sole process or as a pre- or post-process sterilisation phase.
- In processing method 4, particle size of the animal by-products to be processed shall be no greater than 30 millimetres. Particle must be placed in a vessel with added fat and heated in a manner which ensures that a core temperature greater than 100 °C is achieved for at least 16 minutes, a core temperature greater than 110 °C is achieved for at least 13 minutes, a core temperature greater than 120 °C is achieved for at least eight minutes and a core temperature greater that 130 °C is achieved for at least three minutes. The core temperatures may be achieved consecutively or through a coincidental combination of the time periods indicated.

Both processing methods may be carried out in batch or continuous systems.

Theoretically, the two systems can be considered as equivalent in terms of quality and quantity of derived products obtained from the processing. However, it should be considered Cat. 1 MBM obtained from processing method 4 cannot be buried in a landfill. Some difficulties could arise in exporting to EU Member States MBM and animal fat obtained from processing ABPs using method 4, because the EU legislation foresees the possibility that the Competent authorities could ask that derived products are obtained from processing ABPs with method 1 (however this is not an obligation, just a possibility given to the Competent Authority).

In general, from each type/category of processing plant the following Derived Products are obtained:

a) Derived Products of cat.1: MBM and animal/rendered fat for technical purpose. Both these products must be incinerated in one of the existing incineration facilities (thermal power plants, steel mills, incineration plants, concrete plant) in the country or abroad; only MBM processed with method 1 can also be buried in a landfill (unless deriving from animals infected or suspected by a TSE).

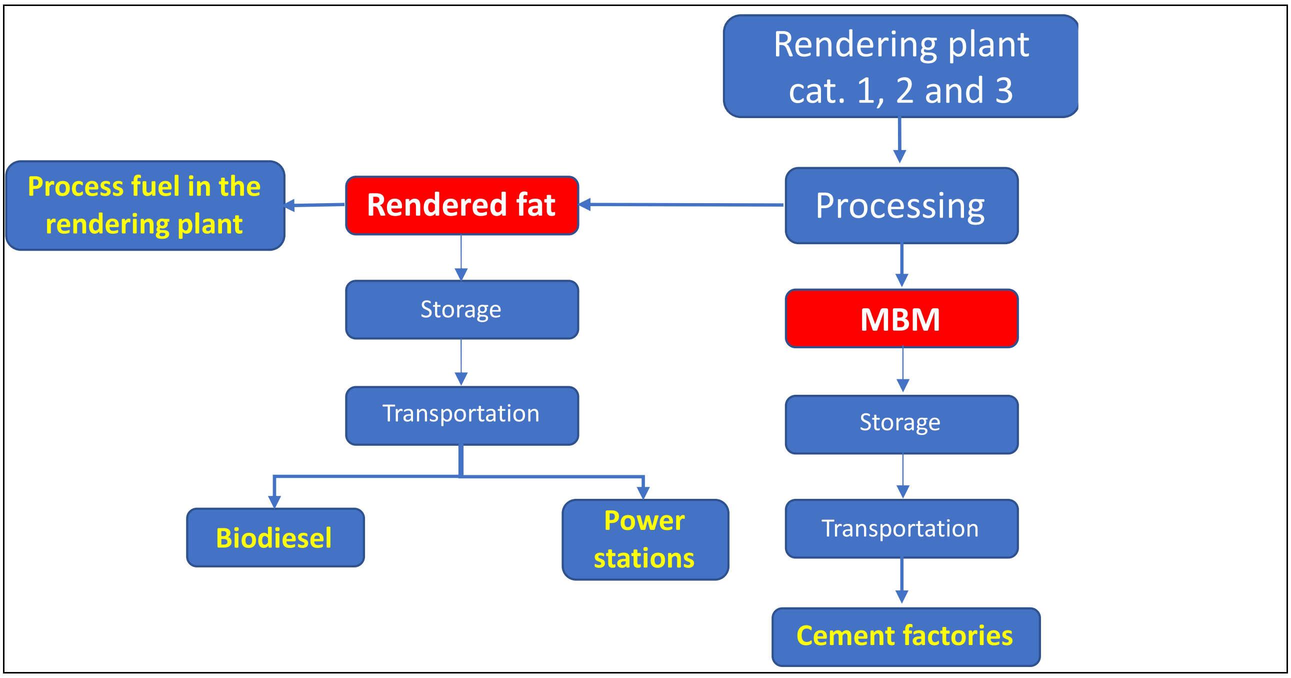
b) Derived Products of cat.2: technical fat and MBM could be incinerated in one of the existing incineration facilities (thermal power plants, steel mills, incineration plants, concrete plant) in the country or abroad; MBM can also be buried in a landfill in line with the conditions prescribed, or used as fertilizer, or in biogas plants, or in one composting plant.

c) Derived Products cat.3: Processed Animal Protein (PAP) and animal fat. This kind of fat could be used as feed for farmed animals. PAPs coming from all animals can be used as raw material for pet food.

1.A.1.6. USE AND DISPOSAL

The last step of the flow diagram of ABPs is the transportation of the derived products for final disposal. From processing category 1 ABPs we will obtain Meat and Bone Meal (MBM) and animal fat, as represented at figure 1.A.16.

Figure 1.A.16. ABPs use and disposal



1.A.1.6.1. MEAT AND BONE MEAL

MBM cannot be used as a feed ingredient but is valued as a source of green energy and a raw material in a variety of industrial applications.

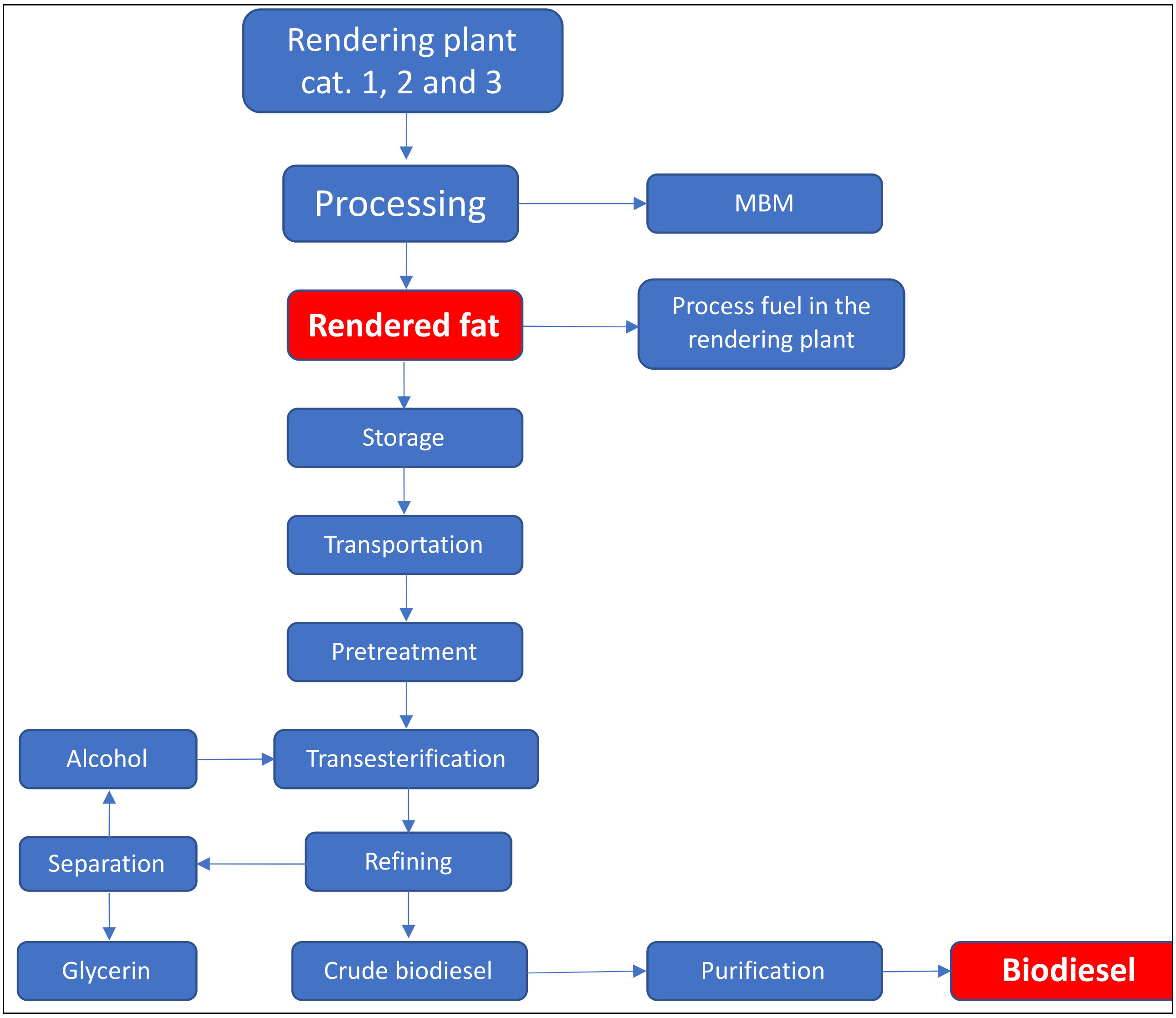
Co-incineration in cement kiln systems is the most common way for MBM destruction: indeed, these process plants are equipped with systems to control the potential adverse effects from combusting this material. If co-incineration in cement kiln is not possible, MBM can be used as a fossil-fuel replacement for energy generation: biomass power stations have taken the use of MBM further as a source of alternative fuel and renewable energy.

Meat and bone meal is used in several cement kilns, in particular in Western Europe. MBM has around two thirds the energy value of fossil fuels such as coal, and it is increasingly used in cement kilns as an environmentally sustainable replacement for coal. Since it contains only biogenic materials it can be categorised as 100% biomass fuel which gives no net carbon dioxide emissions during the combustion process.

1.A.1.6.2. RENDERED FAT

The rendering plant will use animal fat produced in-house to replace the use of oil in their steam boilers, saving large quantities of fuel oil used for producing thermal energy. Depending on the quality and quantity of the Animal By-Products rendered, the plant will be able to cover up to 80% of the boiler’s energy requirements, with the animal fat produced on site. The plant will therefore be able to save most of the amount needed per ton of processed ABPs. The main market for the remaining animal fats is the manufacture of biodiesel. A flow diagram on the production of biodiesel from ABPs is presented at figure 1.A.17.

Figure 1.A.17. Flow diagram: production of biodiesel from ABPs



1.A.2. OVERALL ASSESSMENT OF THE PRE-FEASIBILITY STUDY

A “Prefeasibility study on the utilisation of Moldovan ABPs” has been carried out under the EU-funded ENPARD technical assistance (project reference EuropeAid/137050/DH/SER/MD) in 2017-2018. The prefeasibility study is focused on the establishment of a comprehensive, EU-compliant system for the management of ABPs. Its findings are based on 2015-2016 data and propose several options to be considered in terms of creating the relevant ABP management infrastructure.

In the prefeasibility study is clearly stated that the current way of disposal of animal waste is not in compliance with the EU regulations and standards in terms of sanitary safety and the initial analyses indicate that risks to animal health and environment is very high.

Main conclusions of the prefeasibility study can be summarised as follows:

- there is no systematically designed and operated public or private handling and management directed at ABP in Moldova;
- based on data provided by ANSA or “Statistica Moldovei” the ABPs are estimated about 31,000 tonnes to be disposed-off yearly (1,383 tons/year of cat. 1; 10,727 tons/year of cat. 2; 18,815 tons/year of cat. 3), excluding: manure, hides, skin, feathers, bristles, whey, catering waste;
- it is estimated that ABPs production will increase significantly;
- the majority of ABPs is obtained from slaughtering, preparation and processing of the carcasses/meat, the most hazardous ABPs come from the fallen stock;
- due to small yearly quantity, it is recommended to incinerate cat. 1 ABPs;
- the Moldavian environmental legislative framework should be amended, to remove the inconsistency between the Law for Animal-By- Products and the environmental legislation regards incineration/co-incineration;
- based on the financial calculations and projections, it is recommended the establishment of two separate rendering plants for processing respectively cat.2 and cat.3 ABPs;
- the investment for building two separate rendering plants for processing respectively cat.2 and cat.3 ABPs has been estimated as follows: 9.2 mill EUR, 25% equity and 75% credit;
- the preliminary assessment indicated a positive economic viability for such rendering business.

The prefeasibility study recommends the adoption of the following priority measures.

1. Organisation of a centralised "Call Centre" that would receive requests for collection of ABP Cat.1.
2. Preparation of a detailed Traffic study of the existing main road network (collection rounds and loads).
3. On the basis of the results of the study, identification of the optimized routes for collection and transport of Category 1 ABPs, of the number of vehicles required, skips and handling equipment.
4. Identification of the possible need of intermediary collection points for the temporary, temperature controlled, storage of Category 1 APB.
5. Activation of incineration equipment, central and possibly mobile solutions for treating 1,383 Tons/year of Cat.1 ABPs.

Main conclusions and recommendations of the prefeasibility study have been critically reviewed, and main conclusions are further summarized.

1.A.2.1. AMOUNT OF ABPs TO BE PROCESSED

In the prefeasibility study, no technical detail is provided on the type of ABPs processing establishment to be build (dimension, potentiality, technical characteristics, etc.), but clearly the amount of ABPs to be processed in the forthcoming years is a crucial parameter. Therefore, we consider important that the estimations on future amount of ABPs to be processed is made on the basis of reliable sources.

1.A.2.1.1. CATEGORY 1 ABPs

The prefeasibility study indicates that the priority measures of the Moldova veterinary and environmental institutions should be the creation of the Category 1 collection, transport, storage and disposal system, which will initially target the safe management of solid ABPs of Cat.1.

Based on data provided by ANSA or "Statistica Moldovei" the ABPs are estimated about 31,000 tonnes to be disposed-off yearly (1,383 tons/year of cat. 1; 10,727 tons/year of cat. 2; 18,815 tons/year of cat. 3), excluding: manure, hides, skin, feathers, bristles, whey, catering waste.

A detailed estimation of ABPs amount produced in Moldova is included further on, and results are significantly different.

This is mainly due to the very small amount of cat. 1 ABPs that has been estimated in the prefeasibility study. Indeed, we should consider that cat. 1 ABPs are deriving from two sources: SRM obtained in slaughterhouses (from cattle, sheep and goats) and fallen stock (cattle, sheep and goats). While the estimation of cat. 1 ABPs obtained in the slaughterhouses is acceptable, the prefeasibility study, in our opinion, underestimates the amount of fallen stock to be treated as cat. 1. This is probably due to the fact that the estimation is done on the basis of figures communicated by the competent authority on the number of dead animals that are officially declared by the farmers to the competent authority: 0.03% for adult cattle, 0.01% for sheep and goats.

Actually, according to literature and previous experiences, the mortality rate has to be calculated from 3% to 5%. This would significantly increase the amount of cat. 1 ABPs to be disposed, as it will be shown in detail further on. Roughly, this would mean 3,000-4,000 tons/year (depending on the mortality rate) of cat. 1 deriving from fallen stock to be disposed.

1.A.2.1.2 FUTURE PROJECTIONS FOR ABPSs PRODUCTION

Notwithstanding a decrease of the population in Moldova, a significant increase in the ABPs production has been estimated: if the amount of ABPs calculated for 2019 is 30,925 tons/year in total, it has been estimated that this amount will increase to 54,609 tons/year in 2033, and to about 70,000 tons/year in 2039. This would mean than more than double ABPs would be obtained by 2039. This increase is calculated probably on the basis of a study published by FAO in 2003 (World agriculture: towards 2015/2030).

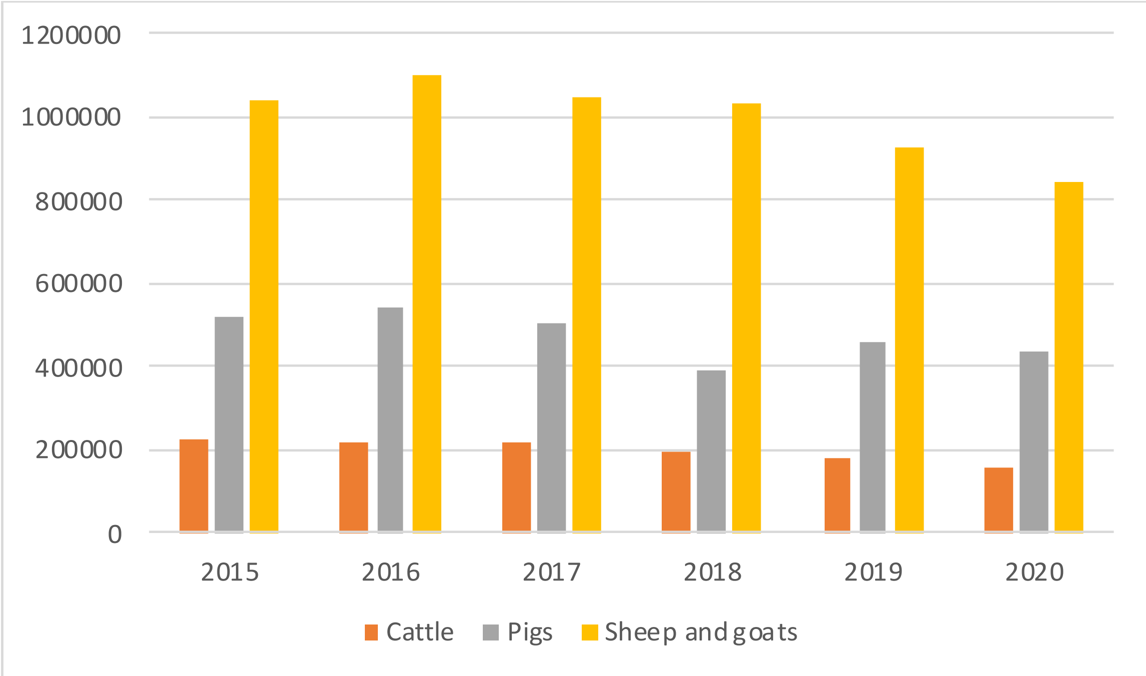
The estimation in the prefeasibility study starts from the assumption that an increase of meat consumption would automatically have a direct backlash on the number of slaughtered animals. Actually, even if such a significant increase in meat consumption would be observed, this would not necessarily mean that the consumed meat would derive from an increased slaughtering activity. Meat could be imported, and in this context, it would be more appropriate to evaluate the increase in the number of farmed animals.

Therefore, we have analysed data on slaughtering activity and livestock for the last 5 years. Observing the trends, there is a constant decrease in the number of livestock in the Country, as it is shown at table 1.A.2 an represented at figure 1.A.18 (data from ANSA).

Table 1.A.2. Trend in livestock population, all categories of producers (ANSA)

Year	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*
Cattle	222,320	215,202	215,742	195,781	178,489	159,145
Pigs	522,566	543,851	505,981	389,111	456,679	434,319
Sheep and goats	1,039,730	1,101,655	1,047,827	1,035,629	931,361	845,014
Horses	37,426	42,306	39,975	35,911	32,442	37,609
Rabbits	355,145	357,765	411,865	365,134	397,832	364,272
Poultry	18,560,634	20,965,211	17,290,745	16,575,968	18,675,982	16,717,769

Figure 1.A.18. Trend in livestock population in Moldova (2015-2020, data from ANSA)

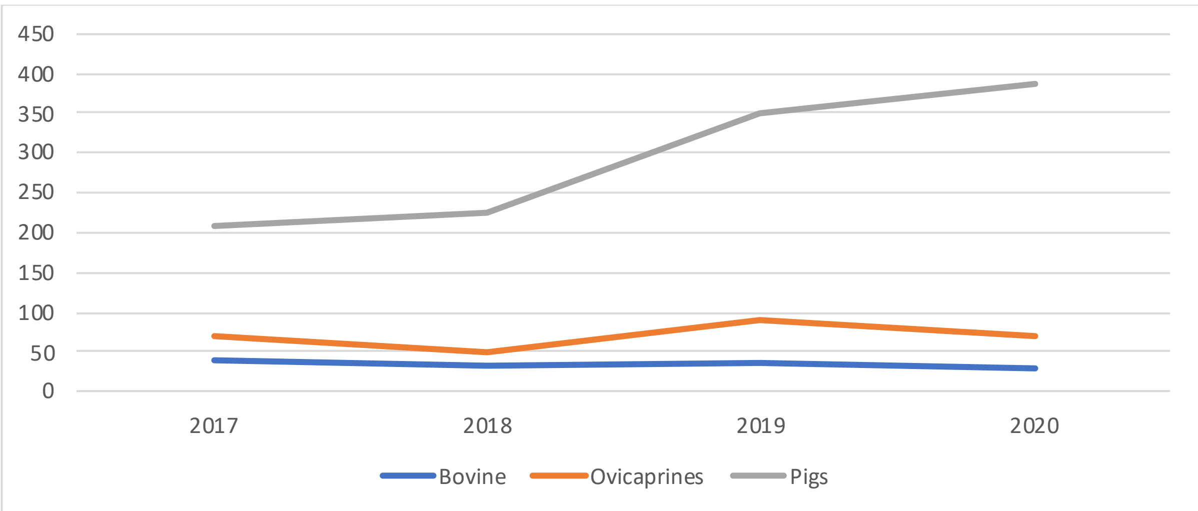


The situation is different if we look at data on slaughtering activity in the last 5 years, as it is shown in table 1.A.3 and figure 1.A.19. While bovines' slaughtering is decreasing quite significantly, the number of slaughtered pigs is considerably increasing (almost doubled in 4 years). Data on ovicaprines and poultry are contradictory, and it is difficult to identify a specific trend. For our purpose, however, we could estimate that ABPs amount deriving from slaughtering activity will remain quite constant, maybe with a small increase.

Table 1.A.3. Trend of slaughtering activity in Moldova (ANSA, 2017 – 2020)

Year	*2017*	*2018*	*2019*	*2020*
Bovine	39,840	34,385	35,670	28,921
Ovicaprines	70,720	50,078	88,592	68,548
Pigs	207,192	226,704	349,092	387,895
Poultry	15,988,618	16,030,403	19,860,512	17,411,547

Figure 1.A.19. Trend of slaughtering activity in Moldova (ANSA, 2017 – 2020)



Based on these data, we estimate that if an increase in ABPs production will be observed, this will be quite limited.

Therefore, we strongly suggest to stick to the amount of ABPs that are currently produced in the Country, and to try, as much as possible, to estimate precisely such amount. This could be increased to face emergency situations like natural disasters or epidemic diseases, therefore we consider appropriate that the ABPs rendering system would have an increased capacity. This is also because a certain increase of slaughtering activity could be determined by the decreasing of “home slaughtering” in the next few years.

Beside, the real challenge is to organize the whole system in a way that ABPs are collected from all the sources (this issue will be further taken in consideration).

1.A.2.2. ABPs DISPOSAL: SUGGESTED SYSTEM

According to the prefeasibility study, ABPs should be disposed as follows:

- incineration of cat. 1 ABPs, due to small yearly quantity, to be carried out using mobile incinerators;
- establishment of two separate rendering plants for processing respectively cat.2 and cat.3 ABPs.

1.A.2.2.1. INCINERATION

In a presentation included in the prefeasibility study, it is stated that on February 2018 a Donation Receiving Act was signed, in relation to a used high capacity incinerator (Hurikan 1000) from Estonia, that could solve the entire processing needs for the estimated quantity of cat. 1 ABPs. It should be clarified if such incinerator is in operation and how much ABPs is incinerating on daily/weekly/yearly basis.

The solution of incineration can be acceptable in emergency situations or when the total amount of ABPs to be disposed is very limited. The reasons for which incineration as a solution for cat. 1 ABPs disposal in Moldova is not recommended, are further summarized.

- Actually, the amount of cat. 1 ABPs to be processed in Moldova is not small. According to our calculation, this would be equal to 4,392 tons/year. The use on an incinerator (Hurikan 1000 emergency incineration system) with a capacity of 1 ton/hour, plus two mobile incinerations (capacity not clarified) would not be sufficient for the needs of the Country. With this capacity, the “main” incinerator could process a maximum of 2,000 – 2,500 tons/years, largely insufficient for the Moldovan needs. The additional mobile incinerators would surely not be able to incinerate a significant amount of ABPs. As an additional remark, it should be noted that Hurikan 1000 is defined as an “emergency incineration system”.
- Direct incineration /co-incineration of fresh ABPs has been evaluated as energetically and economically not feasible by experts who were consulted. Incineration of ABPs has a very high cost, as a considerable amount of fuel has to be used for this process. An estimation made in an incineration plant in Italy resulted in a cost of around € 200.00 for each dead bovine animal (including all the costs: staff, fuel, depreciation); until 2005, the public incinerator of the city of Torino (Italy) applied a rate of € 150 for each dead adult bovine, and this rate covered the costs at that time.

Once we have established that an “emergency incinerator” would not be adequate for solving this problem in Moldova, it is clear that, if the incineration is the solution, a dedicated plant should be built. A rough estimation of the costs for the construction of an incinerator and the relevant annual operating cost can be useful to make a comparison between incineration and processing.

Therefore, an estimation of the costs for the construction of an incinerator and for the annual operating cost has been made and is attached (annex 1.A.3). In relation to the costs for the construction in particular, this estimation has to be considered indicative and anyway very prudent.

This can be compared with the estimation of the costs for the construction of an establishment for ABPs processing establishment and the relevant annual operating costs, using respectively method 1 and method 4. Calculations are summarised at table 1.A.4. Operating costs have been calculated for a period of 8 years.

Table 1.A.4. Comparison of costs (Eur) between ABPs incineration and processing

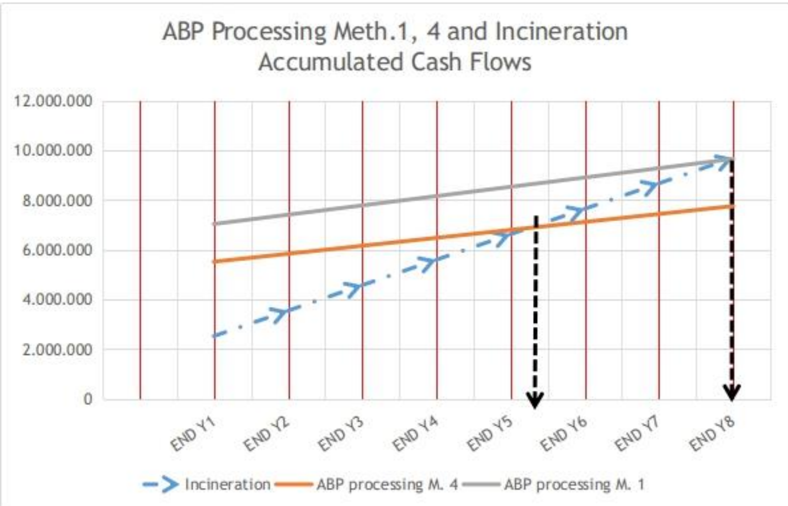
OPTION	CAPEX	OPEX							
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Incineration	1,493,000	1,025,189	1,025,189	1,025,189	1,025,189	1,025,189	1,025,189	1,025,189	1,025,189
ABP processing Method 4	5,193,000	320,219	320,219	320,219	320,219	320,219	320,219	320,219	320,219
ABP processing Method 1	6,657,000	374,430	374,430	374,430	374,430	374,430	374,430	374,430	374,430

Using the data of the above table, the accumulated outflows have been calculated (table 1.A.5), showing that the break even point for Method 4 would be in the sixth year, while for method 1 it would be at the eighth year.

Table 1.A.5. ABPs incineration and processing: accumulated outflows (Eur)

ACCUMULATED OUTFLOWS								
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Incineration	2,518,189	3,543,377	4,568,566	5,593,754	6,618.943	7,644,132	8,669,320	9,694,509
ABP processing Method 4	5,513,219	5,833,437	6,153,656	6,473,874	6,794.093	7,114,311	7,434,530	7,754,749
ABP processing Method 1	7,031,430	7,405,860	7,780,290	8,154,720	8,529.150	8,903,580	9,278,010	9,652,440

Figure 1.A.20. Accumulated outflows (Eur)



Supposing to incinerate 5,000 Tons/year, with 75% water percentage, 75% plant efficiency, with diesel fuel at 1.2 €/lt., the incineration costs would be around 425,000 €/year, not to mention the CO2 produced. For the construction of a processing plant (method 4), the investment would be of around 5.5 million €, there would be no cost for combustion, and there would be some revenues from the sale of MBM and remaining fat. In the likely hypothesis that the remaining management costs (personnel, etc.) of a processing plant and of an incineration plant are similar, and that there would be no revenue from selling MBM and remaining fat, the payback period is about 6 years which, especially in times of stagnant economies, is a valuable result.

Summarising:

- the use of the existing incinerator(s) would not have the adequate potential to incinerate dead animals as needed;
- the construction of an incinerator for cat. 1 ABPs is not recommended because economically non convenient;
- we consider preferable a solution where wastes, whichever is their origin, are not destroyed (using a considerable amount of energy) but are processed so to be used as source of energy.

Additionally, it is worth to mention that the Directive 2008/98/EC on waste includes (annex IVa), as examples of economic instruments and other measures to provide incentives for the application of the waste hierarchy, the following:

1. Charges and restrictions for the landfilling and incineration of waste which incentivise waste prevention and recycling, while keeping landfilling the least preferred waste management option;

12. Economic incentives for regional and local authorities, in particular to promote waste prevention and intensify separate collection schemes, while avoiding support to landfilling and incineration.

Concerning possible disposal of cat. 1 material, the following sentence is included in the prefeasibility study: "*In case it will be chosen to render the Cat.1 the treatment shall take place in and separated processing line alike for the rendering of Cat.2 and Cat.3. The derived products can be used as fuel in the e.g. cement- or power industry but will not generate revenue*".

Actually, there could be revenue from processing cat. 1 ABPs. Indeed, from processing we could obtain MBM and fat. MBM could be disposed in cement factories, and depending on market fluctuations a value of Eur 50/ton could be reached, while in other periods/contexts, disposal could cost around 50 Eur/ton. As far as the fat is concerned, it can be used in the rendering plant for energy purpose, and an additional amount (around 40%) could be sold at a price around 300 Eur/ton.

Therefore, processing cat. 1 ABPs can generate revenues.

1.A.2.2.2. ESTABLISHMENT OF TWO SEPARATE RENDERING PLANTS FOR PROCESSING CAT.2 AND 3 ABPs

Considering the estimation of the quantity of cat. 1, 2 and 3 animal by-products to be disposed of in Moldova, as estimated at chapter 1.A.4 of this report, the opportunity to establish a rendering plant for cat. 3 ABPs could be taken in consideration.

On the opportunity to establish a cat. 2 plant, this should be carefully evaluated. Indeed, the amount of cat. 2 ABPs, as estimated at chapter 1.A.4, is around 2,900 tons/year. If we compare the possible use of products obtained from the processing of cat. 1 ABPs with the possible use of cat. 2 (see annex 1.A.1 for details), we can see that in this last case the additional possibilities are the following:

a. organic fertilisers or soil improvers
b. composted or transformed into biogas

However, for letter b the latter destination is possible without prior processing in the case of manure, digestive tract and its content, milk, milk-based products, colostrum, eggs and egg products which the competent authority does not consider to present a risk for the spread of any serious transmissible disease.

Moreover, manure, digestive tract content separated from the digestive tract, milk, milk-based products and colostrum which the competent authority does not consider to present a risk for the spread of any serious transmissible disease can be applied to land without processing.

Processing cat. 1 ABPs can generate revenues and the difference between revenues generated from processing cat. 1 and those generated from processing cat. 2, considering the relevant amount, does not appear significant. Considering the necessary investment for the establishment of a separate cat. 2 plant, it appears economically more convenient that the cat. 1 processing plant will be used also for the disposal of cat. 2 ABPs.

1.A.2.3. ABPs MANAGEMENT SYSTEM

1.A.2.3.1. COLLECTION POINTS

The prefeasibility study suggests the possibility to locate collection points for the collection and temporary, temperature controlled, storage of Cat. 1 APBs. A detailed opinion on this issue is provided at chapter 1.D.4, however this seems to be a possibility for the temporary storage of dead animals:

- especially for small ruminants, pigs and poultry, in correspondence of large farms;
- in areas where the collection activity could not be organized on daily basis.

Nevertheless, the management costs should be considered: such collection points should be refrigerated (with relevant costs for energy), should be kept clean and should be located in a fenced/controlled area. All together, costs would not be negligible, and advantages and disadvantages should be carefully considered. Moreover, these collection points would have sense only for small ruminants, as it is declared that these collection points will store cat. 1 ABPs, while for collection of large ruminants special vehicles will be needed, and therefore the transportation could be organized directly to the rendering plant. There would be no possibility to use these collection points for dead pigs and poultry, unless to treat them as cat. 1 ABPs. Logistic will play a crucial role in this context.

1.A.2.3.2. THE CALL CENTER

The prefeasibility study indicates as a priority measure the organization of a centralised pan-Moldovan "Call Centre", equipped with a hardware and software solution, receiving requests for collection of ABP Cat.1. While, in principle, we agree on the establishment of such a call center to centralise all the functions related to cat 1 ABPs management (namely fallen stock), the following comments can be made.

- As already stated, the number of fallen stock (cat. 1) that have been estimated to be collected, according to the prefeasibility study, is extremely low. Such a centre could make sense if and when dead animals (bovine and ovicaprines) would be appropriately reported. This could happen essentially when the animal identification and registration system will be in place and regularly functioning.
- The prefeasibility study indicates that such a center could be hosted by the Veterinary department. In another part of the document, it is written that the Call center would be part of the rendering facilities: "*an administrative centre (Call Centre) coordinating collection and transport; calculating costs and prices for the collection and transportation; keeping data regards the raw materials (traceability); issues all papers required for the transportation, collects payments and administers subsidies. The CC will also comprise a traffic centre accommodating the vehicle fleets and containers and the maintenance hereof*".

Role, function, responsibility and location of such a call center should be carefully evaluated and relevant decisions should be adopted on the basis of the outcomes of such evaluation.

1.A.2.3.3. MOTIVATION OF ABPs PRODUCERS

In the "Pre-feasibility study" it is stated "*the clients are very motivated and open for constructive cooperation resulting in continuous rendering of their ABPs lifting their factual burden and maintaining a healthy and safe environment. Alike for farmers with fallen stock*".

This is a key point for the successful implementation of a reliable and comprehensive ABPs management system in the Country, and we consider crucial to verify that the situation remains unchanged as far as the motivation of food business operators of the slaughtering sector and farmers is concerned.

Based on similar experiences faced in other countries, the motivation is strictly connected with awareness, legislation, effectiveness of official control and mostly with a concrete financial support for the disposal. Indeed, if ABPs producers will have to pay a significant cost for ABPs disposal, and if appropriate official control at all stages will be lacking, it will be nearly impossible to put in place an effective ABPs management system.

1.A.2.3.4. OBLIGATIONS OF THE RENDERING BUSINESS OPERATORS

In the prefeasibility it is stated that rendering business operator have to "*put in place, implement and maintain hazard analysis and critical control points (HACCP) in order to monitor and document the required compliance. Hence the standard ISO 22000 for HACCP shall be introduced*". While it is correct that a system based on HACCP principles has to be put in place and implemented, this is not the case for the standard ISO 22000. This is because ISO 22000 is a voluntary standard, and there is no obligation according to the EU legislation to implement such a standard. Moreover, we are doubtful on the possibility to implement ISO 22000 in a rendering company: the title of ISO 22000 is "Food safety management systems—Requirements for any organization in the food chain", and a rendering industry cannot implement a "Food Safety Management System". By the way, we are not aware of any rendering company that is certified against ISO 22000.

Concerning Health & Safety, the prefeasibility study states "*International recognized standard for occupational health and safety at work (ISO 45001) will be implement to assess and manage risks to the workers and the public and -in cooperation with the suppliers- also to their workers involved in the activities with the ABPs*". In this case also, considering that ISO 45001 is a voluntary standard, its implementation can be just recommended, but it is not an obligation.

The same remark can be done concerning the sentence "*ISO 9000 will be implemented to manage the rendering business responsibilities external as internal and ensure satisfaction for the customers as the supplier's expectations*". Again, ISO 9000 is a voluntary standard.

In the ABPs sector, ISO 14001 (environmental management system) is frequently applied. ISO 14001 sets out the criteria for an environmental management system. It maps out a framework that a company or organization can follow to set up an effective environmental management system. Designed for any type of organization, regardless of its activity or sector, it can provide assurance to company management and employees as well as external stakeholders that environmental impact is being measured and improved.

1.A.2.3.5. SWOT ANALYSIS

We decided to expand the SWOT analysis, to take in consideration additional options, like for example:

- Construction of an incineration plant
- Export of all ABPs to a neighbouring country
- Number and type of processing plant(s)
  - ✓ Processing separately cat. 1, 2 and 3 ABPs: construction of 3 processing plants (one for cat. 1, one for cat. 2 and one for cat. 3)
  - ✓ Processing cat. 1 and 2 ABPs together, and cat 3 ABPs separately, in another establishment: construction of 2 processing plants, one for cat. 1 and 2, one for cat. 3 ABPs
  - ✓ Processing cat. 1 - 2 ABPs together, selling/exporting cat. 3 ABPs: construction of a PP for cat. 1- 2 ABPs
  - ✓ Processing together cat. 1, 2 and 3 ABPs: construction of a processing plant for cat. 1, 2 and 3 ABPs
- Processing methods
- Storage establishments
- Modality of collection and transportation of dead animals and ABPs
- Management models of the ABPs processing plant
  - ✓ Public company - Direct management by the State
  - ✓ Public Private Partnership: Fiduciary administration contract for Design –Build—Operate Contract
  - ✓ Public Private Partnership: Fiduciary administration contract Operate - Maintain – Replace- Develop
  - ✓ Public Private Partnership: Concession contract with or without subsequent buy out
- Financing the system
  - ✓ State support for dead animals disposal
  - ✓ State support for ABPs disposal
  - ✓ Insurance systems for dead animals disposal

Among the threats, it is mentioned "*Possible higher pricing of animal products due to offset of costs by food establishments and farmers*." Even if the prefeasibility study does not contain details on how the system will be financed, from this statement it looks like the ABPs producers would have to bear the cost.

Clearly, if no financial support will be provided by the state to support the ABPs producers (especially farmers), the whole ABPs management system will fail.

It should be considered that, when establishing the ABPs management system, all Member States recognised how serious the challenge of dealing with fallen stock was and that state intervention has been essential in order to establish proper systems of collection and disposal, A survey was carried out in 2009 by DAFF (Ireland), collecting information on collection, rendering/processing and incineration/disposal of fallen animals in some EU Member States. (UK, Belgium, the Netherlands, France, Hungary, Finland, Estonia, Luxembourg, Portugal, Norway, Denmark and Austria).

At that time, Belgium, the Netherlands, Finland, Luxembourg, Portugal, Denmark and Austria subsidised the collection, rendering/processing and incineration/disposal of fallen animals. Norway subsidised the collection only of fallen animals, while Estonia and France only subsidised their rendering/processing. Hungary provided subsidies for collection and incineration/disposal. More details are provided at chapter 2.F.1.2.

1.A.2.4. MARKET ANALYSIS

In the prefeasibility study it is stated that "*the market for the derived rendered products is diverse with various potential customers as oleo-chemical industries, biogas plants, producers of lubricants, plastics, rubber-based products such as tyres, cosmetics, paints, polishes, cleaning products and last the feed and pet-food manufacturers*".

Further investigations on the current situation in Moldova and surrounding countries are suggested, concerning for example the following sectors:

- Possible competitors: rendering industry
- Cement industry
- Petfood industry
- Biodiesel production
- Power stations (possible use of fats)
- Biogas plants
- Oleo-chemical industries
- Other industries potentially interested in buying derived products

Under this assignment, a preliminary investigation on cement factories (that are the final destination for MBM) in Moldova and neighbour countries has been carried out (see chapter 1.A.6).

1.A.2.5. TECHNICAL SPECIFICATIONS AND FINANCIAL CALCULATIONS

On the basis of the data provided in the prefeasibility study, we are not able to assess properly the financial calculations. The following comments can be made:

- According to the experts' opinion, costs estimated for the construction of the two rendering plants (respectively Eur. 1,600,000 for cat. 2 and Eur 3,000,000 for cat. 3) are underestimated;
- Only Eur 913,000 have been calculated for fuel consumption: this seems underestimated for the processing of nearly 30,000 tons of ABPs;
- The human resources as indicated in the Business plan (page 6) are as follows: management 4+1, administration 8, workers 30; in the financial calculation they are indicated as follows: management 2, administration 8, workers 15. A discrepancy can be noted: according to the financial calculation, there would be half of the staff for management and workers;

- For 15 workers, the cost/year has been calculated in 451.17 Eur, where it should have been Eur 48,780;
- An yearly increase of fat price has been estimated at 4%. Actually, according to collected information, such price is subject to huge fluctuations and even a decrease of the price has been detected sometimes in the last years;
- The price of the derived products (fat in particular) has been calculated at Eur 700, that appears to be optimistic. Actually, the price of the fat depends in first instance on the quality, and then a huge fluctuation of the price has been observed in the last years.

Finally, only the costs related to the rendering plants have been considered. However, bearing in mind the specificities of the ABPs sector, it seems more appropriate to include in the financial calculations all the costs related to the ABPs management system, to assess the eventual profitability of the business or the necessity to subsidise with public funds, and to establish the fees for ABPs disposal. More in detail, the following additional costs should be included in the financial calculation:

- building and management of the collecting points,
- collection and transportation of ABPs and of derived products,
- buying the vehicles for ABPs transportation and for the transportation of rendered products,
- drivers.

These costs have a huge impact on the whole ABPs management system, and an accurate financial calculation including all the above could result in significantly different outcomes.

The financial calculation considers also the alternative of initially collecting only half of the total quantity of the ABPs in the country, gradually increasing to collection of the full amount at year 20. Even if it is easy to predict that significant difficulties will be faced at the beginning of the establishment of the ABPs management system, it should be considered that, in the period when the rendering plant(s) will be built, there will be enough time to implement a robust awareness campaign, to educate ABPs producers, to reinforce the official control system, to put in place financial subsidies for ABPs producers.

In few words, to establish the whole ABPs management system so as a significant amount of ABPs will be collected since the beginning. Clearly, the construction of the rendering plant(s) is only part of the system.

1.A.2.6. SITUATION REPORTED IN THE PREFEASIBILITY STUDY

As reported in the prefeasibility study, in the Soviet period each farm had a “Bekkari hole” where dead animals were thrown, and the cadavers treated with Sodium Hydroxide or similar.

Apparently, these Bekkari holes still exist, and if this is the case, it could be the reason for the underreporting of dead animals. This should be further investigated, together with the current legal framework in Moldova in relation to the possibility to bury dead animals.

According to the EU legislation, burial of dead animals is allowed only under specific conditions, in particular in remote areas, or in disease control situations requiring the emergency disposal of the animals killed as a measure to control an outbreak of a serious transmissible disease. In particular, disposal on site should be allowed under special circumstances, since the available rendering or incinerator capacity within a region or a Member State could otherwise be a limiting factor in the control of a disease. Burial of dead pet animals and horses is a possibility by derogation (art.19).

The following statement is included in the prefeasibility study: “*Concerning the mortality rates obtained they seem to be low, properly reflecting the extensive husbandry practices in the households and should be expected to increase along the intensifying of the livestock farming with concentration of bigger numbers of heads per holding*”. It shall be clear that dead animals have <u>always</u> to be disposed of according to the ABPs regulation, with the few exclusions that have been listed in the previous paragraph.

Clearly, when facing the problem of dead animals' disposal, the first step should be the harmonisation of the legal framework with EU legislation. Afterward, a robust awareness campaign should be carried out, supported by appropriate training of farmers. A crucial step will be also the financial support to be provided to farmers, to cover entirely the costs for dead animals' disposal. Finally, the system for animals' identification and registration shall be in place and fully functional. It is easy to predict that, if all the above preconditions will not be met, the ABPs management system will fail.

In the prefeasibility study, it is mentioned an "*inconsistency between the Law for ABPs and the environmental legislation regards incineration/co-incineration*". As of the date of this Final Report, legal inconsistencies have been removed.

1.A.2.7. RECOMMENDATIONS

Main outcomes of the overall assessment of the pre-feasibility study carried out under the EU-funded ENPARD technical assistance in 2017-2018, in view of the current situation, can be summarised as follows:

- In the prefeasibility study, the estimated amount of cat. 1 ABPs to be disposed of is very small; we consider that such amount should be significantly increased;
- the prefeasibility study estimates a significant increase in the ABPs production for the next 20 years; according to our estimations, such an increase will not happen;
- the prefeasibility study suggests incineration as the preferable mode for disposal of cat. 1 ABPs, using an emergency incineration system; we do not recommend the adoption of such a solution;
- the construction of a separate establishment for processing cat. 2 ABPs is not recommended. Indeed, the amount of cat. 2 ABPs, as estimated in the report of Task 1, is around 2,900 tons/year. The difference between revenues generated from processing cat. 1 and those generated from processing cat. 2, considering the relevant amount, does not appear significant. Considering the necessary investment for the establishment of a separate cat. 2 plant, it appears economically more convenient that the cat. 1 processing plant will be used also for the disposal of cat. 2 ABPs;
- the opportunity to build a separate establishment for the processing of cat. 3 ABPs will be considered in the next chapters;
- in general, we consider preferable a solution where wastes, whichever is their origin, are not destroyed (using a considerable amount of energy) but are processed so to be used as source of energy.

1.A.3. ANALYSIS OF THE CURRENT SITUATION

1.A.3.1. LEGISLATION, ROLES AND RESPONSIBILITIES IN THE ABPs SECTOR

1.A.3.1.1. ROLES AND RESPONSIBILITIES OF THE COMPETENT AUTHORITIES

National Food Safety Agency (ANSA) and the Ministry of Agriculture, Regional Development and Environment are the key policy making and policy implementation authorities in the area of food safety in Moldova.[1]

Powers and competencies of Authorities in the ABPs sector are defined in the Moldovan Law 129/2019.

Article 4 of the law defines the powers of the Ministry of Agriculture, Regional Development and Environment, that are related to the definition of specific rules and requirements for the implementation of the law and for the establishment of an effective ABPs management system in the Country.

Article 5 defines the competencies of the National Agency for Food Safety: approval, official control, monitoring and verification of the requirements established by the law during the entire processing chain of animal by-products and derived products.

At the central level, the ANSA is the responsible body for the control system of ABPs, control of proper disposal or use of dead animals and other types of animal by-products, control of traceability of by-products at all stages (farms, slaughterhouses, processing establishments) to be re-assured by contraposition of data from different types of controls. Locally, inspectors from the territorial subdivisions are involved in control of by-products, in particular for:

- authorizing establishments where animal by-products are obtained,
- inspection of livestock farms, slaughterhouses, by-product processing enterprises,
- certification of by-products transported to processing,
- taking biological samples from dead animals.

ABPs control process at the moment is not included in a separate procedure. Inspections are carried out together with inspections for control of animal health, and sampling is performed only upon notifications and observations about increased mortality of animals in a particular farm. Accurate sampling procedures are not yet developed.

1.A.3.1.2. LEGAL FRAMEWORK IN THE ABPs SECTOR

At EU level, ABPs are regulated by Regulation 1069/2009, that sets out the requirements for collection and identification of ABPs and defines the different categories of ABPs: Category 1, 2 and 3. For each category, the Regulation 1069/2009 defines the treatment and possible use of ABPs. While EC Regulation 1069/2009 establishes strict rules, procedures and management system, EU Commission Regulation 142/2011 is an implementing act which contains standards for each process in the system.

Moldova has recently adopted a new legislation on ABPs management, harmonizing it with the EU acquis. A new Law has been published on 25 October 2019 in the Official Gazette no. 315-319 art. 459: Law 129/2019 on animal by-products and derived products not intended for human consumption. This Law transposes into national legislation the provisions of Regulation (EC) no 1069/2009. In January 2022 the Government of Moldova has adopted a Decision no.11 of January 12, 2022 approving the Sanitary-Veterinary Rules on animal by-products not intended for human consumption, replacing the old Government Decision no. 315 of 30 April 2010. This Decision no. 11/2022 was adopted for the harmonization with the Regulation (EU) No 142/2011 implementing Regulation (EC) No 1069/2009. The following main differences between EU legal framework and the Law 129/2019 have been detected.

[1] Since the Report on Task 1 was submitted, some significant changes have taken place. Namely, the Ministry of Agriculture, Regional Development and Environment was restructured into 2 separate authorities - Ministry of Agriculture and Food Industry and the Ministry of Environment.

Definition of SRM (Specific Risk Material)

SRM definition is slightly different. Considering that Moldova is a Country with an "undetermined BSE risk", according to Regulation 999/2001 (last amendment: Regulation 2020/772), the following is considered SRM.

Bovine animals over 12 months of age:

- the skull excluding the mandible and including the brain and eyes,
- the spinal cord.

Bovine animals over 30 months of age:

- the vertebral column excluding the vertebrae of the tail, the spinous and transverse processes of the cervical, thoracic and lumbar vertebrae and the median sacral crest and wings of the sacrum, but including the dorsal root ganglia.

Cattle of all ages

- the tonsils,
- the last four meters of the small intestine, the caecum and the mesentery.

Ovine and caprine animals over 12 months of age, or which have a permanent incisor that has erupted from the gums:

- the skull, including brain and eyes,
- the spinal cord.

In the Moldovan legislation, the following is defined as SRM: head (excluding tongue), including brain, eyes, trigeminal ganglion, tonsils, thymus, spleen and spinal cord from cattle over 6 months of age and intestines from duodenum to rectum from cattle of any age; the spine (excluding the caudal vertebrae), the spinous and transverse apophyses of the cervical, thoracic and lumbar vertebrae, as well as the median sacral ridge and sacral wings, but including the dorsal root ganglia from animals over 30 months of age; the skull, including the brain and eyes, the tonsils, the spinal cord of ovine and caprine animals over 12 months of age or having a permanent incisor erupted through the gum, and the spleen of all ovine and caprine animals.

Definition of "remote area"

The EU legislation (Reg. 1069/2009), art. 19, point 1b specifies that "the competent authority may, by way of derogation …, authorise the disposal by burning or burial on site or by other means under official supervision which prevent the transmission of risks to public and animal health of Category 1 material referred to in Article 8(a)(v) and (b)(ii), Category 2 and Category 3 materials <u>in remote areas.</u>

Nearly the same provision is included in Moldovan legislation (art. 19 of the Law 129/2019), but it is not specified that such derogation is allowed only in "remote areas". As a practical consequence, it looks like the disposal by burning or burial on site of ABPs including dead animals is allowed in general, not only in remote areas.

Moreover, Regulation 1069/2009 specifies that "The animal population of a particular species in the remote areas shall not exceed a maximum percentage of the animal population of this species". This provision is not included in the Moldovan legislation.

ABPs Export

Moldovan Law 129/2019, Article 38, specifies that "1. The export of animal by-products and derived products intended for incineration or landfill shall be permitted. 2. The export of animal by-products and derived products for use in a biogas or composting plant shall be permitted."

According to Regulation 1069/2009, art. 43, "The export of animal by-products and derived products destined for incineration or landfill shall be prohibited".

However, we consider positively this difference, because provides an additional possibility in the framework of the establishment of the ABPs management system in the Country.

Registration of operators, establishments or plants

Article 23 of the Regulation 1069/2009 has not been transposed in the Moldovan Law 129/2019. This article refers to the “Registration of operators, establishments or plants”.

It is difficult to estimate the impact of this specific issue. From one side, article 22 of the Moldovan Law 129/2019 (“Authorization of establishments or installations”) provides rule for the authorization of several activities, but on the other side activities such the transportation (that are not subject to approval, instead should be registered according to the EU legal framework) apparently are not taken in consideration. Further investigation would be needed to understand the reason for not having included art. 23 of the Regulation 1069/2009 in the National legal framework, however the main outcome at this stage is that activities like ABPs transportation seem not to be subject to registration in Moldova, and remedial actions should be adopted.

1.A.3.2. ABPs SEPARATION, COLLECTION, TRANSPORT, PROCESSING MANAGEMENT

Problems affecting the ABPs management system in Moldova have been clearly identified in the ToRs. The current methods and patterns of disposal of animal waste are not compliant with international best practice, resulting in high public health and environmental risks. Most of the by-products of animal origin, in particular animal carcasses, are disposed in proximity to human habitats, agricultural land or drinking water. Only a small part of them is incinerated or processed at specialized enterprises.

In the Prefeasibility study, it is stated that:

- in Moldova it is not a current practice dividing the animal-by-products into categories and keep the categories separated from each other;
- the real challenge to the rendering business in Moldova is the classification, separation and traceability / identification-registration of animals.

Nevertheless, it should be pointed out that, according to the Moldovan legal framework, currently “Operators shall collect, identify and transport animal by-products without undue delay, under conditions that prevent risks to public and animal health” (Law No. 129 of 19/09/2019, Chapter V, Section I, art. 20).

An assessment of the current situation as far as separation, collection, transport, processing and management of ABPs would certainly help defining the main problems and issues that could arise in the implementation of the ABPs management system. Unfortunately, due to COVID restrictions to travel, it was not possible to carry out a field trip during the implementation of the project.

1.A.3.3. ABPs PROCESSING ESTABLISHMENTS IN MOLDOVA

The list of ABPs processing plants currently in operation in the Country is reported at table 1.A.6.

Table 1.A.6. List of ABPs processing plants currently in operation in the Country

	Vet. number	*Name*	*Address*	*Municipality*	*Cat.*	*Tons/week*	*Tons/year*
1	VF-0040780-VF	SRL ”Rom-Cris”	s.Tirnova	Donduseni	2-3	224	11,650
2	AS1*VF*0033037*VF	SRL Mixagroprod Extruder	s. Bardar	Ialoveni	2	0.367	19.13
3	AS1*VF*0039489*VF	SRL GARMA GRUP	s. Fîrlădeni	Hîncești	2	7.4	384
4		SRL Terafix	Straseni	Straseni	2-3	100*	

** 60 tonnes feathers / 40 tonnes bones*

Clearly, there are two plants of interest for the purpose of the establishment of the ABPs system in Moldova: SRL ”Rom-Cris” and SRL Terafix. Both of them are operating in the field of ABPs deriving from poultry, and should be able to process the whole amount of ABPs produced in the country deriving from poultry slaughtering.

1.A.4. ESTIMATION OF THE VOLUMES AND FLOWS OF ABPs

A preliminary step for the establishment of an official, comprehensive system for ABPs management is the estimation of the amount of ABPs produced on average in the Country. Therefore, on the basis of documents collected by the experts, a preliminary estimation has been carried out and it will be presented in the following pages.

It should be highlighted that it is difficult to estimate precisely the quantity of ABPs produced in Moldova, since, according to collected information, ABPs categories are not properly separated in all establishments, records on animal deaths on holdings are not accurate, and the tradition of slaughtering animals on the holdings for own needs is still present.

1.A.4.1. ESTIMATION OF ABPs OBTAINED IN SLAUGHTERHOUSES

Data on slaughtering activities have been collected in two different ways:

- aggregated data on slaughtering have been collected from each Region/District (annex 1.A.4), to compare slaughtering activity in the last four years (2017 – 2020);
- in a separate file, data have been collected in relation to slaughtering activity of each slaughterhouse (Annex 1.A.5). These data are related to 2020, and they have been considered for the preparation of the detailed estimation of ABPs deriving from slaughtering activity.

The calculation of ABPs produced on average every year in Moldova's slaughterhouses has been done on the basis of data provided by ANSA.

Preliminary information has been collected on the number, typology and geographical distribution of establishments producing Animal By-Products in the Country. According to collected information, a total of 144 slaughterhouses are approved/registered in the Country, of which 8 are closed or not operating. The list of slaughterhouses with relevant slaughtering activity is summarized at Annex 1.A.5.

Afterward, the number of slaughtered animals, related to each slaughterhouse, has been taken in consideration and a detailed estimation has been carried out to calculate, as much precisely as possible, the amount of each category of Animal By-Products obtained in slaughterhouses, on average. This calculation has been done on the basis of a paper that was published in 2015: "Calculation model for the assessment of animal by-product resources in Estonian meat industry", U. Sannik et al, Agronomy Research 13(4), 1053–1063, 2015. This is the only example that could be found of a specific and detailed study aimed at the elaboration of a calculation model for monitoring system, based on data obtained in the field.

In this study, data about quantities of processed animals by species were collected from existing public databases, Estonian Animal Waste Processing Plant and meat processing enterprises of Estonia. Data from scientific literature and available statistics as well as data about the quantities of meat and slaughtering products observed in slaughterhouses was used for the estimation of the average of ABPs quantities per animal by species. Based on these two datagroups – number of animals (by species) and yield of ABPs per animal during meat processing, the functionality of the general calculation model for monitoring was tested (table 1.A.7).

In the Estonian model, inputs are numbers of animals by species and outputs accordingly the quantities of animal by-products by risk categories and types. The Estonian model still includes beef intestine (cleaned), sheep ileum and spleen as SRM, while only the last four meters of the small intestine, the caecum and the mesentery of bovines have now to be considered as SRM according to the EU legal framework (see Annex 1.A.2 for details). However, the Estonian model reflects the current situation in Moldova, as clarified at chapter 1.A.3.1.2.

Table 1.A.7: Estimation of quantities of ABPs produced on average, Estonian model

Variable	Cattle		Pigs		Sheep		Poultry	
Average weight of carcass, Kg		275		85		15		1,9
Average live weight, Kg		550		110		30		2,225
	%	Kg	%	Kg	%	Kg	%	Kg
Meat	*40.75*	*224.13*	*66.83*	*73.51*	*34.80*	*10.44*	*75.64*	*1.68*
Small fat, skirt, trimmings (edible)	2.12	11.66	1.95	2.15	0.00	0.00	0.00	0.00
Lungs, kidneys (edible)	0.13	0.72	2.19	2.41	0.00	0.00	0.00	0.00
Heart, liver (poultry also crop, neck and partly legs)	0.36	1.98	0.26	0.29	0.63	0.19	3.33	0.07
Bones (edible)	0.01	0.06	9.98	10.98	0.00	0.00	0.00	0.00
Blood (edible)	1.61	8.86	2.00	2.20	0.72	0.22	0.00	0.00
Losses from slaughtering	-2.00	-11.00	-3.00	-3.30	-2.00	-0.60	0.00	0.00
Edible products from slaughtering	*2.23*	*12.27*	*13.38*	*14.72*	*-0.65*	*-0.20*	*3.33*	*0.07*
Meat and edible products	42.98	236.39	80.21	88.23	34.15	10.25	78.97	1.76
Leaf fat, omentum, fatty trimmings (inedible)	4.19	23.05	1.17	1.29	2.70	0.81	0.00	0.00
Lungs, heart, kidneys (inedible)	0.77	4.24	0.54	0.59	1.43	0.43	0.00	0.00
Blood (inedible)	1.61	8.86	1.64	1.80	3.70	1.11	0.00	0.00
Trachea, throat, esophagus	0.70	3.85	0.62	0.68	1.04	0.31	0.00	0.00
Stomachs and intestine (no cattle) cleaned	3.00	16.50	3.77	4.15	5.37	1.61	0.67	0.01
Bladder, genitals, spleens (no sheep), pig brains, hide-trims	2.92	16.06	1.10	1.21	0.84	0.25	0.00	0.00
Legs, horns/bristle/hoofs, feathers, poultry legs	4.82	26.51	2.13	2.34	2.00	0.60	8.44	0.19
Hides	7.63	41.97	0.00	0.00	6.56	1.97	0.00	0.00
12Vessels, tendons, cartilage, glands	2.01	11.06	1.52	1.67	1.00	0.30	0.00	0.00
Others cat. 3 ABP	1.37	7.54	0.95	1.05	2.43	0.73	7.11	0.16
3rd category ABP	**39.70**	**218.35**	**16.77**	**18.45**	**43.57**	**13.07**	**19.33**	**0.43**
Intestinal and stomachs content	8.93	49.12	2.93	3.22	14.26	4.28	0.00	0.00
Others cat. 2 ABP (perished animals etc.)	0.38	2.09	0.10	0.11	0.20	0.06	1.78	0.04
2nd category ABP	**9.31**	**51.21**	**3.03**	**3.33**	**14.46**	**4.34**	**1.78**	**0.04**
Cattle and sheep heads	3.00	16.50	0.00	0.00	4.73	1.42	0.00	0.00
Cattle and sheep spinal cord	0.02	0.11	0.00	0.00	0.08	0.02	0.00	0.00
Beef intestine (cleaned), intestine fat, sheep ileum	5.00	27.50	0.00	0.00	0.77	0.23	0.00	0.00
Sheep spleen	0.00	0.00	0.00	0.00	0.23	0.07	0.00	0.00
1st category ABP	**8.02**	**44.11**	**0.00**	**0.00**	**5.81**	**1.74**	**0.00**	**0.00**
Sum of ABP	***57.03***	***313.67***	***19.80***	***21.78***	***63.84***	***19.15***	***21.11***	***0.47***

The following step was the application of this model to the numbers provided by ANSA in relation to slaughtering activity of each slaughterhouse (annex 1.A.5). We considered these data more reliable than those included in Annex 1.A.4, as they have been collected for each slaughterhouse. However, differences between data reported in Annex 1.A.4 and those reported in Annex 1.A.5 are not significant for the purpose of this general estimation.

Comparing data from the Estonian model and those included in the prefeasibility study, differences can be noticed concerning the live weight and the weight of the carcasses. This could be due in some cases to the different type of animals slaughtered in the two countries (i.e. cattle).

Average weight of live animals and of carcases have been therefore readapted, to get closer to the Moldovan situation, and the results are shown in table 1.A.8.

Table 1.A.8: Estimation of quantities of ABPs produced on average in Moldova – 2020

Variable	**Cattle**			**Pigs**			**Sheep**			**Poultry**			**TOT tons**
Average weight of carcass, Kg			175			75			21			1,9	
Average live weight, Kg			341			100			42			2,225	
Animal slaughtered in 2020			31,929			390,890			83,260			18,000,000	
	%	Kg/ head	Tot tons	%	Kg/ head	Tot Tons	%	Kg/ head	Tot Tons	%	Kg/ head	Tot Tons	
Meat	*40.8*	*139.0*	*4436.8*	*66.8*	*66.8*	*26,123.2*	*34.8*	*14.6*	*1,216.9*	*75.6*	*1.7*	*30,294*	**62,070.7**
Small fat, skirt, trimmings (edible)	2.1	7.2	230.8	2.0	2.0	762.2	0.0	0.0	0.0	0.0	0.00	0.00	**993.1**
Lungs, kidneys (edible)	0.1	0.4	14.2	2.2	2.2	856.0	0.0	0.0	0.0	0.0	0.00	0.00	**870.2**
Heart, liver (from poultry also crop, neck and partly legs)	0.4	1.2	39.2	0.3	0.3	101.6	0.6	0.3	22.0	3.3	0.07	1,333.67	**1,496.5**
Bones (edible)	0.0	0.0	1.1	10.0	10.0	3,901.1	0.0	0.0	0.0	0.0	0.00	0.00	**3,902.2**
Blood (edible)	1.6	5.5	175.3	2.0	2.0	781.8	0.7	0.3	25.2	0.0	0.00	0.00	**982.3**
Losses from slaughtering	-2.0	-6.8	-217.8	-3.0	-3.0	-1,172.7	-2.0	-0.8	-69.9	0.0	0.00	0.00	**-1,460.4**
Edible products from slaughtering	*2.2*	*7.6*	*242.8*	*13.4*	*13.4*	*5,230.1*	*-0.7*	*-0.3*	*-22.7*	*3.3*	*0.07*	*1,333.67*	**6,783.8**
Meat and edible products	**43.0**	**146.6**	**4679.6**	**80.2**	**80.2**	**31,353.3**	**34.2**	**14.3**	**1,194.2**	**79.0**	**1.8**	**31,627.5**	**68,854.5**
Leaf fat, omentum, fatty trimmings (inedible)	4.2	14.3	456.2	1.2	1.2	457.3	2.7	1.1	94.4	0.0	0.00	0.00	**1,008.0**
Lungs, heart, kidneys (inedible)	0.8	2.6	83.8	0.5	0.5	211.1	1.4	0.6	50.0	0.0	0.00	0.00	**344.9**
Blood (inedible)	1.6	5.5	175.3	1.6	1.6	641.1	3.7	1.6	129.4	0.0	0.00	0.00	**945.7**
Trachea, throat, esophagus	0.7	2.4	76.2	0.6	0.6	242.4	1.0	0.4	36.4	0.0	0.00	0.00	**354.9**
Stomachs and intestine (no cattle) cleaned	3.0	10.2	326.6	3.8	3.8	1,473.7	5.4	2.3	187.8	0.7	0.01	268.34	**2,256.4**
Bladder, genitals, spleens (no sheep), pig brains, hide-trims	2.9	10.0	317.9	1.1	1.1	430.0	0.8	0.4	29.4	0.0	0.00	0.00	**777.3**
Legs, horns/bristle/hoofs, feathers, poultry legs (partly)	4.8	16.4	524.8	2.1	2.1	832.6	2.0	0.8	69.9	8.4	0.19	3,380.22	**4,807.5**
Hides	7.6	26.0	830.7	0.0	0.0	0.0	6.6	2.8	229.4	0.0	0.00	0.00	**1,060.1**
Bones from cutting, chicken heads, pork heads (partly)	10.7	36.4	1162.8	3.3	3.3	1301.7	16.5	6.9	577.0	3.1	0.07	1,245.56	**4,287.0**
Vessels, tendons, cartilage, glands	2.0	6.9	218.8	1.5	1.5	594.2	1.0	0.4	35.0	0.0	0.00	0.00	**848.0**
Others of ,the 3rd category ABP	1.4	4.7	149.2	1.0	1.0	371.3	2.4	1.0	85.0	7.1	0.16	2,847.56	**3,453.0**
3rd category ABP	**39.7**	**135.4**	**4322.5**	**16.8**	**16.8**	**6,555.2**	**43.6**	**18.3**	**1,523.6**	**19.3**	**0.4**	**7,741.7**	**20,143.0**
Intestinal and stomachs content	8.9	30.5	972.3	2.9	2.9	1,145.3	14.3	6.0	498.7	0.0	0.00	0.00	**2,616.2**
Others of the 2nd category ABP (perished animals etc.)	0.4	1.3	41.4	0.1	0.1	39.1	0.2	0.1	7.0	1.8	0.04	712.89	**800.3**
2nd category ABP	**9.3**	**31.7**	**1013.7**	**3.0**	**3.0**	**1,184.4**	**14.5**	**6.1**	**505.7**	**1.8**	**0.04**	**712.9**	**3,416.6**
Cattle and sheep heads	3.0	10.2	326.6	0.0	0.0	0.0	4.7	2.0	165.4	0.0	0.0	0.0	**492.0**
Cattle and sheep spinal cord	0.0	0.1	2.2	0.0	0.0	0.0	0.1	0.0	2.8	0.0	0.0	0.0	**5.0**
Beef intestine (cleaned), intestine fat, sheep ileum	5.0	17.1	544.4	0.0	0.0	0.0	0.8	0.3	26.9	0.0	0.0	0.0	**571.3**
Sheep spleen	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	8.0	0.0	0.0	0.0	**8.0**
1st category ABP	**8.0**	**27.3**	**873.2**	**0.0**	**0.0**	**0.0**	**5.8**	**2.4**	**203.2**	**0.0**	**0.0**	**0.0**	**1,076.4**
Sum of ABP	***57.0***	***194.5***	***6,209.3***	***19.8***	***19.8***	***7,739.6***	***63.8***	***26.8***	***2,232.4***	***21.1***	***0.5***	***8,454.6***	**24,635.9**

Hides should not be considered in this calculation, because they have an economic value and consequently treated in dedicated establishments. Similarly, ABPs deriving from deboning should not be considered, because they are usually obtained in cutting plants and not in slaughterhouses. However, for the purpose of this estimation, and considering the difficulties to obtain reliable data in relation to ABPs obtained in cutting plants, we deem appropriate to include ABPs deriving from deboning activity in this estimation.

As reported in table 1.A.8, Cat. 2 material is consisting mainly of intestinal and stomachs content, and the relevant amount is quite significant. Therefore, the possibility to dispose of gastrointestinal content according to art. 13, f, of Regulation 1069/2009, applying to land without processing, should be further investigated. In case gastrointestinal content could be disposed of applying to land, the relevant amount of cat. 2 would decrease significantly (see table 1.A.9).

The summary of ABPs obtained from slaughtering activity (without hides and gastrointestinal contents), divided in categories, is shown in table 1.9.

Table 1.A.9. ABPs from slaughtering activity in Moldova, without hides and gastrointestinal content (2020)

	Cattle			Pigs			Sheep			Poultry			TOT.
	%	Kg/ head	Tot tons	%	Kg/ head	Tot Tons	%	Kg/ head	Tot Tons	%	Kg/ head	Tot Tons	
Cat. 1	8.02	27.35	873	0.00	0.00	0	5.81	2.44	203	0.00	0.00	0	**1,076**
Cat. 2 **without gastrointestinal content**	0.4	1.3	41	0.1	0.1	39	0.2	0.1	7	1.78	0.04	713	**800**
Cat. 3 **without hides**	32.1	109.4	3,491	16.8	16.8	6,555	37.0	15.5	1,294	19.3	0.4	7,741	**19,082**
Tot.	**40**	**138.1**	**4,405**	**16.9**	**16.9**	**6,594**	**43**	**18**	**1,504**	**21**	**0.44**	**8,454**	**20,958**

Comparing this calculation with the estimations included in the prefeasibility study (table 1.A.10) differences are not significant and influenced partially by the fact that more recent data were used, and partially because in our estimation the gastrointestinal contents (to be included in cat. 2 ABPs) is not comprised.

Table 1.A.10: Estimation of ABPs produced in slaughterhouses (tons/year): comparison with the prefeasibility study

ABPs	Prefeasibility study (2019)	Estonian model (2020)
Cat 1	1,341	1,076
Cat. 2	3,264	800
Cat. 3	18,815	19,082
Total	**23,420**	**20,958**

Data on slaughtering activity

If we consider the number of live animals and the number of slaughtered animals (see table below, data provided by ANSA in 2021), and if we compare these data with those obtained in other countries (Member States or Balkan countries), we can observe a significant discrepancy: on average, the percentage of slaughtered animals is substantially lower.

Even if the percentages are very different from country to country (due to different production models adopted), Moldova's percentages are really low. This could be due to several reasons, among others slaughtering in households for own consumption and export of live animals.

This issue should be further investigated, to be sure that the estimation of ABPs deriving from slaughtering activities can be reliable.

Table 1.A.11. Estimated percentage of animal slaughtered compared with live animals' population

	Bovines	*Pigs*	*Sheep and goats*
N. of Live animals	160,000	434,000	845,000
N. of slaughtered animals/year	30,000	390,000	75,000
Percentage	19%	90%	9%
% in Balkan Country 1	37%	86%	24%
% in Member State 1	50%	130%	180%
% in Member State 2	26%	220%	61%

1.A.4.2. ESTIMATION OF ABPs OBTAINED IN FOOD PROCESSING PLANTS

ABPs shall be collected also from establishments processing food of animal origin (meat processing, fish processing, dairy establishments, etc.). It is extremely difficult to estimate the amount of animal by-products (category 3) produced on average in these establishments. However, in relation to establishments processing food of animal origin, a tentative estimation has been carried out and is reported at table 1.A.12.

The list of establishments processing food of animal origin in Moldova has been provided by ANSA, and establishments have been divided according to the type of production and to the geographical location. This second division according to the geographical location of establishments will be used for the calculation of routes for ABPs collection. Afterward, for each type of establishment it has been estimated arbitrarily an average ABPs production, on yearly basis, as follows:

- Farmed game, meat products, minced meat, meat preparations and MSM: 1.2 tons/year,
- Fishery products, Raw milk and dairy products, Eggs and egg products: 0.5 tons/year,
- Treated stomachs, bladders and intestines: 1.2 tons/year.

The so called “General activity establishments” (mainly cold stores) have not been taken in consideration because usually these establishments don’t produce ABPs on regular basis.

Table 1.A.12. Tentative estimation of ABPs produced in establishments processing food of animal origin

Region/ district/ municipality		**III**	**V**	**VI**	**VIII**	**IX**	**X**	**XIII**	**Total**
n.	*name*	*Farmed game*	*Minced meat, meat prep. MSM*	*Meat products*	*Fishery products*	*Raw milk and dairy products*	*Eggs and egg products*	*Treated stomachs, bladders intestines*	
1	m.Bălți		10	3	2	1			**16**
2	Anenii Noi		6	9	3	11	1		**30**
3	Cahul		3	1		2			**6**
4	Calarasi			1	1	1			**3**
5	Chisinau		17	10	8	5	2		**42**
6	Cimislia		1	2		2	2		**7**
7	Criuleni	5		6	2	1			**14**
8	Donduseni		2	1					**3**
9	Drochia		2			2			**4**
10	Edinet/ Briceni			1		146	4		**151**
11	Falesti		1	1		2			**4**
12	Glodeni		1						**1**
13	Floresti		1	2		1			**4**
14	Hincesti				1	1			**2**
15	Ialoveni		4	1	1	2	1		**9**
16	Ocnita					21			**21**
17	Orhei			5		1		1	**7**
18	Rezina					2			**2**
19	Riscani			2		1	2		**5**
20	Soroca			1		1			**2**
21	Taraclia					1	1		**2**
22	Telenesti		1			16	1		**18**
23	Ungheni/ Nisporeni			1		5	2		**8**
24	UTA Gagauzia		1	1		9	1		**12**
TOTAL establish.		**5**	**50**	**48**	**18**	**234***	**17**	**1**	**373**
Average amount of cat. 3 ABPs: tons/year		1.2	1.2	1.2	0.5	0.5	0.5	1.2	
TOTAL cat. 3 ABPs tons/year		**6**	**60**	**57.6**	**9**	**15**	**8.5**	**1.2**	**157.3**

** Considering that the majority of these 234 establishments are milk collecting points, where ABPs are not generated, only 30 dairy plants have been included in the calculation as processing establishments*

These average amounts have been established on the basis of experiences matured in other Countries, however we are aware that the amount of ABPs produced by an establishment is strictly connected with the average production of food of animal origin. Unfortunately, this data is not available, but we should consider that the total amount, as reported in the last row of table 1.A.12, is quite small (157 tons/year). In few words, it is important to consider all the establishments producing food of animal origin primarily for their location, as this influence directly the logistic of ABPs collection.

1.A.4.3. ESTIMATION OF ABPs PRODUCED AT RETAIL LEVEL

Animal by-products shall be collected also from butcher shops, supermarkets and large retails where deboning activities are carried out. Data on the number and locations of such activities have been collected from ANSA (see table 1.A.13), however it is very difficult to estimate the relevant amount of ABPs produced, not only because this is strictly connected with the amount of meat that is sold, but also because there are butcher shops and supermarkets where no deboning is carried out, and therefore the ABPs produced is nearly zero. This list will be useful for the preparation of the traffic study and routes for ABPs collection.

Table 1.A.13. Retail activities

1	2	3	4	5	6	7
Region/ district/ municipality		*Butcher shops*	*Large retails (supermarkets)*	*caterers, canteens*	*Restaurants*	**Total**
n.	*name*					
1	Bălți	0	3	5	12	**20**
2	Anenii Noi		5	4	25	**34**
3	Cahul	9	7	30	14	**60**
4	Calarasi		3	1	2	**6**
5	Leova		1	5	2	**8**
6	Cantemir			2	4	**6**
7	Causeni		4	1	4	**9**
8	Stefan Voda		2		4	**6**
9	Chisinau	35	106	52	23	**216**
10	Cimislia		1	4	2	**7**
11	Basarabeasca		1	2		**3**
12	Criuleni	3	2	4	3	**12**
13	Dubasari			2		**2**
14	Donduseni	1	1	2	1	**5**
15	Edinet/Briceni	7	8		15	**30**
16	Falesti		2	10	4	**16**
17	Glodeni		1	9	2	**12**
18	Floresti		3		12	**15**
19	Soldanesti		2		10	**12**
20	Hincesti		5	7	3	**15**
21	Ialoveni	1	7	6	10	**24**
22	Ocnita			4	7	**11**
23	Orhei	5	2	1	8	**16**
24	Rezina				2	**2**
25	Riscani	8	6	3	19	**36**
26	Soroca			3	9	**12**
27	Straseni	3	3	4	7	**17**
28	Taraclia		3		3	**6**
29	Telenesti		1	8	2	**11**
30	Ungheni/Nisporeni	6	7	10	8	**31**
31	UTA Gagauzia	12	11	18	10	**51**
TOTAL		**90**	**197**	**197**	**227**	**711**

1.A.4.4. ABPs DERIVING FROM DEAD ANIMALS

Data have been collected from ANSA, in different forms, and from the National Bureau of Statistics of the Republic of Moldova. More in details, sources of the relevant data are the following:

- Data provided by ANSA summarising the number of livestock and poultry in Moldova, according to the category, from 2015 to 2020;
- Data provided by ANSA organized according to the geographical distribution of livestock and poultry, related to October 2020 (annex 1.A.6);
- Data obtained from the website "Statistica Moldovei", economic statistics on animal husbandry (https://statbank.statistica.md/PxWeb/pxweb/en/40%20Statistica%20economica/?rxid=b2ff27d7-0b96-43c9-934b-42e1a2a9a774), National Bureau of Statistics of the Republic of Moldova.

According to the source of data, some inconsistencies have to be reported, as far as livestock and poultry are concerned. In general, the total number of animals has been taken in consideration, without making any difference between livestock and poultry reared in commercial farms or in households. This is because, for putting in place an effective and comprehensive ABPs management system, all the sources of ABPs have to be considered.

Data reported at table 1.A.14 are useful to assess the trend related to livestock and poultry in the last six years, and it is clear that a constant decreasing can be observed, nearly for all the animal species (except for poultry).

Table 1.A.14. Number of livestock and poultry from 2015 to 2020 (data from ANSA)

Animal species and category	2015	2016	2017	2018	2019	2020
Bovines - total	**222,320**	**215,202**	**215,742**	**195,781**	**178,489**	**159,145**
Young cattle (calves)	35,025	34,325	36,620	28,240	32,506	26,910
Adult cattle	185,365	178,997	177,272	166,011	144,416	131,233
Heifers	31,873	25,469	25,976	32,213	21,703	23,409
Cows	152,386	146,156	142,812	132,130	120,784	105,609
Male	1,930	1,880	1,850	1,530	1,567	1,012
Sheep - total	**868,776**	**932,485**	**864,611**	**836,439**	**729,796**	**653,107**
Lambs	183,778	247,030	133,036	104,523	58,405	70,836
Adult sheep	669,531	669,255	714,759	718,265	656,793	568,706
Male	15,467	16,200	16,816	13,451	14,598	13,565
Goats - total	**170,954**	**169,170**	**183,216**	**199,190**	**201,565**	**191,907**
young goats under 1 years old	25,254	24,270	26,720	29,560	30,954	23,367
Adult Goats- already kidded	145,700	144,900	156,496	169,630	170,620	168,540
Porcine- total	**522,566**	**543,851**	**505,981**	**389,111**	**456,679**	**434,319**
Females	41,159	43,954	35,902	42,775	31,799	27,684
Males	3,194	4,207	2,972	2,798	2,823	2,981
Fattening pigs (incl. piglets)	478,213	495,690	467,107	343,538	422,057	403,654
Poultry - total	**18,560,634**	**20,965,211**	**17,290,745**	**16,575,968**	**18,675,982**	**16,717,769**
Galinacee	16,373,675	18,821,016	15,333,134	14,622,777	16,752,119	14,994,324
Palmipedes	2,030,801	2,042,085	1,862,411	1,863,891	1,838,143	1,645,825
Other poultry	156,158	102,110	95,200	89,300	85,720	77,620
Solipeds - total	**37,426**	**42,306**	**39,975**	**35,911**	**32,442**	**37,609**
Lagomorphs - total	**355,145**	**357,765**	**411,865**	**365,134**	**397,832**	**364,272**

Beside the total number of livestock and poultry in the Country, it is useful to consider the relevant geographical distribution. On the basis of data provided by ANSA and related to October 2020 (annex 1.A.6) a summary has been prepared and it is presented at table 1.A.15.

Table 1.A.15. Number of livestock and poultry: geographical distribution (data from ANSA, October 2020)

Nr.	County	Bovine	Pig	Ovicaprines	Horses	Poultry, palmipeds	Rabbit
1	Anenii-Noi	4,656	85,270	16,933	260	2,591,960	15,070
2	Basarabeasca	450	1,170	17,750	105	1,134,220	1,720
3	Briceni	3,997	5,562	7,922	504	313,744	6,040
4	Cahul	3,154	11,339	58,350	548	555,057	11,136
5	Cantemir	1,342	5,674	29,301	808	330,293	10,738
6	Călăraşi	2,883	10,381	12,763	1,483	291,106	11,797
7	Căuşeni	5,060	15,994	43,390	150	372,400	6,500
8	Cimişlia	1,456	2,085	15,760	146	573,270	5,480
9	Criuleni	2,101	44,330	5,660	431	410,223	8,570
10	Donduşeni	4,000	6,232	6,500	150	485,100	7,282
11	Drochia	9,410	6,213	17,459	758	203,200	4,980
12	Dubăsari	1,085	3,523	1,733	143	65,958	4,495
13	Edineţ	6,612	6,082	17,558	575	624,401	7,555
14	Făleşti	6,543	11,190	39,070	1,451	431,985	6,920
15	Floreşti	7,624	36,599	28,038	1,257	279,720	11,170
16	Glodeni	6,089	3,822	19,778	1,028	143,380	6,355
17	Hînceşti	16,654	12,668	70,091	2,313	677,010	13,877
18	Ialoveni	4,069	8,766	9,190	232	433,190	14,142
19	Leova	994	2,012	16,991	406	301,402	8,295
20	Nisporeni	1,724	25,429	17,294	938	168,075	8,529
21	Ocniţa	3,664	1,091	5,335	494	76,458	1,720
22	Orhei	4,535	9,045	17,968	1,514	577,294	23,258
23	Rezina	2,714	17,199	7,602	884	218,157	10,767
24	Rîşcani	7,204	5,293	13,584	650	277,921	9,908
25	Sîngerei	4,808	8,478	31,640	787	277,125	32,932
26	Soroca	9,500	10,000	18,500	900	350,000	10,000
27	Străşeni	1,700	15,550	4,000	360	155,020	33,650
28	Şoldăneşti	3,811	14,151	11,035	836	97,330	5,120
29	Ştefan-Vodă	2,020	4,870	9,720	220	333,000	5,000
30	Taraclia	726	5,805	29,685	235	419,140	7,620
31	Teleneşti	4,369	10,304	23,905	1,005	472,862	15,793
32	Ungheni	4,320	13,420	30,283	1,701	430,499	9,145
33	Comrat	2,870	5,968	65,650	519	306,860	11,780
34	Ciadîr - Lunga	2,218	2,654	53,842	322	385,700	13,780
35	Vulcănești	647	3,452	24,098	86	388,051	2,160
36	Chișinău	1,089	936	3,702	262	332,750	20,810
37	Bălți	700	1,047	2,900	65	26,150	1,000
	TOTAL:	**146,798**	**433,604**	**804,980**	**24,526**	**15,510,011**	**385,094**

Data obtained from the National Bureau of Statistics of the Republic of Moldova are presented at table 1.A.16, in this case also they include the geographical distribution.

Table 1.A.16. Livestock by Districts/Regions, 2021, all categories of producers (data from Statistica Moldovei)

	Cattle		**Pigs**		**Sheep and goats**		**Horses**		**Rabbits**	
	%	**N.**	**%**	**N.**			**%**	**N.**	**%**	**N.**
Whole country	**100**	**108,954**	**100**	**339,560**	**100**	**616,894**	**100**	**22,640**	**100**	**319,172**
Municipality Chisinau	*0.86*	*940*	*0.48*	*1,638*	*0.68*	*4,176*	*0.30*	*68*	*5.18*	*16,529*
North	*49.09*	*53,487*	*22.14*	*75,172*	*23.97*	*147,865*	*38.60*	*8,738*	*28.47*	*90,881*
..Municipality Balti	0.54	590	0.38	1,306	0.39	2,428	0.24	54	0.89	2,845
..Briceni	3.30	3,596	1.82	6,195	1.22	7,534	2.40	543	1.60	5,102
..Donduseni	2.80	3,048	0.90	3,059	0.81	4,969	2.05	464	1.40	4,464
..Drochia	5.35	5,832	1.37	4,661	2.13	13,159	3.61	818	1.45	4,642
..Edinet	5.31	5,789	1.40	4,757	2.34	14,463	2.87	649	2.34	7,477
..Falesti	5.06	5,511	1.75	5,929	4.16	25,674	5.83	1,321	1.88	6,014
..Floresti	3.83	4,174	6.71	22,787	2.37	14,609	3.90	883	3.15	10,061
..Glodeni	4.85	5,288	1.24	4,196	2.75	16,946	4.46	1,010	1.29	4,124
..Ocnita	2.93	3,190	1.41	4,804	0.54	3,305	1.62	366	2.29	7,301
..Riscani	5.58	6,085	1.80	6,120	1.88	11,613	3.77	853	2.84	9,067
..Singerei	4.42	4,821	1.31	4,465	3.83	23,638	3.97	899	6.19	19,753
..Soroca	5.11	5,563	2.03	6,893	1.54	9,527	3.88	878	3.14	10,031
Centre	*33.10*	*36,059*	*62.72*	*212,986*	*23.76*	*146,599*	*44.70*	*10,121*	*36.96*	*117,972*
..Anenii Noi	3.27	3,565	20.56	69,828	1.98	12,215	0.89	202	2.88	9,178
..Calarasi	1.47	1,597	1.69	5,725	1.21	7,475	5.23	1,185	3.88	12,375
..Criuleni	1.70	1,847	10.71	36,374	0.83	5,110	1.68	380	3.85	12,273
..Dubasari	0.79	863	1.13	3,838	0.30	1,866	0.53	120	1.53	4,893
..Hincesti	8.65	9,425	3.25	11,021	5.85	36,082	5.93	1,342	3.67	11,702
..Ialoveni	1.15	1,253	0.92	3,124	0.77	4,743	1.13	256	2.18	6,969
..Nisporeni	1.23	1,340	1.08	3,680	1.69	10,412	3.73	844	1.71	5,445
..Orhei	3.16	3,447	3.18	10,806	2.18	13,419	5.49	1,243	4.14	13,220
..Rezina	1.35	1,470	7.09	24,072	0.69	4,281	2.54	574	2.24	7,154
..Straseni	1.30	1,416	4.57	15,530	0.75	4,654	2.50	567	2.55	8,149
..Soldanesti	2.27	2,469	3.20	10,872	1.09	6,720	3.94	891	2.67	8,524
..Telenesti	3.47	3,778	2.16	7,335	3.29	20,323	4.31	975	3.67	11,729
..Ungheni	3.29	3,589	3.17	10,781	3.13	19,299	6.81	1,542	1.99	6,361
South	*12.55*	*13,671*	*11.56*	*39,238*	*32.91*	*203,005*	*13.26*	*3,002*	*21.84*	*69,701*
..Basarabeasca	0.26	283	0.19	634	2.41	14,857	0.38	87	0.63	2,005
..Cahul	1.88	2,043	2.63	8,937	8.72	53,769	2.77	628	3.98	12,707
..Cantemir	1.08	1,173	1.32	4,473	4.59	28,291	3.14	712	3.11	9,922
..Causeni	3.81	4,153	3.76	12,768	5.45	33,651	0.82	186	4.53	14,467
..Cimislia	1.51	1,647	0.72	2,433	2.45	15,085	1.46	330	2.01	6,400
..Leova	1.07	1,161	0.40	1,358	2.91	17,923	2.23	504	2.85	9,084
..Stefan Voda	2.06	2,245	1.29	4,378	1.49	9,168	0.98	223	2.74	8,754
..Taraclia	0.89	966	1.25	4,257	4.91	30,261	1.47	332	1.99	6,362
T.A.U. Gagauzia	*4.40*	*4,797*	*3.10*	*10,526*	*18.68*	*115,249*	*3.14*	*711*	*7.55*	*24,089*

When we compare the different sources, differences between data from ANSA and from the National Bureau of Statistics of the Republic of Moldova are evident (table 1.A.17).

Table 1.A.17. Livestock and poultry, differences between the three formats of data

	ANSA, according to the category (2020)	*ANSA, according to the geographic distribution (2020)*	*Statistica Moldovei (2021)*
Bovines	159,145	146,798	108,954
Ovicaprines	845,014	804,980	616,894
Porcines	434,319	433,604	339,560
Solipeds	37,609	24,526	22,640
Poultry, lagomorphs	17,082,041	15,510,011	na

Subject to a confirmation from Competent authorities, we consider more appropriate to use the estimation of livestock according to the category (year 2020) provided by ANSA, because data with details on the geographical distribution (table 1.A.15) show some inconsistencies when the livestock is classified according to the category (the sum of the various categories of animals does not correspond to the total number of livestock obtained summing up the livestock in commercial farms and in households). However, the difference between the total number of livestock in these two sets of data provided by ANSA is not significant.

These data will be used to calculate the amount of ABPs that could be expected from the average mortality reported in livestock and poultry (table 1.A.18). The mortality rate depends on many factors that is not possible to take in consideration in this report. However, according to the literature, it should be between 3% and 5%. Therefore, for our calculation, these 2 percentages have been taken in consideration.

As a result, the amount of ABPs that could be expected from dead animals (livestock and poultry) are tons 3,186 tons/year with a mortality rate at 3%, and 5,311 tons/year with a mortality rate at 5%. Dead bovines, and ovicaprines shall be considered as cat. 1 ABPs, dead bodies of other species as cat. 2 ABPs.

Table 1.A.18. ABPs deriving from dead animals (livestock and poultry)

Animal species and category	*N.*	*Average weight x head (Kg)*	*Mortality 3%*		*Mortality 5%*	
			N. dead animals	*Total weight (Kg)*	*N. dead animals*	*Total weight (Kg)*
Bovines - total	**159,145**		**4,774**	**1,286,046**	**7,957**	**2,143,410**
Young cattle (calves)	26,910	130	807	104,949	1,346	174,915
Adult cattle	131,233	300	3,937	1,181,097	6,562	1,968,495
Sheep - total	**653,107**		**19,593**	**545,295**	**32,655**	**908,825**
Lambs	70,836	10	2,125	21,251	3,542	35,418
Adult sheep	568,706	30	17,061	511,835	28,435	853,059
Male	13,565	30	407	12,209	678	20,348
Goats - total	**191,907**		**5,757**	**158,696**	**9,595**	**264,494**
young goats under 1 years old	23,367	10	701	7,010	1,168	11,684
Adult Goats- already kidded	168,540	30	5,056	151,686	8,427	252,810
Porcine- total	**434,319**		**13,030**	**222,034**	**21,716**	**370,057**
Adults	33,646	100	1,009	100,938	1,682	168,230
Fattening pigs (incl. piglets)	403,654	10	12,110	121,096	20,183	201,827
Poultry - total	**16,717,769**	**1**	**501,533**	**501,533**	**835,888**	**835,888**
Solipeds - total	**37,609**	**400**	**1,128**	**451,308**	**1,880**	**752,180**
Lagomorphs - total	**364,272**	**2**	**10,928**	**21,856**	**18,214**	**36,427**
TOTAL ABPs to be collected				**3,186,768**		**5,311,281**
Total cat. 1 ABPs				**1,990,037**		**3,316,728**
Total cat. 2 ABPs				**1,196,732**		**1,994,553**

1.A.4.5. ABPs FROM OTHER SOURCES

Above data does NOT include:

- ABPs from animals slaughtered for human consumptions outside slaughterhouses;
- ABPs originating from catering waste and former foodstuff;
- Zoo and circus animals, hunt trophies.

However, the overall picture should not be significantly affected, as these ABPs represent only a small percentage of the total amount of ABPs produced in a Country.

1.A.4.6. TOTAL AMOUNT OF ABPs PRODUCED IN MOLDOVA

Overall, ABPs produced in Moldova on yearly basis have been estimated, respectively for category 1, 2 and 3, as reported at table 1.A.19.

Table 1.A.19. ABPs produced in Moldova, tons/year (without gastrointestinal contents)

ABPs	*Slaughtering and deboning 2020 (Estonian model)*	*Fallen stock (5% mortality, 2020)*		*Food of AO processing plants*	*Others*	*Total*
		Bovines, ovines, caprines	*Pigs, horses, poultry*			
Cat 1	1,076	3,316	0	0		**4,392**
Cat. 2	800	0	1,995	0	100*	**2,895**
Cat. 3	19,082	0	0	157	50**	**19,289**
Total	**20,958**	**3,316**	**1,995**	**157**	**150**	**26,576**

* dogs, cats, etc.

** ABPs from retail and catering (i.e. former foodstuffs; deboning already calculated in the second column)

This quantity should be slightly increased in order to include other animal species (wild animals when suspected of being infected with diseases communicable to humans or animals, etc.), obtaining a final amount of ABPs of around **27,000 tons/year.**

Moreover, it should be considered that eating habits are different from one county to another, and this can influence the amount of ABPs for cat 3. However, figures presented in the above tables can be considered as reliable for the preparation of the strategy on ABPs management.

Once again, we highlight that this estimation has been done on the basis of data that in some cases seem not completely reliable, especially because according to the different sources they are not consistent. Therefore the final estimation could be subject to changes if more accurate data will be obtained.

1.A.4.7. AMOUNT OF ABPs TO BE PROCESSED

As already clarified at chapter 1.A.3.3, a certain amount of ABPs is already collected and processed in Moldova, in four rendering plants, and this should be taken into account for the elaboration of a proposal for the establishment of a comprehensive ABPs management system. In few words, the amount of ABPs already processed in the existing plants has to be subtracted from the total amount of ABPs obtained in the country, as calculated in the previous chapter.

None of the existing rendering plants is authorised to process cat. 1 ABPs, therefore a solution has to be found for the entire amount of cat. 1 ABPs, as calculated in the previous chapter. Moreover, disposal of dead animals is not carried out in the authorised plants, as they are only processing ABPs obtained in slaughterhouses.

Concerning cat. 3 ABPs, according to collected information, the existing plants are processing mainly feathers from poultry (cat. 3), fat and bones from pigs (cat. 3). If the estimation of the amounts currently processed is accurate, nearly the entire amount of ABPs deriving from poultry slaughtering (7,741 tons/year) can be processed in the existing plants. Additionally, a certain amount of cat. 3 ABPs obtained from slaughtering of pigs (6,555 tons/year in total) is already processed in existing plants. For our purpose, we can estimate that half of this amount (around 3,300 tons/year) has to be disposed of.

This results in an amount of around 9,000-10,000 tons of cat. 3 ABPs to be disposed of, while the total of cat. 1 (1,076 tons/year) and cat. 2 (800 tons/year from perished animals at the slaughterhouse) ABPs has to be disposed of. Additionally, dead animals of all the species have to be included in the calculation. The total amount of ABPs to be disposed of is summarised at table 1.A.20.

Table 1.A.20. ABPs to be disposed yearly in Moldova. Summary table.

ABPs	*Slaughtering, deboning 2020*	*Fallen stock (5% mortality, 2020)*		*Food of AO processing plants*	*Others*	*Total ABPs produced in Moldova*	*ABPs already processed in existing rendering plants*	*Total ABPs to be disposed of*
		Bovines, ovines, caprines	*Pigs, horses, poultry*					
Cat 1	1,076	3,316	0	0		**4,392**	**0**	**4,392**
Cat. 2	800	0	1,995	0	100*	**2,895**		**2,895**
Cat. 3	19,082	0	0	157	50**	**19,289**	**11,000**	**8,289**
Total	**20,958**	**3,316**	**1,995**	**157**	**150**	**26,576**	**11,000**	**15,576**

Clearly, more accurate data are needed in relation to the type, category and amount of ABPs currently processed in the existing rendering plants. However, for our purpose, the main outcome is that the total amount of cat. 1 ABPs and probably the total amount of cat. 2 ABPs need to be disposed of. As far as cat. 3 is concerned, the current capacities of existing rendering plants are not sufficient to cover the needs of the Country.

1.A.4.8. FLOWS OF ABPs

ABPs flows will be directly connected with the location of the ABPs processing establishment, and further details are included in the traffic study (section 1.D).

1.A.4.8.1. ABPs FROM SLAUGHTERHOUSES

Annex 1.A.5 includes details on the slaughtering activity of each slaughterhouse. Starting from these data, an estimation has been done on the quantities of ABPs to be collected respectively from the north, central and south area of the Country.

Concerning the frequency of collection, this will be strictly connected with the number of animals slaughtered on average every week and therefore on the amount of ABPs produced on average (on daily/weekly basis). A suggested frequency for ABPs collection is included at table 1.A.21, on the basis of the average number of slaughtered animals per week.

Table 1.A.21. Frequency of ABPs collection on the basis of number of slaughtered animals per week

	Bovines	*Ovicaprines*	*Poultry*	*Pigs*
daily	>100	>500	>5,000	>500
three times per week	51-100	201-500	1,001-5,000	201-500
twice per week	11-50	51-200	101-1,000	51-200
weekly	<10	<50	<100	<50

Following the suggested frequency of collection reported at table 1.A.21, a proposal for the frequency of collection from slaughterhouses in Moldova has been prepared and is attached (annex 1.A.7). Clearly, once the ABPs management system will be in place and the logistic will be fine tuned, these suggested frequencies could be subject to changes. However, we considered useful to elaborate a first proposal, to assess the future possible flows of ABPs.

Therefore, starting from annex 1.A.7, slaughterhouses have been divided according to the geographical area, and the results are showed at annex 1.A.8 (a summary is reported at table 1.A.22). Clearly, for the north and center areas of the Country, ABPs will have to be collected on daily basis, while in the south area and in Gagauzia probably it will be possible to limit ABPs collection to 2-3 days per week. Again, we are here referring only to ABPs to be collected from slaughterhouses. Moreover, poultry slaughterhouses have been included in this estimation, even if, as already clarified, probably the whole amount of ABPs produced in poultry slaughterhouses can be collected and processed by already existing rendering plants.

Table 1.A.22. Number of slaughterhouses and slaughtering activity per geographical area

Area	*Number of slaughter-houses*	*N. of slaughtered animals*							
		Bovine		*Ovicaprine*		*Pigs*		*Poultry*	
		weekly	*yearly*	*weekly*	*yearly*	*weekly*	*yearly*	*weekly*	*yearly*
North	42	351	17,864	908	43,867	1,626	88,653	40,598	2,070,546
Center	69	273	12,262	432	22,417	5,457	276,186	330,801	16,032,042
South & Gagauzia	27	44	1,853	329	16,926	663	26,531		4,280
Total	138	667	31,929	1,670	83,260	7,736	390,890	371,400	18,106,868

From the table above, we can see that most of 50% of the bovines are slaughtered in the north area of the country, almost 30% in the center and a very small percentage in the south. Concerning ovicaprines, again more than half are slaughtered in the north, more than 25 % in the center and around 20% in the south. As far as pigs are concerned, nearly 70% are slaughtered in the center, and also for poultry the vast majority are slaughtered in the center.

At this point, it is interesting to see how this distribution of the slaughtering activity impacts on the amount of ABPs produced in the 3 geographical areas. At table 1.A.23, 1.A.24 and 1.A.25 we can find the amount of ABPs (divided in categories) produced at the slaughterhouse respectively in the north, in the center and in the south.

Table 1.A.23. Amount of ABPs (divided in categories) produced yearly at the slaughterhouse - North

NORTH	**Cattle**			**Pigs**			**Sheep**			**Poultry**			**TOT.**
	%	Kg/ head	Tot tons	%	Kg/ head	Tot Tons	%	Kg/ head	Tot Tons	%	Kg/ head	Tot Tons	
Cat. 1	8.02	27.35	488.55	0.00	0.00	0.00	5.81	2.44	107.04	0.00	0.00	0.00	596
Cat. 2 without gastrointestinal content	0.38	1.30	23.15	0.10	0.10	8.87	0.20	0.08	3.68	1.78	0.04	82.00	117.70
Cat 3 without hides	32.1	109.4	1,953.6	16.8	16.8	1,486.7	37.0	15.5	681.9	19.3	0.4	890.5	5,012.7
Tot.	**40**	**138**	**2,465**	**17**	**17**	**1,496**	**43**	**18**	**793**	**21**	**0**	**973**	**5,726**

Table 1.A.24. Amount of ABPs (divided in categories) produced yearly at the slaughterhouse - Center

CENTER	**Cattle**			**Pigs**			**Sheep**			**Poultry**			**TOT.**
	%	Kg/ head	Tot tons	%	Kg/ head	Tot Tons	%	Kg/ head	Tot Tons	%	Kg/ head	Tot Tons	
Cat. 1	8.02	27.35	335.34	0.00	0.00	0.00	5.81	2.44	54.70	0.00	0.00	0.00	390
Cat. 2 without gastrointestinal content	0.38	1.30	15.89	0.10	0.10	27.62	0.20	0.08	1.88	1.78	0.04	634.95	680.34
Cat. 3 without hides	32.1	109.4	1,341.0	16.8	16.8	4,631.6	37.0	15.5	348.5	19.3	0.4	6,895.3	13,216
Tot.	**40**	**138**	**1,692**	**17**	**17**	**4,659**	**43**	**18**	**405**	**21**	**0**	**7,530**	**14,287**

Table 1.A.25. Amount of ABPs (divided in categories) produced yearly at the slaughterhouse - South

SOUTH	Cattle			Pigs			Sheep			Poultry			TOT.
	%	Kg/ head	Tot tons	%	Kg/ head	Tot Tons	%	Kg/ head	Tot Tons	%	Kg/ head	Tot Tons	
Cat. 1	8.02	27.35	50.68	0.00	0.00	0.00	5.81	2.44	41.30	0.00	0.00	0.00	92
Cat. 2 without gastrointestinal content	0.38	1.30	2.40	0.10	0.10	2.65	0.20	0.08	1.42	1.78	0.04	0.17	6.65
Cat. 3 without hides	32.1	109.4	202.6	16.8	16.8	444.9	37.0	15.5	263.1	19.3	0.4	1.8	912.5
Tot.	**40**	**138**	**256**	**17**	**17**	**448**	**43**	**18**	**306**	**21**	**0**	**2**	**1,011**

As already clarified, a certain amount of ABPs is already processed in the existing establishments. It is very difficult to estimate precisely the relevant amount, however on the basis of what was described before, and observing the location of the existing rendering plant, we can assume that the amount of ABPs to be collected especially in the central area will be significantly reduced (nearly all ABPs from poultry and around half ABPs from pigs are already processed by the existing plant in Straseni). Concerning the rendering plant in Donduseni, where according to collected data a significant amount of ABPs is processed, this is probably related to the fact that the same owners of the rendering plant have a large poultry farm in the same location as the ABPs plant, so the ABPs may come from their own farm.

1.A.4.8.2. ABPs FROM FOOD PROCESSING PLANTS

The geographical distribution of establishments processing food of animal origin is reported at table 1.A.12. As already clarified, it is important to consider all the establishments producing food of animal origin primarily for their location, as this influence directly the logistic of ABPs collection. Therefore, food processing plants have been grouped according to the geographical area, and the results are showed at table 1.A.26.

The majority of food establishments are located in the north of the country: 211 out of 373. Also in the center of the country there is quite a significant number of food plants (135) while in south area the number of establishments is very small.

However, it should be noticed that the high number of food plants in the northern area is strictly related with the presence of several dairy plants (175 dairy plants out of 211 food establishments), especially in the areas of Edinet and Ocnita; however, most of them are milk collection points, where usually no ABPs is produced.

As additional comment, the number of food establishments in the south of the country is very limited. Therefore, the most significant effort for ABPs collection in food establishment should probably be concentrated in the central area of the country.

Considering the relatively small amount of ABPs to be collected from food processing establishments, logistic should be organized in such a way to include these plants in the routine collection from slaughterhouses. On average, it can be estimated that the collection from food processing establishments will be carried out on weekly basis. Providing that specific storage conditions will be guaranteed (i.e freezing of ABPs), frequency could be reduced in some establishments, where needed.

An impact on the logistic will also be determined by the collection of ABPs from the retail level, that so far has not been taken in consideration. Indeed, it is foreseeable that a large number of butcher shops, large retail and catering should be included in the routes for ABPs collection, and all these activities are typically located in the most populated area (central area of Moldova).

Table 1.A.26. Food processing plants: geographical distribution

Region/ district/ municipality		III	V	VI	VIII	IX	X	XIII	Total
n.	name	Farmed game	Minced meat, meat prep. MSM	Meat products	Fishery products	Raw milk and dairy products	Eggs and egg products	Treated stomachs, bladders intestines	
1	m.Bălți		10	3	2	1			**16**
8	Donduseni		2	1					**3**
9	Drochia		2			2			**4**
10	Edinet/ Briceni			1		146	4		**151**
11	Falesti		1	1		2			**4**
12	Glodeni		1						**1**
13	Floresti		1	2		1			**4**
16	Ocnita					21			**21**
19	Riscani			2		1	2		**5**
20	Soroca			1		1			**2**
NORTH		*0*	*17*	*11*	*2*	*175*	*6*	*0*	***211***
ABPs (average): tons/year		*1.2*	*1.2*	*1.2*	*0.5*	*0.5*	*0.5*	*1.2*	
TOTAL tons/year - NORTH		*0*	*20.4*	*13.2*	*1*	*87.5*	*3*	*0*	
2	Anenii Noi		6	9	3	11	1		**30**
4	Calarasi			1	1	1			**3**
5	Chisinau		17	10	8	5	2		**42**
7	Criuleni	5		6	2	1			**14**
14	Hincesti				1	1			**2**
15	Ialoveni		4	1	1	2	1		**9**
17	Orhei			5		1		1	**7**
18	Rezina					2			**2**
22	Telenesti		1			16	1		**18**
23	Ungheni/ Nisporeni			1		5	2		**8**
CENTER		*5*	*28*	*33*	*16*	*45*	*7*	*1*	***135***
ABPs (average): tons/year		*1.2*	*1.2*	*1.2*	*0.5*	*0.5*	*0.5*	*1.2*	
TOTAL tons/year - CENTER		*6*	*33.6*	*39.6*	*8*	*22.5*	*3.5*	*1.2*	
3	Cahul		3	1		2			**6**
6	Cimislia		1	2		2	2		**7**
21	Taraclia					1	1		**2**
24	UTA Gagauzia		1	1		9	1		**12**
SOUTH		*0*	*5*	*4*	*0*	*14*	*4*	*0*	***27***
ABPs (average): tons/year		*1.2*	*1.2*	*1.2*	*0.5*	*0.5*	*0.5*	*1.2*	
TOTAL tons/year - SOUTH		*0*	*6*	*4.8*	*0*	*7*	*2*	*0*	
TOTAL COUNTRY		**5**	**50**	**48**	**18**	**234**	**17**	**1**	**373**
ABPs (average): tons/year		1.2	1.2	1.2	0.5	0.5	0.5	1.2	
TOTAL tons/year		**6**	**60**	**57.6**	**9**	**117**	**8.5**	**1.2**	**259.3**

1.A.4.8.3. ABPs FROM FARMS (DEAD ANIMALS)

As far as dead animals' collection is concerned, the logistic will be completely different, because from one side the frequency of ABPs collection from slaughterhouses and food processing plant can be organised and determined in advance, since such collection shall take place on regular basis, while dead animals' collection is determined by unpredictable situations (unless in case of stamping out for specific diseases) and as such it is carried out on the spot, following a specific request.

For fallen stock, the ABPs flows will be strictly connected with the location of the farms (commercial farms and households) and relevant concentration in the country. Hence, routes for dead animals collection have been hypothesised according to the geographical area, while the “frequency“ of collection is determined by the number of live animals raised in each County (for further details see the traffic study, Section 1.D).

Data on livestock and poultry provided by ANSA (table 1.A.15) have been aggregated according to the geographical areas of the Country (north, center, south, Gagauzia), to assess the concentration of livestock and poultry and therefore to estimate from which area the most relevant amount of ABPs deriving from dead animals have to be collected (table 1.A.27).

Table 1.A.27 Livestock by Districts/Regions, 2020, all categories of producers (data from ANSA)

Nr.	County	Bovine		Pig		Ovicaprines		Horses		Poultry palmipeds		Rabbit	
		%	N.	%	N.	%	N.	%	N.	%	N.	%	N.
Whole Country		**100**	**146,798**	**100**	**433,604**		**804,980**		**24,526**		**15,510,011**		**385,094**
North		*48*	*70,151*	*23*	*101,609*	*26*	*208,284*	*35*	*8,619*	*22*	*3,489,184*	*27*	*105,862*
3	Briceni	2.72	3,997	1.28	5,562	0.98	7,922	2.05	504	2.02	313,744	1.57	6,040
10	Donduşeni	2.72	4,000	1.44	6,232	0.81	6,500	0.61	150	3.13	485,100	1.89	7,282
11	Drochia	6.41	9,410	1.43	6,213	2.17	17,459	3.09	758	1.31	203,200	1.29	4,980
13	Edineţ	4.50	6,612	1.40	6,082	2.18	17,558	2.34	575	4.03	624,401	1.96	7,555
14	Făleşti	4.46	6,543	2.58	11,190	4.85	39,070	5.92	1,451	2.79	431,985	1.80	6,920
15	Floreşti	5.19	7,624	8.44	36,599	3.48	28,038	5.13	1,257	1.80	279,720	2.90	11,170
16	Glodeni	4.15	6,089	0.88	3,822	2.46	19,778	4.19	1,028	0.92	143,380	1.65	6,355
21	Ocniţa	2.50	3,664	0.25	1,091	0.66	5,335	2.01	494	0.49	76,458	0.45	1,720
24	Rîşcani	4.91	7,204	1.22	5,293	1.69	13,584	2.65	650	1.79	277,921	2.57	9,908
25	Sîngerei	3.28	4,808	1.96	8,478	3.93	31,640	3.21	787	1.79	277,125	8.55	32,932
26	Soroca	6.47	9,500	2.31	10,000	2.30	18,500	3.67	900	2.26	350,000	2.60	10,000
37	Bălți	0.48	700	0.24	1,047	0.36	2,900	0.27	65	0.17	26,150	0.26	1,000
Center		*38*	*55,710*	*62*	*270,972*	*29*	*232,159*	*50*	*12,362*	*45*	*6,921,434*	*51*	*195,023*
1	Anenii-Noi	3.17	4,656	19.67	85,270	2.10	16,933	1.06	260	16.71	2,591,960	3.91	15,070
6	Călăraşi	1.96	2,883	2.39	10,381	1.59	12,763	6.05	1,483	1.88	291,106	3.06	11,797
9	Criuleni	1.43	2,101	10.22	44,330	0.70	5,660	1.76	431	2.64	410,223	2.23	8,570
12	Dubăsari	0.74	1,085	0.81	3,523	0.22	1,733	0.58	143	0.43	65,958	1.17	4,495
17	Hînceşti	11.34	16,654	2.92	12,668	8.71	70,091	9.43	2,313	4.36	677,010	3.60	13,877
18	Ialoveni	2.77	4,069	2.02	8,766	1.14	9,190	0.95	232	2.79	433,190	3.67	14,142
20	Nisporeni	1.17	1,724	5.86	25,429	2.15	17,294	3.82	938	1.08	168,075	2.21	8,529
22	Orhei	3.09	4,535	2.09	9,045	2.23	17,968	6.17	1,514	3.72	577,294	6.04	23,258
23	Rezina	1.85	2,714	3.97	17,199	0.94	7,602	3.60	884	1.41	218,157	2.80	10,767
27	Străşeni	1.16	1,700	3.59	15,550	0.50	4,000	1.47	360	1.00	155,020	8.74	33,650
28	Şoldăneşti	2.60	3,811	3.26	14,151	1.37	11,035	3.41	836	0.63	97,330	1.33	5,120
31	Teleneşti	2.98	4,369	2.38	10,304	2.97	23,905	4.10	1,005	3.05	472,862	4.10	15,793
32	Ungheni	2.94	4,320	3.09	13,420	3.76	30,283	6.94	1,701	2.78	430,499	2.37	9,145
36	Chișinău	0.74	1,089	0.22	936	0.46	3,702	1.07	262	2.15	332,750	5.40	20,810
South		*10*	*15,202*	*11*	*48,949*	*27*	*220,947*	*11*	*2,618*	*26*	*4,018,782*	*15*	*56,489*
2	Basarabeasca	0.31	450	0.27	1,170	2.21	17,750	0.43	105	7.31	1,134,220	0.45	1,720
4	Cahul	2.15	3,154	2.62	11,339	7.25	58,350	2.23	548	3.58	555,057	2.89	11,136
5	Cantemir	0.91	1,342	1.31	5,674	3.64	29,301	3.29	808	2.13	330,293	2.79	10,738
7	Căuşeni	3.45	5,060	3.69	15,994	5.39	43,390	0.61	150	2.40	372,400	1.69	6,500
8	Cimişlia	0.99	1,456	0.48	2,085	1.96	15,760	0.60	146	3.70	573,270	1.42	5,480
19	Leova	0.68	994	0.46	2,012	2.11	16,991	1.66	406	1.94	301,402	2.15	8,295
29	Ştefan-Vodă	1.38	2,020	1.12	4,870	1.21	9,720	0.90	220	2.15	333,000	1.30	5,000
30	Taraclia	0.49	726	1.34	5,805	3.69	29,685	0.96	235	2.70	419,140	1.98	7,620
Gagauzia		*4*	*5,735*	*3*	*12,074*	*18*	*143,590*	*4*	*927*	*7*	*1,080,611*	*7*	*27,720*
33	Comrat	1.96	2,870	1.38	5,968	8.16	65,650	2.12	519	1.98	306,860	3.06	11,780
34	Ciadîr - Lunga	1.51	2,218	0.61	2,654	6.69	53,842	1.31	322	2.49	385,700	3.58	13,780
35	Vulcănești	0.44	647	0.80	3,452	2.99	24,098	0.35	86	2.50	388,051	0.56	2,160

We are aware that the estimation of amount of ABPs deriving from fallen stock has been made on the basis of other data (number of animals according to the category), because in that case we needed to assess as much precisely as possible ABPs amount. Those data were not available with the geographical distribution of animals, and therefore in this case we are using the other set of data provided by ANSA (with the geographical distribution. However, as already clarified, for the assessment of the flows the important information is the percentage of animals in the different areas of the country.

The same type of aggregation has been done with the data obtained from the National Bureau of Statistics of the Republic of Moldova (table 1.A.16). Absolute numbers are significantly different, however the percentage of livestock and poultry in the different areas of the country is quite similar.

A summary of the geographical distribution of livestock and poultry according to the different sources of information is provided at table 1.A.28 (from Statistica Moldovei) and at table 1.A.29 (data from ANSA).

Table 1.A.28. Summary of Livestock by Districts/Regions, 2021, all categories of producers (data from Statistica Moldovei)

	Cattle		Pigs		Sheep and goats		Horses		Rabbits	
	%	N.	%	N.	%	N.	%	N.	%	N.
Whole country	**100**	**108,954**	**100**	**339,560**	**100**	**616,894**	**100**	**22,640**	**100**	**319,172**
Municipality Chisinau	*0.86*	*940*	*0.48*	*1,638*	*0.68*	*4,176*	*0.30*	*68*	*5.18*	*16,529*
North	*49.09*	*53,487*	*22.14*	*75,172*	*23.97*	*147,865*	*38.60*	*8,738*	*28.47*	*90,881*
Centre	*33.10*	*36,059*	*62.72*	*212,986*	*23.76*	*146,599*	*44.70*	*10,121*	*36.96*	*117,972*
South	*12.55*	*13,671*	*11.56*	*39,238*	*32.91*	*203,005*	*13.26*	*3,002*	*21.84*	*69,701*
T.A.U. Gagauzia	*4.40*	*4,797*	*3.10*	*10,526*	*18.68*	*115,249*	*3.14*	*711*	*7.55*	*24,089*

Table 1.A.29. Summary of Livestock by Districts/Regions, 2020, all categories of producers (data from ANSA)

Nr.	County	Bovine		Pig		Ovicaprines		Horses		Poultry palmipeds		Rabbit	
		%	N.	%	N.	%	N.	%	N.	%	N.	%	N.
Whole Country		**100**	**146,798**	**100**	**433,604**		**804,980**		**24,526**		**15,510,011**		**385,094**
North		*48*	*70,151*	*23*	*101,609*	*26*	*208,284*	*35*	*8,619*	*22*	*3,489,184*	*27*	*105,862*
Center		*38*	*55,710*	*62*	*270,972*	*29*	*232,159*	*50*	*12,362*	*45*	*6,921,434*	*51*	*195,023*
South		*10*	*15,202*	*11*	*48,949*	*27*	*220,947*	*11*	*2,618*	*26*	*4,018,782*	*15*	*56,489*
Gagauzia		*4*	*5,735*	*3*	*12,074*	*18*	*143,590*	*4*	*927*	*7*	*1,080,611*	*7*	*27,720*

In general, data are in agreement and no significant difference can be noticed concerning the percentage of animals in the different areas of the country.

Main outcomes are as follows:

- Bovines are concentrated particularly in the northern area, where we can find nearly 50% of the heads; a significant percentage of bovines lives in the center (33-38% according to the source), while in the south the number is very limited (10-12%);
- Pigs are mainly concentrated in the central area of the Country (62%), while in the norther area (23%) and in the south (11%) the number is quite limited;
- Ovicaprines are distributed equally in the three areas of the Country;
- Poultry and palmipeds farming is concentrated in the central area (45%), however a significant number of heads can be found also in the northern area (22%) and in the south (26%).

The logistic plan will have to consider that the major effort is usually required to collect dead bovines (in terms of logistic and for the characteristics of the means of transport), and that as we have seen the majority of bovine heads and farms are in the north.

1.A.5. CRITICAL AREAS THAT INFLUENCE PROPER COLLECTION OF ABPs IN THE COUNTRY

1.A.5.1. STAKEHOLDERS AWARENESS, EDUCATION AND TRAINING

Stakeholders like food business operators, slaughterhouses, farmers, private veterinarians, municipalities represent significant business environment factor. Their personal behavioural habits, awareness level and responsibility towards ABP management, considering its impact on environment and general public health, is crucial for the success of the implementation of the ABPs Management Plan.

By definition, an ABP material is the entire body, part of an animal or a product of animal origin which is not intended for human consumption. Slaughterhouses, cutting plants, wild game handling establishments and other animal origin processing facilities make materials that are either unfit or not intended for human consumption. These materials become ABP when it is not intended for human consumption or is no longer intended for human consumption due to the expiration date, damaged food contact material/package, qualitative incompliances, etc. Some of these products may still be fit for human consumption but have no commercial value or they are not be intended for use due to aesthetic reasons. Once material becomes ABP it cannot later revert to being a foodstuff.

Roles, obligations and responsibilities of direct ABPs producers such as slaughterhouses, cutting plants, meat processing establishments and other food processing facilities, are well known and clearly defined in the national legislation. According to collected information, the knowledge and awareness of food business operators on their legal obligations is at a good level. That fact will certainly facilitate and streamline the ABP management implementation process. If that would not be the case, it could slow down implementation of the Plan and might prolong but never endanger national commitment towards safe and sustainable disposal of ABPs. In order to avoid any potential risk, in-depth assessment and evaluation of food business operators' knowledge on ABP management and handling with the ABP materials is to be carried out prior developing an awareness campaign.

In line with the Veterinary law provisions, animal keepers/farmers have the obligation to report death of animals and to follow the instructions given with regard to disposal of carcasses, as well as the obligation to notify officially of the death of animal at the holding. These stakeholders would require continuous education in order to comply with the regulations, provisions and best practices in the ABPs management process.

On the other side, municipalities are involved in the ABPs management in accordance with their obligations, such as collection of dead pets and other animals found in public areas. Having in mind that the staff of the waste disposal sectors within municipalities has limited knowledge of the importance of an appropriate ABPs management and new national approach in that regards, special trainings and/or educative seminars should be planned for that category of stakeholders. Their role should not be neglected, not only due to the ABPs issues but due animal health management as well. It is very common occurrence that animals found dead on the road or other public area are careers of certain infection diseases, e.g. rabies. These animals are epidemiologically recognized as valuable passive surveillance samples, representing the best parameter for recognition, presence or absence of some diseases in the country or region. Consequently, the relevant collection and notification to the veterinary service is of utmost importance.

Public awareness and education in terms of ABP handling is to be carried out through communication tools and awareness raising campaigns. Short and clear messages could be broadcasted via TV spots, radio jingles, internet and/or written media.

Considering the above, ANSA - as competent authority, has important task to implement comprehensive training, awareness raising and communication programmes, respecting variety of stakeholders involved in realisation of the ABPs Management Plan, their roles and specific impacts.

1.A.5.2. ANIMAL IDENTIFICATION AND REGISTRATION SYSTEM

An effective Animal Identification and Registration System shall be in place at least for the bovine and ovicaprine animals. This means that all the animals should be properly identified and a traceability system should be in place, where all the animal movements are properly registered in the system. If such a system is not completely implemented, as from collected information seems to be the situation in Moldova, there is a huge risk that the whole ABPs management system will fail.

The first prerequisite is that an Animal Identification and Registration System is in place and effectively implemented. As a basic rule, each keeper has to report to the CA, in due time, all movements to and from the holding, all births, all deaths, dates of those events, and shall supply to the Competent Authority upon request, information on origin, identification, destination of the animals which he has owned, kept, transported, marketed or slaughtered.

A second prerequisite is a legislation in place according to which there is the obligation for the farmer to dispose of dead animals in an approved ABPs establishment; in few words, it should not be possible (unless in exceptional situations) to bury animals. Clearly, if this is not the case, there will be no motivation to dispose of dead animals in the rendering plant and farmers would continue to dispose of dead animals burying in the Bekkari holes or in the landfills.

Finally, official controls shall be carried out in the farm, to verify the proper implementation of the legislation also concerning the Animal Identification and Registration. An effective, proportionate and dissuasive sanctions system should be foreseen and implemented.

1.A.5.3. OFFICIAL CONTROL IMPLEMENTATION

A critical factor in the implementation of the ABPs management system is the implementation of an effective official control along the whole ABPs chain, from the ABPs production until the final disposal.

An adequate legal framework concerning official control seems to be in place in Moldova. Article 5 of the Law 129 of 19/09/2019 defines the powers of the National Agency for Food Safety, and among others states that the National Agency for Food Safety has the following competencies: "*a) monitors and verifies the fulfilment by the operators of the requirements established by this law during the entire processing chain of animal by-products and derived products, as mentioned in art. 6 para. (2) of this law, through a system of controls carried out in accordance with Law no. 50/2013 on official controls to verify compliance with feed and food law and animal health and welfare rules.*" Article 6 of the Law defines the obligations for the operators.

Moreover, a specific chapter of the Law 129 of 19/09/2019 is dedicated to official control (Chapter VIII), and Article 40 (Official controls) provides specific provisions, stating that "(*1) …the competent authority shall carry out control actions regarding the handling of animal by-products not intended for human consumption and derived products covered by this law. The controls are performed based on Law no. 50/2013 on official controls to verify compliance with feed and food legislation and animal health and welfare rules*".

Capacity building of Competent Authorities for Official Control in the ABPs sector should include the following actions:

- Preparation of a training program for inspectors on ABPs sector and ABPs management
- Drafting training material
- Training of inspectors on ABPs management
- Preparation of a coordinated National Official control plan on ABPs management
- Preparation of SOPs for Official Control on ABPs management, including forms
- Implementation of training of inspectors on the National Official control plan

Summarising, Official controls on ABPs should:

- be part of the Multiannual national control plan (MANCP) and of the Annual national control plan (ANCP);
- follow the national legal framework (harmonized with the EU legislation);
- be carried out on a risk basis;
- cover all ABP operators (establishments for collection, processing and storage of ABPs);
- cover all ABP producers.

Such official controls should be addressed in first instance to assess compliance in correspondence of the first step of the ABPs chain, namely at the “source” of ABPs. This implies the need to carry out official controls at the farms, to assess compliance with the animals’ identification and registration rules, verifying that all animals in the farm are properly registered and identified, that all registered animals are in the farm, that in case of dead animals there is a proper documentation on the proper disposal of the carcass.

Also in food processing establishment, and especially in slaughterhouses, official controls should be carried out to assess the proper management of ABPs: separation of different categories at each step (collection, storage, dispatch), marking of by-products when required. Documentation should also be checked, verifying the proper disposal of ABPs generated in the plant.

1.A.5.4. FINANCING THE SYSTEM

The death of farmed animals, particularly cattle, constitutes significant damage to farmers, both for the loss of the animal and for the costs incurred for the disposal of dead animals. For this reason, in many Member States, the public administration supports farmers to cover partially or totally the cost of disposal of dead animals, in order to motivate the animal keepers to report dead animals.

Funds from the State budget should be allocated for co-financing of by-product producers and for full financing of collection and disposal of dead animals. Direct co-financing of the ABP management (collection, transport, processing) is preferable, as co-financing of relevant FBOs would create an administrative burden. In addition, local or central government should also subsidize all farmers since they already have a loss of future revenues. An insurance scheme could be drawn up in consultation with all major stakeholders and private insurance companies.

The sustainability of a fully operational ABPs management system will be, in our opinion, strictly connected with the establishments of an incentive system. Past experiences of neighbor countries demonstrate the difficulties to establish a fully operational ABPs management system. For example, in Serbia, in 2010, a Belgian company established the ABPs processing plant “Energo-zelena” in Indjija, with an investment of 21.5 Mil EUR. The plant was operating for several years with a very low capacity, the expected profit has never been reached and the facility was out of function for few years. This was essentially due to the fact that ABPs producers (farmers, slaughterhouses in first instance) didn’t deliver ABPs as expected.

Therefore, we consider essential the establishment of an incentive system, that should not be limited to a minimization of the costs for ABPs collection and disposal, even if this can be considered somehow as a prerequisite for the functioning of the whole system. Rather, additional reward mechanisms should be introduced, as experienced in some Member States.

For example, fiscal allowances, a reduction of taxation connected with an amount of ABPs delivered in line with the expectations could be foreseen. Other measures could be connected with a conditionality mechanism for the granting of funds foreseen according to CAP (Common Agricultural Policy) -like measures.

This should be sided, of course, by the establishment of an effective control system to guarantee a strict enforcement of the rules. Penalties applicable to infringements of the Regulation should be effective, proportionate and dissuasive.

1.A.6. ASSESSMENT OF FUTURE DEVELOPMENTS

1.A.6.1. AMOUNT OF ABPs TO BE PROCESSED

This issue has been already considered in chapter 1.A.2.1.

While in the prefeasibility it is estimated that in around 20 years the amount of ABPs to be processed will be doubled, this estimation is not supported by any accurate projection. Instead, assessing indirectly the trend related to ABPs production in the last year, through the evaluation of the trend in number of livestock and on slaughtered animals, we can see a significant reduction in the number of livestock and a fairly stable number of animals slaughtered (with different trends according to the species).

We consider impossible, with available data, to foresee with an acceptable level of approximation which will be the trend in these two sectors. However, we deem improbable such a significant increase, as that one foreseen in the Prefeasibility study. It is our opinion that the amount of ABPs to be currently processed, as estimated in this report, should remain quite stable.

On the other side, we consider important to put in place all the necessary activities to trigger the implementation of an effective ABPs management system since the very beginning. In few words, training, awareness campaign, strengthening official control should anticipate the entering in activity of the rendering plant(s). The final goal is that, when the rendering plant(s) will start the operation, a significant amount of ABPs will be delivered and the rendering plants will be functioning nearly at full power. Experienced matured in other countries have shown that, in case this will not happen, in few years the business would become financially unsustainable and the whole system will collapse.

1.A.6.2. MARKET ANALYSIS: POSSIBLE USES OF DERIVED PRODUCTS, MARKET PRICES

There are three groups of derived products depending on the raw material classification which have different market values:

- Derived products from Category 1: Meat and Bone Meal (MBM) and animal fat;
- Derived products from Category 2: Meat and Bone Meal (MBM) and animal fat;
- Derived products from Category 3: PAP and animal fat.

Indeed, from both cat. 1 and cat. 2 plants we will obtain MBM and animal fat. The difference is the destination of such products, that in the case of cat. 2 could be, additionally, organic fertilisers or soil improvers, composted or transformed into biogas. This issue has been already investigated in chapter 1.A.2.2.2.

Energy costs are the largest single cost incurred in rendering plants, where energy is required for releasing fat, evaporating water, and for the complete sterilization of raw materials. Efficient use of steam and the maximization of heat recovery from the rendering plant are key to minimizing overall plant energy consumption.

1.A.6.2.1. MEAT AND BONE MEAL (MBM)

MBM cannot be used as a feed ingredient but is valued as a source of green energy and a raw material in a variety of industrial applications. MBM can be landfilled (if there is no suspect case of TSE, and only in the case method 1-pressure sterilization is used) or incinerated.

Co-incineration in cement kiln systems is the most common way for MBM destruction. MBM has around two thirds the energy value of fossil fuels such as coal, and it is increasingly used in cement kilns as an environmentally sustainable replacement for coal.

The use of alternative fuels in cement manufacturing affords considerable energy cost reduction, and also has significant ecological benefits of conserving non-renewable resources, the reduction of waste disposal requirements and reduction of emissions.

The wastes used as alternative fuels in cement kilns would alternatively either have been landfilled or destroyed in dedicated incinerators with additional emissions as a consequence. Their use in cement kilns replaces fossil fuels and maximises the recovery of energy. Employing alternative fuels in cement plants is an important element of a sound waste management policy.

The feeding rates of MBM in cement kilns vary from country to country. According to collected information, in Spain the limit is 15 percent of the energy needed in the kilns. In France where about 850,000 tonnes of MBM are produced per year, about 45 percent is burnt in cement plants. The remaining 55 percent is usually stored waiting for further destruction or valorisation.

MBM is subject to high volatility of prices. According to the several variables (Country, situation in the market, etc.), MBM can be disposed of in cement industry generating some income (i.e. € 50/ton), or it can be very difficult to dispose of. In some periods, depending on the situation, the cost for the producer for disposal can be around € 50/ ton.

As an example, in the last months a surplus of MBM on the market has been reported, with serious difficulties in disposing of this material. Consequently, in some countries rendering companies are paying for disposing of MBM.

1.A.6.2.2. ANIMAL FAT

Fat has a similar effective heating value as fossil oil, with an effective heating value of approximately 38 MJ/kg.

Rendered fats may be used in two primary ways as sources of biofuel. First as a direct substitute for fossil fuel sources such as oil and gas used in steam raising boilers or oxidisers. Second as the main ingredient in fatty acid methyl ester (FAME) types of biodiesel that may be used in road and marine vehicles. In both situations, rendered fats can play an important role in achieving significant reductions in greenhouse gas emissions and a reliance on fossil fuels. An even more welcome benefit is that the use of such materials does not influence food policy as these materials are never intended for human consumption.

Summarising, the key applications for the categories of animal fats are:

- as a process fuel in the rendering facility for process heat and power;
- as a feedstock for biodiesel (EU: ~400kT cat 1 and 2 animal fats and ~300kT cat 3 animal fats in 2014[2]);
- as a chemical intermediary for oleochemicals (EU: ~580kT in 2014[1]);
- as a precursor for animal feed (only cat. 3)

Animal fats are also used in very small quantities in the power generation. Very specific conditions are still required for the disposal of category 1 and category 2 animal fat in power stations, so investment would be required at power stations should they wish to switch to using this feedstock.

The animal feed and oleochemical industries can only use cat 3 animal fats, whereas technically, all categories could be used for energy/biofuel production.

The potential to sell the rendered fat for the production of biodiesel is for sure the most important, even if it looks like in Moldova no biodiesel production company can be found. It will be needed to establish contacts with the most important biodiesel producers located in the neighbour countries, where probably there would be an interest in buying animal fat.

Indeed, even if subject to price fluctuations, rendered fat has a good value on the market, and the prices of fats obtained from cat. 1 and 2 are quite close to the prices of the fat obtained from undifferentiated cat. 3 ABPs.

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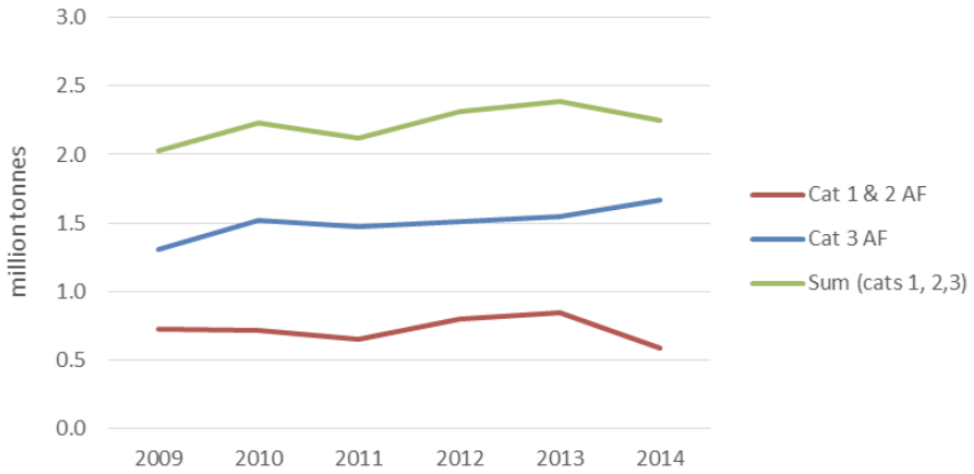
[2] Ecofys, Indirect emissions from rendered animal fats used for biodiesel. Final report ENER/C1/2013-412, 20 June 2016.

EU market of animal fats

Data provided by EFPRA, the European Fat Processors and Renderers Association, show the average amount of animal fats of the 3 categories obtained in the EU rendering sector from 2009 to 2014 (figure 1.A.21). EFPRA's members represent 93% of the category 1, 69% of the cat 2 and 74% of the cat 3 animal fat produced in the EU and the relative proportions are fairly representative of rendering facilities across the EU.

Figure 1.A.21. Total production of different categories of animal fats in the EU. Source: EFPRA



A slight increase in the production of cat 3 animal fats and a decline in the production of cat 1-2 animal fats can be seen, and this could be explained by an improvement in the segregation processes at the rendering facility to produce more cat 3 material, which receives a higher price.

Increase in cat 3 animal fats could be significantly offset by incentives over the use of cat 1-2 animal fats for biodiesel production (e.g. double counting), which might raise the prices of cat 1-2 animal fats to a point where they would become more profitable than cat 3 animal fats.

Animal fat used as a process fuel in the rendering facility

Numerous rendering plants use animal fat to replace the use of oil in their steam boilers. Animal fat has a high calorific value and it is a valuable renewable energy source. The calorific value of animal fat is very similar to that of heavy fuel oil. Animal fat is actually very similar to heavy fuel oil and in most cases only minor adaptations of the boiler are necessary to replace heavy fuel oil by animal fat as boiler feed. For a thorough evaluation of the possibilities of animal fat as a fuel, a detailed comparison of the characteristics of both animal fat and fuel is necessary.

The rendering plant will use animal fat produced in-house to replace the use of oil in their steam boilers. Depending on the quality and quantity of the animal by-products rendered, the plant will be able to cover up to 80% of the boiler's energy requirements, with the animal fat produced on site. The plant will therefore be able to save most of the amount needed per ton of processed ABPs.

Animal fat for the production of biodiesel

The main market for fats is the manufacture of biodiesel.

Biodiesel, otherwise known as Fatty Acid Methyl Ester (FAME) is Europe's most widely used biofuel. It can be produced from vegetable fats and oils such as rape, palm and soya, all of which are used in food and feed, or from animal fats and used cooking oils, both of which are derived from residues or by-products of the food industry but which can no longer be used in food or feed.

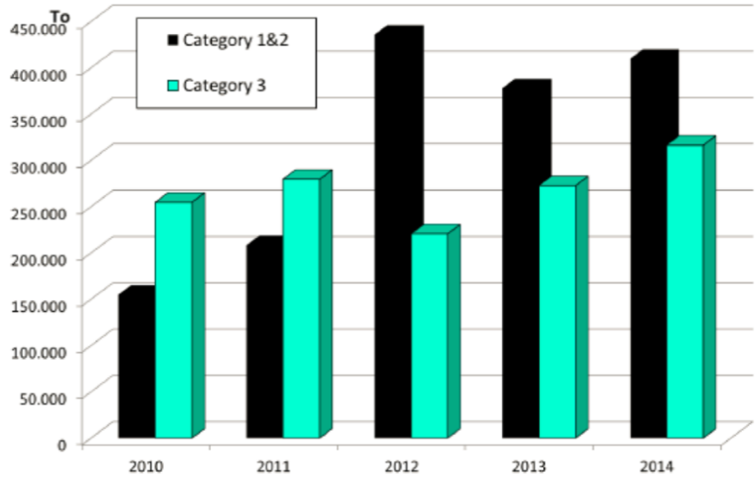
The Renewable Energy Directive (RED 2009/28/CE) states that waste-based biofuels can be counted twice in the calculation of the shares of renewable energies in transport ("double counting system"). However, only categories 1 and 2 can be double counted for reaching the 2020 renewable energy target in transport.

Fats from all three categories can be destined to biodiesel production. Some biofuel producers may only use cat 1 and 2 animal fats since they rely on the double counting to make their economics work. However, some biodiesel producers prefer using cat 3 animal fats due to higher quality: some stakeholders have reported that Category 3 provides better quality for biodiesel production.

Given the limited availability of animal fats cat 1-2 and possible price increases due to enhanced competition, animal fats cat 3 might become price-competitive with animal fats of cat 1-2, which would drive biodiesel producers to use cat 3, even if it remains single-counted.

Data for the UK shows (Ecofys, 2014) that the volume of animal fat that is combusted as a fuel can vary significantly year on year. In 2013, the proportion of cat 1 animal fats used in combustion was 45%, whereas the proportion used in 2014 was 10%. The exact volumes of animal fats used depend very much on the price of alternatives that could be used, such as natural gas, coal and heavy fuel oil, and how this compares with the price that the animal fats may be sold for. In 2014, with the lower volume of UK cat 1 animal fats used in combustion, a much higher proportion was used as biodiesel (55% in 2014 compared with 28% in 2013).

Figure 1.A.22. Biodiesel production from different categories of animal fats, across the EU. Source: EFPRA (2015)



Biodiesel produced from agricultural waste has been rapidly expanded around the world due to its relevant advantages such as being biodegradable, renewable and sulphur-free. The cost of biodiesel majorly depends on the cost of the raw materials being used, with animal fat waste being cheaper than vegetable oil waste. As non-listed commodities, waste-based biofuels and feedstock used in their production are difficult to price.

Market value of animal fats

A wide variation in the price of animal fats can be observed over time. In addition, animal fats may not be bought on an open market but instead bought directly from renderers. Other factors that affect the price are the distance which the animal fats have to be transported, the time of year, how far in advance you want to secure feedstocks and the exact specification of the animal fats. Based on discussions with the rendering industry, there are typically no long-term contracts for animal fats.

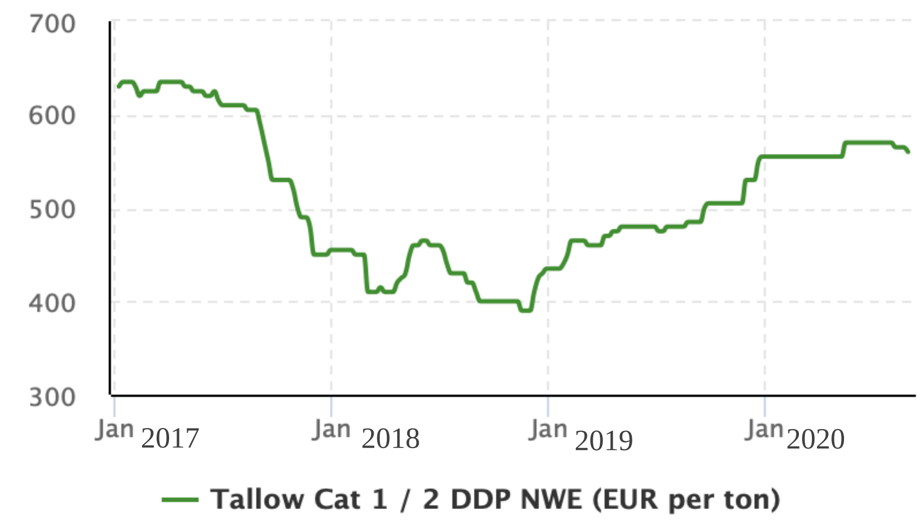
Typically, cat 3 animal fats are more expensive than the other grades of animal fats, since they go to the highest value sectors. However, animal fats are typically lower in price than vegetable oils such as palm oil.

Market value of fats obtained in rendering plants is usually associated with the heavy oil price. The average price for heavy oil in 2019 was 518 pounds/ton, that is Eur 574/ton (https://www.statista.com/statistics/372315/price-of-oil-per-tonne-manufacturing-industry-in-the-united-kingdom-uk/). Considering that the use and handling of the fat is more complicated than fuel oil, it is usually calculated as 80% of the heavy oil price, which means approximately 460 € per ton.

As far as industrial prices are concerned, these are not public. However, as a reference, the website of Greenea has been consulted (http://www.greenea.com/en/market-analysis/).

In this website, average prices of animal fat are considered, cat. 1 produced under the terms of the Regulation (EC) n. 1069/2009 – method 1) with FFA max 20%, impurities 0,15%, water max 0,6%. Prices fluctuation is evident: € 550/ton in January 2020, € 560/ton in August 2020, but in January 2017 price was € 635/ton, in January 2018 € 455/ton, in January 2019 € 435/ton. The graph below shows the huge fluctuations.

Figure 1.A.23. January 2017 – January 2020: example of prices fluctuation, animal fat cat. 1.



In Italy also, prices fluctuations are quite significant, as in the Stock exchange of Bologna the following prices were quoted in previous years for animal fat cat. 3 (zootechnical use):

- May 2018, acidity 4% Eur 506/ton, acidity 7% Eur 486/ton;
- February 2019, acidity 4% Eur 522/ton, acidity 7% Eur 492/ton.

Prices of animal fat cat, 3, zootechnic use, are quoted at the Stocks exchange of Granaries, Milano (Italy), http://www.granariamilano.org/pagina.php?idsottomenu=8&idmenu=2

These prices are influenced by the quality of the rendered fat, as it can be seen in the table below.

Table 1.A.30. Prices of animal fat cat, 3, zootechnic use, €/ton

	Week 48 2020		*Week 49 2020*	
	Min	Max	Min	Max
Tallow FFA [1] 2-3 – MIU[2] 1 – FAC[3] 7-9	713.0	718.0	*718.0*	*723.0*
Fat acidity 4 - MIU 1	693.0	698.0	*698.0*	*703.0*
Fat max 7 FFA - MIU 1	658.0	663.0	*663.0*	*668.0*
Fat max 10 FFA - MIU 1	643.0	648.0	*648.0*	*653.0*

1) FFA: Free Fatty Acids

2) MIU: M - Moisture and Volatiles, I - Insoluble Impurities, U - Unsaponifiables

3) FAC: Fat Analysis Committee. This method determines the Color of Fats

1.A.6.2.3. PROCESSED ANIMAL PROTEINS (PAP)

Animal by-products from Category 3 have a wide range of different applications, though, if the quantity is sufficient, the highest value can be obtained by rendering of these by-products and selling the product for pet food.

From processing category 3 ABPs we will obtain PAP (Processed Animal Protein) and fat.

'Processed Animal Protein' means animal protein derived entirely from Category 3 material, which has been treated in accordance with the Regulation 1069/2009 and the Regulation 142/2011 (including blood meal and fishmeal) so as to render them suitable for direct use as feed material or for any other use in feeding stuffs, including pet food, or for use in organic fertilisers or soil improvers; however, it does not include blood products, milk, milk-based products, milk-derived products, colostrum, colostrum products, centrifuge or separator sludge, gelatine, hydrolysed proteins and dicalcium phosphate, eggs and egg products, including eggshells, tricalcium phosphate and collagen.

PAP is a biosecure feed ingredient with a high protein value and low carbon footprint. The use of PAP in farmed land animals' diets in the EU is currently restricted. However, the export to and use of PAP in third countries is allowed under OIE rules and the conditions of the importing countries where controls of animal proteins successfully exist for many years.

Cat. 3 derived products coming from ruminants can be used (as referred in Annex IV Chapter IV – Section 3 "Disposal and use of derived products) also as pet-food, as organic fertiliser or soil improver and composted or transformed into biogas. A summary of the possibilities to use different ABPs in farm animal feeding in the EU is reported at table 1.A.31.

The cost of production of this kind of PAP is similar of the production of MBM.

It is difficult to obtain average price for Processed Animal Proteins because this material is not quoted at the Stocks exchange.

However, the value of the Processed Animal Proteins obtained in the rendering process (cat. 3) will depend on the composition of the raw material. The value of PAPs varies according to few parameters:

- higher value in case of raw material from non-ruminant animals;
- higher value in case of raw material from monospecies non ruminant animals (medium value: pigs and poultry; high value: fish);
- the % of the protein (40%, 45%, 50%, 55%) and % fat (13%, 15%, 17%, 18% + % ashes low as possible).

From an undistinguished material (mix of all cat. 3 material with rumen and intestines), PAP of minimum value is obtained. On average, the market price of PAP from an undistinguished material would be around 190 – 210 €/t.

Concerning the yields, we have found different estimations according to the source. According to the technological solution of the processing plant using method 4, 26% of MBM and 24% of animal fat of minimum value would be obtained. However, we consider more prudent an estimation of 23% MBM and 16 % fat for such an establishment.

Other estimations are as follows:

- from an undistinguished material (mix of all cat. 3 material with rumen and intestines) 22% of PAP and 8% animal fat of minimum value are obtained;
- from bones, 20% of PAP and 20% animal fat of medium value are obtained;
- from fresh fat, 10% of PAP and 60% animal fat of medium/high value are obtained;
- from kidneys, 15% of PAP and 80% animal fat of medium/high value are obtained.

Table 1.A.31. Summary on authorization of different ABPs in farm animal feeding in the EU

ABP material	*Ruminants (cattle, sheep and goats)*	*Non-ruminants (pigs and poultry)*	*Aquaculture (fish and shellfish)*
Blood products and blood meal from non-ruminants	banned (TSE Regulation)	permitted (only blood products)	permitted
Blood products and blood meal from ruminants	banned	banned	banned
Catering and kitchen waste	banned (ABP Regulation)	banned (ABP Regulation)	banned (ABP Regulation)
Collagen and gelatine from non-ruminants	permitted	permitted	permitted
Di- tri-calcium phosphate from non-ruminants	banned (TSE Regulation)	permitted	permitted
Egg products	permitted	permitted	permitted
Fats from ruminants and non-ruminants, fish oils	permitted	permitted	permitted
Fishmeal	banned (exception: milk replacer for young animals)	permitted	permitted
Former foodstuffs	permitted (under requirements of Feed Reg.)	permitted (under requirements of Feed Reg.)	permitted (under requirements of Feed Reg.)
Gelatine from ruminants	banned	banned	banned
Hydrolysed protein from non-ruminants or from ruminants hides and skins	permitted	permitted	permitted
Milk products	permitted	permitted	permitted
PAPs from non-ruminants	banned (TSE Regulation)	banned (TSE Regulation)	permitted
PAPs from ruminants	banned (TSE Regulation)	banned (TSE Regulation)	banned (TSE Regulation)

Source: D. Jędrejek, J. Levic, J. Wallace and W. Oleszek. Animal by-products for feed: Characteristics, European regulatory framework, and potential impacts on human and animal health and the environment. Journal of Animal and Feed Sciences · January 2016.

1.A.6.3. POTENTIAL ON FUTURE TRADE FLOWS AND PATTERNS

1.A.6.3.1. MEAT AND BONE MEALS

According to the technical report "Evaluation of the energy performance of cement kilns in the context of co-processing" by the European Cement Research Academy, the energy efficiency in the cement kilns varies between 70% to 80% depending on the raw materials moisture content. According to the same report, Co-processing of waste in cement kilns contributes to the solution of three major issues the EU is currently facing:

- Abatement of climate change: alternative fuels (AF) form one of the main levers for reduction of CO2 intensity in cement manufacturing. According to the International Energy Agency (IEA), AF can contribute 0.75 Gt of CO2 reductions worldwide up to 2050.
- Improved waste management: co-processing can reduce the volume of waste that is being landfilled and use its energy content in a very efficient manner. In that sense, it fits directly into the EU waste management hierarchy under the EU Waste Framework Directive.
- Progress towards a circular economy: in co-processing, waste streams from other parts of the economy are valorised in the cement industry – thus contributing towards the circular economy. Furthermore, co-processing allows for partial material substitution replacing certain virgin materials used in cement making.

The European Commission included co-processing of waste in cement kilns in their "Communication on Waste-to-Energy". The main conclusions of the European Commission Communication on Waste-to- Energy (WtE) are:

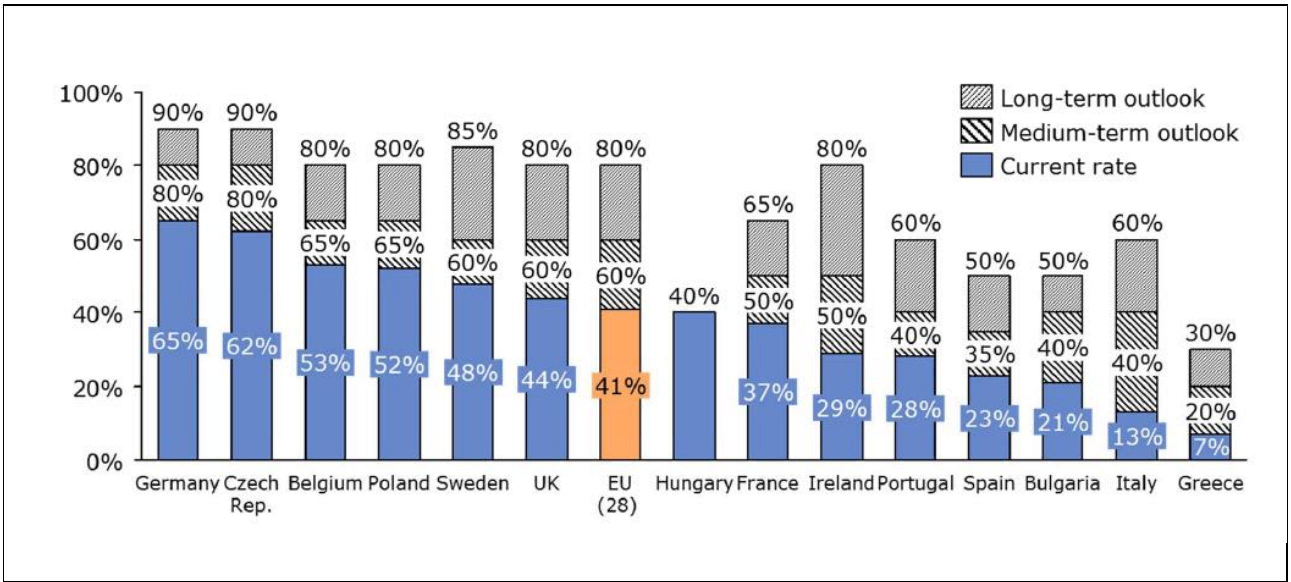
- WtE processes can play a role in the transition to a circular economy, provided that the EU waste hierarchy is used as a guiding principle.
- Following the waste hierarchy more strictly is expected to reduce the amount of waste available for WtE processes.
- It calls on member states to use the guidance to revise their waste management plans with a view to avoiding potential overcapacity in waste incineration due to the possibility of asset stranding.
- Co-processing of waste in cement plants is identified as one of the best proven techniques to improve energy efficiency of WtE conversion.

In 2017, conventional fossil fuels accounted for 54% of the European cement industry's fuel mix, whilst alternative fuels from waste made up 46%. Based on the study "Status and prospects of co-processing of waste in EU cement plants" (Ecofys, 2017), it has been estimated that a coprocessing rate of 60% or more is technically achievable. In future, this figure could even rise to 95%. Making the most of this waste-to-energy capacity has the advantage of reducing the need for additional investment in new waste-to-energy capacity.

Furthermore, Member States could save between €12.2 billion by utilising existing capacity in the EU cement industry, an amount that corresponds to investment required for the construction of new waste-to-energy incinerators.

Status and prospects of coprocessing of waste in EU cement plants were assessed in 14 member states, and the results are shown in figure 1.A.24.

Figure 1.A.24. Current and expected co-processing rates in analysed countries (2017)



Source: Ecofys. Status and prospects of coprocessing of waste in EU cement plants

The perceived potential for further increase in fuel substitution varies significantly between all of the analysed states. Several drivers influence fossil fuel substitution in the cement industry, and among them:

- Waste management policy incentivising more advanced waste treatment methods than landfilling and production of high quality pre-treated waste. Examples might include good implementation of the EU Waste Framework Directive, coordination of waste management between various regions in the country or landfill bans, taxes and gate fees.

- Low levels of bureaucracy in regard to permitting for both waste utilization in cement kilns and imports of preprocessed waste.
- Modernized cement industry ready for further waste uptake and its experience with higher co-processing rates requiring substantial operational excellence.
- Price (total) and price volatility of conventional fossil fuels which can further strengthen the business case for the use of AF, in particular at times when the relative cost of EU emission allowances is low.

Other factors seem to play a role, and three main barriers that hamper a higher co-processing rate were identified as key by the experts:

- unavailability of high quality waste fuels,
- excessive bureaucracy,
- public unacceptance of waste combustion.

In the study Ecofys assess the barriers and opportunities for further uptake of alternative fuels in 14 EU member states. Ecofys found that local factors constrain the market potential to a much larger extent than the technical and economic feasibility of the cement industry itself.

1.A.6.3.2. ANIMAL FAT

Rendering consists in cooking raw material as it is (wet processing) or after the evaporation of existing water (dry processing), after the size reduction of different anatomic parts and bones.

The separation of the three rough constituents of the feedstock (fat, solid fraction and water) is carried out in the wet rendering by means of decanters and centrifuges, while in the dry process the fat is obtained through water evaporation and pressing of dried feedstock, allowing the separation of fat and solid material.

Temperatures in the wet process are relatively low and, in every case, lower than 100°C. This technology allows obtaining a better quality for both fat and solid material. After cooking (100°C × 1 hour as an indication) the obtained sludge material is sent to a triphasic decanter, where fat, water and solid material are separated. The crude fat is delivered to filtration and drying units, water is sent to the waste water treatment and the solid material is processed with a screw press, in order to recover the remaining fatty material and part of water. Part of unwanted contaminants are removed by means of the removal of the aqueous phase.

On the contrary, the dry process is carried out by means of evaporation and temperatures can reach 130°C. The cooked and dried feedstock is finally processed in a screw press for the separation fat/solids. In this case the fraction of contaminants removed by centrifugation in the wet process remains in the two main fractions.

The recent changes in the fat uses for energy purposes caused a return to the wet processing because of the better quality of the final product, and this should be considered when analysing the market opportunities.

Around 60% of the fat that is produced in the rendering plant would be used in the plant itself as fuel, the remaining 40% could be sold.

Currently dominant feedstocks for biodiesel production, in particular vegetable oils, are problematic as they are normally expensive and may have limited availability due to seasonal, social and economic constraints. Thus, there is strong interest in using lower cost feedstocks (Caetano et al., 2012) that do not interfere with important aspects of human societies and contribute to increase its role in sustainability.

On the other hand, biodiesel of animal origin has positive properties, such as large values of heating value (HHV) and cetane number (CN) (Lebedevas et al., 2006).

The heating value, or heat of combustion, is a measure of the energy available from the fuel. Although the heating value is not specified in the biodiesel standard EN 14214, the EN 14213 specifies a minimum heating value of 35 MJ/kg for using biodiesel as heating oil. The heating value of the various biodiesels is around 39-40 MJ/kg biodiesel, slightly lower than that of fossil diesel (45 MJ/kg diesel), but all above the minimum value given in the standard EN 14213.

From the sustainability perspective, beef tallow biodiesel seems to be the most sustainable one, as its contribution to global warming has the same value of fossil diesel and in terms of energy efficiency it has the best value of the biodiesels under consideration.

The possibility to sell rendered fat to power stations should be further investigated, however it should be considered that the use of the fat in power generation plants implies some technical constraints and probably investments would be needed.

1.A.6.4. POSSIBLE CLIENTS

1.A.6.4.1. TECHNICAL FAT

The potential to sell the rendered fat for the production of biodiesel is for sure the most important, even if as it was seen it looks like in Moldova no biodiesel production company can be found.

Contacts should be established with the most important biodiesel producers located in the surrounding Countries, in the Balkans, in Greece and in Italy, where probably there would be an interest in buying animal fat. Indeed, even if subject to price fluctuations, rendered fat has a good value on the market, and as it was already pinpointed the prices of fats obtained from cat. 1 and 2 are quite close to the prices of the fat obtained from undifferentiated cat. 3 ABPs.

Considering Countries with locations that could be reasonably reached from Moldova, the following biodiesel producers are members of the European Biodiesel Board (EBB):

- In Bulgaria, Astra Bioplant (100 Tutrakan Blvd, BG-7000 Ruse), with an annual capacity of 60.000 tons biodiesel, declares that the biodiesel is obtained at esterification of vegetable oils.
- In Greece, Agroinvest s.a. (Achladi 350 13 Stylida, Fthiotida, Greece) is an industrial company with integrated operations in agribusiness, food & bioenergy. Agroinvest produces and trades goods (including biodiesel) along the oilseeds and grains value chains.
- In Greece Elin Verd, 33 Pigon Str., 145 64 Kifissia, Athen, with an annual production capacity of 80.000 tons of biodiesel.
- In Greece, GF Energy (Sousaki – Agioi Theodoroi, 20 003 Korinthos) declares that the establishment can use a variety of oils, vegetable or not, as well as used oils.
- In Italy, Ital Bi Oil srl (Monopoli – BA – Via Baione 223) has a capacity of 200.000 tons/year of biodiesel, but apparently they use only vegetable oils.
- In Italy, ECO FOX S.r.l.,Via Osca 74, 66054 Vasto (CH), has a capacity of 200.000 tons/year of biodiesel.
- In Romania, Expur (45 Tudor Vladimirescu Bvd. District 5, 050881 Bucharest), which main activity is oil seeds processing for the purpose of obtaining crude and refined oil, meal and biodiesel.

1.A.6.4.2. MEAT AND BONE MEAL

Meat and bone meal is used in several cement kilns, in particular in Western Europe. Since it contains only biogenic materials it can be categorised as 100% biomass fuel which gives no net carbon dioxide emissions during the combustion process.

MBM could safely replace more than 40% of the coal energy without giving negative effects. If 40% of the kiln burner coal is substituted by MBM, around 10% of the total annual CO2 emissions from the plant can be avoided.

Under this assignment, a preliminary investigation on cement factories (that are the final destination for MBM) in Moldova and neighbour countries has been carried out (table 1.A.32).

Table 1.A.32. List of cement factories in Moldova and neighbour countries

Group name	*Company name*	*Facility name*	*City*	*Country*
CJSC “Rybnitsa Cement Plant”	CJSC “Rybnitsa Cement Plant”	Rybnitsa	Rybnitsa	Moldova
Lafarge Holcim Ltd	Lafarge Ciment Moldova S.A.	Rezina	Rezina	Moldova
CRH PLC	CRH Ciment Romania SA	Hoghiz	Hoghiz	Romania
CRH PLC	CRH Ciment Romania SA	Megdidia	Megdidia	Romania
CRH PLC	CRH Ciment Romania SA	Targu Jiu	Targu Jiu	Romania
Heidelberg Cement AG	Heidelberg Cement Romania SA	Chiscadaga	Diena	Romania
Heidelberg Cement AG	Heidelberg Cement Romania SA	Fieni Cement Plant	Fieni	Romania
Heidelberg Cement AG	Heidelberg Cement Romania SA	Tasca	Bicaz	Romania
Lafarge Holcim Ltd	Holcim Romania SA	Alesd	Alesd	Romania
Lafarge Holcim Ltd	Holcim Romania SA	Campulung	Campulung	Romania
Lafarge Holcim Ltd	Holcim Romania SA	Turda	Turda	Romania
Soceram	Soceram	Cemrom	Corbu	Romania
CRH PLC	OJSC Podliski Cement	Kamyanet-Podilski	Kamyanet-Podilski	Ukraine
CRH PLC	JSC Mikolaivcement	Mykolaiv	Mykolaiv	Ukraine
CRH PLC	Cement LLC (Odessa Cement)	Odessa	Odessa	Ukraine
Eurocement Group	Eurocement Ukraine	Baltsem- Balakleya	Balakliya	Ukraine
JSC Ivano Frankivscement (Ifcem)	JSC Ivano Frankivscement (Ifcem)	Ivano-Frankivsk	Ivano-Frankivsk	Ukraine
JSC Promcement	JSC Promcement	Amrosievka	Amrosievka	Ukraine
Overin Ltd	PJSC Heidelberg cement Ukraine	Amrovsiyivka	Amrovsievskiy	Ukraine
Overin Ltd	PJSC Heidelberg cement Ukraine	Dniprodzerzhynsk	Dniprodzerzhynsk	Ukraine
Overin Ltd	PJSC Heidelberg cement Ukraine	Kryvyi Rih	Kryvyi Rih	Ukraine
PRJSC Dickeroff Cement Ukraine	JSC Yugocement	Zdolbuniv	Zdolbuniv	Ukraine
PRJSC Dickeroff Cement Ukraine	JSC Volyn-Cement	Olshanske	Olshanske	Ukraine

Only 2 cement factories are located in Moldova, however a certain number of these facilities are located in Romania and Ukraine. In most of the cases cement factories are part of large international groups, and in many cases these companies reported that they have increased the ratio of alternative fuels in cement production, or that they plan to increase.

The possibility to sell MBM to one or more of these cement factories is crucial for the sustainability of the entire system, therefore contacts should be established well ahead the establishment of the whole system. It could be also interesting to investigate on the possible competitors in these countries (rendering plants for cat. 1 ABPs).

SECTION 1.B

TASK 2.

OPERATIONAL /TECHNICAL MODEL

1.B.1. OPTIONS AVAILABLE: ABPs PROCESSING FACILITY TO BUILD

1.B.1.1. POINTS TO BE PRELIMINARILY CONSIDERED

Before to analyse different options for disposal of ABPs, some point of Regulation (EC) No 1069/2009 should be taken in consideration.

- The Regulation requires operators to keep ABPs of different categories separate from each other if they wish to make use of Animal by-products which do not pose a significant risk to public or animal health.
- According to art. 21 of the Regulation, operators shall collect, identify and transport ABPs without undue delay under conditions which prevent risks arising to public and animal health. There is no obligation for the operator to categorise ABPs, providing that, once ABPs of different categories are mixed, the mixture is handled in accordance with the standards laid down for the highest risk category.
- Regulation does not apply to raw pet food originating from retail shops, where the cutting and storage are performed solely for the purpose of supplying the consumer directly on the spot, and to raw pet food derived from animals which are slaughtered on the farm of origin for private domestic consumption.
- Burial and burning of ABPs, in particular of dead animals may be justified in specific situations, in particular in remote areas, or in disease control situations requiring the emergency disposal of the animals killed as a measure to control an outbreak of a serious transmissible disease. In particular, disposal on site should be allowed under special circumstances, since the available rendering or incinerator capacity within a region or a Member State could otherwise be a limiting factor in the control of a disease. Burial of dead pet animals and horses is a possibility by derogation (art.19).

1.B.1.1.1. INCINERATION/CO-INCINERATION

Incineration and co-incineration as a method for ABPs disposal are explicitly foreseen in the EU legislation.

Regulation (EC) No 1069/2009, whereas n. 39, states: "*Disposal of animal by-products and derived products should take place in accordance with environmental legislation regarding landfilling and waste incineration. In order to ensure consistency, incineration should take place in accordance with Directive 2000/76/EC on the incineration of waste. Co-incineration of waste – either as a recovery or disposal operation – is subject to similar conditions regarding approval and operation to those regarding waste incineration, in particular as to air emission limit values, waste water and residue discharge, control and monitoring and measurement requirements. Consequently, direct co-incineration, without prior processing, of all three categories of materials should be permitted*." This is further confirmed at articles 12, 13 and 14 of the Regulation. Rules on incineration and co-incineration are defined in Regulation 142/2001 (whereas n. 9, art. 6, Annex III).

A distinction between incineration plants and co-incineration plants should be made. These are not defined in Regulations 1069/2009 and 142/2011. The relevant definitions can be found in the Directive 2010/75/EU of 24 November 2010 on industrial emissions (art. 3), as Directive 2000/76/EC is not in force anymore:

- 'waste incineration plant' means any stationary or mobile technical unit and equipment dedicated to the thermal treatment of waste, with or without recovery of the combustion heat generated, through the incineration by oxidation of waste as well as other thermal treatment processes, such as pyrolysis, gasification or plasma process, if the substances resulting from the treatment are subsequently incinerated;
- 'waste co-incineration plant' means any stationary or mobile technical unit whose main purpose is the generation of energy or production of material products and which uses waste as a regular or additional fuel or in which waste is thermally treated for the purpose of disposal through the incineration by oxidation of waste as well as other thermal treatment processes, such as pyrolysis, gasification or plasma process, if the substances resulting from the treatment are subsequently incinerated.

Information has been collected regarding incineration and co-incineration, in some member States and in neighbour countries. The relevant outcomes are further summarized.

- Direct incineration /co-incineration of fresh ABPs has been evaluated as energetically and economically not feasible by experts who were consulted. Incineration of ABPs has a very high cost, as a considerable amount of fuel has to be used for this process.
- The possibility to dispose ABPs in existing incinerators treating "common waste" was investigated in some Member States, and some experiences were made. Several difficulties had to be faced, related to the prohibition imposed in some Member States concerning the type of waste that can be incinerated. In general, significant management problems were detected, related to selection of raw materials, high water contents of ABPs and consequent collapse of the temperature of the incinerators, quality of emissions, etc. In addition to this, the low calorific value (below 1800 Kcal/Kg) and the inhomogeneity, the presence of ashes (from bones) which are dangerous waste to be disposed of, and other aspects have dissuaded even the most equipped plants to continue with this approach.
- The situation in some Balkan countries has been evaluated. In Croatia, for example, there are 4 incineration plants of small capacity (up to 50kg/h): 2 are for disposal of dead pets, 1 is for disposal of fresh ABPs (cat 3) from a poultry slaughterhouse of the same FBO, 1 is for disposal of fresh ABP (cat 1, cat 2, cat 3) from a slaughterhouse of ungulates and solipeds. Both facilities of the same operator are located in areas with special geographic constraints (islands), and in such a situation it is justified to identify alternative solutions. In Croatia there is also 1 co-incineration plant (cement plant) - where MBM is co-incinerated.

1.B.1.1.2. EXPORT ABPs TO A NEIGHBOR COUNTRY

Another option to be considered is the possibility to export ABPs to a neighbor country.

Export of ABPs is a possibility included in the legal framework. Art. 4, paragraph 4 of Regulation 1069/2009 prescribes that "*Member States shall ensure that an adequate system is in place on their territory ensuring that animal by-products are: collected, identified and transported without undue delay; and treated, used or disposed of in accordance with this Regulation*." The following paragraph 5 specifies that Member States may fulfil their obligations under paragraph 4 in cooperation with other Member States or third countries.

However, it shall be considered that, according to art. 43 of the Regulation:

- the export of ABPs and derived products destined for incineration or landfill shall be prohibited;
- the export of ABPs and derived products to third countries which are not members of the OECD for use in a biogas or composting plant shall be prohibited. In the neighbor area, no Country is OECD member;
- the export of SRM shall take place only in accordance with Regulation (EC) No 999/2001. Art. 8 of this Regulation states that SRM shall not be imported into the Community (i.e. SRM could not be dispatched to Romania).

Rules for the dispatch of ABPs to other Member States are defined in art. 48 of Reg. 1069/2009, as follows:

"1. Where an operator intends to dispatch Category 1 material, Category 2 material and meat-and-bone meal or animal fat derived from Category 1 and Category 2 materials to another Member State, it shall inform the competent authority of the MS of origin and the competent authority of the MS of destination. The competent authority of the MS of destination shall decide upon application by the operator, within a specified time period:

(a) to refuse receipt of the consignment;

(b) to accept the consignment unconditionally; or

(c) to make receipt of the consignment subject to the following conditions:

(i) if the derived products have not undergone pressure sterilisation, it must undergo such treatment; or

(ii) the animal by-products or derived products must comply with any conditions for the dispatch of the consignment which are justified for the protection of public and animal health in order to ensure that ABPs and derived products are handled in accordance with this Regulation.

2. omissis

3. The competent authority of the Member State of origin shall inform the competent authority of the Member State of destination, of the dispatch of each consignment sent to the Member State of destination, of:

(a) animal by-products or derived products referred to in paragraph 1;

(b) processed animal protein derived from Category 3 material.

When informed of the dispatch, the competent authority of the Member State of destination shall inform the competent authority of the Member State of origin of the arrival of each consignment.

4. Category 1 and Category 2 materials, meat-and-bone meal and animal fat shall be transported directly to the establishment or plant of destination, which must have been registered or approved in accordance with Articles 23, 24 and 44 or, in the case of manure, to the farm of destination."

Export could relate to all ABPs (Cat. 1, 2 and 3) or to one category only (namely Category 1 or 3).

What would be needed, in case of export, is:

- an appropriate separation of the 3 categories of ABPs, starting from the collection and then during storage and at the transportation;
- an adequate logistic planning for the storage and transportation, that of course shall be done at refrigeration temperature, or after freezing of ABPs.

However, the complete outsourcing of ABPs processing implies some possible problems, as further summarized.

- Moldova would have to rely on external companies and relevant decisions: if, for some reasons, these companies would decide to interrupt the collaboration or to change the conditions (first of all economic conditions), suddenly Moldova would find itself with an increasing amount of ABPs to be disposed of and without the real possibility to solve the problem, that would become more serious every day.
- There are some important limitations in the possibility to export ABPs:
  - ✓ the export of ABPs and derived products destined for incineration or landfill is prohibited;
  - ✓ the export of ABPs and derived products to neighbour countries for use in a biogas or composting plant is prohibited;
  - ✓ Specified Risk Material cannot be exported in EU Member States.
- The costs for exporting ABPs are difficult to estimate. Of course, the adequate separation in categories would be very important, as the costs for exporting cat. 1 ABPs would be significantly higher that the costs for exporting Cat. 3 ABPs. However, the limited amount of ABPs produced in Moldova reduces the possibility to valorise separately different types of cat. 3 ABPs. In the worst-case scenario (no separation of ABPs), it can be estimated a global cost of € 150-200/ton (storage + transport + disposal of), with a total cost of around 2,500,000 – 3,000,000 €/year. In case an adequate separation of ABPs would be guaranteed, we could estimate a cost of € 150-200/ton for Cat. 1, while for category 3 the amount obtained from the sale would probably cover the costs of storage and transportation; in this case the total cost would be around € 1,200,000-1,500,000/year.
- Logistic would play a crucial role: a system of collection and storage should be established at National level, and probably one or two storage establishments would be needed. This would be an additional cost.
- In case of an epidemic or non-epidemic emergency (i.e. infectious disease, natural disasters), the Country would have the necessity to dispose in a short time a certain number of bodies of dead animals. In these situations, it is foreseeable that the capacity of the processing plants abroad would be saturated, or that there would be limitations in the possibility to export ABPs, due to public health issues.

Summarising, in the expert's opinion the option to export ABPs is not recommended.

1.B.1.2. ABPs PROCESSING

The elective method for ABPs disposal is processing in accordance with Regulations 1069/2009 and 142/2011, and relevant advantages and disadvantages shall be taken in consideration.

Advantages

- The first reason to suggest processing as the elective method for disposing of ABPs, is that processing plants (cat. 1) reduce the bodies of dead animals into fuel ready for incineration, resulting in an energy recover process. An energy recover process can be defined as any technique or method of minimizing the input of energy to an overall system by the exchange of energy from one sub-system of the overall system with another. Although energy recovery is not recycling, it is an important mean of valorising the waste that does occur and, thus, reducing its environmental and economic impacts. Finally, it is a crucial part of attaining sustainable development goals. Environmental protection is one of the pillars of sustainable development, as a safe and attracting environment contributes to tourism development.
- It is strongly suggested to treat preliminarily fresh ABPs in a processing plant, in order to reduce the bodies of dead animals and other ABPs into fuel ready for incineration. After processing, MBM and fat would be obtained. MBM has a high caloric value (4,500 Kcal/Kg) and it could be sent to cement plants, thermal power plants, steel factories, and fats could be partially used in the processing plant as fuel, and partially sold. In general, fats obtained in processing plant have a very high calorific value (more than 9,000 Kcal/Kg) and therefore quite a significant economic value, as it can be used as fuel in the processing plant itself. Processing plants can be considered, somehow, as “pre-incineration” plants.
- For MBM disposal, is preferable, where possible, to use a cement factory. This is due to the fact that the use of MBM in a cement factory does not result in ashes, which are dangerous waste to be disposed of.
- Experts agreed that there is a possibility of co-incineration of already processed ABPs, providing that the co-incineration plant would use the processed ABPs as source of energy. Fat can be managed like a normal liquid fuel (just preheating it) whose significant self-consumption share allows to significantly reduce the energy costs of the processing plant, and the remainder can be sold to appropriately authorized steam / energy production plants in the area.

Disadvantages

- Significant difficulties have been recently reported on the possibility to dispose MBM in cement plants as fuel, and according to collected information several Cat. 1 plants are currently paying for disposing MBM produced in their plants. Therefore, the use of MBM as a resource is strictly connected with market fluctuations. A reliable estimation of costs and revenues is consequently extremely difficult to be done.

1.B.1.3. IDENTIFIED OPTIONS FOR ABPs DISPOSAL

In the view of the aforementioned processing volumes, the Consultant has identified 5 possible technical solutions:

- Option 1: Incineration of all Categories. 1, 2, 3;
- Option 2: Incineration of Cat.1 e 2, processing of Cat. 3;
- Option 3: Installation of N. 3 plants for processing separately the 3 different Categories;
- Option 4: Processing together cat. 1, 2 and 3 ABPs, in one establishment;
- Option 5: Processing cat. 1 and 2 ABPs together, and cat 3 ABPs separately, in another establishment.

General and specific requirements for the approval of Category 1, 2 and 3 processing plants are summarized in annex 1.B.1.

The options are summarised in the following Table 1.B.1.

Table 1.B.1. Summary of available options

	Option	*Annual volumes*
1	Incineration of all Categories. 1, 2, 3	The annual total volume of ABPs to be incinerated is going to be approx. 16,000 Tons.
2	Incineration of Cat.1 e 2, processing of Cat. 3	The annual volumes would be approx. 8,000 Tons for each of the two installations (ABPs to be incinerated and ABPs to be processed).
3	Installation of N. 3 plants for processing separately the 3 different Categories	Discarded because of the very limited amount of raw material, especially Cat. 2 ABPs.
4	Processing of all Categories in one plant. The final product to be sold as Cat. 1	The total annual volume of ABPs to be processed would be roughly 16,000 Tons
5	Processing of Cat. 1-2 in one plant and Cat. 3 in a separated one. Final products to be sold separately.	The annual volumes to be processed would be roughly 8,000 Tons for each plant (ABPs to be incinerated and ABPs to be processed).

The following chapters will briefly describe the technical solutions proposed for Options 1, 2, 4 and 5 and report the major financial indicators for each of them.

Option 1: Incineration of all product Categories

All product categories, for a total of 16,000 tons a year, would be incinerated using N. 4 incinerators of 1,000 kg/h of incineration capacity each, three of them working on 3 shifts for 250 days/year (6,000 working hours), the fourth one as spare in case of required additional capacity. The incinerators must comply with the EU norms and regulations for such products. Diesel oil burners.

Option 2: Incineration of Cat. 1 and 2, processing of Cat. 3

The incineration plant would be constituted of N. 3 incinerators similar to those described above, with a total nominal capacity of 2,400 kg/h, for 2 shifts a day, 250 days/y (4,000 working hours), annual capacity 8,000 tons roughly. Diesel oil burners.

The Cat. 3 processing line, would have a nominal capacity of 2,500 kg/h, working 2 shifts for 250 days (4,000 hours per year) for a total of 8,000 tons. The recommended technology is Method 1 or pressurized discontinuous method.

Option 4: Processing of all Categories 1, 2 and 3 in one plant. Final products to be sold as Cat. 1

About 16,000 Tons per year of product would be processed in one Method 4 line (or pressurized continuous). Nominal line capacity: 8 Tons/h, one shift, 2,000 working hours per year.

Option 5: One line for processing Cat. 1, 2 and one line for Cat. 3. Final products to be sold as Cat. 1 and Cat. 3.

The Cat. 1,2 processing line, would have a nominal capacity of 2,500 kg/h, working 2 shifts for 250 days (4,000 hours per year) for a total of 8,000 tons. The recommended technology in Method 1 (or pressurized discontinuous method).

The Cat. 3 processing line would have the same operational features as above: nominal capacity of 2,500 kg/h, working 2 shifts for 250 days (4,000 hours per year) for a total of 8,000 tons. The recommended technology is Method 1 or pressurized discontinuous method.

1.B.1.4. OTHER ASSUMPTIONS

In order to make the different options comparable, the Consultant has adopted a few assumptions that will be briefly described in this paragraph.

Disposal fee, is the fee usually paid by the producers of ABPs to the ABPs plant for covering the costs of collection, processing and disposal of the ABPs. This fee is usually paid by the producers of ABPs to the ABPs plant for disposal of Cat. 1 and 2 products whose market value is low. Producers of Cat. 3 products are not obliged to pay for the disposal since these products are more easily placed in the market. The aim of the ABPs plant is to keep this fee as low as possible in order to reduce the costs for the producers. In this first analysis, we keep the same values in all four options:

- ✓ Disposal fee for Cat. 1, 2 products equal 0.11 Euro per kilo of collected ABPs, including costs of transportation, processing and disposal. As we will show at the end of this demonstration, lower fees are envisaged only for Option 4. All other options require higher fee values to become sustainable.
- ✓ Disposal fee for Cat. 3 products equal to 0 Euro/kg.

Sale prices of Cat. 1, 2 fat and meal (MBM)

These prices have been fixed equal to 0.20 Euro/kg for fat and 0.05 Euro/kg for meal. According to our information these are maximum prices for such products on the market. Adoption of lower values will make three options unsustainable: again option 4 is the only one that can allow the adoption of lower sale prices.

Sale prices of Cat. 3 fat and meal (PAP)

Also in this case, we have adopted the maximum values of these products on the European markets: 0.60 Euro/kg for Cat. 3 fat and 0.20 Euro/kg for Cat. 3 meal.

1.B.1.5. FINANCIAL INDICATORS

According to the collected information, the following financial conditions have been taken into consideration for the calculation of the Loans.

Table 1.B.2. Information on 3rd additional Financing Agreement

Indicators	m/unit	Values
Loan amount	EURO	CAPEX value
Loan interest rate	%	1.25
Payment period	years	25
Grace period	years	5
Effective interest rate	%	2.20
Loan Ratio	%	100%
Equity Ratio	%	0
Grant (% of CAPEX)	%	0

The analysis results reported below, are based on preliminary engineering calculations that could lead to changes at a later stage. Investment cost estimation, estimation of fuel expenditures in particular, are based on the knowledge and experience of the Consultant and data delivered by the equipment manufacturers, but subject to changes if the original assumptions are changed in turn.

The financial indicators, namely: CAPEX, OPEX, IRR, Pay Back Period (PBP), NPV and EBITDA are calculated on the 15th year even though the analysis has covered 25 years of operation. 15 years is usually the maximum suggested project life span since depreciation is normally paid back completely. Longer project life periods are unpredictable.

Table 1.B.3: Comparative table

OPTION	1	2	4	5
1. BASIC FINANCIAL STATEMENTS	Incineration of cat. 1, 2 and 3	Incineration of cat. 1 and 2, processing of cat. 3	Processing of cat. 1, 2 and 3 in one plant	Processing cat. 1 and 2 in one plant, and cat 3 in a separate plant
Yearly Working Days	250	250	250	250
Number Of Daily Shifts	3	2	1	2
Working Hours Per Year	6,000	4,000	2,000	4,000
Production Input (Kg/Year)	16,200,000	16,160,000	16,000,000	16,000,000
Disposal Fees Cat.1 (Euro/Kg)	0.11	0.11	0.11	0.11
Average Sale Price Cat. 1 Products			0.10	0.07
Average Sale Price Cat. 3 Products		0.24		0.26
Sale Price Cat. 1 Fat (Euro/Kg)			0.20	0.20
Sale Price Cat. 1 Meal (Euro/Kg)			0.05	0.05
Sale Price Fat Cat. 3 (Euro/Kg)		0.6		0.6
Sale Price Meal Cat. 3 (Euro/Kg)		02		0.2
TOTAL INCOMES Euro	1,782,000	1,260,706	**2,254,329**	1,449,941
CAPEX Euro	1,274,244	4,612,754	5,245,264	7,586,960
OPEX Euro	1,744,937	1,238,451	**356,125**	**895,280**
TOTAL PRODUCTION COSTS AFTER DEPRECIATION INTERESTS	1,830,322	1,667,002	808,201	1,713,179
AVERAGE YEAR INFLATION RATE (%)	1.5%	1.5%	1.5%	1.5%
IRR YEAR 15 (%)	-	-	**56%**	-2%
PAY BACK PERIOD (YEARS)	25[3]	25[4]	**6**	25[5]
NPV YEAR 15	162,751	-5,229,349	20,336,247	-1,675,666
EBITDA YEAR 15	1%	-1%	**79%**	**27%**

ACCUMULATED CASH FLOWS AFTER FINANCING

	END Y1	END Y2	END Y3	END Y4	END Y5	END Y6	END Y7	END Y8	END Y9	END Y10	END Y11	END Y12	END Y13	END Y14	END Y1
Incineration of cat. 1, 2 and 3	25.914	52.383	79.417	107.024	109.565	112.973	117.165	122.304	128.232	135.099	142.831	151.543	161.103	171.659	183.08
Incineration of cat. 1 and 2, processing of cat. 3	-4.630.860	-4.648.633	-4.666.066	-4.683.156	-4.792.736	-4.900.962	-5.008.158	-5.113.761	-5.218.371	-5.321.475	-5.347.252	-5.371.433	-5.394.522	-5.416.013	-5.436.39
Processing of cat. 1, 2 and 3 in one plant	- 3.392.955	- 1.512.174	397.508	2.336.523	4.199.743	6.094.319	8.020.332	9.978.873	11.969.724	13.993.934	16.051.650	18.143.784	20.270.252	22.432.127	24.629.36
: Processing cat. 1 and 2 in one plant, and cat 3 in a separate plant	-7.097.246	-6.599.211	-6.092.732	-5.577.682	-5.203.321	-4.818.522	-4.423.680	-4.017.767	-3.601.618	-3.174.277	-2.736.080	-2.286.283	-1.825.561	-1.352.962	- 869.12

3 More than

4 More than

5 More than

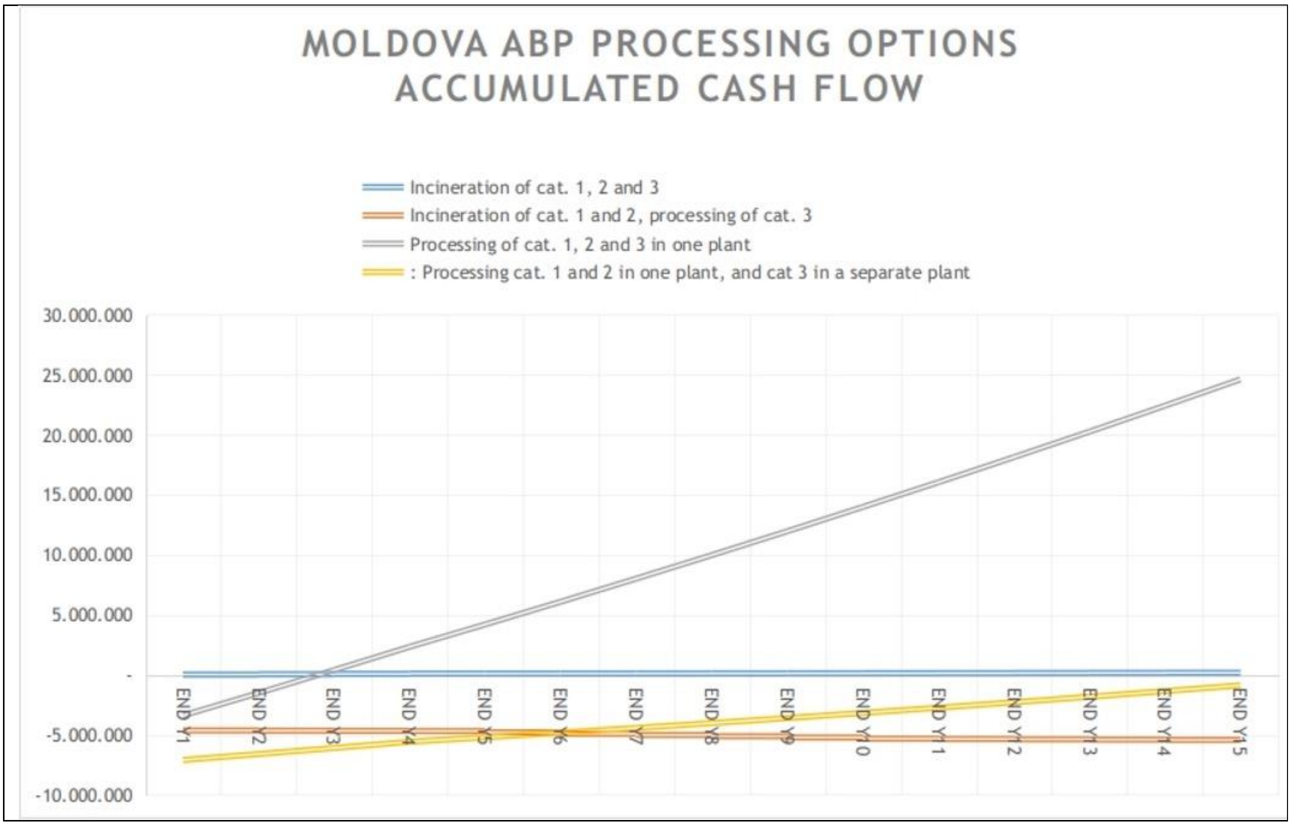


Figure 1.B.1. Accumulated cash flow

1.B.1.6. CONCLUSIONS

Under these assumptions, Option 4 (Processing of cat. 1, 2 and 3 in one plant) is the only sustainable: it gives the highest inflows, the lowest OPEX, a very good IRR and brilliant PBP of 6 years. EBITDA is also very good. Option 4 generates enough cash to consider the introduction of lower disposal fees or lower sale prices.

Option 1 and 2 account for the highest Operational costs due to fuel charges and, despite the low CAPEX, they are not financially viable even in the very long run.

Option 5 (Processing cat. 1 and 2 in one plant, and cat 3 in a separate plant), shows a good EBITDA but does not pay back in an acceptable period of time unless disposal fees for Cat. 3 products or similar measures are introduced.

1.B.2. SWOT ANALYSIS OF AVAILABLE OPTIONS

Export of all ABPs to a neighbour country

	Positive	**Negative**
Internal	*Strengths*	*Weaknesses*
	• No need to build an ABPs processing plant for cat. 2 and 3 in the country (however a solution should be found to dispose of SRM)	• High costs for storage and transport • Adequate logistic planning is needed, with construction of storage establishment(s) • Moldova would not be self-sufficient as far as ABPs management is concerned
External	*Opportunities*	*Threats*
	• ABPs plants in neighbour countries with adequate potential	• Export of ABPs and derived products destined for incineration or landfill is prohibited • SRM cannot be dispatched to EU MS, how to dispose of SRM remains an unsolved problem • Moldova would have to rely on external companies and relevant decisions • In case of an epidemic or non-epidemic emergency the country would probably not be able to hygienically dispose of ABPs, and will have to burn or bury dead animals, with serious backlash on environment and increased risks of spreading animal diseases

Processing cat. 1 - 2 ABPs together, selling/exporting cat. 3 ABPs: construction of a PP for cat. 1- 2 ABPs

	Positive	**Negative**
Internal	*Strengths*	*Weaknesses*
	• Valorisation of ABPs • Reduction of environmental and economic impacts • ABPs are reduced into fuel ready for incineration, resulting in energy recover • Fats could be used as fuel, with a reduction of management cost of the plant • No need to build a cat. 3 ABPs PP plant • Cat. 3 sale would probably cover the costs of storage and transportation	• For Cat. 1 and 2 ABPs a processing establishment should be built, with relevant costs • Adequate logistic planning is needed, with construction of storage establishment(s) • Reduction of ABPs to be processed in the cat. 1 processing establishment • Moldova would not be self-sufficient as far as ABPs management is concerned
External	*Opportunities*	*Threats*
	• MBM could be send to cement plants and thermal power plants • ABPs plants in neighbour countries with adequate potential: possibility to sell fresh cat. 3 ABPs • Category 3 could increase the value if it will be differentiated according to the animal species and to the quality	• Probably, the only option would be to export cat. 3 ABPs • Significant difficulties have been recently reported on the possibility to dispose MBM in cement plants as fuel • Market fluctuations for the disposal of MBM • Moldova would have to rely on external companies and relevant decisions • Appropriate separation of the 3 categories of ABPs should be guaranteed

OPTION 1: Incineration of all Categories. 1, 2, 3

	Positive	Negative
Internal	*Strengths*	*Weaknesses*
	• Lower cost for construction • Quick erection times	• Very high operative cost. High cost for incineration, high consumption of fuel • Not financially viable even in the very long run • Presence of ashes to be disposed of • Works against the circular economy: no by-product can be used as fuel • Environmental issues to be considered very carefully
External	*Opportunities*	*Threats*
	• Possibility to recovery energy from exhaust	• Possible future limitations for more restrictive legislation

OPTION 2: Incineration of Cat.1 e 2, processing of Cat. 3

	Positive	Negative
Internal	*Strengths*	*Weaknesses*
	• Lower cost for construction • Cat. 3 ABPs are valorised • Cat. 3 fat is partially used for steam generation	• High operative cost. High cost for incineration, high consumption of fuel • Not financially viable even in the very long run • Presence of ashes to be disposed of • Works partially against the circular economy: only part of by-product can be used as fuel • Environmental issues to be considered very carefully • Reduction of ABPs to be processed in the cat. 3 processing establishment
External	*Opportunities*	*Threats*
	• Category 3 could increase the value if it will be differentiated according to the animal species and according to the quality • Possibility to recovery energy from exhaust	• Possible future limitations for more restrictive legislation (incineration) • Appropriate separation of the 3 categories of ABPs should be guaranteed

OPTION 3: Processing separately cat. 1, 2 and 3 ABPs: construction of 3 processing plants (one for cat. 1, one for cat. 2 and one for cat. 3)

	Positive	**Negative**
Internal	*Strengths*	*Weaknesses*
	• Valorisation of ABPs • Reduction of environmental and economic impacts • Possibility to use cat. 2 ABPs, following processing, for the manufacturing of organic fertilisers or soil improvers • Fats could be used as fuel, with a reduction of management cost of the plant • Possibility to compost or transform into biogas cat 2 ABPs, following processing	• High cost for the construction, with small amount of cat. 2 ABPs to be processed (especially if gastrointestinal contents will be disposed of without processing) • Economically not sustainable
Extern	*Opportunities*	*Threats*
		• Appropriate separation of the 3 categories of ABPs should be guaranteed

OPTION 4: Processing together cat. 1, 2 and 3 ABPs: construction of a PP for cat. 1, 2 and 3 ABPs

	Positive	**Negative**
Internal	*Strengths*	*Weaknesses*
	• Valorisation of ABPs (MBM and fat) • Reduction of environmental and economic impacts • ABPs are reduced into fuel ready for incineration, resulting in energy recover • Fats could be used as fuel: reduction of management cost of the plant • No need to build a cat. 3 ABPs PP plant • The processing plant would work in line with its potential • The capacity of the establishment would be adequate to cover the needs of the country also for emergency situations • This option gives the highest inflows, the lowest OPEX, a very good IRR and brilliant PBP of 6 years. EBITDA is also very good • This option generates enough cash to consider the introduction of lower disposal fees or lower sale prices	• No possibility to valorise PAP
External	*Opportunities*	*Threats*
	• MBM could be send to cement plants and thermal power plants, in the country or abroad	• Difficulties have been recently reported on the possibility to dispose MBM in cement plants as fuel • Market fluctuations for disposal of MBM and fats

OPTION 5: Processing cat. 1 and 2 ABPs together, and cat 3 ABPs separately, in another establishment: construction of 2 processing plants, one for cat. 1 and 2, one for cat. 3 ABPs

	Positive	**Negative**
Internal	*Strengths*	*Weaknesses*
	• Good EBITDA • Valorisation of ABPs: MBM and fat from cat.1, PAP and fat from cat. 3 • Reduction of environmental and economic impacts • Fats could be used in the processing plant as fuel, with a reduction of management cost of the plants • The capacity of the establishment would be adequate to cover the needs of the country also for emergency situations	• High costs for the construction of 2 establishments • Management costs higher than for managing one single establishment • This option does not pay back in an acceptable period of time unless disposal fees for Cat. 3 products or similar measures are introduced • The efficiency of the processing plant category 1 would be reduced due to the small amount of category 1 material to be processed
External	*Opportunities*	*Threats*
	• MBM could be send to cement plants and thermal power plants • PAP could be marketed at a higher price than MBM • Depending on the market fluctuations, cat. 3 fat could obtain higher prices comparing with cat. 1 fat	• Significant difficulties have been recently reported on the possibility to dispose MBM in cement plants as fuel • Market fluctuations for the disposal of MBM, PAP and fats • Appropriate separation of the 3 categories of ABPs should be guaranteed

1.B.3. SWOT ANALYSIS IN RELATION TO PROCESSING METHODS

Processing method 1

	Positive	**Negative**
Internal	*Strengths*	*Weaknesses*
	• In line with legal requirements • Good traceability • No limitation for exporting derived products	• Higher cost of construction • Before adding more material, it is necessary to weigh the remains after the treatment • More electrical consumption • Higher management cost: more employees
External	*Opportunities*	*Threats*
	• In emergency situations, the plant could easily manage an increase of the amount of ABPs to be treated	

Processing method 4

	Positive	**Negative**
Internal	*Strengths*	*Weaknesses*
	• In line with legal requirements • Lower cost of construction • Good traceability • It is possible to add more ABPs material • Less electrical consumption	
External	*Opportunities*	*Threats*
	• In emergency situations, the plant could easily manage an increase of the amount of ABPs to be treated	• Possible limitations for exporting derived products to EU Member States (Competent Authorities have the possibility to impose special conditions)

1.B.4. WORKSHOPS AND MEETINGS

Following the finalisation of the report related to task 1 “Data collection and critical assessment”, a workshop has been organised and carried out on 31st May 2021, with the objective to present and discuss main outcomes of the preliminary study executed in the framework of task 1. The workshop has been organised remotely, due to travel restrictions related to the pandemic, using the Zoom Platform.

The main purpose of the workshop was the presentation of the 1st part of the Feasibility Study based on the data collection and assessment of ABPs (all three categories). The first package of deliverable included assessment of prefeasibility study developed under ENPARD, ABPs legislation assessment, collection of recent data on ABPs, identification of critical areas and recommendations.

The Team Leader of the project, Alberto Mancuso, gave a presentation (annex 1.B.2) where after a short introduction to the objectives of the project, the following points were presented:

- Overall assessment of the pre-feasibility study: main outcomes
- Analysis of the current situation
- Comments and recommendations
- Actions to be taken

Main outcomes were discussed, starting from the assumption that the amount of cat. 1 ABPs to be disposed of in Moldova is significant, and at the moment, there is no solution for Cat. 1 ABPs. At that stage, the construction of a processing plant, where both cat. 1 and 2 could be disposed of, was recommended.

On 26th July 2021, a workshop for key stakeholders was organised and carried out, with the objective to present the technical options available for the disposal of ABPs in Moldova. The workshop was organised remotely, due to travel restrictions related to the pandemic, using the Zoom Platform.

The key Engineer expert, Mr. Ruggero Malossi, presented main outcomes of his report (Annex 1.B.3), focusing on the analysis of the options available to the Moldovan Government in terms of the type of ABPs processing facility to be built, sided by a comparative table presenting the strengths and weaknesses of each module (SWOT analysis).

Five technical options were presented, and the expert highlighted that the most suitable model, technical solution for future ABPs facility and overall management of ABPs is the Option of processing all categories (Cat. 1, 2 and 3) in one plant, as being the most suitable model from a financial standpoint.

On 16 November 2021 a meeting with main stakeholders was organized in Chisinau. During the meeting, main outcomes of Task 1 were summarised, and available options for ABPs disposal in Moldova were presented. A thorough discussion followed, and on 19 November 2021, the Minister of Agriculture and Food Industry confirmed with letter n. 08-07/3804 (Annex 1.B.4) that preferred option for ABPs management in Moldova is Option 4: processing of all categories (Cat. 1, 2 and 3) in one plant, final products to be sold as Cat.1.

Following the implementation of Phase 2 of the project, on 14th June 2022 a workshop was organized remotely. During the workshop, main outcomes of Phase 1 and Phase 2 of the project were summarized, focusing on some key points:

- Importance of the proper disposal of cat. 1 and 2 ABP from a public health standpoint;
- How the amount of ABPs to be processed in Moldova were calculated;
- Explanation of the reasons for which Method 1 has been recommended for the ABPs processing;
- State support for the activities of collecting and processing ABPs;
- Financial evaluation of the sustainability and management models

Main outcomes of the preliminary study for the construction of a biogas plant were presented.

SECTION 1.C

TASK 3.

ASSESSING LOCATIONS

1.C.1. MAIN CRITERIA FOR ABPs PROCESSING LOCATION

Main criteria for ABPs processing plant location have been defined, as follows.

1. The dimension of plot should have at least 150 m x 120 m.
2. The plot has to be for construction purpose, according to Moldovan legislation The Republic of Moldova Parliament Code No. 828. from 25-12-1991 art.36 https://www.legis.md/cautare/getResults?doc_id=122075&lang=ru
3. Considering environmental, social aspects and world best practices the minimum distance to residential buildings should be at least 1,500 m.
4. The potential plot should have or be close to the following utilities: electric power line, water and sewerage system.
5. The plot should have access to main road or situated close to it.
6. The plot area should be flat.
7. The proposed location should not be in protected zone and do not hold specific value such as biodiversity.
8. For logistic reasons, it would be preferable if the potential plot would be situated in central part of country in an area about 20 km around Chisinau.

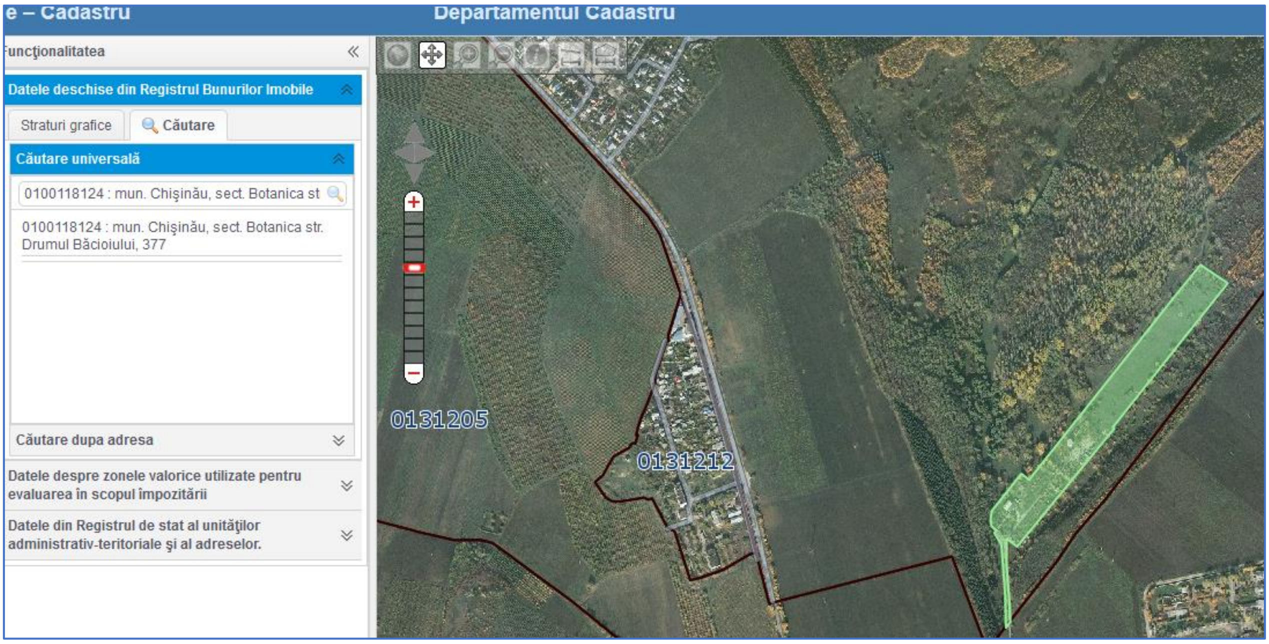
1.C.2. LOCATIONS PROPOSED WITH LETTER 06-04-2487 of 20.04.21

The official letter Nr. 06-04-2487 of 20.04.2021 from Agency of Public Properties offered 5 plots for ABPs processing facility (Annex 1.C.1). The proposed locations have been assessed against the above mentioned criteria, and results are further summarized.

Plot number 0100118124

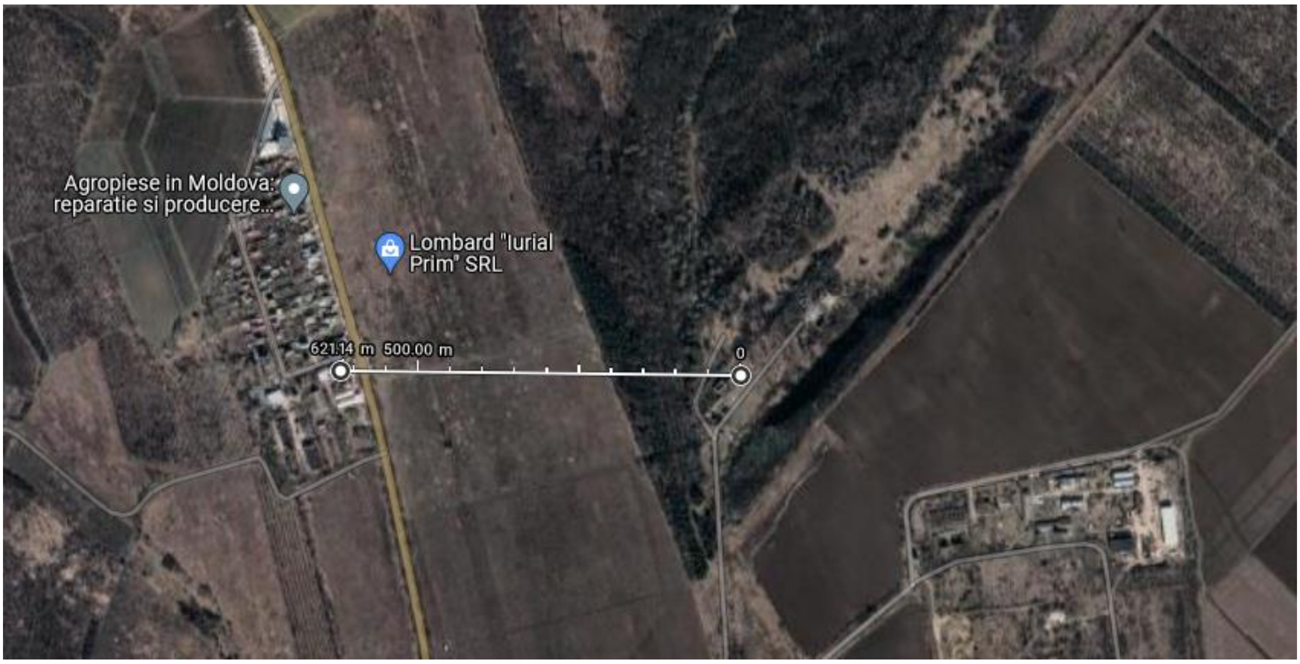
The first Plot to be assessed is identified with number 0100118124. The plot has a surface of 5.5 Ha, as it is represented on Figure 1.C.1.

Figure 1.C.1. Plot 0100118124, surface of 5.5 Ha



The dimension/shape of the plot is about 70 m wide, which is less than required (minimum dimension of 120 m). The distance to the closest residential buildings is about 600 m (Figure 1.C.2) that is considered to be not enough according to the predefined criteria: the minimum distance to residential buildings should be at least 1,500 m.

Figure 1.C.2. Distance to the closest residential buildings



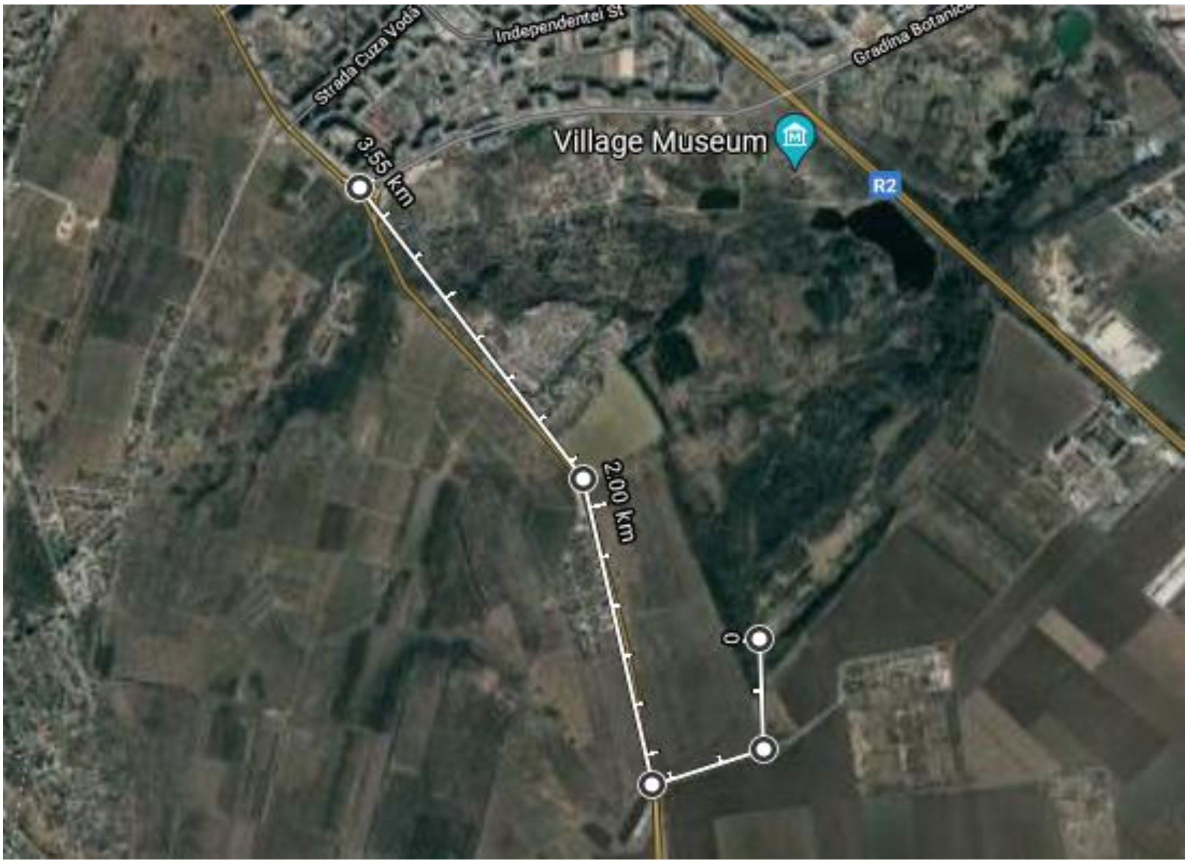
The access to the main road is about 900 m. (Figure 1.C.3).

Figure 1.C.3. Main road access distance.

The access to water and sewage system is about 1,800 m min. On this plot exists a private production facility which may be an obstacle for ABPs plant.

The distance to Chisinau border is 3.5 km. (Figure 1.C.4).

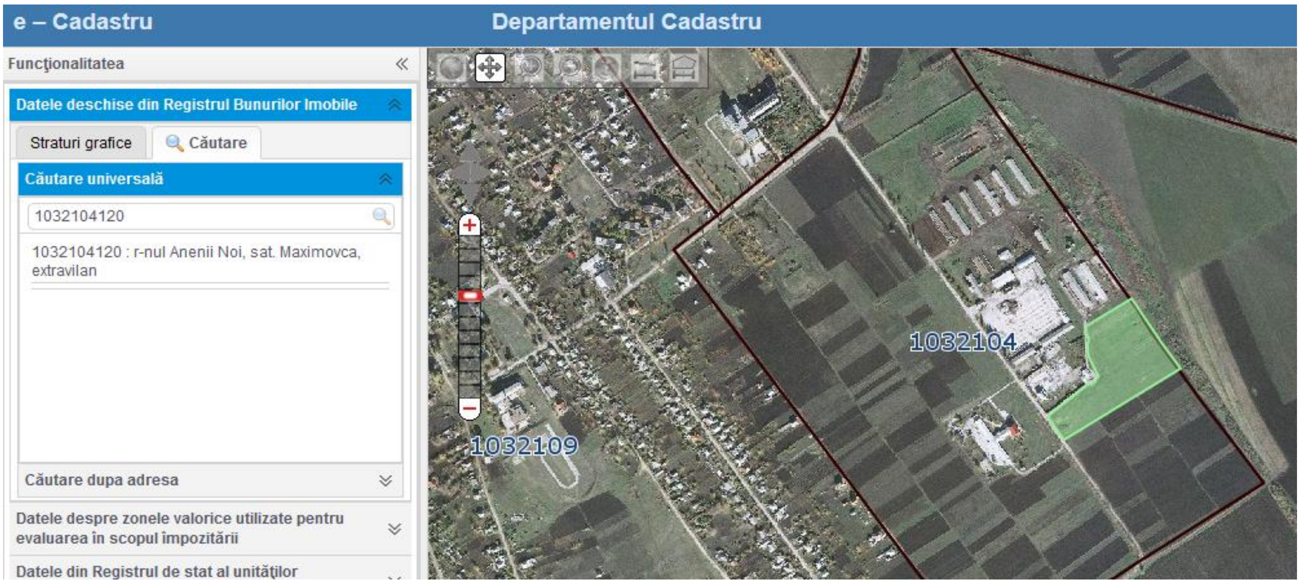
Figure 1.C.4. Distance to Chisinau border



Plot number 1032104120

The second offered plot is identified with number 1032104120, and has a surface of 3 Ha, as represented on Figure 1.C.5.

Figure 1.C.5. Plot number 1032104120, surface of 3 Ha



The dimension/shape of the plot is big enough. The distance to the closest residential buildings is about 650 m (Figure 1.C.6) that is considered to be not enough according to the predefined criteria: the minimum distance to residential buildings should be at least 1,500 m.

Figure 1.C.6. Distance to the closest residential buildings

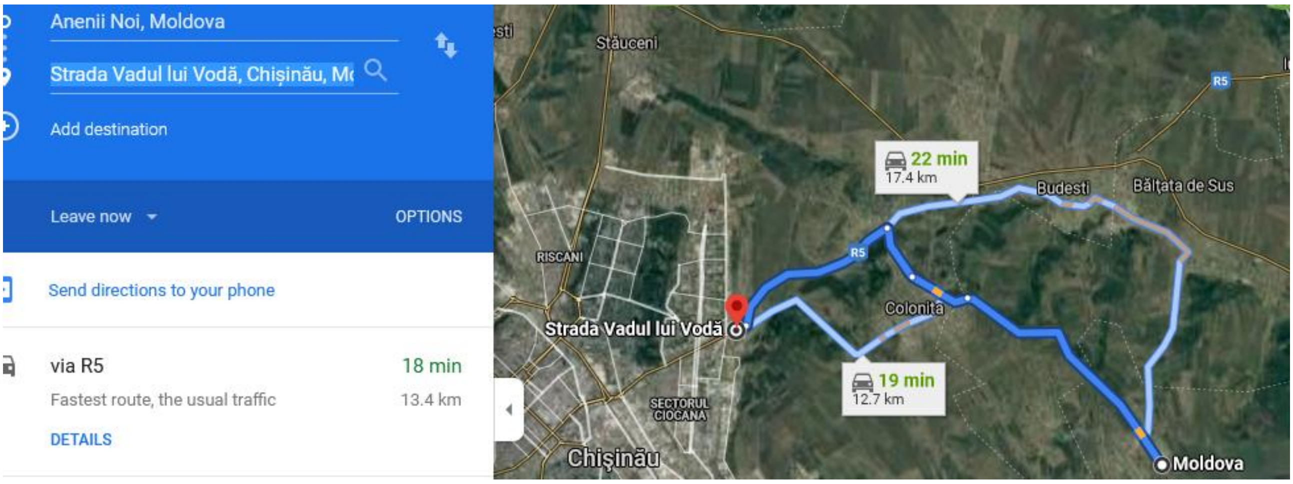
The access to the main road is about 700 m. (Figure 1.C.7)

Figure 1.C.7. Main road access distance.

The distance to utilities is unknown. Most probably the connection points will be in more than 3 km.

The distance to Chisinau border is 13.5 km (Figure 1.C.8).

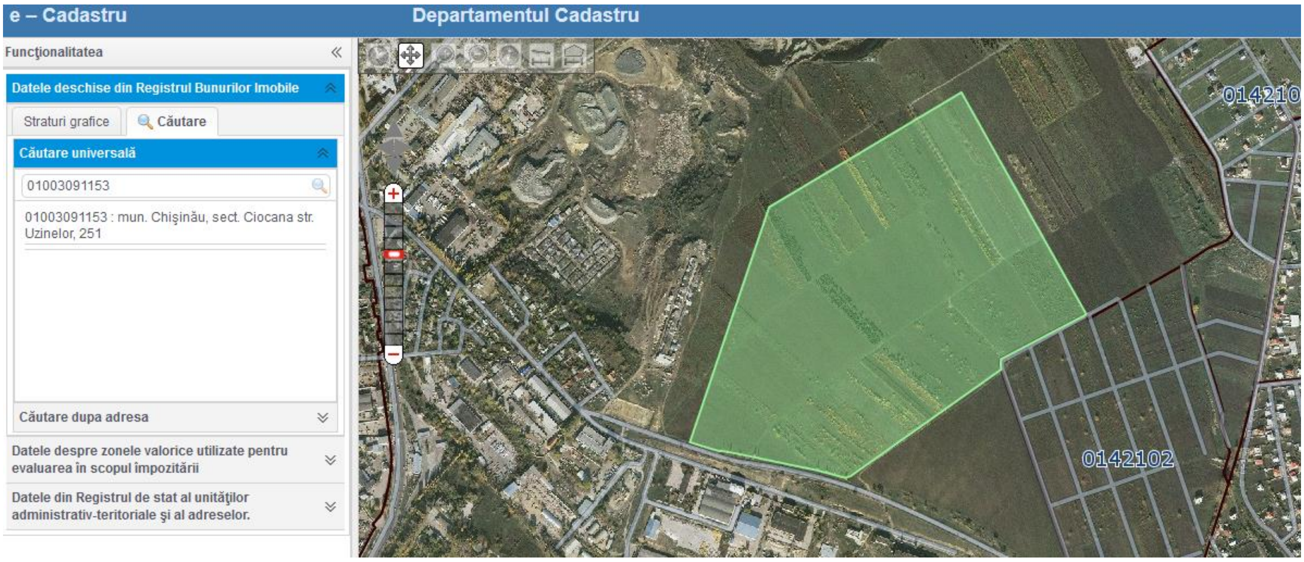
Figure 1.C.8. Distance to Chisinau border



Plot number 01003091153

The third proposal was plot number 01003091153, with a surface of 44.6 Ha, as represented on Figure 1.C.9.

Figure 1.C.9. Plot number 01003091153, surface of 44.6 Ha



The dimension/shape of the plot is big enough. However, the distance to the closest residential buildings is about 650 m (Figure 1.C.10) that is considered to be not enough according to the predefined criteria: the minimum distance to residential buildings should be at least 1,500 m.

The plot is situated in the Chisinau city area. The main road is linked to the plot border.

Figure 1.C.10. Distance to the closest residential buildings

Plot number 1032101043

The plot number 1032101043 has a surface 1.9 ha, but the shape does not respect the criteria of 150 m x 120 m. Additionally, the distance to residential buildings is 300 m, which is not acceptable as well.

Plot number 0100119010

The plot number 0100119010 has a surface 7.9 ha and it is situated in municipality of Chișinău, str. Muncești, 426, as shown on Figure 1.C.11.

Figure 1.C.11. Plot number 0100119010

This plot is situated at a very short distance to residential buildings (about 50-100m) and for this reason cannot be used for ABPs facility.

Overall evaluation of locations proposed with letter 06-04-2487 of 20.04.2021

Considering the criteria mentioned above, just one plot with number 0100118124 looks like a potential candidate. Nevertheless, the dimension is not acceptable, as 70 m wide is not enough. Besides that, on this plot exists a private production facility which may be not suitable to operate nearby. The distance to the closest water supply and sewerage system is about 2,000 m. The access to the main road is 700 m.

1.C.3. LOCATION PROPOSED WITH LETTER 20-07/3313 of 5.10.21

As all plots preliminary offered are not suitable for ABPs processing facility, Moldavian authorities were asked for another set of locations, filtered according to the minimum requirements mentioned above.

On 11 October 2021, a letter from the Ministry of Agriculture and Food Industry of the Republic of Moldova was received (letter n. 20-07/3313 of 5th October 2021, Annex 1.C.2). In the letter, an additional plot was identified with the plot number 31011010.138. This plot has a surface of 96.82 ha, as shown in figure 1.C.12. A detailed view of the plot is presented at figure 1.C.13.

Figure 1.C.12. Plot number 31011010.138, surface of 96.82 ha

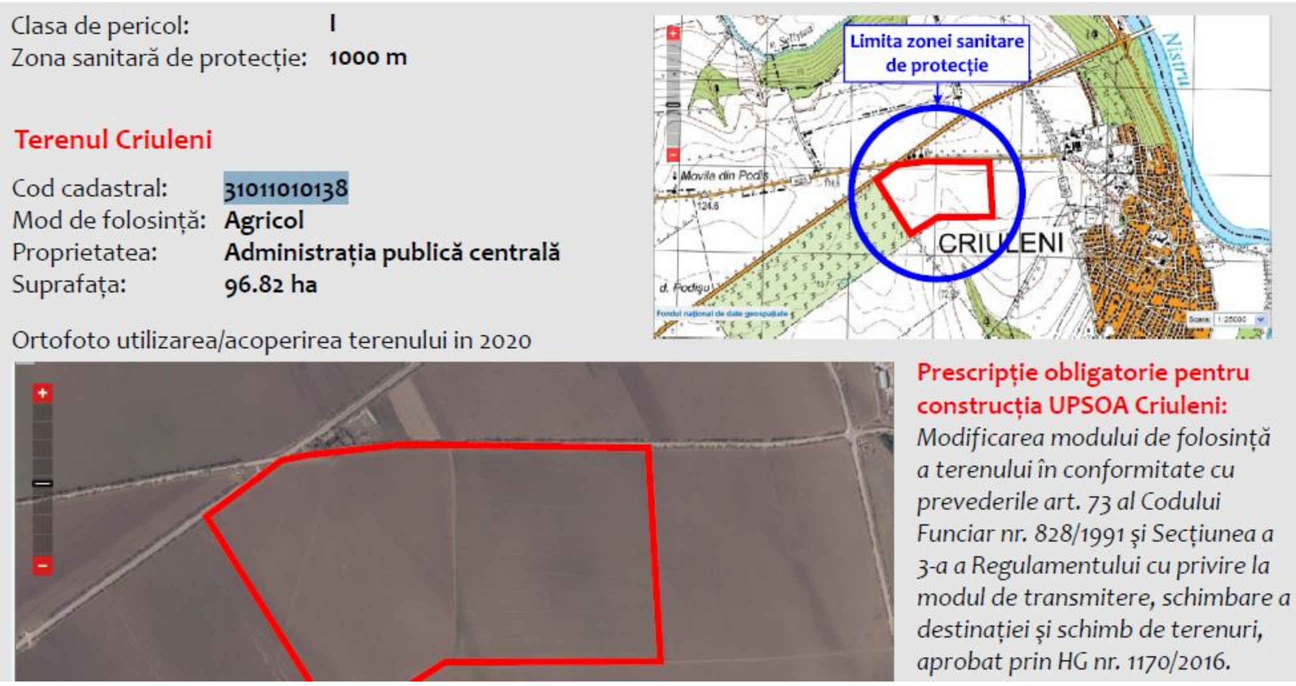


Figure 1.C.13. Detailed view of the plot

The minimum distance to residential buildings is more than 1,500 m, as shown on figure 1.C.14.

Figure 1.C.14. Distance to the closest residential buildings

The plot has access to main road and is situated close to it. So, the necessary dimensions of (150 m x120 m) can be chosen along the road as shown on the picture below.

Figure 1.C.15. Main road close to the plot

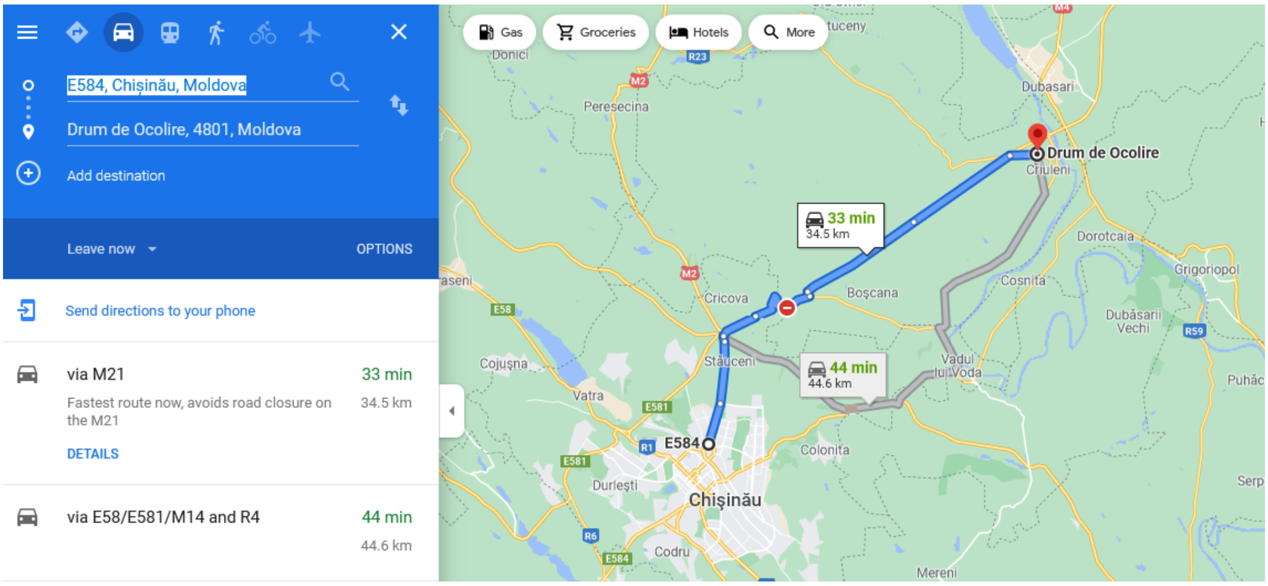
The plot is situated close to the electric power line. Estimated distance to water and sewerage system is about 2,000 m but this has to be revised by requesting the technical condition documents for connection.

The plot area is almost flat, with a slight slope to Criuleni town and this will help for connection to sewerage system. The plot is not situated in a protected zone, which hold specific value such as biodiversity.

The plot is situated in the central part of the country, in an area about 35 km from Chisinau (figure 1.C.16). It can be considered as not far away and can be accepted.

A field visit to the proposed location has been carried out, and it was possible to verify that the plot is located in a flat area, close to communication routes (see pictures at Annex 1.C.3).

Figure 1.C.16. Distance from Chisinau



1.C.4. ACCEPTABILITY OF THE PROPOSED SITES

Main features of the proposed sites that have been taken in consideration for the assessment are further summarized:

- Dimension/ shape
- Use purpose
- Residential buildings distance
- Utilities distance
- Road access
- Elevation
- Protected zone
- Distance to Chisinau

A summary table of the assessment related to the proposed sites is presented at table 1.C.1.

Table 1.C.1: Summary table of the assessment related to the proposed sites

Plot number	*Dimension/ shape 150 m x120 m*	*Use purpose*	*Residential buildings distance >1,500 m*	*Utilities distance in km*	*Road access in m*	*Elevation*	*Protected zone*	*Distance to Chisinau km*	*Accepted*	*Moldovan authority confirmation*
100118124	70m wide	Const.	600m	1.8	900	ok	ok	3.5	NO	NO
1032104120	OK	Agr.	650m	>3	700	ok	ok	13.5	NO	NO
1003091153	OK	Const.	650m	1	10	ok	ok	0	NO	NO
31011010138	OK	Agr.	1,600m	2	10	ok	ok	35	YES	YES

NOT accepted
partially accepted
fully accepted

1.C.5. ADVANTAGES /DISADVANTAGES: SWOT ANALYSIS FOR EACH PROPOSED SITE

PLOT NUMBER 0100118124

	Positive	Negative
Internal	*Strengths*	*Weaknesses*
	• The plot has a sufficient surface. • The distance to Chisinau border is 3.5 km, therefore it is centrally located in the country.	• The dimension/shape of the plot is about 70 m wide, which is less than required. • The distance to the closest residential buildings is about 600 m, that is considered to be not enough. • The access to the main road is about 900 m, a dedicated road should be built.
External	*Opportunities*	*Threats*
	• When the system will be in place, the centralized location will facilitate ABPs collection and the organization of the logistic.	• On this plot exists a private production facility, which could be an obstacle to be verified. • The access to water and sewage system is about 1,800 m, which is quite a long distance to be covered, probably with an increased cost.

PLOT NUMBER 1032104120

	Positive	Negative
Internal	*Strengths*	*Weaknesses*
	• The dimension/shape of the plot is big enough. • The distance to Chisinau border is 13.5 km, therefore it is centrally located in the country.	• The distance to the closest residential buildings is about 650 m that is considered to be not enough. • The access to the main road is about 700 m, a dedicated road should be built.
External	*Opportunities*	*Threats*
	• When the system will be in place, the centralized location will facilitate ABPs collection and the organization of the logistic.	• The distance to utilities is unknown. Most probably the connection points will be in more than 3 km, which is quite a long distance to be covered, probably with an increased cost.

PLOT NUMBER 01003091153

	Positive	Negative
Internal	*Strengths*	*Weaknesses*
	• The dimension of the plot is big enough. • The plot is situated in the Chisinau city area. • The main road is linked to the plot border. • The distance to utilities is unknown. Most probably the connection points will be in around 1 km	• The distance to the closest residential buildings is about 650 m that is considered to be not enough.
External	*Opportunities*	*Threats*
	• When the system will be in place, the centralized location will facilitate ABPs collection and the organization of logistic.	•

PLOT NUMBER 1032101043

	Positive	Negative
	Strengths	*Weaknesses*
Internal	• Not evaluated, as the minimum criteria of dimension of the plot is not respected.	• The plot has a surface of 1.9 ha, but the shape does not respect the criteria of 150 m x 120 m. • The distance to residential buildings is 300 m, which is not acceptable.
	Opportunities	*Threats*
External	• Not evaluated, as the minimum criteria of dimension of the plot is not respected.	• Not evaluated, as the minimum criteria of dimension of the plot is not respected.

PLOT NUMBER 0100119010

	Positive	Negative
	Strengths	*Weaknesses*
Internal	• The dimension/shape of the plot is big enough. • The plot is situated in municipality of Chișinău.	• This plot is situated at a very short distance to residential buildings (about 50-100 m) and for this reason cannot be used for ABPs processing facility.
	Opportunities	*Threats*
External	• When the system will be in place, the centralized location will facilitate ABPs collection and the organization of the logistic.	

PLOT NUMBER 31011010.138

	Positive	Negative
	Strengths	*Weaknesses*
Internal	• The dimension/shape of the plot is big enough. • The minimum distance to residential buildings is more than 1,500 m. • The plot has access to main road and is situated close to it. • The plot is situated close to the electric power line. • The plot area is almost flat, with a slight slope to Criuleni town and this will help for connection to sewerage system. • The plot is not situated in a protected zone. • The plot is situated in the central part of the country, in an area about 35 km from Chisinau.	•
	Opportunities	*Threats*
External	• When the system will be in place, the centralized location will facilitate ABPs collection and the organization of the logistic.	• Estimated distance to water and sewerage system is about 2,000 m, which is quite a long distance to be covered, probably with an increased cost.

1.C.6. RECOMMENDATIONS ON ENVIRONMENTAL AND SOCIAL ASPECTS

1.C.6.1. ENVIRONMENTAL IMPACT

Directive 2008/98/EC on waste excludes Animal By-Products from its scope. Article 2 of the Directive states that, among others, the following are excluded from the scope:

- Animal By-Products including processed products covered by ABPs Regulation, except those which are destined for incineration, landfilling or use in a biogas or composting plant;
- bodies of animals that have died other than by being slaughtered, including animals killed to eradicate epizootic diseases, and that are disposed of in accordance with ABPs Regulation.

ABPs processing would involve certain environmental impact, that has to be reduced through corrective actions:

- Waste water, corrective actions: waste water treatment plant;
- Odour and exhaust gases, corrective action: odour treatment and meeting the EU Regulation for exhaust gases;
- Noise, corrective action: location of the plant;
- Soil, corrective action: construction design of the treatment plant.

Directive 2010/75/EU on industrial emissions (integrated pollution prevention and control) applies to "Annex I 6.5. Disposal or recycling of animal carcases or animal waste with a treatment capacity exceeding 10 tonnes per day". According to Article 11 (General principles governing the basic obligations of the operator) of the Directive, Member States shall take the necessary measures to provide that installations are operated in accordance with the following principles:

(a) all the appropriate preventive measures are taken against pollution;

(b) the Best Available Techniques (BAT) are applied;

(c) no significant pollution is caused;

(d) the generation of waste is prevented in accordance with Directive 2008/98/EC;

(e) where waste is generated, it is, in order of priority and in accordance with Directive 2008/98/EC, prepared for re-use, recycled, recovered or, where that is technically and economically impossible, it is disposed of while avoiding or reducing any impact on the environment;

(f) energy is used efficiently;

(g) the necessary measures are taken to prevent accidents and limit their consequences;

(h) the necessary measures are taken upon definitive cessation of activities to avoid any risk of pollution and return the site of operation to the satisfactory state defined in accordance with Article 22.

1.C.6.2. ODOUR EMISSIONS FROM ABPs PLANTS: CHARACTERIZATION, ANALYSIS AND PREVENTIVE MEASURES

The problem of assessing the olfactory impact originating from industrial plants of various kinds is a theme particularly felt by the community and is often the cause of disputes raised by resident populations against the presence in the territory of existing or future production facilities. Although unpleasant odour emissions are not necessarily associated with toxicological risks, the problem of the low social acceptability of olfactory nuisance remains, which can affect the quality of life of the populations concerned.

The emission of malodorous volatile compounds is intrinsic to a multiplicity of industrial processes, for example waste treatment, livestock farms, waste water treatment plants, Animal By-Products processing, feed production, can be a source of olfactory nuisance.

Analysis or measurement

Odorous substances can refer to a single compound or, more frequently, to a heterogeneous mixture of compounds. These characteristics make the analysis or measurement extremely complex.

Odours are generally picked up at extremely low concentrations of odorous compounds in the air. The human olfactory system is quite sensitive and is able to sense the presence of substances at concentrations in the air of some parts per billion, or even lower. Minor changes in the chemical composition of mixtures of compounds can significantly alter the characteristics of the odour emission. For this reason, chemical-analytical techniques are rarely used to describe the nature of an odour.

The concentration at which an odour is barely perceptible to a "typical" human olfactory sensory organ is referred to as the "threshold concentration". At a European level, standardized methods have been defined for the measurement and attribution of the detectability of an “odour” sample (BSEN 13725: 2003).

The concentration at which a "standard" odour (n-butanol) is barely detectable by a group of selected subjects (panel) is defined as a "perceptible threshold" and assumed to be equal to 1 European odorimetric unit per cubic meter of air (1 OUE / mÑ). An odorimetric unit is therefore defined as the quantity of odorant which, dispersed in 1 cubic meter of air, gives rise to an odorant concentration equal to the olfactory threshold.

At the threshold of perceptibility the concentration of an odour is so low that it is absolutely not recognizable in a specific way but, in any case, it can be perceived when the sample submitted to the evaluator is compared with a sample of "clean" air.

The odour (or perception) threshold is defined as the minimum perceivable concentration by 50% of the people selected for the olfactory analysis, which are assumed to be representative of the population.

The odour concentration of a sample, measured in odorimetric units per cubic meter (OUE / mÑ), in practice is evaluated by initially diluting the sample with odour-free air ("neutral" air), then subjecting it to progressive concentrations according to known sample ratios / neutral air: the dilution ratio by which the odour threshold is reached represents the odour concentration of the sample.

For example, if the dilution ratio for which the analysed sample reaches the odour threshold is equal to 1: 1,000, i.e. 50% of panelists perceive the odour of the sample when it is diluted in neutral air 1,000 times, then the concentration odour associated with that sample will be 1,000 OUE / mÑ.

The instrument used to determine the odour concentration is the olfactometer, which allows the dilution of the sample according to known ratios, the presentation of the sample to the panelists and the recording of the responses.

The EN 13725: 2003 standard defines and standardizes the procedures and the method of analysis, making olfactometric measurement a reliable and consolidated method.

An odour at a concentration of 1 OUE / mÑ is actually so weak that, normally, it cannot be detected outside the controlled environment of a laboratory by the majority of the population. When the smell is more concentrated, it becomes progressively more perceptible.

The guidelines of the United Kingdom Environmental Agency propose the following reference thresholds, determined in the laboratory, for the classification and assessment of exposure to odours:

- 1 OUE / mÑ detection threshold
- 5 OUE / mÑ weak odour
- 10 OUE / mÑ clearly distinguishable odour

For the assessment of the extent of an odour emission, in addition to the odour concentration value, reference is also made to parameters that take into account the flow emitted by the source.

In the case of point sources, the odour flow rate OER (Odour Emission Rate) is considered, calculated as the product between the odour concentration and the gaseous effluent flow rate emitted by the chimney, and expressed in OUE / s.

At international level, the Guidelines of the United Kingdom Environmental Agency (UK-EA) (IPPC-H4 Integrated Pollution Prevention and Control - Draf. Horizontal guidance for Odour. Part 1 - Regulation and Permitting, 2002) are of particular interest. For plants subject to IPPC regulations, the Guidelines include the use of predictive models of dispersion, impact limits (in terms of OUE / mÑ), registration and management of complaints, criteria for the choice of abatement systems, etc.

The reference standards of the aforementioned UK Guidelines assume that not all odours have the same potential to cause annoyance. It should also be noted that any odour, under certain conditions, has the potential to cause annoyance in the exposed population.

The exposure acceptability criteria indicated by the Guidelines therefore refer to the intrinsic level of unpleasantness of the specific odour emission (low, medium and high "offensiveness").

Emission factors characteristic of rendering plants

Table 1.C.2 shows the odour emission factors (OEF - Odour Emission Factor) calculated for each phase and expressed in odorimetric units per ton of raw material treated (ouE / t of raw material).

Table 1.C.2. Odour emission factors for each phase

Phase	*Average OEF (ouE/t)*
Delivery, storage and handling	10 E6 - 10 E7 ouE/t
ABPs crushing	10 E7 ouE/t
Cooking - Pressing - Separation	10 E9 ouE/t
Product drying and storage	10 E7 - 10 E8 ouE/t
Wastewater management	10 E6 ouE/t

The odour emission factors represent a simple method for estimating the odour emissions of a plant based on an activity index, which must be representative of the type of plant considered and associated with the amount of odour emitted. In the specific case of rendering plants, the processing capacity of the plants can be used, expressed in tons of raw material treated per year (t / y). The appropriateness of this choice is demonstrated by experimental evidence that confirms the existence of a correlation between the quantity of raw material treated and the quantity of odour emitted.

The OER relating to a rendering plant can be obtained as a multiplying the treatment capacity of the plant and the sum of the OEFs relating to each of the phases present in the plant considered. If any of the phases is conducted indoors with a system for conveying and treating the effluents, the actual OER must be calculated considering the efficiency of the abatement system adopted.

Odour emissions from ABPs plants and relevant preventive measures

The rendering process identifies a series of industrial sub-processes for the transformation of Animal By-Products. The activity is characterized by the transformation of these by-products into animal fats and meat and bone meal and / or products to be used in the production of energy or pet food (pet food).

The cycle generally includes, in addition to the activities of unloading, storage and handling of incoming materials, at least one phase of volumetric reduction of the raw material and one of heat treatment followed by separation processes of the various products (water, fats); the impact associated with them, specifically in terms of odour emissions, is strongly conditioned by the nature and in particular by the 'freshness' of the starting material.

The main phases of the rendering process are:

1. Delivery of Animal By-Products and their storage and handling
2. Crushing of by-products
3. Cooking of by-products
4. Fat-water separation
5. Solid drying
6. Storage of intermediate and finished products
7. Treatment of effluents deriving from the processes

The olfactory impact of the individual phases is summarized in table 1.C.3.

Table 1.C.3. Olfactory impact of the individual phases

Phases	*Odorous pollutants*
Receipt, storage and handling	- amines (trimethylamine) - sulfur compounds (DMDS) - ammonia - aldehydes - ac. organic (butyric)
Crushing	- amines (trimethylamine) - sulfur compounds (DMDS) - ammonia - aldehydes - ac. organic (butyric)
Cooking - Pressing - Separation	- amines (trimethylamine) - aldehydes (octanal, isobutyraldehyde) - reduced sulfur compounds (DMDS, thiols and sulphides)
Product drying and storage	- nitrogen compounds (pyrazine) - powders - volatile organic substances (VOCs)
Waste management	- reduced sulfur compounds - ammonia

<u>Delivery, storage and handling</u>

The phase concerns the transfer of the raw material, the Animal By-Products, from the production sources (farms, slaughterhouses and distribution centers where the carcasses or parts of the animal to be disposed of are recovered) to the treatment plant, unloading in the sections used for this purpose at the plant, storage and handling for subsequent processing.

ABPs transport usually takes place by means of dedicated wheeled vehicles; the material, once received, is unloaded in the designated areas, in special pits and from there moved by means of conveyor belts or screws for the subsequent processing phases.

The organic nature of the treated material, subject to alteration and decomposition processes, means that the main criticality of the transport and storage phase of the materials consists in the development of diffuse emissions characterized by the presence of malodorous substances (see table above).

In general, it is necessary that the operations of unloading, storage and handling of the material take place in confined environments, equipped with aspiration systems for conveying the emissions to suitable treatment systems, avoiding as much as possible the release of diffuse emissions with the simultaneous development of unpleasant odours outside the establishment. In this sense, appropriate technical measures regarding the design of the premises and systems as well as the necessary operating procedures for proper management must be adopted.

In particular, the following measures should be adopted.

- A correct design of the premises / areas intended for the unloading of the incoming material, providing, in particular:
  - ✓ the installation of aspiration systems and self-closing doors equipped with alarm systems in all departments responsible for processing by-products, in order to ensure the confinement of emissions and their conveyance to an appropriate abatement system;
  - ✓ the closure and negative pressure of the rooms for the delivery of materials where the vehicle stops during unloading and of the storage tanks (pit) with sending the emissions to an appropriate abatement system;
  - ✓ to evaluate the applicability of refrigerated storage systems in order to slow down the decomposition phenomena of materials and / or bacteriostatic diffusion systems in order to contain the development of odorous emissions;
  - ✓ the correct sizing of the aspiration system, in order to avoid the transfer of emissions from the pit into the unloading room;
  - ✓ the preparation of closed collection systems and removal of the leachate coming from the pit.
- A correct planning and management of the transport and handling systems, foreseeing:
  - ✓ closing of containers;
  - ✓ the closure and negative pressure of fixed systems (conveyor belts, tunnels) with the conveyance of the intake air to a suitable abatement system;
  - ✓ cleaning, sanitizing of the handling and transport systems in order to exclude the presence of material residues between one work cycle and the next, in particular if there is an interruption of more than 8 hours.
- The adoption of appropriate procedures for the management of the premises and systems for unloading and handling of materials which include:
  - ✓ the unloading of material in the pit only after closing the doors for vehicle access;
  - ✓ the minimization of the times and quantities of the materials stored by sending them to processing within 24 hours of their receipt, in order to avoid biodegradation phenomena with the simultaneous emission of odorous substances and reduction of the load of BOD and N in the water percolation;
  - ✓ adequate cleaning and sanitizing of the various appliances, floors and rooms in order to minimize odour emissions; floors must be built without obstacles for cleaning and the liquid must be easily and mechanically removed.

<u>ABPs crushing</u>

The tanks / pits for receiving the materials are equipped with transport systems such as augers and / or conveyor belts that send the raw material to the meat grinder or bone crusher, possibly following a pre-crushing treatment to reduce the volume of the materials.

The criticalities linked to the development of malodorous emissions, similarly to what was seen in the ABPs storage and handling phase, are mainly linked to the degree of freshness of the treated material. The crushing systems must therefore be closed, characterized and be equipped with a dedicated aspiration system for conveying to the emission control unit. During the crushing phase, the leachate must be intercepted and sent to the collection system (usually the flooring has an adequate slope so that the leachate is delivered to the pit).

Cooking - Pressing - Separation

The Animal By-Products are loaded automatically, after crushing and grinding, into the cooking container (autoclave or cooker).

Cooking can be carried out in a continuous phase with a stationary reactor even with multiple effects or discontinuously in a static reactor with batch loading and unloading of the by-products.

The cooking, which gives rise to a semi-finished product consisting of a liquid component (fat) and a solid component intended for the production of meat and bone meal, is generally followed by physical and mechanical processes of separation of the products from the processing residues. Usually:

- condensation of the vapours leaving the cooker, which constitute the process water to be sent to the treatment plant;
- pressing of the solid component to remove water and liquid fatty products from it and send it to the subsequent drying, grinding and sterilization phases (meat and bone meal production);
- centrifugation of the liquid component (fats) for a further separation from this of the solid part.

The resulting products are:

- process water consisting of the condensed vapours of the cooking phase, characterized by a high presence of high organic contents (BOD, COD, chlorides, phosphates, nitrogen compounds, ammonia, TOC) and destined for treatment at the purification plant;
- liquid fats that are stored in tanks, usually above ground and placed in special containment basins, to be then transferred to means of transport for dispatch to the customer;
- meat and bone meal stored in silos to be used as fuel in industrial activities or disposed of as waste outside the settlement.

The phase involves the development of emissions with high concentrations of VOC and high odour impact which vary according to the materials treated, making it the most critical of the process. It is necessary:

- to intervene already in the design and construction phase of the cooking system (including the feeding and unloading phases) by evaluating the most suitable solutions in order to contain the development of emissions, such as:
  - ✓ adoption of closed and sealed cooking systems to avoid leakage;
  - ✓ adoption of closed and aspirated transport systems;
- to guarantee the hermetic closure of the hot presses, the emissions of which must be aspirated and conveyed to a suitable abatement system;
- to conduct the cooking cycle using adequate control and management systems, capable of guaranteeing the maintenance of optimal operating conditions (temperature, pressure, type of process, cooking time) and managing any abnormal or emergency operating situations and avoiding permanence of personnel at the plants intended for processing;
- to prepare adequate collection and abatement systems in order to contain emissions characterized by high concentrations and odour impact;
- to keep the ambient air intake systems running even with the systems off.

Product drying and storage

The separated product in the pressing phase is sent to the drying phase in which the separated product is dried and subsequently ground for sending to the storage silos.

The drying phase can be a source of hot emissions, characterized by a high odour impact; it is therefore advisable that the emissions are adequately captured and conveyed into the atmosphere after abatement.

The unloading of the silos of the product (meat and bone meal) obtained subsequently must take place avoiding the dispersion of dust into the environment, for example by carrying it out:

- inside closed environments;
- with movable 'trunk' pipes.

The greases coming from the separation phases (centrifuges) must be stored in tanks equipped with vents, level measurement systems and containment basins. The vents must be sent for treatment.

Wastewater management

The wastewater that originates in the rendering plants, characterized by a high organic and odorous load, is generally made up of:

- leachate from the loading pit;
- process of cooking and separation of liquids;
- washing of systems and means of transport;
- washing and run-off water from paved areas;
- purging of scrubbers.

All the management phases such as collection, handling, any treatment at a purification plant or disposal as waste, must be conducted in such a way as to minimize the development of odours; in particular:

- the containers and tanks for the collection and storage of wastewater must be closed;
- the pipes or supply ducts must be closed;
- the treatment plant must be built and managed taking into account the relevant legislation and guidelines.

Depending on the qualitative and quantitative characteristics of the wastewater, its elimination can take place through the discharge into the available receptor body, after treatment in a suitable purification plant (biological type) or through disposal as part of the waste management.

Methods of conveying and treating the effluents

Given the characteristics of the materials treated, which are particularly subject to decomposition phenomena with the simultaneous development of unpleasant odours, it is of primary importance to ensure the compartmentalization of the premises, as well as the provision of adequate aspiration systems and conveyance of emissions, in order to minimize the release of emissions diffused outside the plant.

For the rendering processes, two main types of emissions can be roughly identified:

- 'Concentrated', consisting mostly of gas emissions in condensable substances deriving from the cooking and drying processes, and which can reach average values up to 400,000 ouE / m3 with peaks of 550'000 ouE / m3;
- 'Diluted' coming mainly from the premises, from handling systems or from 'cold' processing which can reach average values up to 8,000-10,000 ouE / m3 with peaks of 50'000 ouE / m3.

Therefore, suitably sized aspiration systems shall be available:

- dedicated to capture the ambient air of the local process sites;
- localized, in correspondence with the single equipment.

The aspirated flows must be conveyed, in relation to their chemical-physical characteristics, to suitable abatement systems, before their release into the atmosphere through expulsion chimneys.

Below are some basic considerations regarding the use of the various types of systems that can be used, in relation to their effectiveness in reducing odours.

Conventional technology biofilter, Combined technology biofilter

The use of biofiltration to control emissions from this type of plant is rather limited. The presence in the emissions of contaminants that are not very soluble in water that can condense at operating temperatures of the biofilter, which operates in mesophilic conditions, limits its application.

The use of bio-filtering devices is therefore to be considered limited to the control of secondary gas flows characterized by adequate temperature and humidity conditions.

Activated carbon abatement system with internal regeneration, Activated carbon abatement system with external regeneration

These types of systems are not very suitable for reducing odours as the coal requires very frequent regenerations; they can be used for low-flow and low-load flows (such as storage tank vents).

Recovery thermal combustor, Regenerative thermal combustor, Catalytic combustor

These types of plants make it possible to effectively abate effluents with a large odour load (concentrated emissions); their use in diluted flows is not recommended as they constitute a substantial economic burden both for installation and management as they require the consumption of large quantities of fuel.

Wet abatement system

It is a widely used treatment system for the abatement of odours. To ensure good efficiency, it may be necessary to provide several stages in series with different abatement fluids and adequate contact times. For oxidation, hydrogen peroxide is preferred in order not to give rise to "secondary" reactions with the formation of odorous compounds that decrease the abatement efficiency. It is indicated for the treatment of diluted gas streams.

Combustion boilers

Although they cannot be classified as specific abatement systems, they are widespread in rendering plants: boilers in which the gaseous effluents deriving from cooking processes are burned. Combustion in the boiler has the dual effect of reducing odour emissions and using systems that are generally already present in the establishments. The boiler must always be kept running in order to ensure gas combustion; instruments for controlling the flow rate of the gases sent to combustion are required, as well as combustion control systems and possibly chimney monitoring systems in relation to the thermal powers installed. The system is applicable to low flow and high concentration flows.

1.C.7. CROATIAN EXAMPLE: ENVIRONMENTAL/SOCIAL ISSUES

The history of today's processing plant for Animal By-Products, Agroproteinka, dates back to the 1950s. Back then, it was established as a rendering plant within the meat industry in, what then was, the industrial settlement of Sesvete, located on the eastern surrounding to the city of Zagreb. Due to the increase in capacity, the rendering plant and animal feed factory was moved as one enterprise from the center of Sesvete to its current location in Sesvetski Kraljevec in 1985. The new location is a few kilometers east of the old site, but only 20 km away from the Zagreb city center.

At that time, ecology wasn't widely implemented in terms of legal provisions nor established in the public consciousness.

The situation today

Agroproteinka d.d. is located in the area of local self-government of the City of Zagreb and the location is harmonized with the valid spatial plan. It is located in the east direction at a distance of 2 Km from the inhabited area of Sesvetski Kraljevec. The location is square in shape, completely fenced with a metal wire fence 2m high, with outdoor lighting and controlled reception of input materials. Unauthorized persons have been denied access, and everything is also under 24-hour video surveillance by the security service.

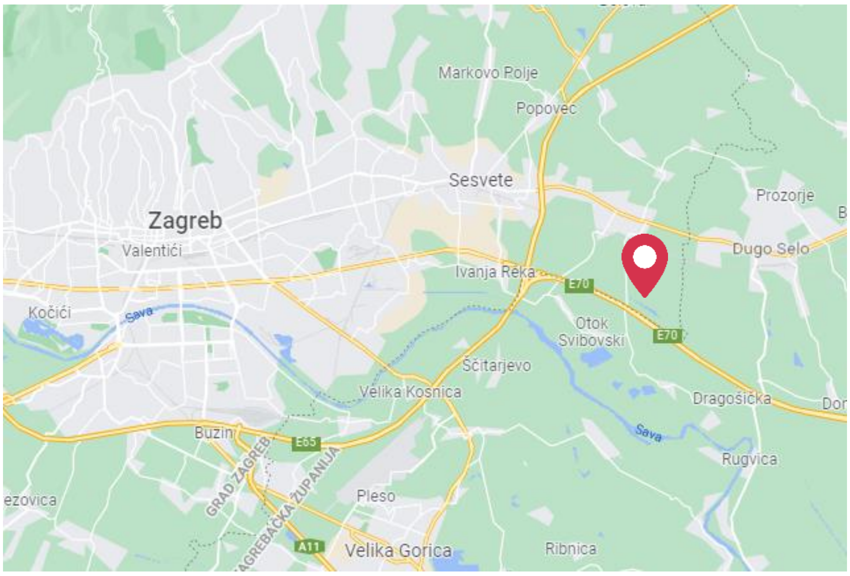
The entire space is supplied with all necessary infrastructure connections and devices for the successful operation of heat treatment activities: electricity connection, natural gas connection, water supply, biofilters for waste air purification, and wastewater drainage system leading to its own treatment plant. The existing location is characterized by the proximity of the highway, the distance of about 5 km is one of the very important conditions for successful performance of this activity.

There are two plants for heat treatment of ABPs: one for processing of categories 1 and 2 together, and the other plant for processing of category 3. The processing procedure in both plants is the same in terms of technological units and the processing procedure, with differences only in the pressure and sterilization time.

Both plants have been approved by the competent authority, the Ministry of Agriculture, and comply with EU legislation regarding Animal By-Products not intended for human consumption: Regulation (EC) 1069/2009 and its implementing Commission Regulation (EU) 142/2011.

- ABP processing plant category 1 and 2 together - approval number HR04-004NP.
- ABP processing plant category 3 - approval number HR04-009NP.

Figure 1.C.17: Location of Agroproteinka and distance from Zagreb



Rendering plants produce wastewater with a high organic load. The organic load from rendering a tonne of raw material is equivalent to that produced by 100 people/day. It also contains high levels of nitrogen and phosphorus. ABPs Regulation 1069/2009 and its implementing Commission Regulation (EU) no. 142/2011 restrict the routes for the use and disposal of all animal material, as defined, collected from Category 1 and 2 processing plants. It also states that wastewater originating from the unclean sector must be treated to ensure, as far as is reasonably practicable, that no pathogens remain.

Technologies and techniques for reducing emissions into the water used by Agroproteinka

Facilities for wastewater treatment from pollution as well as organizational and technical measures to prevent emissions:

1) Mechanical-chemical wastewater treatment

- Mechanical separator (sieve) of technological wastewater - sieve with mesh spacing of 1-2 mm for separating solid particles and material that comes with wastewater (hair, etc.)
- Flow equalization basin (Sodium hydroxide dosing unit for pH regulation)
- Separator of oils and fats for surface waters
- Flotation unit

2) Biological wastewater treatment

- Pump for condensed water and water from pre-treatment
- Equalization pool, SBR pool, pool compartment
- Flotation unit
- Sand filter
- Sludge tank
- Sludge centrifuge
- Polyelectrolyte preparation station
- Chemicals for flotation and pH regulation

Within the site there is a wastewater pretreatment plant and a biological wastewater treatment plant.

During heat processing of ABPs wastewater is formed - turbid water and condensate water. The murky waters go on wastewater pretreatment plant. Incoming wastewater from the collection in the pits is pumped to a mechanical sieve. Large particles are removed on a mechanical sieve, and after the sieve the wastewater is poured into a basin with a capacity of 1 m3, in which it is equalized, mixed with mixer. Wastewater from the pool goes to flotation. During flotation the pH value is adjusted with the help of sodium hydroxide - 45%.

In the process of pre-treatment of wastewater, separation of grease in oil separator (grease trap) has to be done and then return it to the process of thermal processing.

Biological treatment: wastewater from pretreatment and condensate from pumping station is pumped into the equalization basin, where concentrations of two types of wastewater are equalized. In the "Sequential Batch Reactor" SBR biological wastewater treatment takes place. The purification process takes 24 3x8 hours. At the end of all stages of biological treatment, the purified water is discharged from the SBR pool using solenoid valves to pool that is used as a tank for daily amounts of treated wastewater for additional treatment processes that follows after that.

Biological treatment is based on the action of suspensions with activated sludge in wastewater. Oxidation takes place during the nitrification process (aerobic process) nitrate and nitrite thus increasing the pH. In order to ensure the appropriate pH value of wastewater during biological treatment, alkali (sodium hydroxide) is added via membrane dosing pumps. In a biological reactor, the processes follow the prescribed order: pool filling with mixing of contents - anaerobic (denitrification).

After biological treatment and sedimentation, the discharge of treated wastewater and excess begins activated sludge in a special part of the pool with the help of solenoid valves. After complete discharge, the reactor is ready for a new phase or for the supply of a new batch of wastewater.

Excess activated sludge is drained from the reactor into the sludge tank. Purified water from a separate biological section reactor is further purified by the flotation process on the flotation unit (DAF). From the central part of the unit, the fleet is gravitationally transported to the sludge tank, and the flow clear water is drained through submersible pumps mounted on the pool at the last stage of cleaning - a sand filter where fine particles that were not removed by the previous steps are removed.

The filter is regenerated by countercurrent rinsing.

The treated wastewater is discharged into the canal after the treatment process through a sand filter. Excess of sludge and flotation sludge are collected in the sludge storage and go to dehydration on decant centrifuge and the dehydrated sludge is taken to the HR04-004NP plant for processing.

Additional techniques and methods used in individual technological units, which aim to prevent emissions into the water:

- system for disinfection and cleaning of process equipment - reduces the consumption of both water and detergents for washing of used equipment;
- all hazardous chemicals have STL lists, and water permits;
- maintenance and control of the drainage system and wastewater treatment on site are performed regularly;
- in case of sudden pollution of the internal drainage system, actions are taken following the Operational contingency plan.

Odour problems

Odour is a key environmental issue during rendering, even if fresh by-products are treated.

Although odour is widely considered to be an issue of local nuisance, it can, in reality, be the most troublesome day to day environmental problem for plant dealing with ABPs, so it has to be controlled. Typically, odour is caused by the decomposition of ABPs which has other related environmental consequences. For example, it reduces the usability of the ABPs and hence increases waste. Also, the substances causing odour can cause problems during waste water treatment.

If ABPs are not treated quickly after slaughter and before decomposition causes bad odour. To minimize bad odour and remove it when prevention has not been possible, ABPs should be used or disposed of as soon as possible after the animal is slaughtered or died. Agroproteinka utilizes this knowledge and organizes its business in this way.

If the ABPs cannot be treated before the development of the malodorous substances, if they are inherently malodorous, or if the process is inherently malodorous, ABPs are stored for short period and refrigerated as quickly as possible and for as short a time as possible, to minimize decomposition. Both the process and associated activities can give rise to bad odours. These are associated with the reception, handling and storage, transfer, and preparation of raw material; the cooking process; handling and storage of processed product and the handling, storage, treatment, and disposal of solids, liquid effluents, and process gases. The fresher the raw materials are, the fewer odour problems they will cause, either directly or during the rendering process. The odorous substances are characterized by some being insoluble in water and others being volatile in steam. They are detectable at low concentrations. The concentration and composition of the emitted substances can change suddenly during the production process.

Enclose Animal By-Products during transport, loading/unloading and storage

ABPs Regulation 1069/2009 states that "*ABP and derived products must be collected and transported in sealed new packaging or covered leak-proof containers or vehicles. Vehicles and re-usable containers, and all re-usable items of equipment or appliances that come into contact with ABP and derived products, must be: cleaned, washed and disinfected after each use; maintained in a clean condition; and clean and dry before use. Re-usable containers must be dedicated to the carriage of a particular product to the extent necessary to avoid cross-contamination.*"

Agroproteinka meets these prescribed conditions. All vehicles are of appropriate design, construction and operation, specially designed for the transport of this material. Vehicles, handling and storage equipment and premises are smooth, impervious and designed so as not to harbour solids and liquids. Floors have a chemical resistant finish applied, to prevent damage being caused by the chemicals used for cleaning and disinfection. Floors are sloped to holding pits.

By all these measures, environmental benefits, reduction in the consumption of water and its contamination by cleaning chemicals are achieved.

Vehicles and equipment are designed in such a way that ease the movement and removal of materials, e.g. by ensuring that hoppers have sides which slope downwards, by avoiding angles where materials may stick or be difficult to remove and by ensuring that none of the equipment contains any "dead ends" - which eases operation including cleaning; in this way, bad odour emissions are reduced.

The reception, off-loading and storage of ABPs are undertaken within an enclosed area since the facility operates under negative pressure, with extraction ventilation connected to a suitable odour abatement plant to reduce odour emissions. Receiving pits are always closed and opened only when the ABPs are transferred from the delivery vehicle, and immediately closed again after filling.

Doors to areas where ABPs are loaded/unloaded, stored or treated, are close fitting and kept closed other than to allow pedestrian access or the movement of materials.

It can be said that unpleasant odours from Agroproteinka have been almost completely removed. However, since this is a specific industry, they can sometimes be felt in the immediate vicinity of the factory.

Emissions to air

The existing impacts on the air in the area of Agroproteinka are the result of technological discharges from the chimneys and biofilters, which are regularly tested in accordance with applicable legislation.

An overview of the existing impact on air is an outcome from the data of stationary sources of air pollution, the measurement of emissions of pollutants into the air from the heating plant in Agroproteinka, and the Register of Environmental Pollution.

The following sources of air pollutants have been identified at the Agroproteinka site:

a) chimney 1

b) chimney 2

c) biofilter of plant HR04-009NP

d) biofilter of plant HR04-004NP

Chimneys - emissions from boilers

To reduce the amount of emission emitted into the atmosphere, one part of the energy source (medium fuel oil) has been replaced by technical fat, which has the same caloric value but contains a small proportion of sulfur, thus reducing SOx emissions. Since 2009, emissions have been reduced because natural gas started being used.

Biofilter waste air purification

The biofilter is a cover (substrate) of organic material, which enables purification of all types of waste air, substances contained in the waste air that need to be removed. Biofilters are connected directly to the ventilation system of the plant premises in which the waste air is generated. Waste air containing harmful substances is purified before it enters the biofilter. Purification includes removing the grease and other particles to prevent damage to the filter layer so that microorganisms would have optimal living conditions. Waste air passes through the flowing bottom and through layers of the biofilter, where the harmful substances from waste air are absorbed and decomposed by microorganisms in the organic filter bed.

Infective agents

ABPs are a potential source of risks to public and animal health and the environment, as potential sources of infection. Thus, infectivity was identified as a key environmental issue. This risk needs to be adequately controlled, by directing such products towards safe means of disposal like to processing plant as a one of possibility. This is particularly significant during the destruction of SRM, principally due to the concerns arising from the BSE crises regarding both animal health, especially concerning the feed and food chain and human health after the links between TSE in animals and CJD, in humans were discovered.

Control of the handling and treatment of confirmed TSE infected materials, those suspected of being infected, and those arising from animals killed in the context of TSE eradication measures are regulated by Regulation (EC) no. 1069/2009 and its implementing Commission Regulation (EU) no. 142/2011.

Infestation by insects, rodents, and birds can be an issue during ABPs storage and use. For example, the prevention of the spread of BSE risk material by insects, rodents, and birds to material intended for human consumption will make enclosure important.

These Regulations also introduced the principle that high-risk material should not be fed to farmed animals, and that material derived from animals is not to be fed to animals of the species from which it is derived. Under that Regulations, only material from animals, which have undergone veterinary inspection may enter the feed chain. In addition, it lays down rules for processing standards, which ensure the reduction of risks.

There may be a risk of pests, vermin, bacteria, and fungi being attracted by the large amounts of nutrients and moisture in the ABPs or derived products as processed animal proteins. If those derived products are stored in damp conditions, this will provide an ideal medium. If the storage temperature is allowed to exceed 40 °C, processed animal proteins or meat and bone meal may heat up and spontaneously combust.

It is essential that crates, modules, and vehicles used to transport of ABPs are thoroughly cleaned between collections, to reduce the spread of any infection, which may be present. If the deactivation of pathogens is inadequate there is a risk of land and groundwater contamination.

Regular cleaning and disinfection of installations and equipment where ABPs are handled will reduce the risk of diseases being spread by insects, rodents, and birds and will help control the formation of malodorous substances.

Having all the above in mind, compliance with the prescribed requirements of these regulations is of utmost importance. Therefore, processing plants cannot start performing activities without determining the respect of the prescribed conditions, which in Croatia are performed by an expert commission by inspecting the plant on the spot.

Both of Agroproteinka's processing plants meet the prescribed requirements and were entered in the Register of Approved plants dealing with ABPs. Register is publicly available on the official website of the Ministry of Agriculture.

Agroproteinka's environmental management

- Application of a certified environmental management system in accordance with ISO 14001.
- Regular implementation of education of employees in the field of environmental protection as part of certified systems according to ISO 9001, ISO 14001 and HACCP standards.
- Carrying out technical maintenance (weekly, semi-annually and annually).
- Daily measurement and recording of water consumption per hour as part of the automatic metering system.
- Daily dry cleaning of installations of vehicles and equipment for ABPs, followed by cleaning with a pressure device.
- Implementation of energy efficiency monitoring and management system.
- Insulation and separation of steam and water installations to collect condensate and its reuse in the production of steam in boilers.
- Application of waste air biofilters for odour control with record keeping.
- Removal of waste air from all production plants for purification on the biofilter.
- Carrying out unloading/loading of ABPs indoors with a ventilation system connected to the biofilter.
- Implementation of procedures for storage and treatment of collected non-hazardous waste.
- Daily cleaning of plants and storage areas.
- Implementation of a noise management system based on legal obligation.
- Use of natural gas as fuel.
- For washing, use detergents that are not harmful to the environment, do not contain active chlorine and are authorised.
- Application of closed heat treatment lines.
- Before heat treatment, crushing of ABPs with a 50 mm crusher in compliance with Regulation 142/2011.

Noise and vibration

The noise inside Agroproteinka mainly comes from ancillary operations (e.g. compressors, valves) and maintenance department (e.g. trucks, containers, mechanical instruments). Noise pollution was not recorded outside the factory. Environmental noise measurements determined no deviation from the permissible noise levels. During operation, noise levels ranged between 83 dB (A) and 45 dB (A).

Vibration sources are present only in compressor stations (compressors). All compressors are on cushioning pads, so these vibration sources don't pose a danger to workers and the environment.

Internal drainage system

Buildings for drainage of wastewater and rainwater, as well as all tanks for tank storage, meet the criteria of water tightness, structural stability, and functionality.

Above-ground tanks for storage of hazardous materials and liquid waste are located in protective pools made of waterproof material. Also, all tanks, pipelines, and floors in all storages and production facilities are made of resistant material and thus impermeable.

Decision on integrated environmental protection conditions for Agroproteinka

The Ministry of Environmental and Nature Protection issued for Agroproteinka a decision on integrated environmental protection conditions in 2015.

During this procedure, the competent state administration bodies determined the conditions for individual components of the environment and other special conditions and gave opinions on the submitted request and the Technical-Technological solution.

The Ministry of Environmental and Nature Protection has published on its official website information on the subject request for a period of 30 days.

A public hearing was held in coordination with Zagreb's City Office of Energy, Environmental Protection, and Sustainable Development, at which no objections were made. Also, no additional questions were asked at the public presentation.

Since there were no opinions, remarks, or proposals of the public and the interested public from the public debate, and according to the above-mentioned conditions and opinions from competent bodies, it was determined that Agroproteinka's request was valid. Furthermore, integrated environmental protection conditions were established for the plant.

Public informing, Community care

Agroproteinka has a legal obligation to inform the public and the competent authorities, to record all possible complaints from the public, as well as undertaken activities for the purpose of eliminating or mitigating the identified problems. For this purpose, the company established a service for possible complaints.

Agroproteinka wants to be connected with the local community and as responsible members of local community is aware that their responsibility does not end just with the protection of human health and the environment so they strive to build a more active and successful society. For that reason, Agroproteinka supports a wide range of sports clubs, cultural events, charity activities and helps people in need. They also take special care of poor children and victims of the Homeland War.

From the above-mentioned activities, it can be single out their endorsement of the first league handball club from Sesvete and the first league chess club from Sesvete, which is a legacy of Pik Sljeme. Eco-schools and environmental activities for the youngest have also special place. They sponsor the eco-school of the Leptir (Butterfly) kindergarten from Sesvete and the Sesvete primary schools as well as scholarships for one student of the Faculty of Veterinary Medicine every year.

Desiring to bring their work closer to neighbours and fellow citizens, but also to show numerous investments in environmental protection and health and modernization of facilities, Agroproteinka organizes Open Days.

It is an opportunity to get to know and to connect better with the community of which they are a part. Thus, with fun and educational activities, Agroproteinka tries to bring its business closer to the population. Through all these activities, Agroproteinka lives within its community and demonstrates ethical and social sensibility, responsible business and responsible living.

1.C.8. PUBLIC PARTICIPATION IN ENVIRONMENTAL DECISION-MAKING

As far as public participation is concerned, a key document to be considered is the United Nations Economic Commission for Europe (UNECE) “Convention on access to information, public participation in decision-making and access to justice in environmental matters”, of 25 June 1998 (the Aarhus Convention). Indeed, Annex 1 of the Convention includes, among the activities to which the Convention applies, the “installations for the disposal or recycling of animal carcasses and animal waste with a treatment capacity exceeding 10 tonnes per day”.

The convention is based on the premise that greater public awareness of and involvement in environmental matters will improve environmental protection. It is designed to help protect the right of every person of present and future generations to live in an environment adequate to their health and well-being. To this end, the convention provides for action in 3 areas:

- ensuring public access to environmental information held by the public authorities;
- fostering public participation in decision-making which affects the environment;
- extending the conditions of access to justice in environmental matters.

The second part of the convention concerns public participation in decision-making. This must be ensured through the authorisation procedure for certain specific activities listed in Annex I to the convention. The final decision to authorise the activity must take due account of the outcome of the public participation.

According to the Aarhus Convention (art. 6):

"2. The public concerned shall be informed, either by public notice or individually as appropriate, early in an environmental decision-making procedure, and in an adequate, timely and effective manner, inter alia, of:

(a) the proposed activity and the application on which a decision will be taken;

(b) the nature of possible decisions or the draft decision;

(c) the public authority responsible for making the decision;

(d) the envisaged procedure, including, as and when this information can be provided:

(i) the commencement of the procedure;

(ii) the opportunities for the public to participate;

(iii) the time and venue of any envisaged public hearing;

(iv) an indication of the public authority from which relevant information can be obtained and where the relevant information has been deposited for examination by the public;

(v) an indication of the relevant public authority or any other official body to which comments or questions can be submitted and of the time schedule for transmittal of comments or questions;

(vi) an indication of what environmental information relevant to the proposed activity is available;

(e) the fact that the activity is subject to a national or transboundary environmental impact assessment procedure.

3. The public participation procedures shall include reasonable time-frames for the different phases, allowing sufficient time for informing the public and for the public to prepare and participate effectively during the environmental decision-making.

4. Each Party shall provide for early public participation, when all options are open and effective public participation can take place."

According to the same article 6 of the Convention, the competent public authorities shall give the public concerned access for examination, to all information relevant to the decision-making that is available at the time of the public participation procedure. The relevant information shall include at least:

(a) a description of the site and the physical and technical characteristics of the proposed activity, including an estimate of the expected residues and emissions;

(b) a description of the significant effects of the proposed activity on the environment;

(c) a description of the measures envisaged to prevent and/ or reduce the effects, including emissions;

(d) a non-technical summary of the above;

(e) an outline of the main alternatives studied by the applicant;

(f) in accordance with national legislation, the main reports and advice issued to the public authority at the time when the public concerned shall be informed.

A program of information, participation and involvement of the relevant stakeholders in the various project and evaluation phases should be prepared in advance.

The relevant stakeholders must be identified through the analysis of the overall local socio-economic context (analysis of the social context and of all the economic sectors present) and with their detailed mapping.

Upstream of the definition of the project, the consultation of citizens and stakeholders should be the main tool to guarantee information, manage conflicts and reach a general sharing of the chosen scenario or at least the awareness of what emerged and selected during the participatory decision-making process.

SECTION 1.D

TASK 4.

LOGISTIC PLAN INCLUDING A TRAFFIC STUDY

1.D.1. ABPS SOURCES

A thorough analysis has been already carried out under Task 1 and details are included in chapter 1.A.4., that includes also a tentative frequency for ABPs collection.

1.D.1.1. ABPs FROM SLAUGHTERHOUSES

Annex 1.A.5 includes details on the slaughtering activity of each slaughterhouse. Starting from these data, the number of animals slaughtered respectively in the north, central and south area of the Country has been calculated (annexes 1.A.7. and 1.A.8.). A summary is reported at table 1.D.1.

Table 1.D.1. Number of slaughterhouses and slaughtering activity per geographical area

Area	*Number of slaughter-houses*	*N. of slaughtered animals*							
		Bovine		*Ovicaprine*		*Pigs*		*Poultry*	
		weekly	*yearly*	*weekly*	*yearly*	*weekly*	*yearly*	*weekly*	*yearly*
North	42	351	17,864	908	43,867	1,626	88,653	40,598	2,070,546
Center	69	273	12,262	432	22,417	5,457	276,186	330,801	16,032,042
South	27	44	1,853	329	16,926	663	26,531		4,280
Total	138	667	31,929	1,670	83,260	7,736	390,890	371,400	18,106,868

More than 50% of the bovines are slaughtered in the north, almost 30% in the center and a small percentage in the south. Concerning ovicaprines, more than half are slaughtered in the north, more than 25 % in the center and around 20% in the south. As far as pigs are concerned, nearly 70% are slaughtered in the center, and also for poultry the vast majority are slaughtered in the center. It is interesting to see how the distribution of the slaughtering activity impacts on the amount of ABPs produced in the 3 geographical areas. Table 1.D.2 reports the amount of ABPs (divided in categories) produced in the slaughterhouses respectively in the north, in the center and in the south.

Table 1.D.2. ABPs from slaughterhouses produced in the 3 geographical areas

	Cattle			**Pigs**			**Sheep**			**Total**
	%	Kg/head	Tot tons	%	Kg/head	Tot Tons	%	Kg/head	Tot Tons	
Cat. 1	8.02	27.35	488.55	0	0	0	5.81	2.44	107.04	595.59
Cat. 2 without gastroint. content	0.38	1.3	23.15	0.1	0.1	8.87	0.2	0.08	3.68	35.7
Cat 3 without hides	32.1	109.4	1,953.6	17	16.8	1,486.7	37	15.5	681.9	4,122.2
Tot. North	**40**	**138**	**2,465**	**17**	**17**	**1,496**	**43**	**18**	**793**	**4,754**
Cat. 1	8.02	27.35	335.34	0	0	0	5.81	2.44	54.7	390.04
Cat. 2 without gastroint. content	0.38	1.3	15.89	0.1	0.1	27.62	0.2	0,08	1.88	45.39
Cat. 3 without hides	32.1	109.4	1,341	17	16.8	4,631.6	37	15.5	348.5	6,321.1
Tot. Center	**40**	**138**	**1,692**	**17**	**17**	**4,659**	**43**	**18**	**405**	**6,756**
Cat. 1	8.02	27.35	50.68	0	0	0	5.81	2.44	41.3	91.98
Cat. 2 without gastroint. content	0.38	1.3	2.4	0.1	0.1	2.65	0.2	0.08	1.42	6.47
Cat. 3 without hides	32.1	109.4	202.6	17	16.8	444.9	37	15.5	263.1	910.6
Tot. South	**40**	**138**	**256**	**17**	**17**	**448**	**43**	**18**	**306**	**1,010**
Cat. 1			*874.57*			*0*			*203.04*	**1,077.61**
Cat. 2 without gastroint. content			*41.44*			*39.14*			*6.98*	**87.56**
Cat. 3 without hides			*3,497.2*			*6,563.2*			*1,293.5*	**11,353.9**
Tot Country			**4,413**			**6,603**			**1,504**	**12,520**

The fact that a certain amount of ABPs is already processed in the existing rendering plants has been considered. In particular, these plants have the capacity, apparently, to process the whole amount of poultry ABPs produced in the Country. Indeed, our estimation of ABPs produced in poultry slaughterhouses is as follows: 7,741 tons/year of cat. 3 and 712 tons/year of cat. 2, for a total of 8,459.59 tons/year.

Considering that ABPs plant "Rom-Cris" processes 11,650 tons/year, and that according to collected information they process only ABPs from poultry, it looks like all the ABPs from poultry produced in the Country could be processed in this establishment. Unfortunately, no detailed data is available concerning the flow of ABPs from poultry (i.e. from which poultry abattoirs ABPs that are processed in "Rom-Cris" are collected).

Therefore, it is not possible to include ABPs from poultry in the traffic study. Nevertheless, considering the capacity of “Rom-Cris” and the total amount of ABPs from poultry that has been estimated, the rendering plant to be constructed would have the capacity to process ABPs from poultry that possibly are not collected by “Rom-Cris”. In few words, a relatively small amount of ABPs from poultry will have to be collected and therefore there should be no significant impact on the traffic study.

1.D.1.2. ABPs FROM FOOD PROCESSING PLANTS

The list of establishments processing food of animal origin in Moldova has been provided by ANSA, and establishments have been divided according to the type of production and to the geographical location (tables 1.A.12 and 1.D.3). The division according to the geographical location of establishments will be useful for the calculation of routes for ABPs collection.

Table 1.D.3. Food processing plants: geographical distribution and tentative estimation of ABPs produced

Region/ district/ municipality		III	V	VI	VIII	IX	X	XIII	**Total**
n.	*name*	*Farmed game*	*Minced meat, meat prep. MSM*	*Meat products*	*Fishery products*	*Raw milk and dairy products*	*Eggs and egg products*	*Stomachs, bladders intestines*	
1	m.Bălți		10	3	2	1			**16**
8	Donduseni		2	1					**3**
9	Drochia		2			2			**4**
10	Edinet/ Briceni			1		146	4		**151**
11	Falesti		1	1		2			**4**
12	Glodeni		1						**1**
13	Floresti		1	2		1			**4**
16	Ocnita					21			**21**
19	Riscani			2		1	2		**5**
20	Soroca			1		1			**2**
NORTH		*0*	*17*	*11*	*2*	*175*	*6*	*0*	***211***
ABPs (average): tons/year		*1.2*	*1.2*	*1.2*	*0.5*		*0.5*	*1.2*	
TOTAL tons/year - NORTH		*0*	*20.4*	*13.2*	*1*		*3*	*0*	
2	Anenii Noi		6	9	3	11	1		**30**
4	Calarasi			1	1	1			**3**
5	Chisinau		17	10	8	5	2		**42**
7	Criuleni	5		6	2	1			**14**
14	Hincesti				1	1			**2**
15	Ialoveni		4	1	1	2	1		**9**
17	Orhei			5		1		1	**7**
18	Rezina					2			**2**
22	Telenesti		1			16	1		**18**
23	Ungheni/ Nisporeni			1		5	2		**8**
CENTER		*5*	*28*	*33*	*16*	*45*	*7*	*1*	***135***
ABPs (average): tons/year		*1.2*	*1.2*	*1.2*	*0.5*		*0.5*	*1.2*	
TOTAL tons/year - CENTER		*6*	*33.6*	*39.6*	*8*		*3.5*	*1.2*	
3	Cahul		3	1		2			**6**
6	Cimislia		1	2		2	2		**7**
21	Taraclia					1	1		**2**
24	UTA Gagauzia		1	1		9	1		**12**
SOUTH		*0*	*5*	*4*	*0*	*14*	*4*	*0*	***27***
ABPs (average): tons/year		*1.2*	*1.2*	*1.2*	*0.5*		*0.5*	*1.2*	
TOTAL tons/year - SOUTH		*0*	*6*	*4.8*	*0*		*2*	*0*	
TOTAL ESTABLISHMENTS		**5**	**50**	**48**	**18**	**234***	**17**	**1**	**373**
TOTAL cat. 3 tons/year		**6**	**60**	**57.6**	**9**	**15**	**8.5**	**1.2**	**157.3**

** Considering that the majority of these 234 establishments are milk collecting points, where ABPs are not generated, only 30 dairy plants have been included in the calculation as processing establishments.*

Most food establishments are located in the north of the country: 211 out of 373. Also in the center of the country there is quite a significant number of food plants (135) while in south area the number of establishments is very small.

However, it should be noticed that the high number of food plants in the northern area is strictly related with the presence of several dairy plants (175 dairy plants out of 211 food establishments), especially in the areas of Edinet and Ocnita; according to collected information, most of them are milk collection points, where usually no ABP is produced. Therefore, we decided arbitrarily to include only 30 dairy plants in the calculation as processing establishments.

As additional comment, the number of food establishments in the south of the country is very limited. Therefore, the most significant effort for ABPs collection in food establishment should probably be concentrated in the central area of the country.

Concerning the calculation of the amount of ABPs (category 3) produced on average in these establishments, on yearly basis, no data is available. Therefore, we decided to estimate an average of ABPs production for each type of establishment, as follows:

- Farmed game, meat products, minced meat, meat preparations and MSM: 1.2 tons/year,
- Fishery products, raw milk and dairy products, eggs and egg products: 0.5 tons/year,
- Treated stomachs, bladders and intestines: 1.2 tons/year.

The so called “General activity establishments” (mainly cold stores) have not been taken in consideration because usually these establishments don’t produce ABPs on regular basis.

These average amounts have been established on the basis of experiences matured in other Countries, however we are aware that the amount of ABPs produced by an establishment is strictly connected with the average production of food of animal origin. Unfortunately, this data is not available, but we should consider that the total amount, as reported in the last row of table 1.D.3, is quite small (157 tons/year). In few words, it is important to consider all the establishments producing food of animal origin primarily for their location, as this will influence directly the logistic of Animal By-Products collection.

1.D.1.3. ABPs PRODUCED AT RETAIL LEVEL

ABPs (category 3) shall be collected also from butcher shops, supermarkets and large retails where deboning activities are carried out, catering activities. Data on the number and locations of such activities have been collected from ANSA (see table 1.A.13), however it is very difficult to estimate the relevant amount of ABPs produced, not only because this is strictly connected with the amount of meat that is sold, but also because there are butcher shops and supermarkets where no deboning is carried out, and therefore the Animal By-Products produced is nearly zero. Moreover, the reliability of these data should be verified, because some numbers are difficult to interpretate (i.e it looks like a very small number of restaurants are reported, especially from the Chisinau area).

Yet, it is important to collect data on the number of retail activities and relevant location, mainly for logistic purposes. Therefore, retail activities have been grouped according to the geographical area, as it is showed at table 1.D.4.

Clearly, the largest number of retail and caterers is located in the central area of the Country, and particularly in Chisinau. ABPs collection from the retail level will be the last step in the establishment of the ABPs management system, and the relevant logistic could be organised when more detailed and reliable data will be available on the total number of retail activities, relevant amount of ABPs produced in each source, storage conditions etc.

Table 1.D.4. Retail activities: geographical distribution

Region/ district/ municipality		*Butcher shops*	*Large retails (supermarkets)*	*caterers, canteens*	*Restaurants*	**Total**
n.	*name*					
1	Bălți	0	3	5	12	*20*
14	Donduseni	1	1	2	1	*5*
15	Edinet/Briceni	7	8		15	*30*
16	Falesti		2	10	4	*16*
17	Glodeni		1	9	2	*12*
18	Floresti		3		12	*15*
22	Ocnita			4	7	*11*
25	Riscani	8	6	3	19	*36*
26	Soroca			3	9	*12*
North		16	24	36	81	**157**
2	Anenii Noi		5	4	25	*34*
4	Calarasi		3	1	2	*6*
9	Chisinau	35	106	52	23	*216*
12	Criuleni	3	2	4	3	*12*
13	Dubasari			2		*2*
20	Hincesti		5	7	3	*15*
21	Ialoveni	1	7	6	10	*24*
23	Orhei	5	2	1	8	*16*
24	Rezina				2	*2*
19	Soldanesti		2		10	*12*
27	Straseni	3	3	4	7	*17*
29	Telenesti		1	8	2	*11*
30	Ungheni/Nisporeni	6	7	10	8	*31*
Center		53	143	99	103	**398**
11	Basarabeasca		1	2		*3*
3	Cahul	9	7	30	14	*60*
6	Cantemir			2	4	*6*
7	Causeni		4	1	4	*9*
10	Cimislia		1	4	2	*7*
5	Leova		1	5	2	*8*
8	Stefan Voda		2		4	*6*
28	Taraclia		**3**		**3**	*6*
31	UTA Gagauzia	12	11	18	10	*51*
South		21	30	62	43	**156**
WHOLE COUNTRY		**90**	**197**	**197**	**227**	**711**

1.D.1.4. ABPs FROM FARMS (DEAD ANIMALS)

All details concerning the flows, location of the farms (commercial farms and households) and relevant concentration in the Country are provided in chapter 1.A.4.8.3. For the calculation of the average weight of dead animals (bovines, pigs, ovicaprines) we decided to use the data on Moldovan's animals heritage provided from ANSA and related to 2020 (see table 1.A.18) and considering a mortality of 3%. Relevant results are showed at table 1.D.5. Poultry has not been taken in consideration because according to collected information these ABPs could be collected and processed by existing rendering establishments.

Table 1.D.5. Dead animals, average kg/head according to the species

Animal species and category	*N.*	*Avg weight x head (Kg)*	*Mortality 3%*		*Avg kg/head*
			N. dead animals	*Total weight (Kg)*	
Bovines - total	**159,145**		**4,774**	**1,286,046**	**269.39**
Young cattle (calves)	2,691	130	807	104,949	
Adult cattle	131,233	300	3,937	1,181,097	
Sheep - total	**653,107**		**19,593**	**545,295**	**27.83**
Lambs	70,836	10	2,125	21,251	
Adult sheep	568,706	30	17,061	511,835	
Male	13,565	30	407	12,209	
Goats - total	**191,907**		**5,757**	**158,696**	**27.57**
young goats under 1 years old	23,367	10	701	701	
Adult Goats- already kidded	16,854	30	5,056	151,686	
Porcine- total	**434,319**		**13,030**	**222,034**	**17.04**
Adults	33,646	100	1,009	100,938	
Fattening pigs (incl. piglets)	403,654	10	12,110	121,096	

Afterward, the number of animals raised in each County has been considered (see annex 1.D.1), and the total amount of ABPs deriving from dead animals to be collected from each County has been calculated, on weekly and yearly basis, considering the average weight of dead animals as calculated at table 1.D.5, assuming that the mortality will be on average at 3%. Table 1.D.6 summarises the total amount of ABPs deriving from dead animals to be collected from each geographical area of the Country.

Table 1.D.6. ABPs deriving from dead animals to be collected from each geographical area of the Country

	Bovines			**Pigs**			**Ovicaprines**			**Total**	
Region	**N.**	**Ton/ year 3%**	**Ton/ week 3%**	**N.**	**Ton/ year 3%**	**Ton/ week 3%**	**N.**	**Ton/ year 3%**	**Ton/ week 3%**	**Ton/ year 3%**	**Ton/ week 3%**
Tot. North	*70,151*	*566.96*	*10.9*	*101,609*	*51.83*	*0.99*	*208,284*	*173.7*	*3.36*	*792.5*	*15.24*
Tot. Center	*55,710*	*450.24*	*8.65*	*270,972*	*138.2*	*2.65*	*232,159*	*193.6*	*3.72*	*782.07*	*15.03*
Tot. South	*20,937*	*169.23*	*3.25*	*61,023*	*31.11*	*0.61*	*364,537*	*304*	*5.85*	*504.37*	*9.71*
Tot. Country	**146,798**	**1,186.43**	**22.81**	**433,604**	**221.14**	**4.25**	**804,980**	**671.35**	**12.93**	**2,078.94**	**39.98**

1.D.2. MAPS WITH NUMBER AND LOCATION OF ABPs SOURCES

On the basis of the data provided in the chapter 1.D.1.1, maps have been drafted, reporting the location of the ABPs sources. The following maps have been prepared and are attached (annex 1.D.2):

- Slaughterhouses;
- Number of slaughtered animals (bovines and ovicaprines);
- Farmed game establishments;
- Minced meat and meat preparation establishments;
- Meat products establishments;
- Fishery products establishments;
- Dairy products plants;
- Eggs and egg products plants;
- Live animals: bovines
- Live animals: ovicaprines;

The distance estimations were done by google map support. (https://www.google.com/maps/)

1.D.3. ABPs STORAGE ESTABLISHMENT(S)

1.D.3.1. CHARACTERISTICS OF THE STORAGE ESTABLISHMENT(S)

The storage establishment is an intermediate point of storage where ABPs gathered from the "peripheral" areas in a parcelled collection, are temporarily stored and after a short time shipped with one big truck to the processing plant.

Therefore, the activity of storage of ABPs has to be considered as an intermediate operation according to EU requirement, and it is subject to approval according to Regulation 1069/2009, article 24.1(i). Relevant requirements are defined in Regulation 142/2011, Annex IX, Chapter II. Among other requirements, it is foreseen that the plant must have adequate facilities including lavatories, changing rooms, washbasins for staff and, if appropriate, office space which can be made available to the staff performing official controls. The Regulation specifies also that "*Where it is necessary for the purpose of achieving the objectives of this Regulation, plants must have suitable temperature-controlled storage facilities of sufficient capacity for maintaining Animal By-Products at appropriate temperatures and designed to allow the monitoring and recording of those temperatures*". Additionally, category 3 materials intended for the production of feed or raw pet food must be chilled or frozen, unless processed within 24 hours after collection. The temperature of ABPs based on meat and meat products must be kept at a maximum of 7 ° C.

The decision to refrigerate ABPs in a storage establishment is therefore connected with the amount of ABPs that will be stored, the climatic conditions, the length of storage and the frequency of delivery to the processing plant. Logistic will therefore play a significant role in adopting a decision.

In case the storage establishment will collect separately category 1, 2 and 3 ABPs, each plant should be dedicated for one specific ABP or, if built under the same roof, completely divided from the ground to the roof in three separate units (cat. 1, cat.2, cat. 3) or two separate units (cat. 1/cat.2 and cat. 3) where in each unit there is a dedicated entrance and exit, dedicated truck routes and dedicated personnel. Under certain conditions handling and storage of more than one category of Animal By-Products in the same establishment or plant might be possible (Article 29 of Regulation 1069/2009). If ABPs of different categories are mixed, there is no need to have separated storage establishments, ABPs of the three categories can be stored in one plant, it is not necessary to provide any separation and the mixture shall be handled in accordance with the standards laid down for the highest risk category (Cat.1).

Storage establishments must be adequately separated from thoroughfares through which contamination may be spread and from other premises such as slaughterhouses. The layout shall ensure the total separation of Category 1 and Category 2 material from Category 3 material respectively, from reception until dispatch, unless in a completely separate building. Storage establishments must:

- have a covered space to receive and dispatch ABPs, unless the ABPs are being discharged through installations which prevent the spreading of risks to public and animal health;
- be constructed in such a way that it is easy to clean and disinfect; floors must be laid down in such a way as to facilitate the draining of liquids;
- have adequate facilities including lavatories, changing rooms, washbasins for staff and, if appropriate, office space which can be made available to the staff performing official controls;
- have appropriate arrangements for protection against pests, such as insects, rodents and birds;
- where it is necessary for the purpose of achieving the objectives of the Regulation, plants must have suitable temperature-controlled storage facilities of sufficient capacity for maintaining ABPs at appropriate temperatures and designed to allow the monitoring and recording of those temperatures;
- be equipped with adequate facilities for cleaning and disinfecting the containers and for the vehicles in which they are transported. Adequate facilities shall be available for the disinfecting of vehicle wheels.

When storage is carried out in plants approved or registered in accordance with Art. 4 of Reg. (EC) No 853/04 or in accordance with Art. 6 of Reg. (EC) No 852/04, no specific registration is required for ABPs storage.

1.D.3.2. NEED FOR STORAGE ESTABLISHMENT(S)

The opportunity to establish one or more storage plant in the Country is strictly connected with the number and location of the establishments producing ABPs, the frequency of slaughtering, the location of the processing plant(s), the geographical characteristics and the climatic conditions of the Country itself. Besides, the type and conditions of infrastructures (roads, motorways) are to be considered. In few words, investment in means of transport and drivers could be increased and logistic could be organised in such a way to avoid building a storage plant. This seems to be possible, even if the number of Km/year to be travelled would increase significantly, and in parallel time to be dedicated for the ABPs transportation will increase as well.

On the other side, the costs related to build and run such storage plants shall be considered. The evaluation of all these aspects can lead to make a decision balancing public health and economic constraints.

The cost for the construction of a medium size storage establishment has been estimated, with an industrial shed of 300 sqm. including a cold room of 100 sqm., and it is presented at table 1.D.7. A tentative calculation of annual costs for management of a storage establishment has been done, and it is presented at table 1.D.8.

Table 1.D.7. Cost for the construction of a storage establishment

	€
Industrial Shed 300 sqm. including cold room 100 sqm.	450,000
Internal Roads	20,000
Fencing	5,000
TOTAL	*475,000*

Table 1.D.8. Tentative calculation of annual costs for management of a storage establishment

	*Annual costs (€)**
a. Salaries and wages: Two unskilled workers	24,000
b. El. Power	50,000
c. Water	7,000
d. Detergents	4,000
e. Maintenance	10,000
Total	*95,000*

** local costs (salaries, electricity, water, etc.) to be confirmed*

Taking into consideration the total quantities of ABPs to be collected, distances and trip durations which do not exceed 8 hours per round trip (see chapter on the traffic study), we consider that the construction of one or more storage establishment(s) is not needed. This would also result in significant savings in the whole ABPs management system.

Clearly, logistic must be optimised to reduce the time of storage of ABPs before collection, and particularly dead animals are to be promptly collected to avoid public health risks. A relevant proposal is included in the following chapters, and this proposal shall be verified when the ABPs management system will be put in place, adopting amendments as necessary.

An additional option is to include in a specific legislation the possibility to authorize containers (refrigerated) in specific designated areas, where to store fallen stock and to extend the period for the collection. This should be connected with specific geographic constraint, and under specific conditions, and it is the responsibility of the Competent Authority to decide if to give such opportunity.

1.D.4. TRAFFIC STUDY AND OPTIMIZED COLLECTION ROUTES

The routes for collection and transport of ABPs have been planned in accordance with the number of slaughterhouses, livestock population figures and geographical distance from the location planned for the construction of the processing establishment.

The following criteria have been adopted:

- 3 regions have been defined: 1 north, 2 centre and 3 south.
- Category 1, 2 and 3 will be collected together.
- The roads have been chosen based on road quality and shorter distance.
- Where more collection points are located in the same municipality, for each collection point 10 km have been added (i.e. for Drochia with 7 collection points, 70 km have been added, representing the distance between the collection points and Drochia town.).
- Truck load has been considered maximum 10 ton.
- 52 working weeks per year have been considered.
- The number of trips per year has been rounded to the upper value (i.e. 9.4 to 10).
- The average truck speed has been estimated at 70 km/h.
- Time needed for each route is calculated on the basis of round trip (from the processing plant to the destination(s) and back).
- The time for load has been calculated at around 20 minutes.
- The trip number has been set up considering the distance, quantity of ABPs to be collected, number of collection points and time needed for the trip. The trip number represents the destination points where a truck should go. Usually, 2 or more locations have been grouped within the same trip number.
- For dead animals’ collection, the remote collection points have been separated from the others to optimise the frequency of collection and decrease the cost.

1.D.4.1. ABPs FROM SLAUGHTERHOUSES AND FOOD PROCESSING PLANTS

For the definition of optimized routes for ABPs collection from slaughterhouses, the number of slaughtered animals in each geographical area and in each County has been the starting point (see chapter 1.D.1.1.). Afterward, the average frequency of collection, as defined at chapter 1.A.4.8.1, has been considered.

This allowed to propose optimized routes for ABPs produced in slaughterhouses. ABPs collection from food processing plants should be included in the relevant route, meaning that when ABPs collection from slaughterhouses will be carried out in a County, according to the need also food processing plants should be included in the route. Indeed, as previously clarified, the total amount of ABPs to be collected from food processing plants is in general quite limited.

A total of 22 routes are proposed, as follows. For details, see annex 1.D.3. Maps with the detailed routes are presented at annex 1.D.4.

North

- Trip number 1. Processing plant – Ocnita - Processing plant
- Trip number 2. Processing plant - Donduseni – Edinet - Processing plant
- Trip number 3. Processing plant – Drochia - Processing plant
- Trip number 4. Processing plant - Sosoca – Floresti - Processing plant
- Trip number 5. Processing plant - Falesti – Balti - Processing plant
- Trip number 6. Processing plant – Glodeni - Processing plant
- Trip number 7. Processing plant – Riscani - Processing plant
- Trip number 8. Processing plant – Singerei - Processing plant

Center

- Trip number 9. Processing plant - Anenii Noi – Chisinau - Processing plant
- Trip number 10. Processing plant - Nisporeni – Calarasi - Processing plant
- Trip number 11. Processing plant - Ialoveni – Hincesti - Processing plant
- Trip number 12. Processing plant - Criuleni - Dubasari - Processing plant
- Trip number 13. Processing plant - Soldanesti – Rezina - Processing plant
- Trip number 14. Processing plant – Orhei - Processing plant
- Trip number 15. Processing plant – Telenesti - Processing plant
- Trip number 16. Processing plant - Ungheni – Straseni - Processing plant

South

- Trip number 17. Processing plant – Cahul - Processing plant
- Trip number 18. Processing plant – Leova - Processing plant
- Trip number 19. Processing plant - Vulcanesti - Processing plant
- Trip number 20. Processing plant – Ceadir-Lunga – Comrat - Processing plant
- Trip number 21. Processing plant - Cimislia - Processing plant
- Trip number 22. Processing plant – Causeni - Processing plant

As it can be seen in the last row of Annex 1.D.3, this would result in:

- A total amount of 12,525 ton/year of ABPs to be collected;
- A total amount of 240 tons/week of ABPs to be collected;
- An average of 8-10 tons of ABPs collected in each trip;
- n. 1,484 trips/year (around 28/week);
- n. 426,134 km/year.

If we consider 250 working days per year, the minimum number of trucks needed is 6, with 7 drivers (considering annual vacation leave and illness). To simulate a realistic situation, an hypothesis of collection along the week (from Monday to Friday) has been prepared for each truck, and it is summarised at table 1.D.9.

Table 1.D.9. ABPs from slaughterhouses: hypothesis of collection along the week

<table>
<tr><th rowspan="2">Region</th><th rowspan="2">Truck</th><th colspan="2">Monday</th><th colspan="2">Tuesday</th><th colspan="2">Wednesday</th><th colspan="2">Thursday</th><th colspan="2">Friday</th></tr>
<tr><th>Trip n.</th><th>Locations</th><th>Trip n.</th><th>Locations</th><th>Trip n.</th><th>Locations</th><th>Trip n.</th><th>Locations</th><th>Trip n.</th><th>Locations</th></tr>
<tr><td rowspan="2">North</td><td rowspan="2">Truck 1</td><td rowspan="2">4</td><td rowspan="2">Soroca – Floresti</td><td rowspan="2">3</td><td rowspan="2">Drochia</td><td>2</td><td>Donduseni – Edinet</td><td rowspan="2">4</td><td rowspan="2">Soroca – Floresti</td><td rowspan="2">3</td><td rowspan="2">Drochia</td></tr>
<tr><td>1*</td><td>Ocnita</td></tr>
<tr><td>North</td><td>Truck 2</td><td>6</td><td>Glodeni</td><td>8</td><td>Singerei</td><td>5</td><td>Falesti – Balti</td><td>7</td><td>Riscani</td><td>6</td><td>Glodeni</td></tr>
<tr><td>North/ Center</td><td>Truck 3</td><td>12</td><td>Criuleni - Dubasari</td><td>10</td><td>Nisporeni – Calarasi</td><td>6</td><td>Glodeni</td><td>12</td><td>Criuleni - Dubasari</td><td></td><td></td></tr>
<tr><td rowspan="2">Center/ South</td><td rowspan="2">Truck 4</td><td rowspan="2">9</td><td rowspan="2">Anenii Noi – Chisinau</td><td rowspan="2">16</td><td rowspan="2">Ungheni – Straseni</td><td rowspan="2">9</td><td rowspan="2">Anenii Noi – Chisinau</td><td>16</td><td>Ungheni – Straseni**</td><td rowspan="2">9</td><td rowspan="2">Anenii Noi – Chisinau</td></tr>
<tr><td>21</td><td>Cimislia**</td></tr>
<tr><td rowspan="2">Center</td><td rowspan="2">Truck 5</td><td rowspan="2">11</td><td rowspan="2">Ialoveni – Hincesti</td><td rowspan="2">15</td><td rowspan="2">Telenesti</td><td rowspan="2">11</td><td rowspan="2">Ialoveni – Hincesti</td><td>15</td><td>Telenesti**</td><td rowspan="2">11</td><td rowspan="2">Ialoveni – Hincesti</td></tr>
<tr><td>13</td><td>Soldanesti – Rezina**</td></tr>
<tr><td rowspan="4">Center/ South</td><td rowspan="4">Truck 6</td><td rowspan="4">14</td><td rowspan="4">Orhei</td><td>17</td><td>Cahul</td><td rowspan="4">14</td><td rowspan="4">Orhei</td><td rowspan="4">20</td><td rowspan="4">Ceadir-Lunga – Comrat</td><td rowspan="4">14</td><td rowspan="4">Orhei</td></tr>
<tr><td>19</td><td>Vulcanesti</td></tr>
<tr><td>18</td><td>Leova**</td></tr>
<tr><td>22</td><td>Causeni**</td></tr>
</table>

* when necessary
** alternatively

1.D.4.2. DEAD ANIMALS

As already clarified, the logistic for dead animals' collection will be completely different, because such collection is determined by unpredictable situations (unless in case of stamping out for specific diseases) and therefore it is carried out on the spot, following a specific request. Hence, routes for dead animals collection have been hypothesised according to the geographical area, while the "frequency" of collection is determined by the number of live animals raised in each County (for more details, see chapter 1.D.1.4. and annex 1.D.1). A total of 14 routes are proposed, as follows. For a detailed description of the routes, see annex 1.D.5. Maps with the detailed routes are presented at annex 1.D.6.

North

- Trip number 1. Processing plant – Briceni – Ocnita - Processing plant
- Trip number 2. Processing plant – Donduseni – Edinet - Processing plant
- Trip number 3. Processing plant – Drochia – Riscani - Processing plant
- Trip number 4. Processing plant – Soroca – Floresti - Processing plant
- Trip number 5. Processing plant – Falesti – Balti - Processing plant
- Trip number 6. Processing plant – Glodeni – Singerei - Processing plant

Center

- Trip number 7. Processing plant – Dubasari – Criuleni - Anenii Noi – Ialoveni – Hincesti – Chisinau - PP
- Trip number 8. Processing plant - Calarasi – Nisporeni – Straseni - Processing plant
- Trip number 9. Processing plant – Sildanesti – Rezina – Orhei - Processing plant
- Trip number 10. Processing plant – Telenesti – Ungheni - Processing plant

South

- Trip number 11. Processing plant – Cimislia – Basarabeasca - Ceadir-Lunga – Comrat - Processing plant
- Trip number 12. Processing plant – Cahul – Cantemir – Leova - Processing plant
- Trip number 13. Processing plant – Vulcanesti - Taraclia - Processing plant
- Trip number 14. Processing plant - Stefan Voda – Causeni - Processing plant

As it can be seen in the last row of Annex 1.D.5, this would result in:

- A total amount of 2,079 ton/year of ABPs (dead animals) to be collected;
- A total amount of 40 tons/week of ABPs (dead animals) to be collected;
- An average of 7-9 tons of ABPs (dead animals) collected in each trip;
- n. 266 trips/year (around 5/week);
- n. 93,690 km/year

This would mean that n. 2 trucks and n. 2 drivers are needed, considering live animals' mortality rate of 3%, weather conditions, car maintenance, drivers' vacation leave and uncertainties.

The following criteria have been considered for a One-day trip estimation:

- 3-4 Destinations: 70, average speed km/h, 6 hours on road, 2 hours load/unload, 420 km /day.
- 1-2 Destinations: 70 average speed km/h, 7 hours on road 1 hour load/discharge 490 km /day.

1.D.5. ABPs TRANSPORTATION

1.D.5.1. VEHICLES AND EQUIPMENT REQUIRED FOR ABPs COLLECTION AND TRANSPORT

In the previous chapters, the number of vehicles needed for Animal By-Products collection has been estimated, as summarised at table 1.D.10. Characteristics of the vehicles are summarized at chapter 1.A.1.3.3., and examples of vehicles used to transport ABPs are presented at annex 1.D.7.

All slaughterhouses and ABPs processing plant are collecting ABPs on the production line using cleanable containers, easy to disinfect. These containers can be made in different materials (plastic, stainless steel, etc.) and some examples are reported in annex 1.D.8.

According to the calculations included in chapter 4.5, six (6) trucks should be used for collecting Animal By-Products from slaughterhouses and two (2) trucks for collecting dead animals, considering weather conditions, car maintenance, driver vacation leave, animals' dead rate of 3% and uncertainties.

Apparently, as it can be seen in annex 1.D.5, this estimation would imply that in some Counties the dead animals would be collected every 3-4 weeks, and this would be clearly unacceptable from a public health standpoint, unless the dead bodies would be frozen in some intermediate point.

However, keeping in mind that the death of animals is an unpredictable event, these trucks would presumably travel every day of the week, collecting dead animals according to the reporting of the Call Center that hopefully will be established. In few words, it is not possible to establish in advance a work programme for the drivers, instead this will be prepared every day on the basis of the number of dead animals to be collected and relevant locations, as reported to the Call center.

The 2 trucks for the collection of dead animals will be probably dedicate to the following geographical areas:

- 1 truck exclusively dedicated to the north of the Country;
- 1 truck partially dedicated to the center and partially to the south of the Country.

This is mainly for two reasons: on one side, the number of bovines is significantly higher in the north of the Country (48%); secondarily, distances from the processing plant to the north of the Country are bigger comparing with the distances to be covered to the center of the Country, and in the south area the number of animals is really very low.

Concerning the collection of small carcases (ovicaprines and pigs, poultry), small vehicles could be used. However, it is difficult to estimate how many dead animals will be "declared" and therefore would have to be collected. According to our experience, very often dead animals of these species are disposed directly in the farm or, if they are on the mountains on pasture, are left in the field. From a theoretical amount of around 13 tons/week of dead ovicaprines and 4 tons/week of dead pigs to be collected, the real amount could be significantly lower.

Appropriate disposal of these dead animals will be probably in place in a second step, after an adequate awareness campaign, educating properly farmers and also reinforcing official controls in the farms. Therefore, we propose that small vehicles, non refrigerated, for collecting small dead animals (ovicaprines, pigs, poultry, dogs and cats) will be provided at a further stage. It can be estimated that 2 small vehicles will be needed (with an average price per truck of around € 40,000), and they could be located in a similar way as described for the above trucks for large animals.

Table 1.D.10. Trucks needed for collecting ABPs: summary

Type of truck	**N.**
Medium size truck (3 axes, 8 - 11 tons payload capacity)	**6**
Medium size truck (2 axes, 9 - 11 tons payload capacity)	**2**
Small truck, 2 axes, 3.5 tons capacity (at a further stage)	**2**
TOTAL	**10**

1.D.5.2. TECHNICAL SPECIFICATION FOR TRUCKS WITH APPROPRIATE EQUIPMENT

Means of transport to be used for collecting ABPs in slaughterhouses and in food processing plants are different from those that can be used for collecting dead animals, as they have different characteristics. A choice of the vehicle type for collection of animal carcasses and its transport capacity should consider the structure of livestock population in Moldova, as well as the roads conditions in the Country and the type of dead animals to be transported.

Considering the above, we have developed general technical specification for trucks as well as for additional equipment for collecting dead animals such as a crane with a hook. The technical specifications are requirements based on the respective item’s projected function and purpose of vehicles and additional equipment.

Trucks – general technical specification

- Truck to be used for collection and transportation of animal carcasses and Animal By-Products
- Superstructure to be used in combination with container and crane
- Four-wheel drive
- Emission class EURO6
- Compatible gearbox
- Compatible Power Take-Off
- Short cabin, 1 + 1 seat
- Axes
  - ✓ 2 axes - for small size truck
  - ✓ 3 axes – for medium size trucks
- Payload capacity
  - ✓ 1,5 – 2,5 tons
  - ✓ 9 – 11 tons

Crane – applicable for medium size trucks

- Mounting / installation of crane behind the cabin
- Static calculation provided
- Making sub frame for mounting crane
- Strengthening / installing sub frame for mounting crane
- Mounting hydraulic equipment

- Lifting moment at least 5 tm
- Hydraulic outreach min. 7.5 m
- Slewing angle 400º
- Slewing moment min 0.6 tm
- Two laterally extendable stabilizer jacks, stabilizer spread 3 m or more
- Controls on each side of the crane
- Double acting hydraulic cylinders
- Load hold valve on inner, outer and extension boom cylinder
- Load hook of min. 5 t and shackle included
- Additional for crane / grub function:
  - ✓ Emergency cut-off
  - ✓ Hydraulic overload protection
  - ✓ Hose equipment for additional functions (grab)
  - ✓ Load suspension gear
  - ✓ Rotator min. 4,500 kg flange version, endless rotation
  - ✓ Grab capacity min. 0.40 m3
- Attestation in accordance to working security legal provisions of standardization and/or other relevant authority in Moldova

Rear tipper – applicable for all trucks (small, medium)

- Compatible with truck
- Wheelbase compatible with the model of truck
- Inside tipper dimensions' compatible with the model of truck
- Sandblasting primer layer and final painted
- Two-piece tipper cover, made of steel St.52, min. thickness 3.0 mm
- Dimension of front part tipper cover compatible with the model of truck
- Cover leaning position on the upper edge of tipper covered with special material to ensure hermetic closure
- Rear part of tipper cover with the possibility of opening
- Hydraulic cylinder of tipper cover runs over the vehicle hydraulic system
- Three-way valve to separate the functions of tipper and hydraulic cover
- Hydraulic system with telescopic cylinder, tipping valve with pneumatic control from cabin
- Steel tipper body
- Floor and boards made of INOX (to ensure appropriate cleaning and disinfection)
- Attestation in accordance to working security legal provisions standardization and/or other relevant authority in Moldova

Side loader – applicable for medium size truck

- Side loader and unloader for containers with a capacity range from 1,000 to 2,500kg (to be updated after checking the capacity of containers used in slaughterhouses, meat processing plants and other ABP producers)
- Hydraulic cylinders placed on edge of profiles, for extension the telescopic arm
- Traverse for hanging chain, for lifting containers, mounted on telescopic arm
- Attestation in accordance to working security legal provisions of standardization and/or other relevant authority in Moldova

The trucks and all items of additional equipment must comply with applicable National and EU safety standards. Responsibility for obtaining any certificates/approvals/licenses required for the import and putting into use of trucks with equipment supplied rests wholly with the supplier.

All electrical equipment must comply with National electrical standards (specifically including power supplies, sockets, plugs, etc.). All cabling required for installation and use of the equipment must be included.

The warranty period should include after-sales service provided by the supplier, a minimum of 24 months of commercial warranty or 200,000 km covering all delivered equipment, including replacement or repair of defective equipment and / or part of equipment supplied at no additional cost to the purchaser/user.

Considering complexity and special use of trucks with the equipment, an adequate training by authorized trainer for a certain number of end users should be stipulated in a way that they will be able to operate and do the maintenance of the equipment without any help.

1.D.5.3. BUDGET COST ESTIMATION

A market research has been carried out for trucks as well as for the additional equipment separately, bearing in mind that not all equipment will be required for all trucks at all times. Namely, the equipment is to be mountable and could be used as needed, and in this way, it is also possible to plan the purchase of trucks without equipment or certain equipment items too.

Market research shows a huge difference in prices depending on the manufacturer, e.g. Mercedes-Benz and Volvo trucks are the most expensive, while MAN, Iveco, Kamaz and DAF LF trucks are significantly cheaper.

On the other hand, the prices are very similar for the specified mounting equipment with the two largest manufacturers on the European market, Fassi Gru (https://www.fassi.com) and Palfinger (https://www.palfinger.com/en/products/loader-cranes). The estimated prices per item are presented in the table 1.D.11.

Table 1.D.11. Estimated prices per item

Items	Price / EUR
Medium size truck, payload capacity 9 – 11 tons	95,000
Crane (with hook)	10,000
Rear tipper	15,000 – 20,000
Side loader	8,500 – 14,000

At table 1.D.12 a budget cost estimation for trucks is presented.

Table 1.D.12. Budget cost estimation for trucks

Type of truck	Price per truck set	N.	Cost
Medium size truck set	130,000	6	780,000
Truck for dead animals, Medium size truck set	130,000	2	260,000
	Total	6	1,040,000

It is important to highlight that budget cost estimation should always be updated and revised on the basis of market research at the time of initiating the procurement procedure and also if significant changes to the technical specifications have been made.

1.D.5.4. VEHICLES NEEDED FOR TRANSPORT OF RENDERED PRODUCTS

For the transportation of animal fats tanks are used, with a capacity of 27-30 tons. Some companies operating in this sector are shown at table 1.D.13. Examples of these tanks are showed at annex 1.D.9.

For the transportation of meat and bone meal, semi trailers of closed type are used (floor and sides made of solid material and covered with tarpaulin) which are connected to the tractor. This is because MBM are usually packed in a big bag of 1,000 kg. The total capacity of the trailer is approximately 24 tons. Some companies operating in this sector are shown at table 1.D.14.

Based on preliminary calculations the ABPs processing establishment will obtain the following as annual production for sale:

- Animal fats 1,541 tons/year
- MBM 3,016 tons/year

Considering a capacity of tanks for transporting fats of 27 tons, this would result in around 57 trips/year.

Considering a capacity of trucks for transporting MBM of 24 tons, this would result in around 126 trips/year.

Clearly, the costs for outsourced transportations have to be calculated on the basis of the distance to be covered until the final destination, and in this moment this information is not available. However, if we estimate an average cost of Eur 1,000 for each transportation at a distance of Km 300, this would result in around additional Eur 160,000/year.

For fats transportation, an average of 1 trip/week will be needed, and therefore buying a dedicated truck would not be convenient.

For the transportation of MBM, the option to buy a truck could be evaluated, considering that an average of 1 trip every second day will be needed. In case the service would be outsourced, this would result in a cost of around Eur 126,000/year. In case this transportation would be done by the ABPs company:

- the cost for buying a truck can be estimated at around Eur 130,000;
- an average cost of 1.5 €/Km shall be calculated, according to the type of the truck, including fuel, depreciation, maintenance, drivers' salaries. As already mentioned, we don't know now where MBM will be transported. If we presume 300 km round trip, this will result in Eur 56,700/year (n. trip 126 x 300Km x 1.5 Eur). If we presume 600 km round trip, this will result in Eur 113,400.

On the basis of the above calculation, we can conclude that:

- In the case of fats transportation, we would definitely suggest outsourcing the service, considering that an average of 1 trip/week will be needed.
- For MBM transportation, the option of buying a truck should be considered only if the distances to be covered for the transportation would be limited (less than 300 km for roundtrip).

Table 1.D.13. Examples of companies operating in the sector of tanks production

Company	*Web address*	*Examples*
Feldbinder	https://www.feldbinder.com/en/silo-trailers__8/	https://www.truck1.eu/semi-trailers/tank-semi-trailers/feldbinder
Kassbohrer	https://www.kaessbohrer.com/en	https://www.truck1.eu/semi-trailers/tank-semi-trailers/kassbohrer
Klaeser	https://www.klaeser.de/en/services/vehicle-manufacturing/new-vehicle-manufacturing/	https://www.truck1.eu/semi-trailers/tank-semi-trailers/klaeser
Lag	https://www.lag.eu	https://www.truck1.eu/semi-trailers/tank-semi-trailers/lag
Magyar	http://www.gmagyar.com	https://www.truck1.eu/semi-trailers/tank-semi-trailers/magyar
Menci	https://www.menci.it/eng/	https://www.truck1.eu/semi-trailers/tank-semi-trailers/menci
Schrader	http://schrader-trailer.com/en/home.html	https://www.truck1.eu/semi-trailers/tank-semi-trailers/schrader
Schwarzmuller	https://www.schwarzmueller.com/en/home	https://autoline.hr/-/cisterne/SCHWARZMuLLER--c190tm2748

Table 1.D.14. Examples of companies operating in the sector of semi-trailers production

Company	*Web address*	*Examples*
Kogel	https://www.koegel.com/en/	https://autoline.hr/-/poluprikolice/KOEGEL--c43tm2636
Krone	https://www.krone-trailer.com/english/	https://www.basworld.com/stock/semi-trailer/curtainsides/krone?page=1 https://www.trucksnl.com/semi-trailers/krone https://autoline.hr/-/poluprikolice/KRONE--c43tm2641
Schmitz	https://www.cargobull.com/en	https://www.basworld.com/stock/semi-trailer/curtainsides/schmitz?page=1
Schwarzmuller	https://www.schwarzmueller.com/en/home	https://autoline.hr/-/poluprikolice/SCHWARZMuLLER--c43tm2748

1.D.6. COST ESTIMATION FOR THE LOGISTIC

1.D.6.1. ABPs FROM SLAUGHTERHOUSES AND FOOD PROCESSING PLANTS

It is difficult to estimate precisely the costs for the collection of ABPs, because some data related to ABPs producers are missing. Indeed, beside the slaughterhouses (for which data are available), information like amount of ABPs produced is missing in relation to other ABPs producers (retail activities, catering, establishments producing food of animal origin).

However, a first estimation has been done on the basis of the optimised routes as described in the previous chapter, and this estimation is summarised at table 1.D.15.

Table 1.D.15. Cost estimation of ABPs collection from slaughterhouses– optimised routes

Fuel price/L	Eur	1,5
Consumption	L/100 km	30
Total mileage	Km	426,134
Total fuel need	L	127,840
Fuel cost/year	Eur	191,760
Drivers	N.	7
Monthly salary and taxes/driver	Eur	1,000
Total cost for driver/year	Eur	84,000
Frequency of maintenance	Km	10,000
Maintenance/year/truck	N.	7
Maintenance cost (each intervention)	Eur	500
Total maintenance cost	Eur	21,307
Distance truck /year	Km	71,022
Calculation of total costs		
Fuel cost/year	Eur	191,760
Total cost for driver/year	Eur	84,000
Total maintenance cost	Eur	21,307
Total costs		*297,067*

The above calculations are referred exclusively to ABPs produced in slaughterhouses. To these amounts, a certain quantity of ABPs to be collected from other establishments processing food of animal origin shall be added. As already clarified, it is very difficult to make an estimation, due to the lack of production data of these establishments. More important is to consider the number and location of these establishments for the organisation of ABPs collection. Theoretically, in all these establishments the frequency of ABPs collection could be on weekly basis, therefore there should be no significant impact on the overall cost for ABPs collection.

More important, the above estimation does not take into account the costs of the trucks and the relevant depreciation. According to collected information, the cost for ABPs transportation is in general estimated around 1.5 €/Km, according to the type of the truck, including fuel, depreciation, maintenance, drivers' salaries. Applying this average cost per Km, the total amount for ABPs transportation would be significantly higher: Eur 639,201.

1.D.6.2. DEAD ANIMALS' COLLECTION

A first estimation has been done on the basis of the optimised routes as previously described, and this estimation is summarised at table 1.D.16.

Table 1.D.16. Cost estimation of dead animals' collection – optimised routes

Fuel price/L	Eur	1,5
Consumption	L/100km	30
Total mileage	Km	93,690
Total fuel need	L	28,107
Fuel cost/year	Eur	42,161
Drivers	N.	2
Monthly salary and taxes/driver	Eur	1,000
Total salary cost	Eur	24,000
Frequency of maintenance	Km	10,000
Maintenance/year/truck	N.	4.7
Maintenance cost (each intervention)	Eur	500
Total maintenance cost	Eur	4,684
Distance truck /year	Km	46,845
Calculation of total costs		
Fuel cost/year	Eur	42,161
Total cost for driver/year	Eur	24,000
Total maintenance cost	Eur	4,684
Total costs		*70,845*

Also in this case, the above estimation does not consider the costs of the trucks and the relevant depreciation. Applying the same average cost per Km (1.5 €/Km), the total amount for dead animals' transportation would be significantly higher: Eur 140,535.

1.D.6.3. TOTAL COST ESTIMATION FOR THE LOGISTIC

First hypothesis

If we consider parameters applicable in Moldova (salaries, costs for maintenance, fuel cost, etc.) the amount as calculated in the previous chapters would be Eur 297,067 + Eur 70,845 = Eur 367,912. As already explained, this cost does not include the cost for buying the trucks and the depreciation costs. Table 1.D.17. summarises data related to this hypothesis.

Table 1.D.17. Total cost estimation: first hypothesis

		ABPs from food processing	*Dead animals*	*Total*
Total cost fuel + salaries + maintenance	Eur	297,067	70,845	367,912
Total distance	Km	426,134	93,690	519,824
ABPs amount	Tons	12,525	2,078	14,603
Trucks	N.	6	2	8
Drivers	N.	7	2	9
Average load	Tons			8.7
tonkm (total distance x average load)				4,522,468
cost/tonkm EUR (total cost/tonkm)				0.0814

Second hyphotesis

If we apply an average cost of Eur 1.5/km (estimation including all the relevant costs), this will result in Eur 639,201 + Eur 140,535 = Eur 779,736. However, we should consider that the average cost of Eur 1.5/km is referred to some EU countries where the costs for salaries, maintenance and sometimes fuel are significantly higher.

Third hypothesis

If we apply a depreciation cost of around 10%/year to the total cost for buying the 8 trucks (Eur 1,040,000) this results in an additional amount of Eur 104,000 to be added to the amount as calculated in the first hypothesis, for a total amount of around Eur 394,000.

Concluding, we prudentially can estimate that the total cost for the logistic (ABPs transportation) should be around Eur 400,000 – 450,000 /year. To this amount, additional Eur 160,000/year should be calculated for the transportation of derived product. The total cost for the logistic can therefore be estimated at Eur 600,000.

The precise calculation of the cost for collection and transportation could be done using the “Total Operating Cost”, in English called TCO (Total Cost of Ownership): this is the total cost of the vehicle throughout its useful life and includes any type of expense. It takes into account not only the purchase and maintenance costs, but also the proceeds from the subsequent sale or the scrapping cost, as well as the cost of the driver. The TCO can be expressed in absolute value, or in € / km or in € / month. A precise analysis of the TCO shows how often the purchase cost is very far from the cost incurred over the entire life cycle. When you remain in possession of a resource for a long time, as happens with trucks, the difference can also be very high.

SECTION 1.E

TASK 5.

FINANCIAL PLAN

1.E.1. ESTIMATION OF THE INVESTMENTS REQUIRED

The project involves the construction in Moldova of an Animal by-Products processing plant for ABPs category 1,2 and 3 and the establishment of an ABP management system in accordance with the EU requirements.

1.E.1.1. ESTIMATION OF ABP PROCESSING CAPACITY

At the stage of data collection and evaluation of ABP flows and volumes generated by slaughterhouses in Moldova, the meat processing industry and the percentage of animal falls, the annual volume of ABP produced in Moldova was estimated (Table 1.E.1).

Table 1.E.1. Quantity of ABPs produced in Moldova, tons/year

ABPs category	Amount of ABPs produced yearly at the slaughterhouse, tn					Fallen stock (5% mortality, 2020), tn					Food of AO processing plants	Others	Total country volume of ABPs	ABPs already processed	ABPs to be disposed
	Cattle	Pigs	Sheep	Poultry	**Total**	Cattle	Sheep and goats	Horses	Pigs poultry, rabbits	**Total**					
Cat. 1	873.2	0	203.2	0	**1076.4**	2143.4	1173.3			**3316.7**	**0**	0	**4393.1**		**4,393.1**
Cat. 2 without gastro-intestinal content	41.4	39.14	7.0	712.9	**800**	0.0		752.0	1242.4	**1994.4**	**0**	**100**	**2894.8**		**2,894.8**
Cat. 3 without hides	3491.8	6555.2	1294.2	7741.7	**19082.9**	0.0				**0.0**	**157.3**	**50**	**19290.2**	**11,000**	**8,290.8**
Total, tons	4406.4	6594.3	1504.4	8454.6	**20960.3**	1243.4	1173.3	752.0	1242.4	**5311.1**	**157.3**	**150**	**265781**	**11,000**	**15,578.1**

As a result of the analysis of future growth trends of ABP, it was found that a significant increase in the volume of ABP is unlikely, and it was recommended that the tasks set for the ABP processing plant be linked to the estimated volume of ABP in the analysis process.

Considering that a certain amount of ABPs is already processed in existing rendering plants, about 11,000 tons, it has been estimated that the volume of ABPs to be processed is around 16.000 tons/year of cat. 1,2 and 3. Five technical options for processing the mentioned quantities were proposed.

The proposed options are in compliance with the provisions of Regulation (EU) 1069/2009 and Regulation (EC) 142/2011. Regulation 1069/2009 lays down strict ABP management rules and procedures, and Regulation 142/2011 defines the standards for each process of the ABP management system.

As a result of the evaluation of the indicators established for the 5 technical options presented, an option was selected, according to which the processing of categories 1, 2 and 3 of ABPs will be carried out in a single processing plant with an installed capacity of 5,000 kg/hour, or 20,000 tons/year, and a work schedule of two shifts per day.

Table 1.E.2. Assumptions regarding capabilities of the processing ABPs plant

	Units	**Installing capacity of processing ABPs line, kg / h**	**Operational Capacity, 80%**	
Nominal line capacity per hour	kg/h	5,000	4,000	4,000
Daily shifts	Nr.	2	2	3
Hours for shifts	Nr.	8	8	8
Hours per day	Nr.	16	16	24
Days per year	Nr.	250	250	250
Hours per year	Nr.	4,000	4,000	6,000
Annual volume of ABPs processing	kg	20,000,000	16,000,000	24,000,000

A sudden increase in the percentage of falls of registered animals can lead to a lack of processing capacity. In this case, the processing capacity can be increased by organizing the work regime in three shifts.

Starting with the first year of operation, it is assumed that the plant will start with a volume of 70% of the expected 16,000 tons of ABPs. The full collected volume of 16,000 tons to be processed, is expected to be reached at year 4.

Table 1.E.3. Forecast volume of ABPs, kg

	Y1	Y2	Y3	Y4	Y5	Y6
Collection rate	75%	85%	95%	100%	100%	100%
ABP from slaughterhouses and food processing, cat2&3	8,016,675	9,085,565	10,154,455	10,688,900	10,688,900	10,688,900
Fallen stock	3,983,325	4,514,435	5,045,545	5,311,100	5,311,100	5,311,100
Total transportation volume of ABPs for processing, kg	12,000,000	13,600,000	15,200,000	16,000,000	16,000,000	16,000,000

1.E.1.2. TRANSPORTATION OF ABPs

The transportation of ABPs will be performed with specialized transport, which will be authorized to carry out this specific load. The project includes 2 trucks with a capacity of 9-10 tons for the collection of dead animals, and 6 trucks with the same capacity for the transport of ABPs generated by slaughterhouses and the meat processing industry.

Table 1.E.4. Transportation volume of ABPs, kg

Type of ABPs	Transport unit	Transportation volume of ABPs, kg	Share between ABPs types, %	Cost per kg, Euro
ABP cat. 3&cat 2 from slaughterhouses and food processing	6	10,688,900	66.8	0.03
Fallen stock, cat 1	2	5,311,100	33.2	0.01
Total	**8**	**16,000,000**	**100.0**	

1.E.1.3. ESTIMATING PRODUCTION VOLUME OF FINISHED GOODS

The finished products at the output will correspond to the parameters of category 1 derived products. The equipment proposed for processing will extract from 1 ton of ABPs about 16.3% animal fat and 18.9% meat and bone meal. The expected production volume of the by-products was deducted according to the average extraction rate of the fat and meat and bone meal from a ton of ABPs.

Table 1.E.5. Forecast of finished goods, Tons

Product category	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Fat, cat. 1	1,820	2,080	2,340	2,600	2,600	2,600	2,600
Meat and Bone Meal, cat.1	2,111	2,413	2,714	3,016	3,016	3,016	3,016
Total annual production	3,931	4,493	5,054	5,616	5,616	5,616	5,616

1.E.1.4. FORECASTED DERIVED PRODUCTS INTENDED FOR SALES

Of the total volume of fat produced, it was estimated that 59,3% would be exported to biodiesel producers, members of the European Biodiesel Committee (EBB), and 40,7 % of the volume would be used for the plant's internal consumption.

Table 1.E.6. Fat internal consumption needs, Tons

	Units	**Operational Capacity, 80%**
ABPs processing volume, kg	Kg/year	16,000,000
Hours per year	h/year	4,000
Quantity of extracted fat cat.1per hour	*kg/h*	*650.0*
Annual extracted volume of the fat, cat.1	***kg/year***	***2,600,000***
Fat cat.1 for self-consumption	*kg/h*	264.7
	kg/year	1,058,800

In order to estimate the sales volume of fats and bone meal, it was assumed that the volume of the stocks will equal to one-month quantity produced, which will be sold in the next month after their production.

Estimated annual quantities of the Fat cat. 1 and Meat and Bone Meal, cat.1, intended for sales, are presented in the tables below.

Table 1.E.7. Forecasted sales of fat cat.1, Tons

	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Initial stock of fat	0	90	103	116	128	128	128
Fat produced	1,079	1,233	1,387	1,541	1,541	1,541	1,541
Fat Sales	989	1,220	1,374	1,528	1,541	1,541	1,541
Final stock of fat	90	103	116	128	128	128	128

Table 1.E.8. Forecasted sales of MBM cat.1, Tons

	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Initial stocks of MBM	0	176	201	226	251	251	251
MBM produced	2,111	2,413	2,714	3,016	3,016	3,016	3,016
MBM sales	1,935	2,388	2,689	2,991	3,016	3,016	3,016
Final stocks of MBM	176	201	226	251	251	251	251

Meat and bone meal is expected to be sold to cement factories in Moldova, Romania and Ukraine. Cement plants can certainly replace more than 40% of coal's energy with meat and bone meal. This combination can reduce the cost of cement produced and annual CO_2 emissions by about 10%.

The market price for a ton of animal fat was estimated at 200 euros, and for a ton of Meat and Bone Meal 50 euros.

The expected annual revenues from the sale of derivatives are shown in the table below.

Table 1.E.9. Forecasted income from sales, Eur

Products category	**Market price EUR/tn**	**Y1**	**Y2**	**Y3**	**Y4**	**Y5**	**Y6**	**Y7**
Fat for sale, cat. 1	200.00	197,782	244,017	274,840	305,663	308,232	308,232	308,232
MBM for sale, cat.1	50.00	96,763	119,383	134,463	149,543	150,800	150,800	150,800
Total Income from sales	**99.89**	**294,546**	**363,400**	**409,304**	**455,207**	**459,032**	**459,032**	**459,032**

1.E.2. FORECAST OF ABPs PROCESSING COSTS

The costs for ABPs processing and the production of derived products, generated in the processing of ABPs will include:

(i) the cost of transporting ABPs to the processing plant,

(ii) the cost of labor of employees in the production process

(iii) the cost of utilities that participate and are consumed to obtain derived products, such as electricity and water.

1.E.2.1. ABPs TRANSPORTATION COSTS

The cost of transporting collected ABPs to the processing plant was estimated in relation to the loading capacity of a route, the mileage of a route planned and optimized for each area of the North, South and Center regions. The transport cost is 20 Eur for a ton transported at an average distance of 71 km, or 0.02 Eur/kg.

The annual cost deducted for transporting ABPs according to the planned routes to the processing plant is shown in the table below.

Table 1.E.10. Transportation costs by type of ABPs, Eur

	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Annual ABP transportation cost from abattoirs and food processing	222,800	252,507	282,214	297,067	297,067	297,067	297,067
Annual transportation cost of Fallen stock	53,134	60,218	67,303	70,845	70,845	70,845	70,845
Total ABPs transportation cost	275,934	312,725	349,516	367,912	367,912	367,912	367,912

The cost of transporting of the collected ABP may be paid by the ABPs producers as the services provided. In the P&L forecast, transportation services are included as revenue, and the cost of the services provided is attributed to the cost of production.

1.E.2.2. LABOUR COSTS

The labor regime will be organized in two shifts. 20 people will be employed in the production, and 5 people will be employed to ensure the management of the company's activity.

The salary was calculated in accordance with the Labor Code of the Republic of Moldova and the corresponding qualification. The calculated annual salary is reflected in the table below.

Table 1.E.11. Costs of labor for ABPs processing plant

Employees	#	Monthly gross salary per employee	Social fund, 24%	Monthly labour cost, Euro	Annual labour cost, Euro
Production	**17**	**5,300**	**1,272**	**6,572**	**224,688**
Production manager	1	1,500	360	1,860	22,320
Lift truck drivers	4	900	216	1,116	53,568
Unskilled workers	8	700	168	868	83,828
Steam boiler operator	2	1,100	264	1,364	32,736
Maintenance sector	2	1,100	264	1,364	32,736
Administration	**8**	**5,000**	**1,200**	**6,200**	**74,400**
General director	1	2,500	600	3,100	37,200
Chief Accountant	1	1,500	360	1,860	22,320
Secretary	1	1,000	240	1,240	14,880
Adm. workers (Cleaning, green spaces works)	2	00	120	620	14,880
Security guards	3	800	192	992	35,712
Total	**25**	**11,600**	**2,784**	**14,384**	**349,680**

1.E.2.3. COST OF UTILITIES

Energy consumption cost

The energy consumed in the ABPs processing was based on the information presented by the expert engineer in report no.6 “Conceptual design of installations”. The tariff for one kW/hour delivered by the supplier was assumed to increase and reach the value of 0.13 euro/kW. The amount of electricity consumed is shown in the table below. For the estimation of electricity consumption, the 95% usage factor of energy was applied.

Table 1.E.12. Installed power of processing equipment and process facilities and estimated energy

Electricity consumption units	Installed power kW	Consumption power kW/h	Annual consumption kW/year	Energy cost per year, EUR
Main ABP processing equipment	**420**	**399**	**1,596,000**	**207,480**
Water treatment station	50	48	190,000	24,700
Ventilation system	12	11	45,600	5,928
Chemical scrubber tower	45	43	171,000	22,230
Steam production plant	35	33	133,000	17,290
Water pumping station	10	10	38,000	4,940
Air compressor station	8	8	30,400	3,952
Plant indoor lightening	10	10	38,000	4,940
Plant outdoor lightening	20	19	76,000	9,880
Total	**610**	**580**	**2,318,000**	**301,340**

Table 1.E.13. Costs estimation of energy consumption for ABPs processing

	Units	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Volume of ABPs processing	Tons	11,200	12,800	14,400	16,000	16,000	16,000	16,000
Energy consumption	kW	1,622,600	1,854,400	2,086,200	2,318,000	2,318,000	2,318,000	2,318,000
Cost of energy consumption	Eur	210,938	241,072	271,206	301,340	301,340	301,340	301,340

Estimation cost of water consumption

The amount of water consumed was estimated from the capacity of the water treatment plant, and it is assumed that this quantity complements the water supply network in the centralized network. The tariff for one cubic meter of water is one set for Chisinau. The annual quantity of water is estimated in volume 12,500 m3/year, and the applied tariff 3.74 euro/m3. The cost of the volume of water consumed annually is reflected in the table below.

Table 1.E.14. Estimate cost for water consumption

Indicators	Unit	Technical Values
Volume of ABPs processing	**kg**	**16,000,000**
Working hours per day treatment water station	h/day	16
Flow rate of treatment station	m3/day	50
	m3/h	3
Hours per year	h/year	4,000
Flow rate of water treatment station per year	m3/year	12,500
Pumping capacity of station	m3/h	30
Feeding the processing system with mains water	m3/year	12,500
Price per one cubic meter of water	Eur/m3	3.74
Cost of annual water consumption	**Eur/year**	**46,750**

1.E.2.4. PRODUCTION COST STRUCTURE

The structure of production costs generated in the process of processing ABPs into derived products includes:

(i) transporting ABPs from collection centers to the plant,

(ii) payroll of employees in the production process,

(iii) electricity consumed, water and chemicals used for water treatment.

The costs were estimated based on the technical consumption parameters of the transport used, processing equipment, water and steam treatment installations.

The estimated annual costs are presented in the table below.

Table 1.E.15. Structure of annual forecasted production costs for processing ABPs

Items	Unit	Y1	Y2	Y3	Y4	Y5	Y6
Amount of finished goods	**kg**	**3,931,200**	**4,492,800**	**5,054,400**	**5,616,000**	**5,616,000**	**5,616,000**
ABP transportation cost	Eur	275,934	312,725	349,516	367,912	367,912	367,912
Production labour costs	Eur	224,688	224,688	224,688	224,688	224,688	224,688
Energy consumption for ABPs processing in the derived products	Eur	210,938	241,072	271,206	301,340	301,340	301,340
Water consumtion , Eur	Eur	32,725	37,400	42,075	46,750	46,750	46,750
Chemicals for water treatment	Eur	3,500	4,000	4,500	5,000	5,000	5,000
Total production costs, Eur	Eur	**747,785**	**819,885**	**891,985**	**945,690**	**945,690**	**945,690**
Production costs per kg of finished goods	Eur/kg	**0.19**	**0.18**	**0.18**	**0.17**	**0.17**	**0.17**

1.E.2.5. COST OF GOODS SOLD

The quantities of processed by-products differ from the quantities intended for sales, by the quantities remaining as stocks of by-products at the end of the period and by the quantity of fats used by the company for internal consumption.

The cost of sales was deducted using the production cost for a tone of derived product and their quantity for sale. The cost of transportation was attributed to the cost of sales.

Two options have been proposed for transporting finished products to buyers:

- Hiring an outsourcing company that will provide animal fat transportation services.
- Purchase of a vehicle with a capacity of 20 ton, intended for transporting MBM at distances not exceeding 300 km.

Based on the annual volume of fat predicted for sale, the list of potential buyers and the capacity of the transport tank, it was estimated that the company will transport 48 tanks annually at an average distance of 1,590 km.

The possible price of outsourcing companies is assumed to be 2.0 euros/km. Until the increase in fuel prices, the companies offered 1.2 euros/km.

Table 1.E.16. Estimated annual transport costs, assigned to sale of the fats

Items	M.un	Outsourcing services Fat cat.1 for sale
Annual sales volume	Ton	1,565
Monthly sales volume	Ton	130
Weekly sales volume	Ton	32.6
Capacity of oil tank	Ton	26
Number of tanks per week	unit	1
Number of tours		48
Mileage per tour	Km	1,590
Estimative price, tn/km	Eur/km	2.00
Cost a tour	Eur	3,180
Annual transportation cost for fat sales	**Eur**	**152,640**

The transportation cost of MBM was also estimated. The MBM will be transported, with a transport unit that is expected to be purchased by the company. Cost for one ton of MBM transported at a distance no more than 300 km, it was estimated at 0.82 euros per km.

Table 1.E.17. Estimated annual transport costs, assigned to MBM

Items	M.un	MBM
Annual transportation volume of MBM	Ton	3,016
Average loading of trucks	Ton	20.0
Number of tour	unit	151
Fuel price/L	Eur/l	1.5
Consumption	L/100km	30
Average mileage per tour	Km	300
Annual mileage	Km	45,240
Total fuel need	L	13,572
Fuel cost/year	Eur	20,358
Salary and taxes/driver salary	Eur/month	1,100
Annual salary cost	Eur	13,200
Frequency of maintenance	Km	10,000
Maintenance/year	Nr interv.	5
Maintenance cost (each intervention)	Eur	500
Total maintenance cost	Eur	2,262
Estimated annual transportation cost for MBM sales	***Eur***	***35,820***
Estimation cost for transported a ton of MBM	***Eur***	***11.88***

The cost of sales for a ton of derived product, starting with the fifth year of activity, is expected to be 99.7 Euro. The cost of sales per ton of derivative product is shown in the table below.

The average selling price for a ton of derived product is in the range of 101.2 Euro.

Table 1.E.18. Estimated cost of good sold

Items	Unit	Y1	Y2	Y3	Y4	Y5	Y6
Amount of derived products processing from collected ABPs	tn	3,931,200	4,492,800	5,054,400	5,616,000	5,616,000	5,616,000
Amount of derived products to sale	tn	3,190,012	3,645,728	4,101,444	4,557,160	4,557,160	4,557,160
Production costs, Euro	Eur	**747,785**	**819,885**	**891,985**	**945,690**	**945,690**	**945,690**
Production costs per tn of derived products	Euro/kg	0.19	0.18	0.18	0.17	0.17	0.17
Production costs per tn of derived products to sale	Euro/kg	0.23	0.22	0.22	0.21	0.21	0.21
Transport cost assigned to sales	Euro/kg	0.06	0.05	0.05	0.04	0.04	0.04
Cost of goods sold per kg	***Euro/kg***	***0.29***	***0.28***	***0.26***	***0.25***	***0.25***	***0.25***
Cost of goods sold	**Euro**	**936,245**	**1,008,345**	**1,080,445**	**1,134,150**	**1,134,150**	**1,134,150**

The operating profit generated by processing of ABPs into derivatives, based on existing market prices, cannot cover the general and administrative expenses and financial expenses of the enterprise.

1.E.2.6. AMORTIZATION & DEPRECIATIONS, MAINTENANCE COST

The investments allocated in the construction of the ABPs processing plant are public investment. The asset that will be built represent the property of the state and will be administered by the state institution.

The State institution responsible for the assets put into operation may transfer these assets into the management of an enterprise. The legal organizational would be a state-owned company. The asset can be transferred free of charge in the management of the state-owned company.

The value of the transmitted asset will be held in accounts of the state institution, decreasing yearly the value invested with the value of the depreciation calculated annually.

The amount of the maintenance cost was deducted for the maintenance of the assets managed by the company, as 2% of the total value of the fixed assets.

Table 1.E.19. Maintenance costs

Items	Euro	Y1	Y2	Y3	Y4	Y5
Equipment	2,881,490					
Building	3,220,050					
Total fixed assets cost	**6,101,540**					
2% of fixed assets cost - for their maintenance.	122,031	122,031	122,031	122,031	122,031	122,031

1.E.2.7. GENERAL AND ADMINISTRATIVE EXPENSES

The structure of general and administrative costs included the management salary and the estimated value of the cost for detergents, which will be used to maintain sanitary norms in the administrative spaces and the related administrative infrastructure.

Table 1.E.20. General & Administrative costs

	Unit	Y1	Y2	Y3	Y4	Y5
Wages for administration employees	Euro	124,992	124,992	124,992	124,992	124,992
Detergents	Euro	5,000	5,000	5,000	5,000	5,000
Energy consumption	Euro	7,410	7,410	7,410	7,410	7,410
Total	Eur	137,402	137,402	137,402	137,402	137,402

1.E.3. STRUCTURE AND VALUE OF THE INVESTMENT PROJECT

The estimated value of the land allocated for construction would be Eur 500,000, based on the market value of a plot of land for industrial construction compared to the allocated area of 2.50 hectares.

Until the start of the construction works, it is foreseen to contract a company that will provide engineering services related to the design, supervision and expertise of the construction, in the commissioning process and in the period established for defect notification.

The Engineer will manage the Contractor's activities, approve the Contractor's work schedules, technologies applied in construction, calculation and technical specifications, procurement of equipment and materials, will supervise the works and the quality, will check the Contractor's plan regarding occupational health and safety and will approve the Contractor's insurance policies and guarantees until the plant is put into operation and during the period of notice of defects.

The supervision and expertise services offered by the Engineer during the design, construction, commissioning and also the period of notification of defects, was estimated by the Opera SRL expert, amounting to Eur 600,000.

The estimated value, provided by the expert engineer, for the civil and construction works is worth about Eur 3,200,000. The works are expected to be procured from Moldova.

Most of the equipment in the processing line will be imported. The value of the planned import is estimated at Eur 2,900,500 CIF, the value includes the cost of loading, transport before and after loading and all related taxes up to the border of Moldova including the cost of insuring the goods.

The transport units, 6 specialized trucks, intended for the transport of different types of ABPs, represent 12.5% in relation to the investment value or Eur 1,040,000. For MBM transportation a truck will be purchased with a capacity of 20 tons and estimated value of Eur 260,000.

The investment value of the Project also includes the cost of working capital in the amount of Eur 104,300, deducted as value of working capital for a month of activity, and which is intended to ensure the start-up of the company's activity.

Table 1.E.21. Project Investment Plan, Euro

nr	Investment categories	Total Investments Euro	Financial resources Loan	
			Imported equipment, installations and services, CIF	Local procurement
1	Land allocated for the plant and its infrastructure, 2,5 ha	-	-	
2	Engineering Services and Work Supervision	600,000		600,000
3	Civil and building works	3,220,050	-	3,220,050
4	ABP processing equipment, CIF	1,811,490	1,811,490	-
5	Spare parts for 2 years operation	90,000	90,000	
6	Scrubber	250,000	250,000	
7	Room air scrubber	230,000	230,000	
8	Waste water treatment unit	500,000	500,000	
9	Truck for ABPs collecting	1,040,000	1,040,000	-
10	Truck for MBM sales	260,000	260,000	
11	Working capital	100,426		100,426
	TOTAL INVESTMENT COSTS	**8,276,967**	**4,241,490**	**4,035,447**
INVESMENT STRUCTURE, %		**100.0**	**51.2**	**48.8**

1.E.4. SOURCES OF FINANCING

In accordance with the objective established in the investment climate reform project in the Republic of Moldova (MD ICR Project) and following the adoption of law 129/2019 on animal by-products and derived products not intended for human consumption, the Government of the Republic of Moldova has reached a financing agreement with the World Bank on the establishment of a comprehensive ABP management system in line with EU requirements.

The investment cost of the project is estimated at Eur 8,405,000, of which 94.1% is expected to be financed from the World Bank's loan resources, and 5.9% of the total investment value is the value of land allocated by Moldova for the construction of the processing plant.

The World Bank will provide the loan on the following terms:

Indicators	m/unit	Values
Loan amount	EURO	8,276,967
Interest rate	%	2.2
Payment period	years	25
Grace period	years	5
Loan Ratio	%	100%

It is important to note that the revenues generated are not enough to cover the repayment of the loan principal (Annexes 1.E.1. and 1.E.2. Forecast results - Profit and Loss. Scenario 1).

The introduction of a fee for ABPs disposal services (Annexes 1.E.3. and 1.E.4. Forecast results - Profit and Loss. Scenario 2) will institutionalize the responsibility of meat producers and processors and bring their activities in line with EU requirements. This provides entrepreneurs in the industry with the opportunity to take advantage of the provisions of the Free Trade Agreement and the opportunity to export its products to EU countries.

The establishment of a complex and reliable ABPs management system will ensure the functionality of the plant, ensure public health and protect the environment.

In the Republic of Moldova, the law no. 99/2018 provides the rules and method of calculation of the payment for the storage of production waste, according to which the company, depending on the degree of toxicity, pays a coefficient related to the minimum wage established in the country.

The mentioned law does not stipulate the destination of the payment, as well as the Fiscal Code do not provide such information. Thus, a regulation as regards to the payment/tax (disposal fee) for the elimination of ABPs would be the source, which will allow the Republic of Moldova to repay the loan provided by the World Bank.

Two scenarios were compared:

(i) Recovering investment from the proceeds from the sale of derivatives,

(ii) Covering the negative cash flow from the disposal fee, which will be paid by the producers of ABPs. The deducted amount of the ABPs disposal fee is EUR 0.11.

The feasibility indicators of the investment planned for the construction of the APBs processing plant for the above-mentioned scenarios are presented in the table below.

Table 1.E.22. Efficiency of project scenarios

Feasibility indicators	Scenario 1 (annex 1.E.3) Revenues from sales	Scenario 2 (annex 1.E.4) Including Revenues from disposal fee
IRR	negative	13.8%
NPV (19%)	(36,211,496)	2,968,622
ROI	-11%	15%
Payback period	0	5

The investment project shall be considered feasible, if the internal rate of return (IRR) of the project is higher than 12.5% and the net present value is positive. The IRR of the project must be equal to or greater than the value of the country risk of the Republic of Moldova. According to the Moody's rating agency, the country rating is currently B3, which would correspond to the risk of investment and return on investment requiring a minimum IRR of 12.5%.

Scenario two states the feasibility of the investment project financed from the World Bank's resources.

SECTION 1.F

TASK 6.

TECHNICAL SPECIFICATIONS

CONCEPTUAL DESIGN OF THE FACILITIES

This part of the report deals with the conceptual design and description of necessary parts of the rendering plant facilities of new construction for Category 1,2,3 products, all processed as Category 1, and recommendations for the design with description of their functions and spatial arrangements in one free location within the National territory, taking in consideration all technological, technical and environmental issues in line with the Moldova Standards and regulations.

The Section provides an analytical evaluation of the necessary financial resources to complete the construction of the facilities, a preliminary subdivision of the supplies into Lots to be tendered or contracted by the Beneficiary, including services for the Final Design and Work Supervision.

The documentation is completed with the full preliminary technical description of all supplies, like processing equipment, auxiliary installations, civil and building works as well as the list of staff necessary to the management of the plant.

1.F.1. STRUCTURE OF THE CONCEPTUAL DESIGN

The design of the rendering plant is composed of the following chapters:

1. Basic design data for the construction of the ABP processing plant, raw material supply quality and capacity, final product capacity and quality
2. Splitting the construction works into commercial Lots: analytical evaluation of the required financial resources (CAPEX)
3. Production Flow diagram and Process Description
4. Full technical description of the supply split into Lots
5. List of required staff for running the ABP plant
6. Analytical list of energy and water consumption
7. Detail estimation of the engineering costs including work supervision
8. GANTT diagram covering the erection phase
9. Drawings

1.F.2. FLOW DIAGRAM AND PROCESS DESCRIPTION CAT. 1 METH. 1

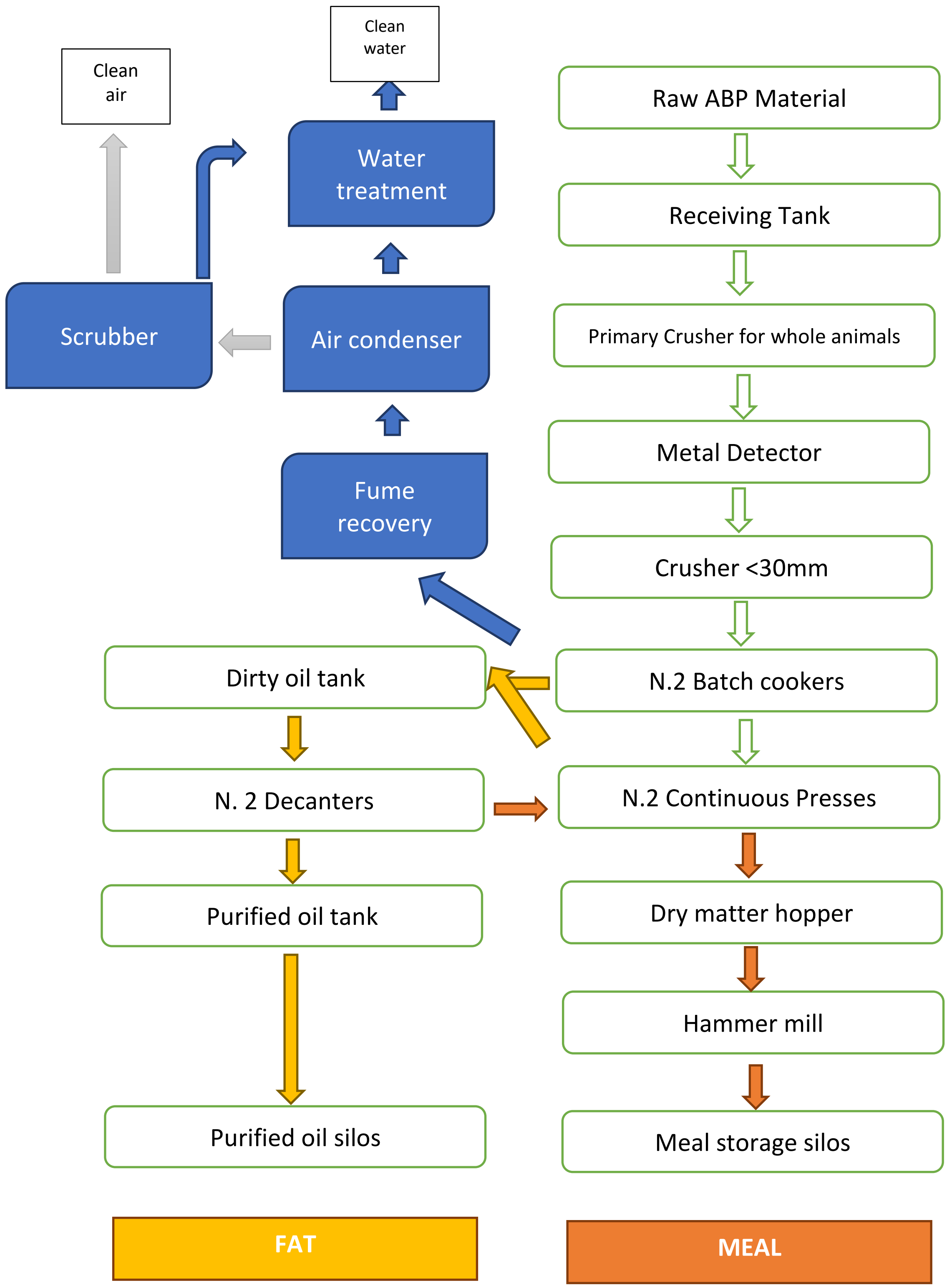


Figure 1.F.1. Category 1,2,3 Method 1 Process Flow Sheet

Raw Material Capacity

The raw materials processed are:

- 5 tons/h. approx. (3,000 Kg/h approx. of evaporate) composed of bone and fat.

Considering a batch process of 16 hours per day, the production capacity in terms of raw material is 80 tons.

Characteristics of raw material

a) ABPs originating from slaughterhouses, meat processing plants, butcher shops: ABPs consisting of parts of slaughtered animals, or any material containing such by-products which are:
   - fit for human consumption, but not intended for human consumption for commercial reasons;
   - rejected as unfit for human consumption but not affected by any signs of diseases communicable to humans or animals and derive from carcasses fit for human consumption.
   - SRM (cat 1)
   - Manure and digestive tract content (cat 2)
   - Material more than 6 mm. from wastewater treatment (slaughterhouses etc.)
   - Blood

   Source: slaughterhouses, butcher shops, meat processing facilities.

b) Fallen stock: livestock that dies of natural causes or disease, or is killed on a farm for purposes other than human consumption.

   Source: farms, individual households.

c) Pet animals, zoo and circus animals, hunt trophies, road kills.

d) Former foodstuffs: products of animal origin or foodstuffs containing products of animal origin that are no longer intended for human consumption for commercial reasons or due to problems of manufacturing or packaging defects or other defects which do not present any risk to humans or animals, including out of date foods.

   Source: food retailers, supermarkets, distributors, food of animal origin producers.

e) Catering waste: all waste food (including used cooking oils).

   Source: restaurants, caterers, canteens, kitchens.

f) International catering waste

- bone grease 60-65% approx.
- humidity 35-40%

Finished Products

Based on the nature of the raw materials processed, the end products obtained by fusion in the batch Cookers will have different characteristics strictly based on the characteristics of the materials used. The final products are intended to be sold under Cat. 1 products.

The following is, however, obtained:

- Animal fat: approximately 650 kg/h.
- Animal protein meal: approximately 750 kg/h with:
  - ✓ fats 8-10%
  - ✓ humidity 6%
  - ✓ protein 52-58%

Storage of end products in outdoor silos and tanks.

Processing method 1 (pressure sterilization)

Reduction

1. If the particle size of the animal by-products to be processed is more than 50 millimeters, the animal by-products must be reduced in size using appropriate equipment, set so that the particle size after reduction is no greater than 50 millimeters. The effectiveness of the equipment must be checked daily and its condition recorded. If checks disclose the existence of particles larger than 50 millimeters, the process must be stopped and repairs made before the process is resumed.

Time, temperature and pressure

2. The animal by-products with the particle size of no greater than 50 millimeters must be heated to a core temperature of more than 133 °C for at least 20 minutes without interruption at a pressure (absolute) of at least 3 bars. The pressure must be produced by the evacuation of all air in the sterilisation chamber and the replacement of the air by steam ('saturated steam'); the heat treatment may be applied as the sole process or as a pre- or post-process sterilisation phase.

3. The processing may be carried out in batch or continuous systems.

Process description

The raw material is delivered to the site in bulk with trucks of different dimensions.

The raw material is then downloaded into a reception bin with a movable powered lid to reduce dispersion of bad odors and material.

Then the material is crushed by the mean of a powerful crusher suitable to chop whole carcasses.

The chopped material is then taken though screw conveyors to the final chopper able to reduce the size of the particles to less than 30 mm in dimensions. On the transport line a metal detector is positioned to identify and expel eventual foreign bodies that could harm the equipment.

The chopped material is then taken to batch cookers, provided with suitable feeding system, in order to sterilize the product and separate dirty oil from the solid component. The condensate is taken back to the steam generator powered with clean, processed and self-produced animal oil, while the vapors/ incondensables are collected and taken to the air condenser. The product must be kept at 133 °C for at least 20 minutes without interruption at a pressure (absolute) of at least 3 bars. The pressure must be produced by the evacuation of all air in the sterilisation chamber and the replacement of the air by steam ('saturated steam). The dehydrated product is then taken by means of screw conveyors to the pressing station able to finally separate the solid from the liquid phase. The pressing system is of the batch type. The capacity of the press must be adequate to the plant capacity.

A re-circulation system of the minced material to the press is recommended to increase the oil extraction efficiency.

The pressed material is then taken to the hammer mill through screw conveyors. Once properly ground, the meal is taken to the final storage silos by means of a proper transportation system.

The dirty oil is delivered to an intermediate tank to feed the decanter/centrifuge for cleaning. A screw conveyor collects the solid particles from the fat cleaning centrifuge/decanter to take them to the press(es) for further extraction.

The clean fat is collected in a proper bin located at the end of the centrifuge/decanter and pumped to the fat final storage tanks. From here it can be poured into the tankers to deliver it or partly recovered for feeding the steam generator.

1.F.3. BASIC DESIGN DATA

Annual production

Table 1.F.1. Estimation of the plant annual capacity

	Production plan (kg/h)	Self-consumption (kg/h)	Working hours/day	Working day/month	Working hours/year	Production (kg/day)	Self-consumption (kg/day)	Annual production (kg/years)	Annual product for sale (kg/y)
Cat 1,2,3 fat	650	264.71	16.00	22	4,000.00	10,400	4,235	2,600,000	1,541,176
Meal Cat 1,2,3	754		16.00	22	4,000.00	12,064		3,016,000	3,016,000

The plant will have a hour capacity of 5,000 kg/h and it will be able to cover the year production in 4,000 hours/year under normal conditions and an annual production capacity of 16,000 Tons taking into account a general efficiency of 80%. In case of emergency (i.e. epidemic) the plant capacity can be boosted to 24,000 Tons by working on a 3 shifts basis or 50% more than in normal conditions.

A considerable part of the oil (40%) is used to produce the steam for cooking. Under these assumptions, the expected total production on year basis is:

- Fat as Cat. 1: 1,540 Tons
- MBM Cat. 1: 3,016 Tons

The installation will not make use of any fossil fuel since the energy required to produce the steam mostly for cooking, is provided by the same animal fat produced by the plant. The actual estimated quantity of needed fat for self consumption is roughly 1,100 Tons per year, leaving about 1,540 Tons for sale.

Taking this into consideration, the proposed plant has a considerable **low impact on the environment,** making other options not competitive on this regard.

Fat and MBM Cat. 1 is normally purchased by the cement and green energy production enterprises to be used as a compound and as a fuel. Market sale prices of such products are dealt with in a different document.

Finished product storage capacity

The proposed installation has a storage capacity of finished product equal to:

- ✓ 120 Tons of meal
- ✓ 180 Tons of fat

Equivalent, at the current conditions, to 10 days storage for meal and 30 days for fat.

1.F.4. CONSTRUCTION WORKS

It is normal and recommended practice to split the construction works into homogeneous type of supply to avoid undesired commercial mark-up applied by main Contractors to equipment delivered by sub-suppliers and overlapping of responsibilities in case of complaints from the side of the Investor.

For example, the main Contractor can usually supply building works on turn key basis, including services and ancillary installations, but it is risky and uneconomical to leave him also the responsibility of the supply of the main process equipment.

On the other hand, if splitting the works into too many suppliers, their organization is going to take more time and may results in delays, complaints and additional costs.

Therefore, the Engineer has split the construction works into 4 main Lots:

1. Engineering Services;
2. Processing Equipment including spare parts and scrubber to eliminate bad odor from the exhaust air;
3. Waste water treatment unit, a very specialized installation required to meet the quality standards of wasted waters;
4. Building and civil works including auxiliary installations and electrical installation.

1.F.4.1. FINANCIAL EVALUATION OF THE LOTS

The financial evaluation of the Lots has been carried out based on:

- ✓ Relevant technical proposals received from different suppliers, starting from rough design data elaborated by the Engineer on the basis of his experience and knowledge;
- ✓ Where offers were not available, the evaluation has been done by the Engineer based on normal European market prices.

Details are provided in Annex 1.F.1.

LOT 1

Table 1.F.2. Cost estimation of the Engineering Services and Work Supervision, based on roughly 10% of the Investment value

LOT		Price Euro
1	Engineering and work supervision	600,000

LOT 2

Table 1.F.3. Cost estimation of the ABP Processing line construction works

LOT	ABP Processing Line Method 1	CIF price Euro
2.1	Processing equipment	1,811,490
2.2	Spare parts for 2 years operation	90,000
2.3	Scrubber	250,000
2.4	Room Air scrubber	230,000
	SUB-TOTAL LOT 2	**2,381,490**

LOT 3

Table 1.F.4. Cost estimation of the Waste water treatment unit

LOT		CIF Price Euro
3	Waste water Treatment Unit	500,000
	SUB-TOTAL LOT 3	**500,000**

LOT 4

Table 1.F.5. Cost estimation of the Civil and building works

	DENOMINATION	Price Euro
4.1	Industrial shed	1,233,050
4.2	Offices	180,000
4.3	Internal roads	392,000
4.4	Fencing	20,000
4.5	Green area	10,000
4.6	Weigh bridges	60,000
4.7	Thermic power station	250,000
4.8	Pumping station	20,000
4.9	Compressed air station	50,000
4.10	Compressed air distribution line	15,000
4.11	Steam distribution line	50,000
4.12	Cold water distribution line	50,000
4.13	Firefighting equipment	30,000
4.14	Electric plant	800,000
4.15	Assistance to main equipment assembling, start up	60,000
	SUB-TOTAL LOT 4	3,220,050

COST RECAPITULATION

Table 1.F.6. Cost estimation of the erection works of the ABP plant Cat. 1 Method 1

	SUB-TOTAL LOT 4	3,220,050
	SUB-TOTAL LOT 3	500,000
	SUB-TOTAL LOT 2	2,381,490
	SUB-TOTAL LOT 1	600,000
	TOTAL	**6,701,540**

1.F.5. LOT 1 - ENGINEERING SERVICES

The Engineering Services will cover all the activities and services related to the design and Work Supervision for the construction of an ABP Rendering plant of nominal capacity 8 Tons/h of raw material. The services to provide are the following:

1. Civil and building works
   a) Revision of the project concept design
   b) Documents containing structural calculations
   c) Detailed design of the buildings with dimensioning of concrete foundations, vertical walls, internal walls, industrial paving, roofs, windows, office, outdoor wall finishing and other services
   d) Detailed of the concrete tank and small room required for the functioning of the waste water treatment plant
   e) Design of the required basements for the equipment (silos and tanks)
   f) Design of sewage lines for process waste waters and civil sewage and rain waters
   g) Outdoor paving and roads
   h) Outdoor fencing and gates
   i) Outdoor green area and gardens
   j) Preparation of plans, elevations of the complex buildings and outdoor facilities where required
   k) Preparation of technical specifications of the civil and building works
   l) Preparation of Bill of Quantities for the above mentioned works
   m) Technical assistance to the preparation of the supply contracts

2. ABP processing lines and auxiliary equipment
   a) Revision of the concept design, technical description
   b) Preparation of plans and elevations of the ABP processing equipment
   c) Design of the discharge points
   d) Design of connections to the utilities: steam, cold water, compressed air
   e) Preparation of the Bill of Quantities

3. Auxiliary installations
   a) Revision of the concept design
   b) Preparation of technical calculations
   c) Preparation of plans for the erection of the boiler room, water and air compressor room
   d) Detailed design of the room ventilation installation
   e) Preparation of plans of steam and condensate recovery pipelines, water distribution pipeline, compressed air pipeline
   f) Preparation of technical specifications and Bill of Quantities
   g) Assistance to the preparation of the supply contract

4. Electrical installations
   a) Preparation of the technical calculations
   b) Design of the electrical room
   c) Design of the electric distribution lines
   d) Preparation of the technical specifications of the electric power devices
   e) Design of the MT, LT, 3-P, 1-P, earthing lines, internal and outdoor lightening, sockets and plugs
   f) Preparation of technical specifications and Bill of Quantities of the electrical components
   g) Assistance to the preparation of the supply contract

5. Work Inspection and Work Supervision
   a) The Construction Supervision and Inspection of Equipment shall be performed for the selected components of the project i.e. whole of the Works and whole or parts of the Supply components. For this project, the selected components of the project shall be as follows:
      - Supply Contract: Lot 2: Supply and Installation of the ABP Processing Equipment
      - Supply Contract Lot 3: Supply and Installation of Waste Water treatment equipment
      - Works Contract: Lot 4: Realization of Civil and building works, Supply and installation of M&EI Mechanical and Electrical Systems
   b) The Consultant shall work exclusively for the Contracting Authority. The Contracting Authority shall also be the Employer, as that term is defined in the FIDIC contract for the performance of the Works with the Contractor(s). On behalf of the Contracting Authority, and as directed by it, the Consultant shall be required to coordinate with and inform the Contracting Authority (CA), in particular regarding contractual issues, work progress and costs.

6. Preparation of ex-built plans and drawings at the completion of the construction works.

1.F.6. LOT 2 - SUPPLY AND INSTALLATION OF THE ABP PROCESSING EQUIPMENT

ITEM 2.1 - ABP processing equipment (see Annex 1.F.3. dwg T01/04: Plant Layout)

RECEIVING AND CRUSHING SECTION

Pos. 1

N° 2 receiving bins

Suitable to receive loose product from trucks, with free unloading with inclined coils.

Total storage capacity mc. 35 each approx.

Construction: Base made up of:

- ✓ Front wall for supports and gear-motors in 10 mm thick carbon steel.
- ✓ Auger case and conical base in carbon steel with anti-wear plates in the housings.
- ✓ Carbon steel vertical side walls to be bolted to the base and welded to the finished machine.
- ✓ External reinforced ribbing, with corner profiles.
- ✓ Unloading spirals in stamped sheet metal, of proper diameter.
- ✓ Carbon steel central tubular axis.
- ✓ Support frame made of hot galvanized material beams.

Pos. 1.a

N° 1 lid for receiving container

Of suitable dimensions for reception containers made of AISI 304, 3 mm thick stainless steel sheet with reinforcement ribbing.

No. 2 hydraulic cylinders for lid operation controlled by a hydraulic motorized control unit with solenoid valves.

Pos. 2

N° 1 slope screw conveyor

Double auger conveyor receiving from the container and conveying to the crusher.

Adequate length.

Construction:

- ✓ Bearings support head and gearmotor in carbon steel.
- ✓ Case and side boards in carbon steel.
- ✓ Wear-resistant plates in the spiral housing in 6 mm thick carbon steel.
- ✓ N. 2 450 mm diameter conveyor spirals, in thick carbon steel.
- ✓ Complete with supporting frame in coated carbon steel.

Pos. 3

N° 1 crusher

For breaking whole carcasses of dead animals including cows.

Characteristics:

- ✓ Self-supporting, very thick and robust sheet metal construction.
- ✓ Robust carbon steel profile base frame.
- ✓ Side plugs for dismantling the rotating shaft.
- ✓ Closure gland in the rotating shaft passages.
- ✓ Rotating blades and fixed blades max. Diam. Dimension 900 mm.
- ✓ 50 mm thick shaped rotating blades.
- ✓ 50 mm thick fixed shaped blades.
- ✓ 65 mm clearance between the rotating blades and the fixed blades.
- ✓ Appropriately 55 kw motor coupled to the gearbox.
- ✓ Complete with carbon steel supporting frame for placing the crusher above receiving container made of robust coated carbon steel.
- ✓ Construction material painted carbon steel.

Pos. 4

N° 1 slope screw conveyor

Single auger conveyor receiving from the container and conveying to the process and finishing crusher.

Adequate length.

Construction:

- ✓ Bearings support head and gearmotor in carbon steel.
- ✓ Case and side boards in carbon steel.
- ✓ Wear-resistant plates in the spiral housing in 6 mm thick carbon steel.
- ✓ 500 mm diameter conveyor spirals, in thick carbon steel.
- ✓ Complete with supporting frame in coated carbon steel.

Pos. 5

N°1 metal detector

To identify and reject metal pieces which could damage the equipment.

Control panel containing:

- ✓ Current rectifier.
- ✓ Transformer.
- ✓ On and off commands.
- ✓ Sloping made of AISI 304 Stainless Steel.

Pos. 6

N° 1 finishing crusher

For carrying out a second crushing or to chop small dimension animal carcasses.

- ✓ Self-supporting, robust coated carbon steel frame.
- ✓ Dynamically balanced rotating roller, with rotating blades with carry-over of anti-wear material.
- ✓ Double row of fixed blades for double crushing, made of heat-treated steel.
- ✓ Knives clearance 35 mm.
- ✓ Maximum cutting diameter of rotating knives 600 mm.
- ✓ Cast iron supports, bearing housing.
- ✓ Approximately 45 kw electric motor.
- ✓ Complete with carbon steel support frame.

Pos. 7

N° 1 slope screw conveyor

Single auger conveyor to bring the product to the final crushing stage and start the cooking cycle. Adequate length.

Construction:

- ✓ Bearings support head and gearmotor in carbon steel.
- ✓ Case and side boards in carbon steel.
- ✓ Wear-resistant plates in the spiral housing in 6 mm thick carbon steel.
- ✓ 400 mm diameter conveyor spiral, in thick carbon steel.
- ✓ Complete with supporting frame in coated carbon steel.

Pos. 8

N° 1 roller crusher

For crushing of raw process material, in 30x30 mm particle size, according to EC standards in force.

- ✓ Crushing stars mounted on shafts with a diameter of 360 mm.
- ✓ Knives clearance 16 mm.
- ✓ Cleaning combs mounted on the two side walls. Execution of the stars and combs in highly wear resistant material.
- ✓ Electro-welded and bolted carbon steel body.
- ✓ Installed power 37 kW approx.
- ✓ Carbon steel supporting frame with grid floor located above the reception tank, with access stairs and protection rails.

Pos. 9

N° 1 slope screw conveyor

Single auger conveyor to bring the product to the receiving container and start the cooking cycle. Adequate length.

Construction:

- ✓ Bearings support head and gearmotor in carbon steel.
- ✓ Case and side boards in carbon steel.

- ✓ Wear-resistant plates in the spiral housing in 6 mm thick carbon steel
- ✓ 400 mm diameter conveyor spiral, in thick carbon steel.
- ✓ Complete with supporting frame in coated carbon steel.

COOKING AND PRESSING SECTION

Pos. 10

N° 1 receiving container

For a suitable feeding of the continuous cooker. Total storage capacity mc. 25 approx.

Construction:

- ✓ Front wall for supports and gear-motors in carbon steel
- ✓ Auger case and side boards in carbon steel
- ✓ External reinforced ribbing, with corner profiles
- ✓ Extracting spirals 300 mm diameter
- ✓ Carbon steel central tubular axis
- ✓ Support frame made of painted carbon steel
- ✓ Variable frequency drive to adjust the auger speed

Pos. 11

N° 1 slope screw conveyor

Single auger conveyor for taking the product to the cooking section. Adequate length.

Construction:

- ✓ Bearings support head and gearmotor in carbon steel
- ✓ Case and side boards in carbon steel
- ✓ Wear-resistant plates in the spiral housing in 5 mm thick carbon steel
- ✓ 400 mm diameter conveyor spiral, in thick carbon steel.
- ✓ Installed power 3 kW approx.
- ✓ Complete with supporting frame in coated carbon steel.

Pos. 12

N° 1 slope screw conveyor

Single auger conveyor for feeding the batch cookers. Adequate length.

Construction:

- ✓ Bearings support head and gearmotor in carbon steel
- ✓ Case and side boards in carbon steel
- ✓ Wear-resistant plates in the spiral housing in 6 mm thick carbon steel
- ✓ 400 mm diameter conveyor spiral, in thick carbon steel.
- ✓ Complete with supporting frame in coated carbon steel.

Pos. 13

N° 2 horizontal screw conveyor

Single auger conveyor for feeding the batch cookers. Construction, painted carbon steel complete with support frame. Adequate length.

Pos. 14

N° 2 batch cookers

Designed for the hydrolysis and sterilisation of the product, manufactured in accordance with EC laws with certified materials and qualified operators.

Suitable for melting and pouring of slaughter animal by-products.

Capacity: 16,000 Lt each.

Heating mean: saturated steam at 6 bars in the gap. Operating internal pressure 3 bar.

The machine is composed of:

- ✓ Internal and external painted carbon steel cylindrical walls.
- ✓ Central spinning shaft, internally heated with steam at 6 bars, provided of mixing and discharge heavy duty rotating blades.
- ✓ Condensate unloading device to recover the condensate.
- ✓ 6.5 Bar safety valve for the gap pressure.
- ✓ 3.5 safety valve for the control of the internal pressure.
- ✓ Temperature detector PT 100 for reading the working temperature.
- ✓ Pressure detector for reading the internal operating pressure.
- ✓ Upper cyclone of the evaporated fumes, entirely made of AISI 304 stainless steel.
- ✓ Resistant coated carbon steel support frame.
- ✓ Loading cells for loading the product.
- ✓ Inspection platforms, gangways and stairs for easy access to all parts of the cooker.
- ✓ Temperature and time regulation device to assure the full conformity with the EU regulations.
- ✓ Steam consumption 2,000 kg/h at 6 bars approximately each.

Pos. 15

N° 2 dripping tanks

Suitable to receive and drain the cooked sterilized product discharged from the cookers.

Construction:

- ✓ Front wall for supports and gear-motors in carbon steel.
- ✓ Auger case and side boards in carbon steel.
- ✓ Extracting spiral 250 mm diameter.
- ✓ Carbon steel central tubular axis.
- ✓ S.s. AISI 304 bottom perforated metal sheet.
- ✓ Support frame made of painted carbon steel.
- ✓ Variable frequency drive to adjust the auger speed.
- ✓ Complete of carbon steel support frame.

Pos. 16

N° 1 horizontal screw conveyor

Single spiral screw conveyor for conveying cooked and dripped product to continuous presses.

Adequate length.

Construction:

- ✓ Bearings support head and gearmotor in carbon steel.
- ✓ Case and side boards in carbon steel.
- ✓ Wear-resistant plates in the spiral housing in 6 mm thick carbon steel.
- ✓ 250 mm diameter conveyor spiral, in thick carbon steel.
- ✓ Complete with supporting frame in coated carbon steel.

Pos. 17

N° 1 slope screw conveyor

Single auger conveyor to transport the product to the presses.

Adequate length.

Construction:

- ✓ Bearings support head and gearmotor in carbon steel.
- ✓ Case and side boards in carbon steel.
- ✓ Wear-resistant plates in the spiral housing in 6 mm thick carbon steel.
- ✓ Carbon steel tubular central axis.
- ✓ 250 mm diameter conveyor spiral, in thick carbon steel.
- ✓ Complete with supporting frame in coated carbon steel.

Pos. 18

N° 1 slope screw conveyor

Single auger conveyor to distribute the product to the presses.

Construction:

- ✓ Bearings support head and gearmotor in carbon steel
- ✓ Case and side boards in carbon steel
- ✓ Wear-resistant plates in the spiral housing in 6 mm thick carbon steel
- ✓ Carbon steel tubular central axis
- ✓ 250 mm diameter conveyor spiral, in thick carbon steel.
- ✓ Complete with supporting frame in coated carbon steel

Pos. 19

N° 2 feeding tanks

Suitable to properly feed the continuous presses. Approximate volume: 4.5 c.m. each.

Construction:

- ✓ Front wall for supports and gear-motors in carbon steel.
- ✓ Auger case and side boards in carbon steel.
- ✓ Extracting spiral 250 mm diameter.
- ✓ Carbon steel central tubular axis.
- ✓ S.s. AISI 304 bottom perforated metal sheet.
- ✓ Support frame made of painted carbon steel.
- ✓ Variable frequency drive to adjust the auger speed.
- ✓ Complete of carbon steel support frame and side reinforcements.

Pos. 20

N° 2 continuous presses

For pressing the solid material.

Characteristics:

- ✓ Base and frame in robust carbon steel, self-supporting and appropriately machined and bored for alignment with the various components.
- ✓ Parallel axis gearmotor.
- ✓ Cast steel pressing cage.

Pressing equipment (blades, slats, cone etc..) in special heat treated steel, the last pressing blade in highly resistant steel.

Pressure cone adjustment activated by the hydraulic control unit powered by means of an electric motor.

Complete with supporting structures.

- ✓ Coil on the liquid fat ejection base powered by a gearmotor.
- ✓ Inlet production 3,000 Kg/h.
- ✓ Command motor for central pressing shaft.
- ✓ Total installed power: approximately 90 Kw.

Pos. 21

N° 1 horizontal screw conveyor

To collect the pressed product.

Construction:

- ✓ Bearings support head and gearmotor in carbon steel.
- ✓ Case and side boards in carbon steel.
- ✓ Wear-resistant plates in the spiral housing in 6 mm thick carbon steel.
- ✓ 250 mm diameter conveyor spiral, in thick carbon steel.
- ✓ Complete with supporting frame in coated carbon steel.

Pos. 22

N° 1 slope screw conveyor

To bring the pressed product to the hammer mills.

Construction:

- ✓ Bearings support head and gearmotor in carbon steel.
- ✓ Case and side boards in carbon steel.
- ✓ Wear-resistant plates in the spiral housing in 6 mm thick carbon steel.
- ✓ 250 mm diameter conveyor spiral, in thick carbon steel.
- ✓ Complete with supporting frame in coated carbon steel.

Pos. 23

N° 1 horizontal screw conveyor

To distribute the pressed product to the hammer mills feeding tanks.

Construction:

- ✓ Bearings support head and gearmotor in carbon steel.
- ✓ Case and side boards in carbon steel.
- ✓ Wear-resistant plates in the spiral housing in 6 mm thick carbon steel.
- ✓ 250 mm diameter conveyor spiral, in thick carbon steel.
- ✓ Complete with supporting frame in coated carbon steel.

GRINDING AND MEAL STORAGE SECTION

Pos. 24

N° 2 hammer mill feed balance tank

For storage of pressed material and dosing of the hammer mill. Total storage capacity c.m. 30 approx. each.

Construction:

- ✓ Front wall for supports and gear-motors in carbon steel.
- ✓ Auger case and side boards in carbon steel.
- ✓ External reinforced ribbing, with corner profiles.
- ✓ Extracting spiral 250 mm diameter.
- ✓ Carbon steel central tubular axis.
- ✓ Support frame made of painted carbon steel.
- ✓ Variable frequency drive to adjust the auger speed.
- ✓ Complete with support frame.

Pos. 25

N° 1 slope screw conveyor

To transfer the pressed meal to the hammer mill.

Construction:

- ✓ Bearings support head and gearmotor in carbon steel.
- ✓ Case and side boards in carbon steel.
- ✓ Wear-resistant plates in the spiral housing in 6 mm thick carbon steel.
- ✓ 250 mm diameter conveyor spiral, in thick carbon steel.

Pos. 26

N° 1 slope screw conveyor

To feed the hammer mill.

Construction:

- ✓ Bearings support head and gearmotor in carbon steel.
- ✓ Case and side boards in carbon steel.
- ✓ Wear-resistant plates in the spiral housing in 6 mm thick carbon steel.
- ✓ 250 mm diameter conveyor spiral, in thick carbon steel.

Pos. 27

N° 1 hammer mill

For grinding the pressed material. Grinding capacity 4,000/4,500 Kg/h.

- ✓ Made of thick, welded and bored carbon steel sheet.
- ✓ Frame in sturdy profiles supported by anti-vibration dampers.
- ✓ Internal, easily removable and heat treated, wear-resistant plates.
- ✓ Dynamically balanced disc rotor hammer holder.
- ✓ Easy replaceable perforated mesh.
- ✓ Heat treated, easily replaceable crushing hammers.
- ✓ Installed power approximately 55 Kw.
- ✓ Flexible joint connecting motor and rotor.
- ✓ Complete with supporting structure.

Pos. 28

N° 1 slope screw conveyor

To bring the ground meal to the bucket elevator.

Construction:

- ✓ Bearings support head and gearmotor in carbon steel.
- ✓ Case and side boards in carbon steel.
- ✓ Wear-resistant plates in the spiral housing in 6 mm thick carbon steel.
- ✓ 250 mm diameter conveyor spiral, in thick carbon steel.

Pos. 29

N° 1 bucket elevator

Vertical bucket elevator for loading the ground meal into the storage silos.

- ✓ Made of painted carbon steel with external parts in hot galvanized steel.
- ✓ Nominal flow rate 5,000 kg/h powdered meal.
- ✓ Driving head with 1.1 kw gearmotor approx.
- ✓ Upper cover and front closure made of wear-resistant sheet metal.
- ✓ Return head with cage pulley.
- ✓ Screw belt tension system.
- ✓ Double emptying and cleaning hatch.
- ✓ Oil-resistant three-layer polyester tape with rubber lining.
- ✓ Molded steel cups.
- ✓ Inspection ladder with EC protection for access to the control head.
- ✓ Maintenance walkway at the control head, with EC approved railings.

Pos. 30

N° 1 distributing screw conveyor

Single spiral, it receives the meal from the bucket elevator and loads the 4 storage silos.

Construction:

- ✓ Bearings support head and gearmotor in carbon steel.
- ✓ Case and side boards in carbon steel.
- ✓ Wear-resistant plates in the spiral housing in 8 mm thick carbon steel.
- ✓ 250 mm diameter conveyor spiral, in thick carbon steel.
- ✓ S.s. AISI 304 covers.
- ✓ One end discharge opening plus 3 intermediate ones with pneumatically operated discharge valves.

Pos. 31

N° 4 meal storage silos

Approximately 30 c.m. each, total storage capacity approximately 120,000 kg.

External dimensions 2.40 m.

Vertical unloading motorized system directly on the tankers.

Construction:

- ✓ Painted carbon steel sheets.
- ✓ Upper walkable end in carbon steel.
- ✓ EC approved upper perimeter railings.
- ✓ EC approved hooped ladder to access the top.
- ✓ Support structure in painted carbon steel heavy beams with support plates, anchors and bracing.
- ✓ Lower clearance 3.20 x 12.80 m to allow vehicle transit.
- ✓ Surface coatings suitable for external weather conditions.

FAT AND FAT STORAGE SECTION

Pos. 32

N° 1 group of 2 screw conveyors for recycling to presses

To recycle the powder unloaded from the dripping tanks (15) back to the presses.

Made up of:

- ✓ Horizontal Auger Screw with perforated double base to drain the liquid fat.
- ✓ Liquid fat collection tank incorporated in the auger screw, and connected to the centrifugal pump.
- ✓ Inclined screw conveyor to transport meal to the loading screw conveyor of the continuous presses.
- ✓ Spirals with 200 mm diameter made of carbon steel.
- ✓ Perforated base for fat drain.

Pos. 33

N° 1 group of 2 screw conveyors

To recover the powder unloaded from the presses back to press it again.

Made up of:

- ✓ Horizontal Auger Screw with perforated double base to drain the liquid fat.
- ✓ Liquid fat collection tank incorporated in the auger screw, and connected to the centrifugal pump.
- ✓ Inclined screw conveyor to transport meal to the loading screw conveyor of the continuous presses.
- ✓ Spirals with 250 mm diameter made of carbon steel.
- ✓ Perforated base for fat drain.

Pos. 34

N° 1 dirty fat tank

To contain dirty fat coming from the batch cookers and the continuous presses.

- ✓ Storage capacity approx. 6,000 kg.
- ✓ Tapered base for total emptying.
- ✓ Made of carbon steel plate, with steam circulation coils at 3 bar for fat heating.
- ✓ Central stirrer powered by gearmotor.
- ✓ Steam consumption: 100 kg/h at 3 bars.

Pos. 35

N° 1 horizontal decanter/centrifuge

For fat cleaning (powder separation).

- ✓ Capacity 2,500/3,000 L/h.
- ✓ Main motor power 18.5 kw approx.
- ✓ Sludge scraper motor power 0.25 kw.
- ✓ With electrical control panel and accessories.
- ✓ AISI 304 stainless steel clean fat recycling tank.

Pos. 36

N° 1 slope screw conveyor

To recycle the powder extracted from the decanter.

Construction:

- ✓ Bearings support head and gearmotor in carbon steel.
- ✓ Case and side boards in carbon steel.
- ✓ Wear-resistant plates in the spiral housing in 6 mm thick carbon steel.
- ✓ 200 mm diameter conveyor spiral, in thick carbon steel.

Pos. 37

N° 2 clean fat tank

To store centrifuged, clean fat.

- ✓ Storage capacity approx. 6,000 kg each.
- ✓ Tapered base for total emptying.
- ✓ Made of carbon steel plate, with steam circulation coils at 3 bar for fat heating.
- ✓ Central stirrer powered by gearmotor.
- ✓ Steam consumption: 100 kg/h at 3 bars.

Pos. 38

N. 1 group of centifugal pumps for fat delivery:

- ✓ N. 1 pump for fat delivery from the screw conveyors (33) to the dirty fat storage tanks (34).
- ✓ N. 2 pumps for fat delivery from the dirty fat storage tanks (34) to the decanter (35).
- ✓ N. 1 pump for delivery of clean fat from the decanter (35) to the clean fat storage tank (37).
- ✓ N. 2 pumps for delivery of clean fat from the storage tank (37) to the vertical storage tanks (39).

Pos. 39

N° 4 clean fat storage tank

- ✓ Construction in carbon steel, dimensions diam. 2.4 m, height 10.00, approximate capacity 50 c.m. each.
- ✓ Support sleeve and lower cone 8 mm thick.
- ✓ Upper shells mm 5 and mm 4 thick.
- ✓ Inner heating coil with SS tubes 1” ¼.
- ✓ Inspection hatches.
- ✓ Max and min level indicator.
- ✓ Vehicle loading centrifugal horizontal pump kw 4 head from 6 to 20 m.
- ✓ Manual fat unloading valves.
- ✓ Compliant hooped ladder with access to the top made of hot-galvanized carbon steel.
- ✓ Compliant upper walkway made of hot-galvanized carbon steel, length 6,000 mm.

Pos. 40

N° 2 air condenser

Stainless steel tube nest condensers to condensate the fumes from the batch cookers. Condensing capacity 2,500 l/h.

Construction:

- ✓ Side bundles in galvanised sheet metal.
- ✓ Pipe plates and pipe bundle completely made of stainless steel AISI 304.
- ✓ Fume receiving chamber in AISI 304 stainless steel.
- ✓ Unloading chamber of the condensate in AISI 304 stainless steel.
- ✓ Fume receiving manifold and pipe bundle distribution.

Air ventilation unit and supporting structure in painted carbon steel. Made up of:

- ✓ Delivery duct to the pipe bundle.
- ✓ Air blower, total flow rate 270,000 m3/hour.
- ✓ Centrifugal 4 kw extraction fan with speed adjustment in stainless steel AISI 304 stainless steel.
- ✓ Supporting structure for the air-cooled condenser, height 2.00 m, made of robust painted carbon steel beams.

Pos. 41

N. 1 two stages scrubber

Capacity: 25,000 m3/hr. poly-propylene scrubber, with a static bed filling, operating with counter flow liquids with SCR different reagents in order to neutralize pollutants.

The installation consists of N.2 vertical washing scrubbers in succession for vapor removal carried by the air stream.

The treatment stages consist of:

SCRUBBER 1:

Fist stage to remove NH3, with sulphuric acid, with two separated chemical washing stages.

Total contact time > 3.5 sec.

SCRUBBER 2:

Second stage to remove H2S and odour, with caustic soda and sodium hypochlorite with two separated chemical washing stages.

Total contact time > 2.0 sec.

Final washing with industrial water.

Estimated pressure drop: 90 mm.w.c.

Construction material:

- ✓ External/internal material: P.P.
- ✓ Reinforcements / Supports: P.P.
- ✓ Spraying nozzles: P.V.C.
- ✓ Drop stopper: P.V.C.
- ✓ Washing ramp: P.P.
- ✓ Packing: P.P.

The following components of the vertical scrubber are included in the supply:

a) Electric pumps for washing solution recirculation.

b) Packing layers consisting of highly efficient random rings PP.

c) Spray nozzle header over static filling media support.

d) Demister for vertical flow placed after each bed stages.

e) Valves, electrovalves, control levels and other fittings necessary for the proper functioning of the scrubbers.

CHEMICALS DOSING SYSTEM

In order to optimize the scrubber's operation, chemicals dosing is necessary to improve the pollutants adsorption.

The automatic dosing system is made up with:

- ✓ pH monitoring and regulation system.
- ✓ Dosing pumps operated by the pH monitoring system.

Pos. 42

N° 1 electric command board

To control and command the entire system of receiving – crushing – cooking – pressing – grinding - liquid fat processing.

Complete with N° 1 industrial color screen PC.

Series of frequency drive variators for the following components:

- ✓ Cooker feeding system.
- ✓ Cooker unloading system.
- ✓ Press feeding system.
- ✓ Mill feeding system.
- ✓ Flash condensate recovery pump.

Hydraulic material for steam and condensate piping

From the steam distribution collector to the batch cookers, with relevant adjustment valves.

Condensate drainage from the batch cookers to the condensate recovery device with relevant condensate drains and accessories.

All necessary material for the proper operation of the system.

Electrical connections form the electric command board to the use points complete with:

Galvanised cable ducts.

Galvanised cable pipes.

Cables for connection of the motors of each individual device.

Shielded and profibus cables for the industrial control and supervision equipment.

Electrical connections from the electrical panel to each individual use point.

ITEM 2.2 - Spare parts for two years of operation

This list will be prepared once the ABP equipment supplier has been selected.

ITEM 2.3 – ROOM AIR SCRUBBER

N. 1 **Set Room Air Ducting**

Set of Room Air Ducting with connecting room air vent.

N. 1 **Centrifugal fan**

Capacity: 50,000 m3/hr. Constructed of stainless steel with electrical motor, coupled to the fan with V-belt drive arrangement, basement Mild steel, shaft seals, rubber shock absorber.

N. 1 **Butterfly valve with electro-pneumatic control**

Stainless steel butterfly valve, for control of vacuum at starting of the fan.

N.1 **Chemical Scrubbing Pack Tower (Single Stage)**

Capacity: 50,000 m3/hr. poly-propylene scrubber, with a static bed filling, operating with counter flow liquids with different reagents in order to neutralize pollutants.

Scrubber is complete with:

- Integrated liquid storage tank.
- Fresh water automatic injection system.
- Level probe control 4 positions.
- Recirculation pumps for washing/oxidation liquids.
- Connecting piping.
- Poly-propylene packing.
- Demister package (loss of liquid for washing 0.4-0.5‰).
- Inspection/Filling ring loading/unloading door.
- Drain bottom valve.
- Valve for manual supply of the liquids.
- Electric valve for charging.
- Chimney expulsion poly-propylene for exhaust air.
- Sample opening.

Chemicals required: NaOH, NaOCl.

Chemical dosing pumps:

- 1 electromagnetic membrane metering pumps with pH instrument with following features:
  - automatic operation on/off, in accordance with the measured pH value;
  - manual operation with potentiometer;
  - pH glass probe with 5 m electrical wire;
  - 1 output 4-20 mA for the remote visualization of the pH value;
  - 1 regulator with 1 set point for the intervention of the pump.
- 1 electromagnetic membrane metering pump with Red ox instrument completed with the following features:
  - automatic operation on/off, in accordance with the measured mV value;
  - manual operation with potentiometer;
  - pH glass probe with 5 m electrical wire;
  - 1 output 4-20 mA for the remote visualization of the mV value;
  - 1 regulator with 1 set point for the intervention of the pump.

1.F.7. LOT 3 SUPPLY AND INSTALLATION OF WASTE WATER TREATMENT EQUIPMENT

The waste water treatment plant will be built in order to receive and treat the waste water coming from the animal by-products processing plant.

The proposed design solution must be developed to improve the insertion of the plant in the environment, to reduce the occupying area, to improve the management of the plant, to minimize operational costs, also allowing for an eventual future extension, maintaining the same type of treatment sections.

A completely biological treatment will be adopted in order to produce a sludge which can be re-usable and sufficiently stabilized to obtain an efficient dewatering.

DESIGN DATA

Characteristics of the water to be treated

The adopted data for the project are the following:

- Type of sewage water Industrial.
- Daily flow rate 50 m3/d.
- BOD concentration 16,824 mg/l.
- COD concentration 30,049 mg/l.
- Suspended Solids 20,000 mg/l.
- TNK 600 mg/l.
- P 447 mg/l.
- FOG < 120 mg/l.
- Water temperature 15 – 25 °C.
- Altitude 2,000 m.a.s.l.

Required parameters of waste water.

The treatment plant is designed to respect the following outlet parameters:

- COD concentration ≤ 80 mg/l.
- BOD concentration ≤ 30 mg/l.
- Suspended Solids ≤ 40 mg/l.
- FOG ≤ 5 mg/l.
- P ≤ 2 mg/l.

GENERAL DESCRIPTION OF THE WATER TREATMENT PROCESS

The water treatment plant is MBBR biological type (or equivalent method) with denitrification and removal of phosphorous. The removal of phosphorous is carried out biologically and simultaneously operated with addition of chemical products.

Due to the very high biological loads at the inlet it will be provided a Dissolved Air Flotation pre-treatment in order to reduce the loads.

The excess sludge is digested aerobically, due to the elevated age of the sludge reached in the oxidation section, and subsequently is sent to a storage tank (to be built on site and at customer's care) and dewatered by centrifuge.

In short, the water depuration process consists of the following phases:

- Accumulation-equalization (tank excluded at Customer's care; equipment included);
- Fine screening;
- Dissolved Air Flotation (IDRO DAF);
- Denitrification;
- MBBR Biological oxidation;
- Mixed liquor recirculation;
- Phosphate removal;
- Dissolved Air Flotation (IDRO DAF);
- On line chlorination;
- Excess sludge extraction;
- Centrifugal Decanter;
- Technical room.

Sludge treatment

Due to the high content of suspended solids is expected a sludge daily production around 24 m3/d @ 4% of solid content. For this reason a sludge accumulation tank of at least 40 m3 will be built.

Tank will be realized on site in concrete above ground.

Level sensor for sludge level control.

The sludge treatment plant will include:

Mechanical sludge dewatering with centrifuge

Dewatering system is installed indoor inside a dedicated room.

Sludge conditioning during centrifugation including:

Automatic polyelectrolyte preparation and dosing plant.

Control Panel

All water treatment plant functions are controlled by a control panel that consists of a section of power and a section on automation.

The power section is primarily secured by a main circuit breaker which protects the entire control panel. The panel must be powered by low voltage.

The case is entirely realized in IP54 painted metal and the base is reinforced with steel sections as the top with a lifting bar.

Each user of the plant can be operated manually or automatically. For each user there is a switch with three positions, "0-Manual-Automatic". When the Automatic mode is selected, the plant is controlled by the PLC though a supervision program which is usually displayed on a touch screen monitor and installed on the electrical panel.

Electrical feed lines to electrical control panel are not included.

Technical characteristics:

- Voltage: three phase 400 V, 50 Hz + neutral.
- Installed Power: approx. 43 kW (included sludge dewatering).

1.F.8. LOT 4: CIVIL AND BUILDING WORKS, SUPPLY, INSTALLATION OF AUXILIARY PLANTS

ITEM 4.1 - Industrial shed (see Annex 1.F.4. dwg T03/03: Plant Layout)

Pos. 1

Automatic/manual transit gates for trucks uploading finished MBM and fat. Of suitable dimensions to allow coming and outgoing vehicles to drive through contemporarily.

Pos. 2

Parking area for operators and visitors, bitumen layer, shaded.

Pos. 3

Office building. Internal and external walls of concrete block or bricks, internal divisions and dimensions as per drw., paving with good quality tiles, locker walls protected with tiles. Common material ceiling. Good quality internal and external doors and windows. Dimensions: 10 x 18 x 3 mts. Complete with perimetral concrete walkway, 900 mm width.

Pos. 4

Locker and filter area for access to the plant through the Pressing Area, entirely made of concrete block walls protected with tiles up to 3 mt of 'height, complete of separation walls for w.c. and showers, same materials, heavy or light counter ceiling, 'tiles paving. N° 1 window, N° 2 entrance doors. Dimensions: 5 x 5,5 x 3 mts.

Pos. 5

N°1 work shop room, 5x5.5 mts, 5 mt height, external and internal walls of concrete blocks; ceiling not necessary. N°1, 3 x 3 access door.

Pos. 6

N°1 electrical room, 5x5.5 mts, 5 mt height, external and internal walls of concrete blocks; ceiling not necessary. N°1, 3 x 3 access door.

Pos. 7

N°1 pressurized water and air compressor room, 5x5.5 mts, 5 mt height, external and internal walls of concrete blocks; ceiling not necessary. N°1, 3 x 3 access door.

Pos. 8

N° 1 boiler room, 15.5x5.5 mts, 5 mt height, external and internal walls of concrete blocks; ceiling not necessary. N°2, 3 x 3 access door.

Pos. 9

Locker area for the Reception Area, entirely made of concrete block walls protected with tiles up to 3 mt of 'height, complete of separation walls for w.c. and showers, same materials, heavy or light counter ceiling, 'tiles paving. N° 1 window, N° 2 entrance doors. Dimensions: 5 x 5.5 x 3 mts.

Pos. 10

Pressing area, dim. 30 x 24 mts, 7 mts high, reinforced concrete structure, mesh 24x8 mts, brick or concrete block walls minimum thickness 250 mm, white painted, insulated panel roofing in precoated insulated panel 80 mm thickness; improved concrete floor; separation wall, stainless steel inspectionable drains. Two sides windows 4 x 5 x 1 mts, 30% openable, reinforced glass with aluminum frame. N° 2 fire resistant main doors 6 x 3 mt H.

Pos. 11

Reception area, dim. 34.5 x 24 mts, 7 mts high, reinforced concrete structure, mesh 24x8 mts, brick or concrete block walls minimum thickness 250 mm, white painted, insulated panel roofing in precoated insulated panel 80 mm thickness; improved concrete floor; separation wall, stainless steel inspectionable drains. Two sides windows 4 x 5 x 1 mts, 30% openable, reinforced glass with aluminum frame. N° 2 fire resistant main doors 6 x 3 mt H, N°1 2.5 x 2.5H fire resistant internal door.

Pos. 12

N° 1 outdoor air condenser concrete platform, double reinforced concrete socket 20 mm thickness, dim: 17x2.5 mt.

Pos. 13

N° 1 outdoor scrubber concrete platform, double reinforced concrete socket 20 mm thickness, dim: 5x3 mt.

Pos. 14

Outdoor MBM storage silos concrete platform, double reinforced concrete socket 30 mm thickness, dim: 3x12 mt. Suitable to keep permanent and incidental loads according to local and international standards.

Pos. 15

Outdoor clean fat holding tanks concrete platform, double reinforced concrete socket 20 mm thickness, dim: 3x12 mt. Suitable to keep permanent and incidental loads according to local and international standards.

Pos. 16

N° 2 outdoor truck wheels washing platforms, double reinforced concrete socket 20 mm thickness, dim: 3x8 mt each, provided with drain.

Pos. 17

N° 1 outdoor weighbridge concrete platform, double reinforced concrete socket 20 mm thickness, dim: 3x8 mt.

Pos. 18

N° 1 outdoor waste water collection tank, capacity 30 c.m. reinforced concrete walls and socket, dim: 4x4x2 mt provided with level meter, overfull discharge, inlet and outlet pipes, drain.

Pos. 19

N° 1 waste water treatment station command room, realized in pre-coated insulated panel, 80 mm thick, insulated roof same material, two windows, one access door, concrete floor. Dimensions 4x4x3 mt.

Pos. 20

N° 1 outdoor sludge accumulation tank, capacity 40 c.m. reinforced concrete walls and socket, dim: 5x5x2 mt provided with level meter, overfull discharge, inlet and outlet pipes, drain.

Pos. 21

Roads and squares for heavy vehicles transit, covered with bitumen, approx. 9,800 s.m.

Pos. 22

Fencing protecting the Category 1 processing area, future expansion area and whole perimeter from intruders, height 3 mts., length approx. 500 mts, provided with access gates as described above.

Pos. 23

Green area, approx. 2,200 s.m. of surface.

Pos. 24

Indoor truck washing and sanitation area provided with floor delimitation signs and washing waste water collection pitch and pipeline. Dimensions approx.: 10x 13 mts.

ITEM 4.2 - Weighbridge

Able to meet the EU standards for such equipment.

Assembling: underground, constructed using modules of variable size buried flush with the floor.

Main features

The platform consists of 4/6 standardized modules, which can be easily assembled in work with monolithic structure consisting of IPE / HE beams electro-welded with embossed sheet metal sheared and trimmed on 4 sides.

The modules are bolted to crosspieces, covered with removable hatches for inspection load cell groups.

The breakdown of the bridge into a few elements facilitates handling and allows the transport on open top vehicles, making installation simple and very fast.

In the underground version there are no limits to transverse transit.

Supporting structure

Dimensioning of the load-bearing structures and the choice of electronic sensors holds account of the EC standards, as well as a significant overload on the maximum masses of fully loaded vehicles provided for by the highway code, to the full advantage of the reliability and duration of the system weighing.

Surface Treatment

Surface treatment of the carpentry with gray paint RAL 7031, thickness 90/120 micron, fast drying synthetic finish, single layer with high protection anticorrosive, performing a "one-coat" function of antirust and covering (compatible with any type of paint for future further coating).

Complete with connection cable and display

Dimensions: 8 x 3 meters.

Capacity: 40 Tons.

Division: 10 kg.

ITEM 4.3 Steam generation installation

Power station for the production of steam for the ABP plant.

Main features:

- ✓ N. 1 Steam boiler wet back, three pass design, passing flame, having the following main features: steam output 5,000 kg/h, rated pressure 12 bar.
- ✓ Flanged tube plates not angle welded.
- ✓ 1 Automatic blow down system.
- ✓ N. 2 By-pass pumps installed.

GAS BURNER

N. 1 Modulating Animal fat Burner complete with electronic cam and steam atomisation.

Steam collector with drainage system in black pipe of proper diameter complete with:

N ° 1 floating drain;

N ° 2 shut-off globe valves;

N ° 1 passage indicator;

N ° 1 check valve;

N. 2 Water softeners, 2x250 (250 + 250 litres of resins), automatic and volumetric, by pass installed on a stainless steel skid;

N. 1 Metering pump;

N. 1 Feed water tank, cylindrical, vertical design, with a capacity of 5,000 litres, made of black steel;

N. 1 Water preheating system;

N. 1 Supporting frame;

N.1 Chimney.

ITEM 4.4 - Water pumping station

The system is used to supply drinking water to production lines, sanitary services, and equipment, building sanitary services, outdoor wheel washing points and lawn irrigation.

It is composed as follows:

- ✓ Pressurized group composed of a galvanized tank, assembled electro-pump group with discharge and suction manifolds, fittings, valves on base.
- ✓ Flow rate and water head to be defined during the design phase. Series of galvanized steel pipes, special parts and supports.
- ✓ Series of pipes and special parts in high density polyethylene tube PN16 in various diameters for distribution to buildings.
- ✓ Flow rate from 30 m3 / h to around 4 bars, 3,000 liter tank, N ° 3 pumps of 7.5 HP each.

ITEM 4.5 - Compressed air installation

Used to operate the processing line valves and motors in the production area, workshop, steam generation cabin, waste water treatment plant.

Type: air compressor, stationary, electric motor, piston complete with buffer tank.

Description:

- ✓ Compact structure thanks to the direct connection between the engine and the compressor block.
- ✓ Particularly durable thanks to pistons coated with Teflon and at low speed (1,500 rpm).
- ✓ Tank with internal lining.

Dual cooling system

Efficient cooling system with double air flow; the internal cooling of the housing allows a maximum pressure of 10 bar.

Direct output.

Compact structure thanks to direct drive units. They are maintenance-free and operate without transmission losses.

Characteristics to be defined during the design phase.

Characteristics:

- ✓ Lubrication: oil free.
- ✓ Other features: compact, direct-drive, vertical, horizontal.
- ✓ Pressure: 7 bar, 10 bar (101.53 psi).
- ✓ Capacity: Min: 59 l / min (15.59 us gal / min); Max: 920 l / min (243.04 gal / min).
- ✓ Power: Min: 1.5 kW (2.04 hp); Max: 8 kW (10.88 hp).

ITEM 4.6 - Compressed air distribution line

Made of seamless galvanized steel pipes and supports of proper diameter, complete of special pieces and fittings. The compressed air must be available at all points of the processing equipment as required by Customer specifications, in the work shop room and in at least 5 locations inside the processing building.

ITEM 4.7 Steam distribution and condensate recovery pipelines

The steam distribution system will be designed to feed the batch cooker sand all the dirty and clean fat tanks. The condensate is completely recovered.

Composed of black pipe SS EN 10255, MEDIA series (unless differently specified during the design phase) of proper size, insulated with cupels in phenolic resin and aluminum coating, minimum thickness 20 mm. The network is equipped with an end-of-line drainage system.

ITEM 4.8 - Clean water distribution line

Made of:

- ✓ 1 set of seamless galvanized steel tubes of proper size in the center, divided into different diameters, complete with fittings, curves and special parts.
- ✓ 1 set of valves.
- ✓ PE piping to ensure high pressure UNI 7611 Type 312 p 50 (unless differently specified during the design phase) complete with special parts, with proper diameters - series of interception valves.
- ✓ Series of adjustable flow nozzles with brass body and head.
- ✓ 1 set of washing nozzles.
- ✓ 1 set of supports.

ITEM 4.9 - Firefighting equipment

To protect the production premises, especially the MBM storage, the dirty and clean fat storage, the steam power station, the electrical cabinet and offices. It will be composed of:

- ✓ Wheeled fire extinguishers powder - from 25 to 150 kg powder or foam - from 25 to 150 l. at permanent pressure or pressurizable at the time of use by means of an external N2 or CO2 cylinder for high fire load points.
- ✓ MED portable powder extinguishers of different sizes.

ITEM 4.10 - Electric power distribution

The electric power distribution system shall be able to supply the following:

- ✓ Main ABP processing equipment, installed power 420 kW estimated consumption 250 kW.
- ✓ Water treatment station, estimated installed power 50 kW.
- ✓ Ventilation system, estimated installed power 12 kW.
- ✓ Chemical scrubber tower, estimated installed power 45 kW.
- ✓ Steam production plant, estimated installed power 35 kW.
- ✓ Water pumping station, estimated installed power 10 kW.
- ✓ Air compressor, estimated installed power 8 kW.
- ✓ Plant indoor lightening, estimate power 10 kW.
- ✓ Plant outdoor lightening, estimated power 20 kW.
- ✓ Office and other services, estimated power 15 kW.

Electrical cabinet suitable to host a 1,000 KVA transformer.

Prepared for MT supply with painting by M.T. the cabinet will be provided of lighting, grounding network.

All material suitable for current CEI standards, with constant rated power of 1,000 KVA, primary voltage to be defined and secondary 380V / 220V with neutral. Complete with accessories such as acoustic alarm for high temperature.

Supply of new framework for power factor correction, placed in a cabinet, with protection equipment of the LT line outgoing and plant equipment power factor correction. Complete with voltmeters, disconnectors, fuses, control unit adjustment, warning lights.

Transformers and force distribution drive, with copper bars, cables power inside the panel, terminals and required terminal blocks, circuits auxiliaries, all with the necessary grades of protection required.

Realization of general network for distribution and control of lighting and small driving force, with 30% free space for unexpected additions.

Earthing system, with collector ring dispersant around the building, connected to dispersing pits.

Connection of the same in several points.

Ring connection, by bare copper rope, of all external metal structures, by means of clamps or other to ensure electrical continuity.

Connecting the ring to the earthing network of the other buildings.

Power supply, building framework and distribution to the utilities.

The building's power supply will be derived from the general distribution panel, located in the cabin.

This power supply will be placed under a switch housed within the general distribution network.

The cables must be of adequate section, type.

For crossing areas subject to passage of vehicles heavy cables will be placed within a suitable plastic tube section placed in excavation and protected with concrete slabs, or within a conduit placed in an inspectable tunnel, prefabricated or built on site.

AUTOMATIC DIESEL GENERATOR

Main characteristics:

Self-supporting canopy capable of guaranteeing 70 dB (A) @ 7 meters in free field,

- ✓ structure and sheet in cold galvanized steel laser cut and bent, assembled with steel bolts and bearing rivets; can be dismantled and inspected in all its sides;
- ✓ base and structure are completely free of welds to avoid rusting and surface deterioration with time which makes it particularly suitable and resistant for outdoor installations and use;
- ✓ the painting is made with high resistance epoxy powder;
- ✓ insulation with sound-absorbing materials with Euroclass A1 fire resistance degree.

Power for continuous duty P.R.P. - ISO 8528: 480 kw equal to 600 kVA at 0.8 cosfi10% overloadable for 1 hour every 12.

Power for emergency service L.T.P. - ISO 8528: kW 528 equal to kVA 660 at cosfi 0,8 not overloadable.

Voltage V400 / 220 Frequency 50 Hz.

Rpm: 1,500.

These last parameters to be confirmed during the design phase.

ITEM 4.11 - Assistance to main equipment assembling and start up

The Works Contractor will provide assistance to the process equipment and waste water equipment suppliers during the equipment reception, installation and start up phases.

The main Contractor will take care of the transport of the equipment from CIF to the site location, will locate the equipment in a guarded and repaired place wait for the installation to take place, provide lifting and transportation means and the workmanship of assistance. The technical specifications of the lifting means will be put at disposal by the equipment Suppliers.

1.F.9. LIST OF CONSUMPTION

This installation has been designed to have a very low environmental impact on the basis of the following criteria:

1. The steam needed to cook the raw material and to keep in temperature the dirty and clean fat tanks, is self generated. The fat obtained from the process is used to provide 100% of the energy required for heating. About 56% of the fat produced is recycled back to the plant, thus saving about 1 Million liters of diesel oil annually, that otherwise should be used instead.
2. The use of potable/well water is reduced to the minimum by recovering 100% of the condensate from the cooker and the heated oil tanks. Only a small make up is needed from time to time to integrate the losses along the pipelines. Almost 100% of the clean water is used for cleaning the equipment, the production premises and the wheels of the incoming and outcoming vehicles.
3. The air inside the production premises is always very much polluted and bad smelling. Therefore this installation foresees the use of ventilation system to collect the air inside the industrial premises (of 10 volumes/h capacity approximately) and to take it to a double column scrubber that, by means of circulated clean water and some chemicals, purifies it before discharching it. The pollutants and bad odors are retained by the waste water that is led to the waste water treatment system.
4. The use of clean water is reduced to the minimum and practically only the cleaning and sanitizing water is required to be treated. The average estimated amount of water to treat is 50 cubic meters per day. The treatment system is conceived in a manner that the outgoing clean water and solid waste can be used for agricultural purposes and irrigation.

Table 1.F.7. List of consumption

	Denomination	Installed power	Steam	Water	Compressed air
		kW	*kg/h*	*mc/h*	*Nl/1'*
1	Main ABP processing equipment	420	5,000		300
2	Water treatment station, estimated	50		5	150
3	Ventilation system	12			
4	Chemical scrubber tower	45		5	150
5	Steam production plant	35			
6	Water pumping station	20			50
7	Air compressor	8			
8	Plant indoor lightening	10			
9	Plant outdoor lightening	20			
10	Office and other services	15			
11	Cleaning operations			20	
	Totals	**635**	**5,000**	**30**	**650**

1.F.10. CLASSIFICATION OF PRODUCTION AREAS

In such plants the risk of cross contamination of the finished products and transfer of contaminants to other service areas is very high and it must be contained.

In order to do so, the risk areas have to be classified and keep separated by establishing filtering areas to get though before passing from one area to the other.

This particularly affects:

a) The reception of raw material;

b) The delivery of finished products;

c) The movement of operators and visitors.

According to the attached drawing, the areas are identified into two different classes:

1. Low care area
2. High care area

The **Low care area** is where people, materials and products are supposed to be free from pollutants and the risk to harm people health is low.

The **High care area** is where people, products and materials are exposed to high contamination risk that could harm people health.

Therefore the two different areas are kept isolated one from the other by physical barriers (fences, rooms, doors) and the passage of materials and people from one area to the other are prohibited and strictly controlled.

For example, according to the drawing, the incoming product track is isolated from the delivery one and it is not permitted to a truck carrying raw product, to make use of the low care track without being preliminarily sanitized.

On the top of it, incoming and outcoming trucks in both areas, must undergo a wheel cleaning procedure before being weighed in the platforms.

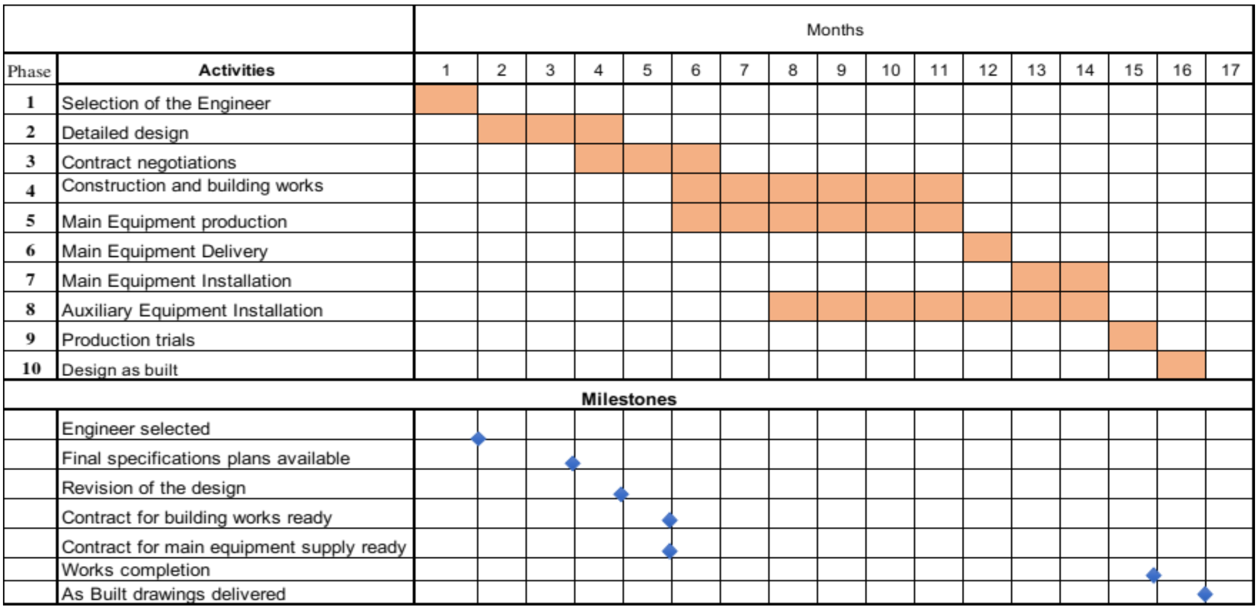
As a rule, the truck drivers in the low care area, should not be allowed to leave the vehicle at all time.

The plant operators and visitors will have access to the production premises only from the office area, considered low care, reach the premises on foot, change dress and shoes in the filtering area, and only after that they are allowed to enter the high care area. On their way back, they will be obliged to change dresses and shoes again in the filtering room; only in such a case, they are allowed to come back to the office.

The area classification and the paths for vehicles and personnel is clearly indicated in the drawing.

1.F.11. GANTT DIAGRAM OF THE PROJECT ACTIVITIES AND MILESTONES

Figure 1.F.2. GANTT Diagram



The total timeframe necessary to the completion of the construction works is estimated in 16 months starting from the selection of the Engineer from the side of the Contracting Authority.

This evaluation may be revised during the Contract finalization phase and it has to be kept continuously updated during the Construction Works by the Engineer after consultation with the Contractor, the suppliers and the Contracting Authority itself.

1.F.12. WORKING PERSONNEL

This list has been produced on the basis of 2-shifts per day working regime.

Table 1.F.8. Staff

Working Personnel	**Units**
Production manager	1
Lift truck drivers	4
Unskilled workers	8
Steam boiler operator	2
Security guards	3
Subtotal	***18***
Administration	
General director	1
Secretary	1
Chief Accountant	1
Subtotal	***3***
Total	**21**

In case of increased production requirements, the number of staff has to be increased proportionally.

SECTION 1.G

TASK 7.

IMPLEMENTATION PLAN

1.G.1. PLAN FOR THE SUSTAINABLE ABPS MANAGEMENT SYSTEM IN MOLDOVA

The objective of the Animal by-products system in Moldova is the establishment of an official, comprehensive system for the safe disposal and/or processing of Animal by-products in accordance with EU and national legislation, from ABPs production, through collection transportation, processing and disposal of derived products.

The scope includes Animal by-products production (in slaughterhouses, food processing establishments, butchers and retail sector, catering waste, former foodstuffs, and Animal by-products deriving from fallen stock), Animal by-products collection and transportation, storage, processing, the storage and the disposal of derived products.

The establishment of a sustainable system for the Animal By-Products management in Moldova requires the adoption of actions in different domains.

The general objective is to establish an official, comprehensive system for the safe disposal and/or processing of ABPs in accordance with EU and national legislation. The specific objectives are as follows:

- To establish a system of collection and transport of ABPs and the system for notifying the by-products to competent services/organisations;
- To establish a system of (temporary) storage of by-products, including storage centres;
- To establish a system of by-products treatment/processing;
- To establish an effective official control system for ABPs;
- To guarantee stakeholders’ awareness, in particular on ABPs management and obligations.

To reach these goals, a detailed plan outlining actions needed has been drafted and is attached (annex 1.G.1), together with a Timetable (Annex 1.G.2). The action plan includes details on:

- Activity,
- Responsibilities,
- Target date,
- Expected results.

In the following pages, details on actions to be adopted are provided. The action plan is completed with a GANTT Diagram for the construction of the processing establishment (Annex 1.G.3).

1.G.1.1. ESTABLISHING THE SYSTEM OF ABPs MANAGEMENT, RAISING AWARENESS

a. Setting up of a central register for all ABPs producers

A prerequisite for the implementation of the ABPs management system is the availability of a register where all ABPs producers are listed, possibly with data on the average amount of ABPs produced on weekly/monthly basis. Considering that main ABPs producers are slaughterhouses, cutting plants, meat processing plants, food of animal origin processing plants and livestock owners, these activities should be already subjected to registration, with basic data already available (name, address, type of activity, responsible person, contact details). The register of ABPs producers should be included in the Veterinary Information System.

b. Setting up of a central register for all ABPs operators

In accordance with the Animal By-products Regulation (EC) No 1069/2009 (art. 47), Member States shall make available lists of approved or registered establishments, plants or operators which are handling animal by-products. The Regulation (art. 41) also provides that lists of establishments or plants approved or registered by the competent authority of a third country from where animal by-products or derived products are exported or sent in transit to the European Union, shall be communicated to the Commission and the Member States and shall be made available to the public.

Format for the presentation of such lists is defined in the document “Technical specifications for the format for the lists of approved or registered establishments, plants or operators handling animal by-products inside the European Union and in Third Countries”, SANCO/7177/2010/rev2. This document provides two formats for the lists, respectively:

- For Member States;
- For Third Countries.

They are presented at Annex 1.G.4, and both the formats are taken in consideration. In view of the possible future accession to the EU, it is suggested to prepare the lists in both the formats. Once they are prepared, the lists will be populated and updated when the animal by-products storage plants and processing plants will be approved.

c. Drafting guidelines for all ABPs producers on ABPs management

The slaughterhouses operators are responsible for implementing adequate procedures for collecting, handling, storing and disposing of ABPs based on their classification, so that do not constitute a risk for animal and human health.

For the sustainability of the ABPs management system, it will be crucial that all ABPs producers will comply with the legal requirements and will adopt Good Practices for ABPs management. To facilitate the implementation of common and correct practices, it will be very useful the preparation of specific guidelines, especially in the sector of slaughtering.

Guidelines should provide indications and instructions to the FBO in the slaughterhouses about the enforcement of legislation related to ABPs management to protect public health, animal health and environment.

d-e. Design and implement awareness campaign for FBOs and stakeholders on their obligations

Stakeholders’ awareness represents a crucial prerequisite for a successful implementation of the ABPs management system in the Country.

In order to avoid any potential risk, in-depth assessment and evaluation of food business operators’ knowledge and of livestock owners on ABPs management and handling with the ABP materials is to be carried out prior developing an awareness campaign. Afterward, a comprehensive awareness campaign shall be developed, targeting different stakeholders, with the objective to make aware every subject of the relevant obligations and responsibilities as far as ABPs management is concerned.

f. Definition of rules concerning the financing and payments for ABPs producers

Considering the situation in Moldova and the relevant amount of ABPs, the activity of ABPs disposal cannot be profitable and it is a real cost that can be supported by the State or by the ABPs producer, or shared between the State and the ABPs producer, according to the system that will be chosen.

It is suggested to provide funds from the State budget for co-financing of by-product producers and for full financing of collection and disposal of dead animals. This was the experience of EU Member States, where at the beginning of the establishment of an ABPs management system compliant with the EU legislation, animal keepers received subsidies for each dead animal reported, in order to motivate the animal keepers to report dead animals (for more details, see chapter 2.F.1.)

Initially, the option of subsidies for establishments producing by-products (slaughterhouses, meat cutting and meat processing facilities) could be considered. In a second phase, if animal by-products will be separated by categories (at the production, collection and processing), it would be justified to review the situation and possibly suspend the co-financing of FBOs producing ABPs (slaughterhouses, meat processing facilities, other food of animal origin processing facilities).

To alleviate the economic burden that ABPs producers would have to bear for the disposal of dead animals and other ABPs, the State could intervene in different ways. For example:

- providing subsidies to ABPs producers: animal keepers would receive subsidies to cover partially or totally the cost for each dead animal reported, while slaughterhouses, cutting plants, meat processing plants and other establishment processing food of animal origin would receive subsidies to cover partially the cost for ABPs collection and disposal;
- if a public enterprise would be established (joint stock company, limited liability company under State ownership or as a form of a public-private partnership), financing directly, with the State budget, the public enterprise in charge for the ABPs management (collection, storage and processing). In this case there would be no cost (or a limited cost) charged to the ABPs producers for collection and processing of animal by-products.

The first option will create an administrative burden with the possibility of mistakes or even fraud by directly subsidizing the ABPs producers. The second option is preferable, even if the enterprise is private.

At a further stage, consideration could be given to reducing the State's share of the costs. This would be in line with the 'polluter pays' principle, also referred to as 'extended polluter responsibility', a key principle of environmental law which strives to transfer the responsibility for dealing with waste to those producing it. However, as the problem of fallen animals impacts on so many areas and could pose a significant risk to biosecurity, it is important that any shift in the share of costs takes account of the public good, so that the correct balance is struck between the latter and the polluter pays principle.

A suitable voluntary insurance Scheme could be drawn up in consultation with all major stakeholders and private insurance companies. This type of insurance system is approved by the EU. In the long term, this might be a very good option for dealing with the permanent problem of fallen animals. It could take the form of a mutual fund into which all livestock farmers make contributions and which pays for the collection and disposal of fallen animals.

1.G.1.2. ESTABLISHING THE SYSTEM OF COLLECTION AND TRANSPORT OF ABPs

a. Definition of criteria for registration/approval of services/organisations in charge of collection and transport

Criteria for registration/approval of services/organisations in charge of collection and transport have been already described at chapter 1.A.1.3.3. ABPs transportation.

b. Identification of services/organisations in charge of ABPs collection and transportation

ABPs collection and transportation can be carried out by the organisation/company that will have the responsibility for the ABPs processing plant, or by a company that will be authorized for this specific activity.

The possibility to use local public utility services could be evaluated, providing that they will be adequately equipped with vehicles adhibited to the transportation of ABPs. Ideally, local public utility services could collect ABPs from retail activities (butcher shops, fishery shops, large retail, supermarket, etc.) and from small establishments. They could therefore be equipped with small vehicles with a capacity of 3-4 tons. However, it should be considered that ABPs should be transported to the processing plant, according to the option that will be chosen. Therefore, the possibility for local public utility services to travel outside the boundary of the area of competence should be further investigated.

Considering advantages and disadvantages, it can be suggested that ABPs transportation will be carried out directly by the organisation/company that will have the responsibility for the ABPs processing plant, as this would be the easiest solution. However, the possibility to involve local public utility services in the collection activity could be considered, especially in the case the processing establishment will be managed by the State.

c. Drafting guidelines for collection and transport of ABPs

Specific Guidelines on collection and transportation of ABPs should be drafted, in order to facilitate activities carried out by hauliers. Guidelines should define good practices related to ABPs transport and collection, starting from legal requirements and explaining in practice how these requirements should be applied. It is important that the Guidelines will have a practical approach, avoiding complicated professional terms: they should be drafted keeping always in mind the final users.

A first part of the Guidelines will be dedicated to the obligation of registration for hauliers', which documents have to be presented and to whom, as this is a preliminary obligation before to start activities.

The second part should be focused on good practices to be applied in daily activity, which containers can be used, which are the obligations concerning temperature requirements, containers' material, cleaning and disinfection operations. Practical examples on how to implement such good practices should be included.

A third part should be focused on traceability obligations, how to keep registers (including an example for the registers), which documents have to follow ABPs during transportation, example of such documents and practical instructions on how to fill them. Rules for keeping documentations should also be incorporated in the Guidelines and explained.

The last part of the Guidelines should include several pictures showing examples of vehicles, containers, containers' identification, storage location of the vehicle or of the reusable containers, equipment for cleaning and disinfecting the vehicles or reusable containers or receptacles, examples of cleaning and disinfection operations, etc.

d. Registration/approval of services/organisations in charge of collection and transport of ABPs

Operators transporting ABPs must be registered ABPs hauliers and listed on Competent Authority's animal by-products transport register. In order to be registered, it is suggested that every company that transports by-products of animal origin and derived products communicates to the Competent Authority the list of vehicles and / or reusable containers placed under its control (model and license plate) and its variations. The communication must contain at least:

a) model and registration plate of the vehicle; in the case of non-labelled reusable containers, the characteristics and dimensions;

b) the storage location of the vehicle or of the reusable container;

c) the office where the register of consignments is held pursuant to art. 22 of Regulation (EC) 1069/2009, if different from the operational or storage site;

(d) the category of animal by-products and derived products transported;

(e) the indication of the washing / disinfection points of vehicles and / or reusable containers.

The operator must clean and disinfect the vehicles or reusable containers or receptacles in which ABPs are transported.

During transport and storage, a label attached to the packaging, container or vehicle must clearly indicate the category of the animal by-products (Reg. 142/2011, Annex VIII, Chapter II); in the case of Category 1 material, 'for disposal only'.

e. Defining operational plans for services/organisations in charge of collection and transport

Several hypothesis of routes for ABPs collection and transportation have been drafted in the framework of this project, and they have been included in Section 1.D. In that Section, detailed calculations are provided, where possible routes are suggested on the basis of the location of ABPs producing establishments (slaughterhouses and food of animal origin processing plants), the frequency of collection, the ABPs amount to be collected. To simulate a realistic situation, an hypothesis of collection along the week (from Monday to Friday) has been prepared.

f. Equipping of services/organisations in charge of collection and transport (vehicles, etc.)

Vehicles and containers should be provided to the services/organisations in charge for ABPs collection and transportation. Number of vehicles, relevant typology and characteristics are strictly connected with the logistic that will be chosen for the system.

An assessment of the needs, types and capacities of the means of transport to be used for the collection of ABPs in slaughterhouses, food processing plants and those to be used for the collection of dead animals has been included in Section 1.D. This also includes general technical specifications for trucks as well as for additional equipment for collecting of animal carcases such as a crane with a hook. On the basis of the technical specifications, and considering the logistical plan that will be chosen, decisions on the procurement of vehicles for ABPs transportation could be adopted.

g. Training of services/organisations in charge of collection and transport of ABPs

The implementation of a system for ABPs collection and transportation compliant with legal provisions requires the implementation of an adequate training program addressed to services/organisations in charge of collection and transport of ABPs.

The training should involve responsible person of the services/organisations in charge of collection and transport of ABPs and all employees, especially drivers. Training activities should be oriented toward a practical approach, focusing on good practices related to ABPs transport and collection.

Considering the target audience, it is strongly suggested to include in the training material videos and picture, showing from a practical point of view how to implement legal requirements and explaining in practice how these requirements should be applied.

An important part of the training should be dedicated to the Guidelines on collection and transport of ABPs drafted under point c of this chapter.

We suggest considering as a prerequisite the attendance to such a training course the possibility for services/organisations to register in the Competent Authority registry for collection and transport of ABPs activity.

1.G.1.3. ESTABLISHING THE SYSTEM OF ABPs STORAGE

The opportunity to establish one or more storage plant in the Country is strictly connected with the number and location of the establishments producing ABPs, the frequency of slaughtering, the location of the processing plant(s), the geographical characteristics and the climatic conditions of the Country itself. Besides, the type and conditions of infrastructures (roads, motorways) are to be considered.

This issue has been already investigated in Section 1.D and preliminary calculations have been already included. The conclusion was that, taking into consideration the total quantities of ABPs to be collected, distances and trip durations which do not exceed 8 hours per round trip (see chapter on the traffic study), we consider that the construction of one or more storage establishment(s) is not needed. This would also result in significant savings in the whole ABPs management system.

Clearly, logistic must be optimised to reduce the time of storage of ABPs before collection, and particularly dead animals are to be promptly collected to avoid public health risks.

An additional option is to include in a specific legislation the possibility to authorize containers (refrigerated) in specific designated areas, where to store fallen stock and to extend the period for the collection. This should be connected with specific geographic constraint, and under specific conditions, and it is the responsibility of the Competent Authority to decide if to give such opportunity.

1.G.1.4. ESTABLISHING THE SYSTEM OF BY-PRODUCTS TREATMENT/PROCESSING

a. Estimation of ABPs quantities per category

A fundamental parameter to be taken in consideration is the amount of ABPs to be processed on yearly basis. It is difficult to estimate the quantity of ABPs produced in Moldova, since categories are not separated in the establishments, records on animal deaths on holdings are not accurate, and the tradition of slaughtering animals on the holdings for own needs is still present.

A detailed estimation has been included in chapter 1.A.4, calculating the amount of each category of ABPs obtained in slaughterhouses, cutting plants, food processing plants, and from fallen stock. The final results are summarised at table 1.A.20.

b. Definition of the most acceptable method for by-products disposal in accordance with the law

This issue has been already evaluated in previous activities of the project, with the final outcome that the recommended method for ABPs processing is method 1. For more details, see Sections 1.B. and 1.F.

c. Preparation of technical specifications for processing, including calling of a tender, selection of location

Technical specifications for the processing plants shall be drafted in line with legal requirements and based on the specifications provided in Section 1.F. As clarified in Section 1.C, the location of the ABPs processing establishment has been already selected and it will be in the surrounding of Criuleni, Plot number 31011010.138.

d. Construction and equipping of the processing plant

The processing plant shall be constructed and equipped In line with the legal requirements, that are summarized at annex 1.B.1. In the framework of the project, technical specifications of the processing plant have been prepared and are provided at Section 1.F.

e. Defining operational rules for the processing plant

Beside requirements related to premises and equipment, the legislation (Reg. 1069/2009, art. 25) includes provisions on hygiene requirements for all ABPs plants, as follows:

- any person working in the plant shall wear suitable, clean and, where necessary, protective clothing;
- persons working in the unclean sector shall not enter the clean sector without first changing their work clothes and shoes or without having disinfected them;
- equipment and machinery shall not be moved from the unclean to the clean sector without first being cleaned and disinfected;
- the operator shall establish a procedure relating to the movements of persons in order to monitor their movements and describe the correct use of footbaths and wheel baths.

In addition, processing plants shall observe the following rules:

- animal by-products shall be handled in such a way as to avoid risks of contamination;
- animal by-products shall be processed as soon as possible. After processing, derived products shall be handled and stored in such a way as to avoid risks of contamination;
- during any processing applied to animal by-products and derived products every part of the animal by-product and derived products shall be treated to a given temperature for a given period of time and risks of re-contamination shall be prevented;
- the operators shall check regularly the applicable parameters, particularly temperature, pressure, time, size of particles, where appropriate by automatic devices;
- cleaning procedures shall be established and documented for all parts of the establishments or plants.

In order to be approved, an own check plan shall be available (Reg. 1069/2009, art. 28), including the prerequisite programs that will be implemented in the plant to guarantee the achievement of the objectives of the regulations. The own check plan shall include an HACCP plan (Reg. 1069/2009, art. 29).

Among the prerequisite programs, a documented pest control program is specifically mentioned in Regulation 142/2011 (Annex IV, Chapter II, Section I), for the implementation of the arrangements for protection against pests, such as insects, rodents and birds. However, it is strongly suggested that at least the following prerequisite programs will also be drafted and implemented:

- Cleaning and disinfection procedure
- Water supply
- Personnel hygiene, health status
- Training and instruction
- Temperature control of storage environment
- Waste management
- Waste water management
- Maintenance and repair
- Traceability
- Calibration (accurately calibrated gauges/recorders must be used to monitor continuously the processing conditions. Records must be kept to show the date of calibration of gauges/recorders)
- Raw materials (supplier selection, specifications)

Concerning the HACCP plan, this shall consider the specific parameters defined for the processing method applied (in our situation, processing method 1).

Prior to issuing an approval for a processing plant, the competent authority must check that a validation of the processing plant has been carried out by the operator in accordance with the following procedures and indicators (Reg. 142/2011, Annex XVI, Chapter I, Section 2):

- a description of the process by a process flow diagram;
- an identification of Critical Control Points including the material process rate for continuous systems;
- the compliance with the specific process requirements laid down by the Regulation;
- the achievement of the following requirements:
  - ✓ particle size for batch-pressure and continuous processes, defined by the mincer hole or the anvil gap size;
  - ✓ temperature, pressure, processing time and, in the case of continuous processing systems, the material processing rate.

In the case of a batch pressure system:

- the temperature must be monitored with a permanent thermocouple and it must be plotted against real time;
- the pressure stage must be monitored with a permanent pressure gauge; pressure must be plotted against real time;
- the processing time must be shown by time/temperature and time/pressure diagrams.

At least once a year the thermocouple and the pressure gauge must be calibrated.

In the case of a continuous pressure system:

- the temperature and the pressure must be monitored with thermocouples, or an infrared temperature gun, and pressure gauges must be used at defined positions throughout the process system in such a way that temperature and pressure comply with the required conditions inside the whole continuous system or in a section of it; the temperature and pressure must be plotted against real time;

- measurement of the minimum transit time inside the whole relevant part of the continuous system where the temperature and pressure comply with the required conditions, must be provided to the competent authorities, using insoluble markers, such as manganese dioxide, or a method which offers equivalent guarantees. Accurate measurement and control of the material process rate is essential and must be measured during the validation test in relation to a CCP that can be continuously monitored such as:
  - ✓ feed screw revolutions per minute (rev./min.);
  - ✓ the electric power (amps at given voltage);
  - ✓ the evaporation/condensation rate; or
  - ✓ the number of pump strokes per unit time.

  All measuring and monitoring equipment must be calibrated at least once a year.
- The competent authority must repeat the checks on the validation procedures when it considers it necessary, and in any case each time any significant alterations are made to the process, such as modifications of the machinery or changes of raw materials

f. Establishment approval

According to Regulation 1069/2009 (art. 24), processing establishments shall be approved. The competent authority shall approve establishments or plants only where an on site visit, prior to start-up of any activity, has demonstrated that they meet the relevant requirements.

The competent authority may grant conditional approval (Reg. 1069/2009, art. 44) if it appears, from the on site visit, that the establishment or plant meets all the infrastructure and equipment requirements with a view to ensuring the application of the operational procedures in compliance with Regulation 1069/2009.

It shall grant full approval only if it appears, from another on site visit carried out within three months of granting conditional approval, that the establishment meets the other requirements. If clear progress has been made, but the establishment still does not meet all of these requirements, the competent authority may extend conditional approval. However, conditional approval shall not exceed a total of six months.

A procedure for the approval of establishments in the ABPs sector should be drafted, specifying:

- Rules for the presentation of the application
- Documentation to be attached to the application
- Details on characteristics of the plan (layout)
- Technical specifications
- Tasks of the Competent Local Veterinary Inspector
- Tasks of the Central Competent Authority
- Rules for issuing the conditional approval
- Flow of information

The procedure should include templates and forms as follows:

- Application form
- Template for the verification of the application and of the documentation
- Check list for the assessment of the plant
- Template of the temporary approval
- Template of the permanent approval
- Template for the communication from Central CA to the operator on the outcomes of evaluations

g. Identification of the most appropriate system for the ABPs processing plant management

Concerning the management of the system, different models can be applied. When choosing the appropriate model, it should be considered that the animal by-products processing plant is run for the benefit of the animal and public health and as such the broader national economy preventing outbreaks of serious diseases. Its objective is to facilitate an efficient nationwide service for the collection and disposal of ABPs and fallen stock. However, the possibility to involve the private sector shall be considered for the overall ABPs management system (processing plant, collection system) or for part of the system, like collection and transport.

In order to achieve the objectives, it is necessary to organise a system of efficient by-products collection and processing. According to preliminary estimations, taking into account the quantities and manner of treatment of by-products at the initial stage, this activity cannot be profitable. Therefore, it is justified to consider the option of establishing a public enterprise (joint stock company, limited liability company under State ownership) for ABPs collection and processing.

Authorities may as well consider a form of a public-private partnership, particularly with regard to management of the system, with the appropriate financial structuring given limited commercial attractiveness of the activity.

hi. If the private solution has been chosen: drafting the tender dossier, award of contract and starting the operations

The preparation of the tender dossier for Procurement of services for management of the ABPs processing plant shall be done following the local Public Procurement Law and the Procurement Rules. Usually, the whole tender procurement process includes the following steps:

- Form Procurement Team
- Develop Tender & Evaluation Criteria eg: Specification or general requirement, Supplier requirements and mandatory requirements (eg ISO standards), Questions, Tender rules or instructions, Evaluation criteria, Contract, The tender procurement process
- Pre Qualification Questionnaire (PQQ) or Tender Long-List
- Issue Tender
- Tender Briefing Meeting
- Initial Evaluation
- Tender Short-list
- Presentations, Interviews & Visits
- Selection
- Negotiations
- Contract Award

It is strongly suggested that a prior specific experience in the ABPs sector will be required to tenderers. Indeed, ABPs sector has peculiarities that require specific skills and knowledge for managing the plant, for ensuring adequate implementation of legal requirements, for organizing an optimized ABPs collection and transportation, for positioning the products on the market.

Approval procedure should be completed before launching the tender, to guarantee that at the time of tendering the establishment is in compliance with legal requirements.

1.G.1.5. CAPACITY BUILDING OF COMPETENT AUTHORITIES IN THE ABPs SECTOR

a. Preparation of a training program for inspectors on ABPs sector and ABPs management

The implementation of effective official controls over the ABPs sector is crucial for a successful implementation of the ABPs management system in Moldova. Therefore, adequate training sessions should be organized, involving authorities with responsibility in the organization of official controls and all the inspectors involved in control activities on ABPs operators (processors, transporters,) and on ABPs producers (slaughterhouses, food processing plants).

The main difficulty is connected with the fact that the ABPs management system has to be implemented in a sector where currently a complete deregulation is observed. A change of the approach of the inspectors toward this sector is therefore required, and this implies the adoption of training strategies focused on a practical approach. The methodology adopted must result in positive changes in participants' capacity to fully understand and properly apply tools and procedures relating to the ABPs sector.

Considering the above, the following principles should be applied to the organisation and delivery of the trainings:

- Emphasis on practice vs. theory
- Blended learning – use of different learning tools
- Group discussion

The training shall be aimed at improving knowledge and skills of control staff on official control in the ABPs sector, disseminating best practices and enabling the exchange of practical experience in the matters covered by the training. Furthermore, the agenda for the workshop shall be centered on enhancing the participation of all trainees in discussions and practical exercises.

b. Drafting training material

Training material shall be prepared on the basis of the approach that will be decided when drafting the agenda. Presentations and lectures should constitute the core of the training, however several videos and picture illustrating field situations should be prepared.

Promoting uniform practices should be mainstreamed in all training activities and this should be taken in account when preparing slides and exercises. The agenda for the training course should be focused on promoting the participation of all participants in discussions and practical exercises, and most the training course time should be dedicated to interactive sessions.

Videos and pictures illustrating field examples of situations described during the training session and commented by trainers should be included in the training program. Videos should be prepared also for case studies, and should be focused, for example, on how to carry out official controls in the field. The videos should include examples of good and bad practices when carrying out inspection and audit. The video should be interspersed with Q&A sessions and participants should be challenged with questions aimed to clarify which approach should be followed during official controls. This should result in a certain harmonisation of practices and it is intended to increase the effectiveness of the training.

Key issues to be considered:

- each theoretical presentation should be followed by a structured discussion; trainers will act as facilitators asking probing questions to stimulate plenary discussion;
- to promote active participation, the trainers will promote preparation of case studies supplied by the participants prior to the course. In this way, the course will be used as an opportunity for participants to develop together action plans dealing with real-world problems and taking account of current situations.

c. Training of inspectors on ABPs management

The methodology should be tailored to the needs of officials involved in official control activities in the ABPs sector. Care should be taken to ensure that traditional academic teaching methods do not dominate the training programme. Instead, the material should be presented in novel and practical ways that will maintain interest and provide effective learning. Lectures should be kept short and interspersed with other activities.

An alternate system should be employed. This approach should consist of a methodological mix of classroom training focusing on niche topics, case studies and simulation exercises. The combination of various methodologies in addition to a mix of plenary and breakout sessions is designed to retain participant interest and build interpersonal relationships among participants.

This method of teaching promotes active learning. Lectures will be followed by case studies illustrating the concepts and principles presented.

Participants will also be invited to present a specific case study based on a relevant situation occurring in their daily activity which then can be used as practical case study. This format is designed to promote an exchange of ideas and experiences between participants and will give an insight into the alternative approaches adopted. An interactive discussion supported by input from the trainers should help participants to solve the problem and describe the suggested approach.

It is expected that a combination of different and proactive methodologies will stimulate interaction between participants and provide a highly effective mixture of theoretical and practical training content. The general approach should be to limit conventional classroom lecture to not more that 30-40% of overall time dedicated to training. The remaining part should be dedicated to case studies and interactive exercises.

Group work will stimulate individuals to openly participate to discussions and confront opinions with other participants and with the trainers. All this will enhance the learning process and ensure more durable and effective training results. Group work will also constitute an opportunity for trainers to check the degree of understanding of participants. This will enable trainers to hold short refresher sessions in subsequent phases of the programme and include participants who showed a minor level of understanding during group work.

In order to evaluate the impact of the training on trainees, a test of knowledge should be carried out by all participants at the beginning and at the end of each training session.

d. Preparation of a coordinated National Official control plan on ABPs management

Regulation 625/2017 on official controls and other official activities performed to ensure the application of food and feed law, rules on animal health and welfare, plant health and plant protection products requires Member States to set up and regularly update a Multi-Annual National Control Plan (MANCP) covering all the areas governed by Union agri-food chain legislation and containing information on the structure and organisation of its system of official controls (art. 109). Animal by-products official control is included among these areas, therefore a National Control Plan on ABPs management shall be prepared.

The general goal of the National Control Plan is to foster a coherent, complete and integrated approach of official control in the ABPs sector with the aim to protect the animal and public health.

Specific goals are further summarised:

- ensure the uniform and coordinated implementation of control activities on the entire national territory;
- ensure the respect of operative criteria established in the Regulation 625/2017 when conducting the control activities;
- improve the efficiency of official control activities and of the subsequent activities;
- define the priorities based on the risks and the criteria for risk classification of the concerned activities and the most efficient control procedures;
- raise the visibility of services.

Programming and implementation of official control includes different stages:

1. definition of structures subject to controls;
2. definitions of control procedures and the relative modules;
3. assessment of available resources;
4. assessment of level of risk of the activities;
5. programming of official control activities;
6. implementation of official controls;
7. documentation of activities;
8. reporting;
9. verification of activities;
10. reprogramming of activities.

The National Control Plan shall be prepared starting from the assumption that there will be at least two level of responsibilities as far as official control is concerned: the first level being the "Inspector", in charge for carrying out inspection in the ABPs establishments, for reporting, for taking actions in case of non compliances and the second level being the "supervisor", in charge for verifying activity carried out by local inspectors.

e. Preparation of SOPs for Official Control on ABPs management, including forms

Official controls shall be carried out using appropriate control methods and techniques such as audit, inspection, sampling and analysis. Other control activities, as monitoring, verification and surveillance, can be applied accordingly to the instructions set in the National official control plan.

In the framework of the official control programming activity, it shall be decided the most appropriate technique(s) having regard to:

- *the available resources*: auditing requires more time, personnel, skilfulness and knowledge than inspection. Sampling and analysis activity depend on adequate laboratory resources availability;
- *the food chain stage*: controls techniques used to assess the ABPs sector, are substantially different from those utilized at different stages of food production;
- *the business size*: this aspect directly impacts on the complexity of the activity carried out and, consequently, on the type of controls;
- *the relative ranking:* each business should be ranked according to the risk, in order to obtain a risk classification on the basis of which the CA establishes the official control activities and frequency. Higher relative risk leads to more frequent and deeper (i.e. audit vs. inspections) controls.

Regulation 625/2017 (art. 5) requires that the competent authorities shall:

(a) have procedures and/or arrangements in place to ensure the effectiveness and appropriateness of official controls and other official activities;

(b) have procedures and/or arrangements in place to ensure the impartiality, quality and consistency of official controls and other official activities at all levels;

(c) have procedures and/or arrangements in place to ensure that staff performing official controls and other official activities are free from any conflict of interest.

The same Regulation (art. 3) defines 'control verification procedures' as follows: the arrangements put in place and actions performed by the competent authorities for the purpose of ensuring that official controls and other official activities are consistent and effective. 'Control system' is defined as a system comprising the competent authorities and the resources, structures, arrangements and procedures set up in a Member State to ensure that official controls are performed in accordance with the Regulation 625/2017.

Therefore, Competent authorities shall perform official controls in accordance with documented procedures. Those procedures shall contain instructions for staff performing official controls.

Usually, these procedures are foreseen for main control activities: inspection, audit, sampling.

The adoption of Standard Operating Procedures guarantees that official controls are carried out uniformly and are of a high quality. Procedures should be complemented with templates like check lists and other forms. It is important that specific instructions will be provided for each template that has been prepared.

f. Implementation of training of inspectors on the National Official control plan

Inspectors should be fully aware of the approach and of the detailed contents of the MANCP and of the specific National Plan on the ABPs sector. Proper implementation and enforcement can be achieved only through theoretical understanding and practical experience in official controls, and through familiarity with the roles and responsibilities of inspectors and economic operators.

Therefore, a specific training should be organized and implemented, focused on the main contents of the National Control Plan in the ABPs sector. During this training, beside the main contents of the NCP, specific sessions should be dedicated to training on official control procedures, namely audit and inspection. It can be presumed that inspector will be already trained on the main concepts related to audit and inspection, so this training should be focused on the specificity of the ABPs sector.

As far as the method of the training is concerned, training should be carried out also in the field, through simulations of inspections and audits, where trainees will be asked to perform official control activities following the procedures and adopting forms and check lists. This approach should facilitate the adoption of a common approach toward official controls in the ABPs sector, facilitating the harmonisation of inspections and the execution of official controls in compliance with legal provisions. During the training sessions, the trainer should focus not only on possible lack of theoretical knowledge, rather on deficiencies in practical implementation during official control activities.

A significant part of the training should be dedicated to practical exercises and the format should include lessons/discussions during which the exchange of knowledge and experiences should be encouraged among colleagues coming from different areas of the Country. Practical exercises should aim at assessing the acquired knowledge, and should provide inspectors with practical tools to be used during daily work activity.

1.G.1.6. TRACEABILITY

a. Drafting guidelines on ABPs traceability

As Best Practices, key steps in developing traceability systems should include:

- Step 1. Define the scope of the traceability system,
- Step 2. Decide on the optimal batch size,
- Step 3. Identify the traceability information needed,
- Step 4. Establish a system of record keeping and retrieval,
- Step 5. Establish procedures for review and testing of the traceability system,
- Step 6. Document the traceability system.

Reg. 1069/2009 provides specific rules on ABPs traceability (art. 22), specifying that Operators consigning, transporting or receiving ABPs or derived products shall keep a record of consignments and related commercial documents or health certificates. These operators shall have in place systems and procedures to identify:

(a) the other operators to which their animal by-products or derived products have been supplied; and

(b) the operators from whom they have been supplied.

The requirement relies on the “one step back”-“one step forward” approach which implies for Operators that:

- they shall have in place a system enabling them to identify the immediate supplier(s) and immediate customer(s) of their products;
- a link “supplier-product” shall be established (which products supplied from which suppliers);
- a link “customer-product” shall be established (which products supplied to which customers).

During transportation, a commercial document or, when required by the Animal By-Product Regulation, a health certificate must accompany animal by-products and processed products (Reg. 142/2011, art. 17, Annex VIII, Chapter III). Commercial documents must specify:

- the date on which the material was taken from the premises;
- the description of the material, including:
  - ✓ the category of the animal by-products or, in the case of processed products, the category of animal by-products from which the processed products were derived;
  - ✓ in the case of Category 3 material, the words ‘not for human consumption’;
  - ✓ in the case of Category 2 material, other than manure and digestive tract content and processed products derived therefrom, the words ‘not for animal consumption’;
  - ✓ in the case of Cat. 1 material and processed products derived therefrom, the words ‘for disposal only’;
  - ✓ the animal species for Category 3 material and processed products derived therefrom destined for use as feed material;
- the quantity of the material;
- the place of origin of the material;
- the name and the address of the consignor
- the name and the address of the carrier;
- the name and the address of the receiver and, if applicable, its approval number;
- if appropriate:
  - ✓ the approval number of the plant of origin;
  - ✓ the nature and the methods of the treatment.

The commercial document must be produced at least in triplicate (one original and two copies). The original must accompany the consignment to its final destination. The receiver must retain it. The producer must retain one of the copies and the carrier the other. Documents must be kept for minimum 2 years. Annex VIII of Regulation 142/2011 provides a model commercial document which may be used but it is not mandatory to do so provided all the required information is recorded.

Every Operator, at every step in the ABPs chain, has a role to play in the ABPs traceability. Consequently, Operators should pay particular attention to the effective and efficient transfer of accurate traceability information to their immediate customers.

The above rules apply to the whole ABPs chain, starting from the ABPs origin, through transportation, storage, further transportation, processing, until the final destination of the derived products. Therefore, the preparation of guidelines on ABPs traceability that will apply to the whole ABPs chain is considered necessary, where general instructions on how to comply with legal requirements should be provided, together with examples of best practices. Such Guidelines should serve as a reference both for the operators and for the Competent authority.

bcde. Drafting procedures and templates for the establishment of a record-keeping system: ABPs production, transportation, storage, processing

As stated above, art. 22 of Regulation 1069/2009 requires that Operators consigning, transporting or receiving animal by-products or derived products shall keep a record of consignments and related commercial documents or health certificates.

Rules concerning the records to be kept are defined in Regulation 142/2011, Annex VIII. The records shall contain:

(a) a description of:

(i) the animal species for Category 3 material and derived products therefrom, destined for use as feed material and, if applicable, in the case of whole dead animals and heads, the ear-tag number;

(ii) the quantity of the material;

(b) in the case of records kept by any person consigning ABPs or derived products, the following information:

(i) the date on which the material was taken from the premises;

(ii) the name and the address of the transporter and of the receiver and, if applicable, their approval or registration number;

(c) in the case of records kept by any person transporting animal by-products or derived products, the following information:

(i) the date on which the material was taken from the premises;

(ii) the place of origin of the material, from where the material is dispatched;

(iii) the name and the address of the receiver and, if applicable, its approval or registration number;

(d) in the case of records kept by any person receiving ABPs or derived products, the following information:

(i) the date of reception of the material;

(ii) the place of origin of the material, from where the material is dispatched;

(iii) the name and address of the transporter.

Operators do not have to keep the information referred to in point (a) and points (b)(i), (c)(i) and (iii) and d(ii) and (iii) separately, if they keep a copy of the commercial document for each consignment and make such information available in conjunction with the other information required. In the same way, the Regulation does not require to keep the records electronically.

Considering the importance to guarantee traceability in the whole chain, for each sector of the ABPs chain (production, transportation, storage) procedures and templates for the establishment of a record-keeping system should be developed and implemented.

1.G.1.7. FACILITATION OF HACCP PRINCIPLES IMPLEMENTATION IN THE ABPS PROCESSING PLANT

a. Preparation of Official guidelines on HACCP implementation in ABPs processing plants

A system of own check control is necessary to ensure that within a processing plant, the requirements of the ABPs Regulation are fulfilled. The own checks should be carried out based on the hazard analysis and critical control points (HACCP) principles. The HACCP principles should be based on the experience of their implementation under Community legislation on food and feed hygiene.

Therefore, implementation of a system based on HACCP principles, according to Regulation 1069/2009 (art. 29), is an obligation for operators of ABPs processing plants.

By the way, article 30 of Regulation 1069/2009 states that "…competent authorities shall encourage the development, dissemination and voluntary use of national guides to good practice in particular for the application of HACCP principles. Operators may use such guides on a voluntary basis."

The experience matured in sector where HACCP implementation is required since many years (i.e. the food sector) strongly suggest that specific guidelines will be prepared and that support will be provided in the development of national guides to good practice and for the application of HACCP principles.

In order to create a common language and to spread basic concepts, Guidelines on prerequisites and HACCP implementation should be developed by a Working group appointed for that scope.

Components of the Working Group should be representatives of relevant Institutions including inspectors and official veterinarians that are in charge to carry out official control activities in the field. The Working Group could be supported by experts in specific fields. International reference documents should be taken in consideration for the development of these Guidelines.

Guidelines on prerequisites and HACCP should provide:

- a glossary;
- definitions and clarifications on prerequisites and HACCP principles;
- basic information on the minimum requirements that a HACCP plan should satisfy;
- examples for the facilitation of the implementation of prerequisites and HACCP;
- generic HACCP and prerequisites plans;
- specificities of the HACCP plan in the ABPs sector (requirements concerning the validation of the process);
- forms and templates for a practical implementation;
- references.

These Guidelines should not be used as they are, meaning that a “copy and paste” approach should be avoided; they should be the basis for the preparation of HACCP plans adapted to each establishment. This means that each operator should, on the basis of the Guidelines, conduct a study of the process and of the product, in order to guarantee that the HACCP plan is tailored on the specific situation of the establishment.

b. Development of Guidelines on HACCP assessment in the ABPs sector

Another fundamental instrument for correct implementation of HACCP systems is the Official Guidelines for audit and HACCP assessment. These guides describe methods, approach, techniques, for auditing of HACCP systems and can be used by inspectors but also by operators for own-check activities.

The already appointed Working Group, with the support of experts in audit techniques and in the ABPs sector, considering the specific National situation and using similar Guidelines already published, should develop Guidelines for own-check and HACCP assessment. The WG’s members should be initially trained, about general concepts and point of view of audit approach, EU legal framework on inspection and audit.

These Guidelines should deal with topics such as:

- how to plan, conduct, follow up an audit;
- how to communicate with the organization audited;
- how to register and communicate the results;
- how to use the results for the future planning.

The content of the Guidelines should include the following points (this is not an exhaustive list):

- glossary;
- differences between inspection, audit, verification, evaluation;
- assessment of prerequisites;
- assessment of an HACCP plan;
- documental evaluation;
- audit techniques;
- enforcement actions;
- practical suggestions;
- check-lists and relevant explanations;
- how to check that a validation of the processing plant has been carried out by the operator.

c. Training of inspectors on HACCP assessment in the ABPs processing plants

Considering HACCP principles and relevant assessment, two separate training sessions should be organised, with the overall objective to enhance the inspector's knowledge concerning the HACCP principles and consequently to make the trainees familiar with relevant assessment techniques, in order to improve their controlling capacities.

HACCP is a topic that usually is not easy to manage in a training session. This is mainly because, usually, trainees have already undergone theoretical training sessions on HACCP and for this reason the common thought is that there is no need for additional training. Previous experience in the field, matured evaluating the performance of inspectors assessing HACCP and own-check plans, clearly shows the frequent inadequateness of theoretical knowledge on prerequisites programs and HACCP principles, relevant implementation and assessment, and the improper approach that is often followed during the assessment in the field. For this reason, the training should be organised mainly through exercises based on the preparation of an HACCP plan (first session on HACCP) and on the evaluation of an HACCP plan that will be presented to the trainees. This will allow to discuss about practical problems that could emerge in the HACCP assessment, and will facilitate the adoption of best practices.

A specific part of the training should be dedicated to the contents of the Guidelines prepared under the previous activity, and special focus should be given on the checks to be performed in relation to the validation of the process.

1.G.2. NEEDS FOR THE OFFICIAL CONTROL

1.G.2.1. ABPs OFFICIAL CONTROL SYSTEM

The implementation of a systematic and effective Official Control system on animal by-products requires the adoption of some basic principles, that are further summarized.

Control planning

Official Control on animal by-products shall be integrated in the Multiannual national control plan (MANCP) and in the Annual national control plan (ANCP). Specific rules on the preparation and implementation of the MANCP are included in Regulation 625/2017 (art. 110). MANCPs shall contain general information on the structure and organisation of the systems of official control in each of the areas covered (therefore, including animal by-products), and shall contain information on at least the following:

(a) the strategic objectives of the MANCP and on how the prioritisation of official controls and allocation of resources reflect these objectives;

(b) the risk categorisation of the official controls;

(c) the designation of competent authorities and their tasks at central, regional and local level, and on resources available to those authorities;

(d) where appropriate, the delegation of tasks to delegated bodies;

(e) the general organisation and management of official controls at national, regional and local level, including official controls in individual establishments;

(f) control systems applied to different sectors and coordination between the different services of competent authorities responsible for official controls in those sectors;

(g) procedures and arrangements in place to ensure compliance with the obligations of the competent authorities

(h) the training of staff of the competent authorities;

(i) the documented procedures to carry out official controls.

Adherence to the national legal framework (harmonized with the EU legislation)

Official controls shall be carried out in line with the national legal framework which shall be fully harmonized with Regulation 1069/2009 laying down health rules as regards animal by-products and derived products not intended for human consumption and Regulation (EU) No 142/2011, implementing Regulation (EC) No 1069/2009.

Specific provision on official controls to be carried out in ABPs plants are defined in Regulation 142/2011, Annex XVI, where it is prescribed that the competent authority shall supervise processing plants to ensure compliance with the requirements of Regulations 1069/2009 and 142/2011. The competent authority shall, in particular:

- check the general conditions of hygiene of the premises, equipment and staff;
- check the efficacy of the own checks carried out by the operator of the processing plant; such checks must include an examination of the results of those checks and if necessary, the taking of samples;
- check the effective implementation of the permanent written procedure based on the HACCP principles; such checks must include an examination of the results of this implementation and if necessary, the taking of samples;
- check the standards of the products after processing; the analyses and tests must be carried out in accordance with scientifically recognised methods;
- check the storage conditions;
- take any samples required for laboratory tests.

Article 45 of Reg. 1069/2009 states that the competent authority shall at regular intervals carry out official controls and supervision of the handling of animal by-products and derived products falling within the scope of this Regulation.

Article 32 of Regulation 142/2011 foresees that control is carried out on the entire chain of collection, transport, use and disposal of animal by-products and derived products, and specific reference is made to the principles for official controls laid down in Article 3 of Regulation (EC) No 882/2004 (now replaced by Regulation 625/2017).

Regulation 625/2017 applies to the official controls performed for the verification of compliance with the rules in the areas of "…prevention and minimisation of risks to human and animal health arising from animal by-products and derived products". Article 20 states that Official controls shall be performed at any stage of production, processing and distribution, on animals, on products of animal origin, on germinal products, on animal by-products and on derived products. Art. 18 of the Regulation specifies that official controls performed in slaughterhouses, cutting plants and game-handling establishments shall be carried out including the handling and disposal of animal by-products and of specified risk material.

Official controls shall include checks on the keeping of records and other documents required by the rules laid down in this Regulation.

Additional rules are provided in the Commission Implementing Regulation 2019/627 laying down uniform practical arrangements for the performance of official controls on products of animal origin intended for human consumption. Article 7 states that the competent authorities shall, when carrying out an audit in establishments handling fresh meat, verify continuous compliance with food business operators' own procedures concerning the collection, transport, storage and handling of fresh meat, and the use or disposal of animal by-products, including specified risk material, for which they are responsible.

Article 29 clarifies that the official veterinarian shall check the removal, separation and, where appropriate, marking of specified risk material. Moreover, the official veterinarian shall ensure that the food business operator takes all necessary measures to avoid contaminating meat with specified risk material during slaughter, including stunning. This includes the removal of specified risk material.

Risk based approach

As already stated, Regulation 625/2017 requires a risk-based approach in official control. Therefore, a tool to classify establishments and activities according to the risk should be prepared, with the aim to make available an objective tool, useful to increase or decrease control's frequency on the basis of uniform criteria.

Many factors can be considered in order to determine the category into which a particular business falls. Risk criteria can be divided in two groups:

- risk factors related to the establishments which are determined by the type of the business, amount of production, final destination of the products;
- risk factors related to the actions put in place by the operator (prerequisites and HACCP principles implementation) and the level of compliance with legal requirements.

A preliminary tool for risk classification of business can be based on the grounds of type of activities and category of the ABPs.

The purpose of this tool is to allow for the preparation of an official control plan, which results will be used in the future for the implementation of a more detailed tool on risk classification, that will consider also the hygienic situation of the establishment, past non compliances, adequateness of the management system of the plant and HACCP.

The risk categorisation provides a risk management tool that will allow competent authorities to provide a consistent approach to inspection planning and resource allocation, giving greater attention to higher risk establishments and therefore improving public health protection. Basically, frequency of audit and inspections will be decided on the basis of objective criteria, to be set up when defining the risk classification tool.

Coverage of the whole ABPs chain

As already specified, official controls shall be carried out on animal by-products producers, especially in the fresh meat sector (slaughterhouses, cutting plants, game handling establishments), and in the animal production sector.

Operators of the whole ABPs chain shall be included in the Official control plan. In first instance, ABPs operators shall be covered by official control activities:

- Incinerators;
- Establishments disposing animal by-products, if they are waste, by co-incineration;
- Processing plants;
- Establishments carrying out one or more of the following activities: sorting, cutting, chilling, freezing, salting, removal of hides and skins or of specified risk material;
- Plants manufacturing organic fertilisers and soil improvers;
- Plants transforming animal by-products and/or derived products into biogas or compost;
- Pet food plants;
- Storage establishments for ABPs;
- Storage establishments for derived products.

Operators dealing with ABPs transportation activities shall also be covered by official control.

In the case where authorised veterinarians carry out the activities of official controls - checks of animals before and after slaughter and fresh meat in approved establishments and control of classification and marking of by-products in slaughtering facilities, an adequate supervision shall be guaranteed.

1.G.2.2. CONTROL’S FREQUENCY AND NEEDS FOR OFFICIAL VETERINARIANS

Official control of ABPs operators

A basic frequency level should be established, and an example is presented at table 1.G.1. Afterward, the frequency of Official controls should change, following a risk based approach in control visits being focused on higher risk operators/facilities and those previously non-compliant with the requirements of the ABPs regulation. It shall be pinpointed that this is only an example, to be adapted to the specific situation of the Country. The frequency should be raised at the beginning.

Table 1.G.1. Example of minimum frequency of official control in the ABPs sector

Type of facility	Audit	Inspection
ABP plant handling and storage of one Category of ABPs	1/year	2/year
ABP plant processing of Category 1 ABPs	2/year	10/year
ABP transportation means	1/year	4/year
Incineration plants	1/year	2/year

The minimum duration of an inspection and of an audit can be established on the basis of the type of activity and the dimension of the company. For processing plants, audit duration is estimated on average in 1 working day, the duration of an inspection is around half working days. These durations are reduced in simpler activities, like transportation or storage.

The practice shows that regular official control visit lasts for 3-4 hours (half working day). It is carried out without prior announcement, or with a short notice to ensure the availability of relevant staff for interviews (managers and responsible persons for certain tasks, facility operations and data records / documentation).

Additional controls in case of identified non-compliances and follow up activities are usually announced and deadlines stipulated in the inspection/control record sheet (e.g. technical defects of equipment, poor commercial documents, poor traceability documents, pest control issues, poor bio-security measures, leaking vehicles and transport documentation issues). The control of the ordered measures (correction of irregularities) is not long-lasting, it is usually connected with other activities in that geographical area and lasts for a maximum of 1-2 hours.

The implementation of official ABP controls will (especially related to ABP traceability) be significantly improved and facilitated once the Veterinary Information Management System / Application for ABPs management is operational.

Needs for official veterinarians can therefore be established on the basis of the number of establishments/operators and according to the typology.

On average, working days required every year for carrying out inspection and audit in the ABPs sector are shown at table 1.G.2.

Table 1.G.2. Average working days required every year for official control in the ABPs sector

Type of facility	Audit	Inspection	Total
ABP plant handling and storage of one Category of ABP	1/year	2/year	2 wds/year
ABP plant processing of Category 1 ABPs	2/year	10/year	7 wds/year
ABP transportation means	1/year	4/year	3 wds/year
Incineration plants	1/year	2/year	2 wds/year

The above calculations do not include time for signing certificates, for sampling and more in general the additional time required for situations/establishments particularly at risk. Moreover, when a processing plant starts the operations, control frequencies should be significantly increased.

Official control of ABPs producers

As already clarified, main ABPs producers are slaughterhouses, cutting plants and farmers. Official control activities in these sectors are already carried out for food safety, animal health and animal welfare purposes. Therefore, specific controls on ABPs are to be included in the more general official control activities, and it is difficult to estimate how much additional time should be dedicated to this specific activity.

Concerning live animals in the farm, we can say that for animal health purposes the farm register shall be checked, evaluating animals' movements and regularity of the documentation. In this sector, we cannot say that additional time has to be dedicated for checking compliance with animal by-products provisions.

Official control of animal by-products in the slaughterhouses includes specific activities that have to be carried out to verify that the FBO is implementing measures in compliance with obligations foreseen in Regulation 1069/2009. We can estimate that for each slaughtering session an average of 30 minutes should be dedicated to official controls specifically focused to ABPs management. Therefore, in a slaughterhouse that operates on daily basis (from Monday to Friday), half working day/week has to be added to the time usually dedicated to official control. This means around 25 additional wds/year for each plant operating on daily basis.

A total of 144 slaughterhouses are registered in Moldova, out of which 138 are in operation. Based on the data collected in relation to the frequency of slaughtering, results are showed a table 1.G.3.

According to this preliminary rough estimation, around 1,700 – 1,750 additional working days/year are needed in Moldova for appropriate control on ABPs producers. This means around 7 veterinarians to be added to the staff. Clearly, these 7 veterinarians are not to be considered as staff dedicated only to official controls on ABPs. Rather, the workload for the veterinarian staff will be increased and therefore 7 additional veterinarians could be needed.

Table 1.G.3. Time needed for Official controls on ABPs in slaughterhouses

N. of slaughtering days/week	*Time for Official control on ABPs/week*	*N. of slaughterhouses*	*Total Time for Official control on ABPs*		
			Hours per week	*Hours per year*	*Days per year*
1	30’	21	10.5	546	68
2	60’	19	19	988	123
3	90’	24	36	1,872	234
4	120’	10	20	1,040	130
5	150’	28	70	3,640	455
6	180’	32	96	4,992	624
7	210’	4	14	728	91
Total		144	265.5	13,806	1,725

1.G.2.3. ASSESSMENT OF NECESSARY EQUIPMENT

Equipment regularly used when carrying out official control shall be available:

- clean protective clothing, hairnets/hats, helmets, overshoes/boots, protective masks, plastic gloves;
- sampling equipment, plastic bags, cold box;
- temperature-monitoring device;
- phmeter if needed.

Whenever measurement devices are used, they must be calibrated in the same measure interval in which the instrument is reasonably used.

Additional equipment needed for TSE sampling (in case it is carried out in the processing plant):

- Plastic spoon able to remove the brain stem intact, without damage to the obex area;
- Forceps: disposable, single use plastic dressing forceps, preferably blunt ended;
- Scissors;
- Sample pots: standard 100ml polypropylene pots with spin seal cap;
- Ice pack: reusable leak proof plastic pouch containing a non-toxic, non-caustic refrigerant gel;
- Packaging plastic bags with label, large enough to carry an ice pack and several 100ml sample pots;
- Packaging box (for the transport) made by temperature-proof insulating material, with dimensions adequate to carry multiple samples and ice packs

1.G.2.4. ASSESSMENT OF COSTS FOR THE OFFICIAL CONTROL

As we have seen, no additional control will be necessary in the live animal sector, while in slaughterhouses the time to be dedicated to this specific control activity is minor, comparing with the normal activity carried out by the official veterinarian in the slaughtering sector. However, additional staff will be needed (7 veterinarians).

Concerning the cost for official control on the ABPs operators, we can initially consider that one processing establishment will be built. For this plant, around 10 wds/year will have to be dedicated to official control. It is more difficult to make an estimation concerning transporters. However, if the ABPs management plan will be implemented as suggested, ABPs transportation activity will fall directly under the responsibility of the ABPs processing plant, and therefore we can assume that the general official controls carried out on the processing plant will include also controls of the transportation activity.

If TSE sampling activity will be carried out in the ABPs processing plant, additional resources (official veterinarian time) will need to be allocated in case this activity will be assigned to the official veterinarian. Sampling could also be performed by lay persons under the responsibility of the Competent Authority. However, it should be considered that in this case there will be no need to carry out the sampling activity at the farm, instead we will have aggregately a saving of time to be dedicated to the sampling activity.

PHASE 2

SECOND PHASE OF THE PROJECT

Following the delivery of the key outputs under this assignment, the Government has requested IFC to produce a second set of deliverables covering a technical option different (additional) from the one initially recommended by the Feasibility Study.

Particularly, the Government showed interest in the feasibility of processing Category 3 Animal by-products separately from Category 1 &2; additionally, the Government showed interest in the feasibility of constructing a biogas generation installation to complement the ABP processing facility for more sustainable operation.

This Chapter presents an update of the tasks and deliverables following the additional request by the Government, as further summarized.

- *TASK 2: Operational /technical model.*

  To develop an Operational/Technical model reflecting the second technical option as requested by the government. Additionally, to perform a preliminary analysis on the possibility to construct a biogas plant.

- *TASK 3: Assessing location.*

  To provide any upgrades that may be necessary to reflect the additional technical option requested by the Government.

- *TASK 4: Traffic study.*

  To update the Traffic study to reflect the changes caused by the second technical option requested by the government.

- *TASK 5: Financial plan.*

  To develop a Financial plan reflecting the second technical option as requested by the government.

SECTION 2.A

TASK 2

OPERATIONAL /TECHNICAL MODEL

2.A.1. FEASIBILITY STUDY

The Part 2 of the feasibility study will provide the financial analysis of the construction of two separated ABP processing facilities, one for Category 1 and 2 (to be sold as Category 1 products) and one for Category 3 products. These two lines will be completely independent and separated, meeting the EU production standards and run on self-produced animal oil, leaving the use of fossil fuels for the emergencies and drastically reducing the environment impact and CO2 production.

The feasibility study will include, for each option the following information:

1) Data and critical assumptions

2) Operational /technical model

3) Calculation of CAPEX

2.A.1.1. PRODUCTION PLAN AND ADOPTED TECHNOLOGY

Data and assumptions

The processing volumes have been estimated under the Task 1 and are reported in the following Table 2.A.1.

Table 2.A.1. ABPs to be disposed yearly in Moldova. Summary table.

ABPs	*Slaughtering, deboning 2020*	*Fallen stock (5% mortality, 2020)*		*Food of AO processing plants*	*Others*	*Total ABPs produced in Moldova*	*ABPs already processed in existing ABPs plants*	*Total ABPs to be disposed of*
		Bovines, ovines, caprines	*Pigs, horses, poultry*					
Cat 1	1,076	3,316	0	0		**4,392**	**0**	**4,392**
Cat. 2	800	0	1,995	0	100*	**2,895**		**2,895**
Cat. 3	19,082	0	0	157	50**	**19,289**	**11,000**	**8,289**
Total	**20,958**	**3,316**	**1,995**	**157**	**150**	**26,576**	**11,000**	**15,576**

On the basis of these data, the Consultant has assumed that roughly 8,000 Tons per year will be processed as Category 1 and 8,000 Tons as Category 3 products.

Other assumptions

The Consultant has adopted a few assumptions that will be briefly described in this paragraph.

Disposal fee, is the fee usually paid for covering the costs of collection, processing and disposal of the ABP. This fee is usually paid for disposal of Cat. 1 and 2 products whose market value is low. Producers of Cat. 3 products are not obliged to pay for the disposal since these products are more easily placed in the market. The aim of the ABP plant is to keep this fee as low as possible in order to reduce the costs for the producers. In this first analysis, we keep the same values in all four options considered in Part 1 of the study:

1. Disposal fee for Cat. 1, 2 products ranging from 0.17 to 0.2 Euro per kg of collected ABP, including costs of transportation, processing and disposal. As we will show at the end of this demonstration, lower fees are envisaged only for Option 4. All other options require higher fee values to become sustainable.

2. Disposal fee for Cat. 3 products equal to 0 Euro/kg.

3. The Consultant, in the attempt to reduce Investment and Operational costs, especially in conditions of uncertain raw material supply, is proposing two batch processing units working on a double-day-shift or 4,000 hours per year. To reduce energy and water consumption, ABP plants would be ideally operated on a 3-daily shifts basis since warming up the cooker contributes to increase the steam requirements. Even in these conditions, one third of the plant capacity (one work shift) is left as spare in case of emergencies (i.e. pandemics). Indeed, both lines are working on a 2 daily shifts basis. In case of emergency they can be operated for 3 shifts getting one third extra capacity

Processing methods

It is recommended to adopt processing Method 1 for both ABP categories based on safety considerations and production volumes. Method 1[6] has potentially more market opportunities, being considered safer than other methods. Furthermore, Method 1 is usually obtained by under pressure batch cookers that are commonly available, by their nature, in smaller sizes than continuous cookers often adopted for Method 4[7].

On the basis of the preceding assumptions, the Consultant has proceeded to the preliminary design for the:

1) Construction of two separated and independent processing facilities in a common location; the two facilities will have in common the office building and the waste water treatment unit
2) Construction of an establishment for processing Category 1,2 (sold as Category 1) animal by-products in the first unit, with a capacity of roughly 8,000 tons/year in two daily shifts, using Method 1 by pressure sterilization.
3) Construction of an establishment for processing Category 3 ABPs in the second unit with a capacity of roughly 8,000 tons/year in two daily shifts, using Method 1 by pressure sterilization.

The two production lines are based on the same technology, only the Primary crushers are different since a bigger size machine is needed for Category 1,2 that must be able to crush whole animals. A graphic representation of the process flows is reported in the following diagrams (figures 2.A.1. and 2.A.2.).

2.A.1.2. RAW MATERIAL

Each production line has a capacity of 2.5 tons/h. Approx. (1,700 Kg/h approx. of evaporate) composed of meal and fat. Considering a batch process of 16 hours per day, the production capacity in terms of raw material is 40 tons.

Characteristics of the raw materials

a) <u>ABPs originating from slaughterhouses, meat processing plants, butcher shops</u>: ABPs consisting of parts of slaughtered animals, or any material containing such by-products which are:
   - fit for human consumption, but not intended for human consumption for commercial reasons;
   - rejected as unfit for human consumption but not affected by any signs of diseases communicable to humans or animals and derive from carcasses fit for human consumption;
   - SRM (cat 1);
   - Manure and digestive tract content (cat 2);
   - Material more than 6 mm. from wastewater treatment (slaughterhouses etc.);
   - Blood.

   Source: slaughterhouses, butcher shops, meat processing facilities.

b) <u>Fallen stock</u>: livestock that dies of natural causes or disease, or is killed on a farm for purposes other than human consumption.

   Source: farms, individual households.

c) <u>Pet animals, zoo and circus animals, hunt trophies, road kills.</u>

[6] Method 1, as further described at chapter 5.7, is also known as under pressure cooking of the ABP. It is usually carried out with batch cookers.

[7] Method 4 refers to cooking of ABPs under controlled circumstances but at atmospheric pressure. According to the current legislation Method 1 and 4 are equivalent from the side of safety. The advantage of Method 4, compared to Method 1 is that cooking is done with continuous cookers, enabling the user to increase the production capacity with lower need of space and slightly lower energy consumption.

d) Former foodstuffs: products of animal origin or foodstuffs containing products of animal origin that are no longer intended for human consumption for commercial reasons or due to problems of manufacturing or packaging defects or other defects which do not present any risk to humans or animals, including out of date foods.

   Source: food retailers, supermarkets, food of animal origin producers.

e) Catering waste: all waste food (including used cooking oils).

   Source: restaurants, caterers, canteens, kitchens.

f) International catering waste
   - bone grease 60-65% approx.
   - humidity 35-40%

2.A.1.3. FINISHED PRODUCTS

ABP Cat. 1 production line

Based on the nature of the raw materials processed, the end products obtained by cooking and sterilizing the raw material in a batch cooker, will have variable characteristics strictly based on the nature of the materials used. The final products are intended to be sold under Cat. 1 products or used as biofuel for the production of the steam to be used to feed the cookers of the Cat. 1 and Cat. 3 lines.

According to the Author's experience, the average expected output is the following:

- Animal fat: approximately 345 kg/h.
- Animal protein meal: approximately 400 kg/h with:
  - ✓ fats 8-10%
  - ✓ humidity 6%
  - ✓ protein 52-58%

Storage of end products in outdoor silos and tanks whose nature is going to be described below.

ABP Cat. 3 production line

This line will have the same production features as the previous one, the only difference is the milling system and final product storing capacity which are going to be described below. To resume it, the average expected output is expected to be:

- Animal fat: approximately 345 kg/h.
- Animal protein meal: approximately 400 kg/h with:
  - ✓ fats 8-10%
  - ✓ humidity 6%
  - ✓ protein 52-58%

Storage of end products in outdoor silos and tanks whose nature is going to be described below.

2.A.1.4. PROCESSING METHOD

Both processing lines, ABP Cat.1 and ABP Cat.3 will make use of the Method 1, better known as pressure sterilization, according to the EU current standards. Its main features are described here below.

Reduction

1. If the particle size of the animal by-products to be processed is more than 50 millimeters, the animal by-products must be reduced in size using appropriate equipment, set so that the particle size after reduction is no greater than 50 millimeters. The effectiveness of the equipment must be checked daily and its condition recorded. If checks disclose the existence of particles larger than 50 millimeters, the process must be stopped and repairs made before the process is resumed.

Time, temperature and pressure

2. The animal by-products with the particle size of no greater than 50 millimeters must be heated to a core temperature of more than 133 °C for at least 20 minutes without interruption at a pressure (absolute) of at least 3 bars. The pressure must be produced by the evacuation of all air in the sterilisation chamber and the replacement of the air by steam ('saturated steam'); the heat treatment may be applied as the sole process or as a pre- or post-process sterilisation phase.

3. The processing is carried out in batch both for Cat. 1,2 and Cat. 3 products.

Process description

The raw material is delivered to the site in bulk with trucks of different dimensions, and then is downloaded into a reception bin with a movable powered lid to reduce dispersion of bad odors and material.

Afterward the material is crushed by the mean of a powerful crusher suitable to chop whole carcasses (only in case of Cat. 1,2 processing).

The chopped material is then taken though screw conveyors to the final chopper able to reduce the size of the particles to less than 30 mm in dimensions in case of Cat. 3 and less than 50 mm in case of Cat. 1 products. On the transport line a metal detector is positioned to identify and expel eventual foreign bodies that could harm the equipment.

The chopped material is then taken to batch cookers, provided with suitable feeding system, in order to sterilize the product and separate dirty oil from the solid component. The condensate is taken back to the steam generator powered with clean, processed and self-produced animal oil, while the vapors/ incondensables are collected and taken to the air condenser. The product must be kept at 133 °C for at least 20 minutes without interruption at a pressure (absolute) of at least 3 bars. The pressure must be produced by the evacuation of all air in the sterilization chamber and the replacement of the air by steam ('saturated steam). The dehydrated product is then taken by means of screw conveyors to the pressing station able to finally separate the solid from the liquid phase. The pressing system is of the batch type. The capacity of the press must be adequate to the plant capacity. A re-circulation system of the minced material to the press is recommended to increase the oil extraction efficiency.

The pressed material is then taken to the hammer mill. Once properly ground, the meal is taken to the final storage silos by means of a proper transportation system. The meal storage silos will be constructed in such a way that they can be used for transferring the meal both to the tankers and to big bags.

The dirty oil is delivered to an intermediate tank to feed the decanter/centrifuge for cleaning. A screw conveyor collects the solid particles from the fat cleaning centrifuge/decanter to take them to the press(es) for further extraction.

The clean fat is collected in a proper bin located at the end of the centrifuge/decanter and pumped to the fat final storage tanks. From here it can be poured into the tankers to deliver it or partly recovered for feeding the steam generator.

Flow Diagram Cat. 1,2 Method 1

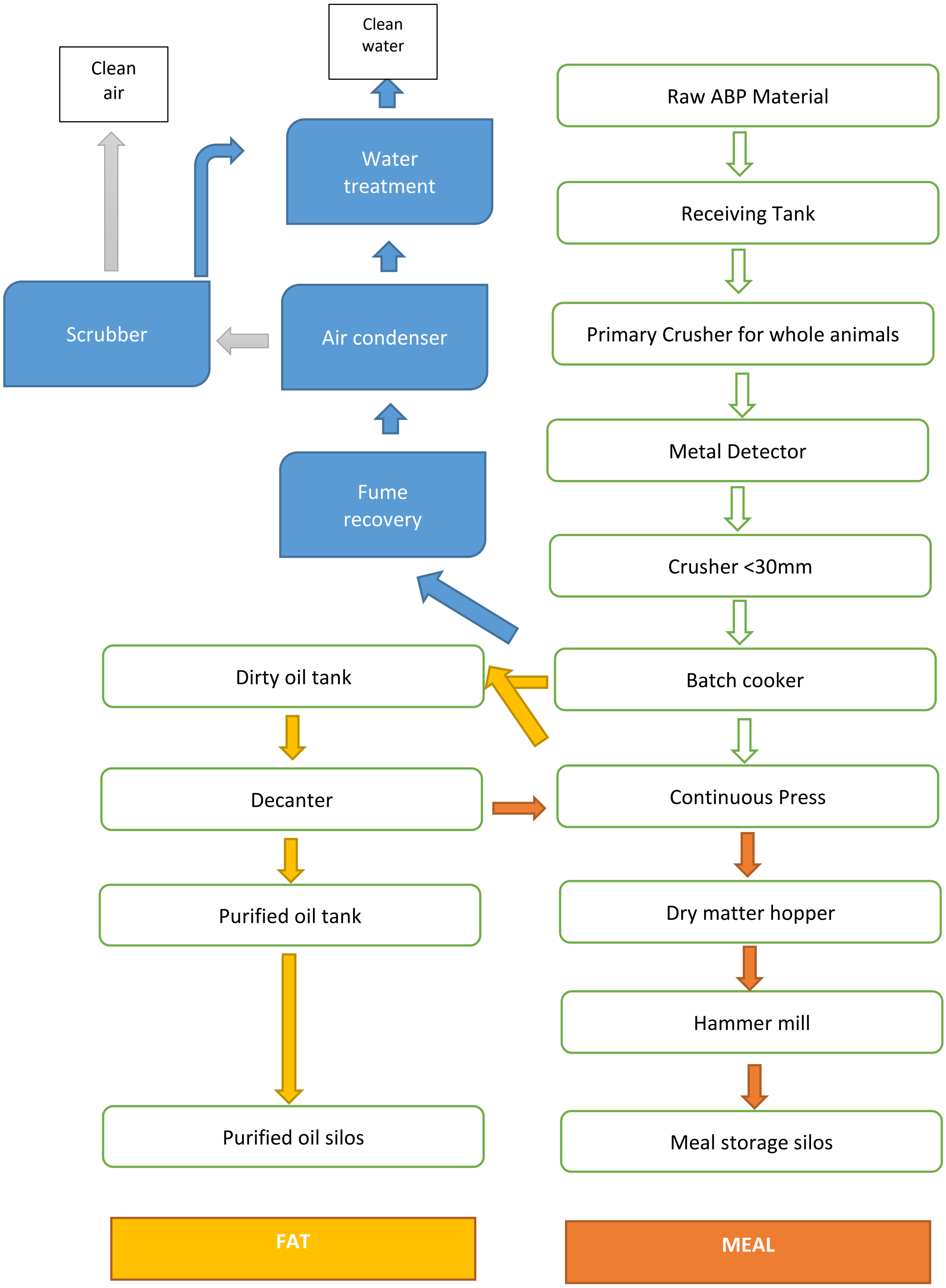


Figure 2.A.1. Flow Diagram Cat. 1 Method 1

Flow Diagram Cat. 3 Method 1

Figure 2.A.2. Flow Diagram Cat. 3 Method 1

2.A.1.5. INPUTS AND OUTPUTS

Inputs

The business inputs are basically disposal fees and revenues from sales of Cat. 1 meal, Cat. 3 fat and meal.

Sale prices are fixed by the market and they have been adopted to calculate the revenues. The adopted values are in line with the current prices in Western countries.

The Disposal fees are applied only to collection of Category 1 and 2. No fee is applied to collection of Category 3 products. In Western countries the current values of disposal fees is 0.150 Euro/kg but rising due to the increasing prices of fuels.

Even though energy prices are rising, the current product sale prices are used while collection fees have been considered ranging from 0.18 to 0.20 Euro/kg. The following table shows the values adopted for the calculations.

Table 2.A.2. Cat. 1 and Cat. 3 disposal fees and product sale prices

Investment in Moldova. Inputs prices		
Disposal Fee Cat 1,2	Euro/kg	0.15- 0.20
Sale price fat Cat. 1	Euro/kg	0.2
Sale price meal Cat. 1	Euro/kg	0.05
Sale price fat Cat. 3	Euro/kg	0.6
Sale price meal Cat. 3	Euro/kg	0.2
Disposal fee Cat. 3	Euro/kg	0

Outputs

The expected outputs for commercialization are:

Cat. 1,2 production line: Meal

Cat. 3 production line: Meal and Fat

Production volumes

The main production features of the two lines are reported in the following table.

Table 2.A.3. Cat. 1 and Cat. 3 production line basic design features

	Cat. 1,2	*Cat. 3*
Annual working days	250	250
Working hours x day	16	16
Annual working hours	4,000	4,000
Nominal line capacity (kg/h)	2,500	2,500
Production efficiency (%)[8]	85 %	85 %
Line capacity (kg/year)	8,500,000	8,500,000
Estimated water content (%)	65%	65%

[8] Production efficiency is the rate of utilization of the line. Production efficiency is affected by start up, maintenance and other unexpected losses of time that reduce the theoretical nominal line capacity. 85% is an average reasonable rate of utilization. As per current table, the full line capacity should be 2,500 kg/h multiplied by 4,000 hours/year or 10,000,000 kg/year. By applying the production efficiency rate of 85% we get 8,500,000 kg/year which is the value effectively used in the financial calculations.

Under these assumptions, the volumes of fat and meal Cat. 1 and Cat. 3 produced in one year of production are given in the table below.

Table 2.A.4. Cat. 1 and Cat. 3 production outputs

	Production (kg/day)	*Self-consumption (kg/day)*	*Self-consumption (kg/y)*	*Annual production (kg/year)*	*Annual recovered oil as fuel Cat. 3 (kg/y)*	*Annual product for sale (kg/y)*
Cat 1 Fat	5,525	5,020	1,254,902	1,381,250	126,348	-
Cat 1 Meal	6,409			1,602,250		1,602,250
Cat 3 Fat	5,525	5,020	1,254,902	1,381,250	126,348	252,696
Cat 3 Meal	6,409			1,602,250		1,602,250

Outputs of the current project will be calculated later in details as CAPEX and OPEX. In particular Operational Costs are mostly salaries, wages and electricity.[9]

Final product packaging and safety procedures

Cat. 3 fat is delivered in bulk, Cat. 3 and Cat. 1 meals are usually packed in a big bag of 1,000 kg. All derived products must be collected and taken away with tankers or properly designed vehicles in order to ensure the safety of the product, operators and infrastructures. Incoming and outgoing vehicles must undertake sanitation of the wheels. Empty vehicles have to be cleaned in the dedicated area where water is collected and delivered to the treatment.

Finished product storage capacity

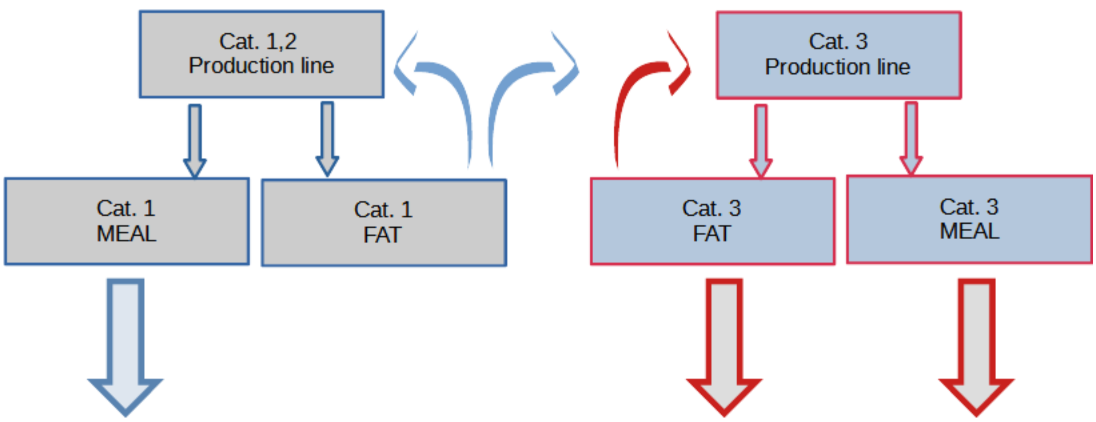
The proposed installation has a storage capacity of finished product equal to:

- 60 Tons of Cat. 1 meal
- 60 Tons of Cat. 3 meal
- 40 Tons of Cat. 1 fat
- 80 Tons of Cat. 3 fat

Equivalent, at the current conditions, to 9 days storage for meal and 15 days for fat.

2.A.1.6. ENERGY SAVINGS AND ENVIRONMENTAL CONSIDERATIONS

Figure 2.A.3. Schematic representation of the animal fat use for steam generation



9Moldova Electricity: https://www.globalpetrolprices.com/Moldova/electricity_prices/

As indicated in the diagram above, the fat coming from Cat. 1,2 processing line is totally used to generate the steam required for both production lines. Cat. 3 fat is only partially used to supply the steam generator of the Cat. 3 ABP plant.

This result can be achieved by adopting double fired steam generators, able to make use of diesel oil or biodiesel internally produced. As indicated in the diagram, Cat. 1 fat is expected to be completely used to generate steam for both lines while Cat. 3 fat will supply the remaining power need for the generation of the steam required by the ABP Cat. 3 production line. This approach has been adopted in order to reduce to zero the use of diesel oil for steam generator with benefits both from the financial and the ecological sides.

The ABP facilities described in this document will be meeting the most advanced standards in terms of:

1) reduction of air emissions of odours that could affect the living standards of the population living in the proximity of the facilities;
2) reduction of CO_2 emission by replacing the use of fossil fuel with biofuel internally produced;
3) containment of emission in waste waters;
4) compliance with noise emissions.

Volatile odours emissions

Odours emitted by the ABP facilities are commonly reason for complains by the surrounding populations and administrative authorities. In order to reduce these risks, it is highly recommended to install the units away from habited centres and located downwind. In addition to that, the following measures and installations have been taken into account during the preliminary design of the facilities.

Firstly, the fumes coming from the cookers are collected, condensed and the not condensed air is released in atmosphere after filtration.

Secondly, odors and vapors released by the equipment are aspirated by means of hoods and ducts placed above the operating machines such as:

- Receiving tank
- Dripping tank
- Continuous press
- Decanter
- Flour mill

Therefore, two-unit odour elimination systems, one per each plant, by means of vertical scrubber with at least 3 treatment stages and chemical treatment, should be adopted.[10]

Containment of emissions in waste water

The current document does not give indications on the quality and quantity of wasted water to be released in the environment because these details are to be defined during the final design stage in accordance with local regulations, EU standards and/or National laws. Later in this document, the Author is reporting the estimated volume and quality of the wasted water according to his knowledge and experience and it is not binding the supplier of the related equipment nor lifting his responsibilities regarding the performance of the installation he is going to provide.[11]

[10] Indicated as N. 2 Item 2.3 Room air handling 50.000 cm/h one per Cat. 1 and one per Cat. 3 products

[11] Details of the assumptions used to design the waste water installation, one common to both production lines, are given in LOT 3 SUPPLY AND INSTALLATION OF WASTE WATER TREATMENT EQUIPMENT

Containment of noise emissions

All the equipment subject to this supply has to be produced according to National law and standards, EU regulations and provided with CE mark unless differently required by the Beneficiary and better defined during the final design stage. Under these conditions, noise emissions will be contained into acceptable limits.[12]

Reduction of CO_2 emissions

The proposed facilities are making use of steam generators provided with dual fuel burners: diesel oil/ internally produced biofuel. According to calculations, the units can be run fully on bio oil while leaving the use of diesel oil for emergency cases. Standing the current trend of energy prices, using its own biofuel will make a huge difference in financial terms.

The table below shows the benefits from using biofuel instead of diesel oil by taking into account the money saved from diesel oil annual savings after deduction of losses due to missed sales of biofuel.

Table 2.A.5. Energy savings and reduction of CO2 emissions

	Annual Thermal Energy load	*Fuel Oil thermal capacity*	*Annual oil calculated consumption*	*Fuel price (1 l = 0,88 kg)*	*Annual fuel oil running cost*
	Kcal/y	*Kcal/kg*	*Kg.*	*Euro/kg*	*EURO*
Fuel oil	21,333,333,333	10,600	2,012,579	1.32	2,656,604
Sale losses Cat. 1 fat			-1,381,250	0.20	-276,250
Sale losses Cat. 3 fat			-1,128,554	0.60	-677,132
Total thermal load annual savings					*1,703,222*

The table below shows the benefits of using biofuel instead of diesel oil in terms of the reduction of CO_2 emissions. Coefficients are taken from Emission Factors for Greenhouse Gas Inventories[13]. CO_2 savings in using biofuel instead of diesel oil for steam production have been calculated in 337 kg of CO_2 per year compared to a total consumption of 6,011 kg per year.

Table 2.A.6. CO2 emission calculations: Steam production

	Required thermal load	*Fuel Oil thermal capacity*	*Annual Expected consumption*	*Required thermal load*	*CO2 factor*	*CO2 emissions*	*Total CO2 emissions*	*CO2 emissions saved*
	kcal/y	*Kcal/kg*	*kg*	*mmBTU/y*	*kgCO2/ mmBTU*	*TonCO2/ year*	*Ton CO2/year*	*Ton CO2 /year*
Fuel oil requirements		10,600	2,012,579	79,804	75.0	5,988		318
Cat. 1 + Cat. 3 lines	21,333,333,333	8,500	2,509,804	79,804	71.1	5,671	5,671	

Total CO_2 emission calculation

The great majority of the CO_2 emissions are related to electric consumption. This value is not easy to calculate properly since the Output Emission Factor depends mostly on the local conditions the power is generated. Missing the information, the Author has adopted a value of 400 kg CO_2/MWh which corresponds to a reasonable value according to his experience in former Soviet Union countries.

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12 Details of the assumptions used to contain noise pollution are given in the Chapter ENERGY SAVINGS AND ENVIRONMENTAL CONSIDERATIONS

13 https://www.epa.gov/sites/production/files/2021-04/documents/emission-factors_apr2021.pdf

The following table gives the estimated CO_2 emission calculation for the installation. This value does not include emissions from vehicles serving the area.

Table 2.A.7. CO2 emission calculations: Electricity

	Power consumption	*Output Emission Factor*	*CO2 emission electricity component*	*CO2 emission steam production component*	*Total CO2 emissions*
	kWh/year	*kg/MWh*	*kgCO2/year*	*kgCO2/year*	*TonCO2/year*
Cat. 1 + Cat. 3 lines	3,382,000	400	1,352,800	5,671	7,024

2.A.1.7. WORKING PERSONNEL

The following table reports the list of the personnel required to run the two ABP plants on the basis of a two-shifts working day. In case the number of shifts is changed, the list has to be updated accordingly.

In the list the administration costs are completely assigned to the Cat. 1 ABP plant. This choice has been made by the Author in order to keep the Cat. 3 ABP Plant cash flow positive. Different options can be adopted by the Beneficiary, once the facilities are started and in accordance with the design finalization.

Table 2.A.8. Working personnel

	Cat_1	*Cat_3*
Working personnel	*Units*	*Units*
Production manager	1	1
Lift truck drivers	4	4
Unskilled workers	8	8
Steam boiler operator	2	2
Maintenance sector	1	1
Subtotal	**16**	**16**
Administration		
General director	1	-
Deputy General Director	1	-
Chief Accountant	1	-
Secretary	1	-
Administrative workers	2	-
Security guards	3	-
Subtotal	**9**	-
Total	**25**	**16**

2.A.1.8. DESCRIPTION OF THE FACILITIES

The two ABP lines, one for Cat. 1 and the other for Cat. 3 ABPs, will be allocated in two separated buildings of similar dimensions and located in the same area.

The ABP facility is complete with:

- Administrative office,
- Two separated entrances for lorries and trucks to the different buildings,
- Main processing building with service areas,
- One common area for waste water treatment,
- Green areas,
- Car parking area.

All construction works are made according to EU and National standards and regulations. Construction materials are prime quality.

A preliminary general plant layout is attached.

Preliminary list of Construction Works

Table 2.A.9. Site construction works

Denomination	*UNITS*	*Q.ty*
Industrial Shed	m^2	3,582
Cleaning Area	m^2	216
Car Park Area	m^2	600
Offices	m^2	180
Internal Roads	m^2	17,000
Fencing	m^2	920
Green Area	m^2	600
TOTAL	$\mathbf{m^2}$	**23,098**

The ABP facilities have been allocated in an area of 158 x 143 meters. In case the construction plot has different dimensions the entire layout has to be reviewed. In the report of Task 2 – Location assessment (Phase 1), it was estimated that for the construction of the ABPs plant an area of 120 m. x 150 m. would be needed. However, the identified plot has a surface of 96.82 ha, and therefore it would be possible to slightly increase the dimension of the area to be dedicated to the construction of the ABPs plants.

Required infrastructures

Mains electricity (3 phase) is required, for a total power of 900 kW (450 kW each unit). The water consumption is estimated in 100 m^3 per day when working on 2-shifts basis.

Costs for the installation of a main transformer cabinet High or Medium Voltage to Low Voltage have not been taken into consideration and must be provided by the Client.

The treated waste water can be used for irrigation. The solid waste can be composted and reused as fertilizer.

The location of the facility will be decided by the Customer and must be well served with one main road suitable for the transit of heavy trucks. Telephone lines and mobile communications must be available.

All main services (gas, mono phase electricity, urban water and sewerage, must be available in the area.

2.A.1.9. FINANCIAL EVALUATION OF THE WORKS AND THE SUPPLIES

It is normal and recommended practice to split the construction works into homogeneous type of supply to avoid undesired commercial mark-up applied by main Contractors to equipment delivered by sub-suppliers and overlapping of responsibilities in case of complaints from the side of the Investor.

For example, the main Contractor can usually supply building works on turn key basis, including services and ancillary installations, but it is risky and uneconomical to leave him also the responsibility of the supply of the main process equipment.

On the other hand, if splitting the works into too many suppliers, their organization is going to take more time and may results in delays, complaints and additional costs.

Therefore, the Engineer has split the construction works into 4 main Lots:

1. Engineering Services;
2. Processing Equipment including spare parts and scrubber to eliminate bad odor from the exhaust air;
3. Waste water treatment unit, a very specialized installation required to meet the quality standards of wasted waters;
4. Building and civil works including auxiliary installations and electrical installation.

The financial evaluation of the works and supplies has been carried out based on:

- ✓ Relevant technical proposals received from different suppliers, starting from preliminary design data elaborated by the Engineer on the basis of his experience and knowledge;
- ✓ Where offers were not available, the evaluation has been done by the Engineer based on normal European market prices.

Cat 1,2 ABP processing line

Table 2.A.10. Cost estimation of the Engineering Services and Work Supervision, based on roughly 7% of the Investment value for each line

LOT	ABP Processing Line Method 1 Cat. 1,2	Price Euro
1	Engineering and work supervision	**350,000**

Table 2.A.11. Cost estimation of the Cat. 1,2 ABP Processing line construction works

LOT	ABP Processing Line Method 1 Cat. 1,2	CIF price Euro
2.1	Main production equipment	1,685,953
2.2	Additional equipment and services	171,990
2.3	Spare parts for 2 years operation	33,719
2.4	CIF Transportation	101,157
	SUBTOTAL LOT 2	**1,992,819**

Table 2.A.12. Cost estimation of the Waste water treatment unit

LOT	ABP Processing Line Method 1 Cat. 1,2	CIF Price Euro
3	Waste water Treatment Unit	880,000
	SUB-TOTAL LOT 3	**880,000**

Table 2.A.13. Cost estimation of the Civil and building works

LOT	ABP Processing Line Method 1 Cat. 1,2 - CONSTRUCTION WORKS	Price Euro
4.1	Industrial shed	716,400
4.2	Truck cleaning area	32,400
4.3	Offices	144,000
4.4	Internal roads	340,000
4.5	Fencing	13,800
4.6	Green area	3,000
4.7	Weigh bridges	70,000
4.8	Thermic power station	180,000
4.9	Pumping station	30,000
4.10	Compressed air station	40,000
4.11	Compressed air distr. line	13,000
4.12	Steam distribution line	50,000
4.13	Cold water distribution line	50,000
4.14	Firefighting equipment	25,000
4.15	Electric plant	700,000
4.16	Assistance to main equipment assembling, start up	120,000
	SUB-TOTAL LOT 4	**2,527,600**

Cat 3 ABP processing line

Table 2.A.14. Cost estimation of the Engineering Services and Work Supervision, based on roughly 7% of the Investment value for each line

LOT	ABP Processing Line Method 1 Cat. 3	Price Euro
1	Engineering and work supervision	350,000

Table 2.A.15. Cost estimation of the Cat. 3 ABP Processing line construction works

LOT	ABP Processing Line Method 1 Cat. 3	CIF price Euro
2.1	Main production equipment	1,635,953
2.2	Additional equipment and services	171,990
2.3	Spare parts for 2 years operation	32,719
2.4	CIF Transportation	98,157
	SUBTOTAL LOT 1	**1,938,819**

Table 2.A.16. Cost estimation of the Civil and building works

LOT	CONSTRUCTION WORKS	Total price
4.1	Industrial shed	716,400
4.2	Cleaning area	32,400
4.4	Internal roads	340,000
4.5	Fencing	13,800
4.6	Green area	3,000
4.7	Weigh bridges	70,000
4.8	Steam generator	180,000
4.9	Pumping station	30,000
4.10	Compressed air station	40,000
4.11	Compressed air distr. line	13,000
4.12	Steam distribution line	50,000
4.13	Cold water distribution line	50,000
4.14	Firefighting equipment	25,000
4.15	Electric plant	700,000
4.16	Assistance to main equipment assembling, start up	120,000
	SUB-TOTAL LOT 2	**2,383,600**

Cost recapitulation

Table 2.A.17. Cost estimation of the erection works of the ABP plant Cat. 1 -2, Cat. 3 Method 1

		Cat. 1,2	**Cat. 3**	**Totals**
	Denomination	Euro	Euro	Euro
Lot 1	Engineering and Work Supervision	350,000	350,000	700,000
Lot.2	Equipment	1,993,000	1,939,000	3,932,000
Lot.3	Waste water treatment	880,000		880,000
Lot.4	Construction costs, other costs	2,528,000	2,384,000	4,912,000
	Totals	**5,751,000**	**4,673,000**	**10,424,000**

Capital Requirements

Table 2.A.18. Basic financial statements

1. BASIC FINANCIAL STATEMENTS	Processing Cat. 1,2	Processing Cat. 3	Processing cat. 1,2,3 in two plants
Start up date			
Yearly working days	250	250	250
Number of daily shifts	2	2	2
Working hours per year	4,000	4,000	4,000
Production input (kg/year)	8,500,000	8,500,000	17,000,000
Production output fat cat. 1 (kg/year)	0		0
Production output meal cat. 1 (kg/year)	1,602,250		1,602,250
Sale price cat. 1 fat (euro/kg)	0.20	0.00	0.20
Sale price cat. 1 meal (euro/kg)	0.05		0.05
Maximum production efficiency	85 %	85 %	
Disposal fee per ton of raw material (euro/ton)	0.20		0.20
Average sale price cat. 1 products			-
Production output fat cat_3 (kg/year)		252,696	252,696
Production output meal cat. 3 (kg/year)		1,602,250	1,602,250
Sale price fat cat_ 3 (euro/kg)		0.6	0.60
Sale price meal cat_ 3 (euro/kg)		0.2	0.20
Average sale price cat. 3 products			-
Total annual inflows disposal fees (euro)	1,700,000	0	1,700,000
Total annual inflows sales (euro)	80,113	472,068	552,180
Annual Turnover	***1,780,113***	***472,068***	**2,252,180**

Table 2.A.19. Invested Capital Calculation

2. INVESTED CAPITAL CALCULATION			
2.1 INSTALLATION AND EQUIPMENT COST CALCULATION	Processing Cat. 1,2	Processing Cat. 3	Processing cat. 1,2,3 in two plants
Cost item	EURO	EURO	EURO
Lot 2: main equipment	1,993,000	1,939,000	3,932,000
Lot 3: water treatment plant	880,000	-	880,000
Import duties not due			-
Assembling, start up and tests			-
Local training			-
Furniture and workshop			-
License and statutory obligations			-
GRAND TOTAL A)	2,873,000	1,939,000	**4,812,000**
2.2 LOCAL COSTS			
Local costs	EURO	EURO	EURO
Construction works	2,528,000	2,384,000	4,912,000
Local assembling costs (labour and lifts)			-
Local training	-		-
Lot 1. engineering and work supervision	350,000	350,000	700,000
Technical document translation	-		-
Air conditioning unit			-
Forklift and trucks			-
Electrical installation and generator			-
GRAND TOTAL LOCAL COSTS B)	2,878,000	2,734,000	5,612,000
CONTINGENCY C)	86,000	82,000	168,000
TOTAL ERECTION COSTS D= A+B+C)	5,837,000	4,755,000	10,592,000

The total investment in buildings and other infrastructure, imported equipment and machinery amounts to EURO 10,592,000.

2.A.2. TECHNICAL SPECIFICATIONS

This chapter deals with the technical description of necessary parts of the rendering plant facilities of new construction for Category 1,2,3 products, processed in two faculties and one for Cat. 3, one for Cat. 1,2 , and recommendations for the design with a description of their functions and spatial arrangements in one available location within the National territory, taking into consideration all technological, technical, and environmental issues in line with the Moldova Standards and regulations.

The documentation is completed with the preliminary technical description of all supplies, like processing equipment, auxiliary installations, civil and building works as well as the list of staff necessary for the management of the plant.

The scope of this chapter is to provide the guidelines for the procurement of the detailed design of the complex, while the exact technical specifications will be finalized during the design stage of the project.

The number of commercial lots and their nature has been recommended according to the professional experience in the industry, however it can be organized differently by the Beneficiary during the final design and/or procurement stage, on the basis of updated conditions defined during the final design phase and of available commercial, local laws and regulations, and technical opportunities or rules and limitations provided by the Financing Bodies.

The design of the rendering plant is composed of the following chapters:

- Basic design data for the construction of the ABP processing plant, raw material supply quality and capacity, final product capacity and quality
- Technical description of the supply and services
- List of required staff for running the ABP plant
- Guidelines on energy, water consumption, and expected Greenhouse Gas Emission levels
- GANTT diagram covering the erection phase
- Drawings

2.A.2.1. LOT 1 - ENGINEERING SERVICES

The Engineering Services will cover all the activities and services related to the design and Work Supervision for the construction of an ABP Rendering plant of nominal capacity 8 Tons/h of raw material. The services to provide are the following:

1. Civil and building works
   a) Revision of the project concept design
   b) Documents containing structural calculations
   c) Detailed design of the buildings with dimensioning of concrete foundations, vertical walls, internal walls, industrial paving, roofs, windows, office, outdoor wall finishing and other services
   d) Detailed of the concrete tank and small room required for the functioning of the waste water treatment plant
   e) Design of the required basements for the equipment (silos and tanks)
   f) Design of sewage lines for process waste waters and civil sewage and rain waters
   g) Outdoor paving and roads
   h) Outdoor fencing and gates
   i) Outdoor green area and gardens
   j) Preparation of plans, elevations of the complex buildings and outdoor facilities where required
   k) Preparation of technical specifications of the civil and building works

Feasibility Study for an animal by-products processing facility in the Republic of Moldova.

l) Preparation of Bill of Quantities for the above mentioned works
m) Technical assistance to the preparation of the supply contracts

2. ABP processing lines and auxiliary equipment
   a) Revision of the concept design, technical description
   b) Preparation of plans and elevations of the ABP processing equipment
   c) Design of the discharge points
   d) Design of connections to the utilities: steam, cold water, compressed air
   e) Preparation of the Bill of Quantities

3. Auxiliary installations
   a) Revision of the concept design
   b) Preparation of technical calculations
   c) Preparation of plans for the erection of the boiler room, water and air compressor room
   d) Detailed design of the room ventilation installation
   e) Preparation of plans of steam and condensate recovery pipelines, water distribution pipeline, compressed air pipeline
   f) Preparation of technical specifications and Bill of Quantities
   g) Assistance to the preparation of the supply contract

4. Electrical installations
   a) Preparation of the technical calculations
   b) Design of the electrical room
   c) Design of the electric distribution lines
   d) Preparation of the technical specifications of the electric power devices
   e) Design of the MT, LT, 3-P, 1-P, earthing lines, internal and outdoor lightening, sockets and plugs
   f) Preparation of technical specifications and Bill of Quantities of the electrical components
   g) Assistance to the preparation of the supply contract

5. Work Inspection and Work Supervision
   a) The Construction Supervision and Inspection of Equipment shall be performed for the selected components of the project i.e. whole of the Works and whole or parts of the Supply components. For this project, the selected components of the project shall be as follows:
      - Supply Contract: Lot 2: Supply and Installation of the ABP Processing Equipment
      - Supply Contract Lot 3: Supply and Installation of Waste Water treatment equipment
      - Works Contract: Lot 4: Realization of Civil and building works, Supply and installation of M&EI Mechanical and Electrical Systems
   b) The Consultant shall work exclusively for the Contracting Authority. The Contracting Authority shall also be the Employer, as that term is defined in the FIDIC contract for the performance of the Works with the Contractor(s). On behalf of the Contracting Authority, and as directed by it, the Consultant shall be required to coordinate with and inform the Contracting Authority (CA), in particular regarding contractual issues, work progress and costs.

6. Preparation of ex-built plans and drawings at the completion of the construction works.

2.A.2.2. LOT 2 - SUPPLY AND INSTALLATION OF THE ABP PROCESSING EQUIPMENT

2.A.2.2.1. CAT. 1 ABP PROCESSING EQUIPMENT- GENERAL DESCRIPTION

(see Annex 2.A.1. dwg T01/02/01: Plant Layout)

The production line will have a capacity of 2.5 Tons/h of raw material, will work according to Method 1 and meeting the requirements as stated above. The processing line will be composed of 4 main sections:

1. receiving and crushing section
2. cooking and pressing section
3. grinding and meal storage section
4. fat and fat storage section

Construction material: Painted carbon steel. The supplier may offer stainless steel AISI 304 as an Option to be evaluated by the Beneficiary.

The production line will be complete of air condenser to condensate the fumes from the batch cooker of proper capacity.

A chemical scrubbing pack tower of proper capacity, collecting the internal air, operating with different reagents in order to neutralize pollutants.

An electric command board to control and command the entire system of receiving – crushing – cooking – pressing – grinding - liquid fat processing. Complete with N° 1 industrial color screen PC.

Hydraulic material for steam and condensate piping

Electrical connections form the electric command board to the use points

Set Spare parts for two years of operation

Room air handling system to collect the internal air and to the chemical scrubbing pack tower.

ITEM 2.1 – ABP CAT. 1 PROCESSING EQUIPMENT

CATEGORY 1 - RECEIVING AND CRUSHING SECTION

Pos. 1

N° 1 receiving bin

Suitable to receive the loose product from trucks, with free unloading with inclined coils.

Total storage capacity mc. 35 approx.

Construction: Base made up of:

- ✓ N° 3 transport augers of diam. Not less than 450 mm
- ✓ Front wall for supports and gear-motors in 10 mm thick carbon steel.
- ✓ Auger case and conical base in carbon steel with anti-wear plates in the housings.
- ✓ Carbon steel vertical side walls to be bolted to the base and welded to the finished machine.
- ✓ External reinforced ribbing, with corner profiles.
- ✓ Unloading spirals in stamped sheet metal, of proper diameter.
- ✓ Carbon steel central tubular axis.
- ✓ Support frame made of hot galvanized material beams.

Optional: construction material stainless steel AISI 304

Pos. 1.a

N° 1 lid for receiving container

Of suitable dimensions for reception containers made of AISI 304, 3 mm thick stainless steel sheet with reinforcement ribbing.

No. 2 hydraulic cylinders for lid operation controlled by a hydraulic motorized control unit with solenoid valves.

Pos. 2

N° 1 slope double auger conveyor

Single auger conveyor receiving from the container and conveying to the crusher.

Adequate length.

Construction:

- ✓ Bearings support head and gearmotor in carbon steel.
- ✓ Case and side boards in carbon steel.
- ✓ Wear-resistant plates in the spiral housing in 6 mm thick carbon steel.
- ✓ N°2 450 mm diameter conveyor spirals, in thick carbon steel.
- ✓ Complete with supporting frame in coated carbon steel.

Optional: case and side boards wear plates and bearing support in s.s. AISI 304

Pos. 3

N°1 metal detector

To identify and reject metal pieces which could damage the equipment.

Control panel containing:

- ✓ Current rectifier.
- ✓ Transformer.
- ✓ On and off commands.
- ✓ Sloping made of AISI 304 Stainless Steel.

Optional: construction material in s.s. AISI 304

Pos. 4

N° 1 crusher

For breaking whole carcasses of dead animals including cows.

Characteristics:

- ✓ Self-supporting, very thick and robust sheet metal construction.
- ✓ Robust carbon steel profile base frame.
- ✓ Side plugs for dismantling the rotating shaft.
- ✓ Closure gland in the rotating shaft passages.
- ✓ Rotating blades and fixed blades max. Diam. Dimension 900 mm.
- ✓ 50 mm thick shaped rotating blades.
- ✓ 50 mm thick fixed shaped blades.
- ✓ 60 mm clearance between the rotating blades and the fixed blades.

- ✓ Appropriately 55 kw motor coupled to the gearbox.
- ✓ Complete with carbon steel supporting frame for placing the crusher above receiving container made of robust coated carbon steel.
- ✓ Construction material painted carbon steel.

Pos. 5

N° 1 slope screw conveyor

Single auger conveyor receiving from the container and conveying to the process and finishing crusher.

Adequate length.

Construction:

- ✓ Bearings support head and gearmotor in carbon steel.
- ✓ Case and side boards in carbon steel.
- ✓ Wear-resistant plates in the spiral housing in 6 mm thick carbon steel.
- ✓ Not less than 400 mm diameter conveyor spiral, in thick carbon steel.
- ✓ Complete with supporting frame in coated carbon steel.

Optional: case and side boards wear plates and bearing support in s.s. AISI 304

Pos. 6

N° 1 finishing crusher

For carrying out a second crushing or chopping small dimension animal carcasses in conformity with current standards and regulations.

- ✓ Self-supporting, robust coated carbon steel frame.
- ✓ Dynamically balanced rotating roller, with rotating blades with carry-over of anti-wear material.
- ✓ Double row of fixed blades for double crushing, made of heat-treated steel.
- ✓ Cast iron supports, bearing housing.
- ✓ Approximately 75 kw electric motor.
- ✓ Complete with carbon steel support frame.

Pos. 7

N° 1 slope screw conveyor

Single auger conveyor to bring the product to the final crushing stage and start the cooking cycle. Adequate length.

Construction:

- ✓ Bearings support head and gearmotor in carbon steel.
- ✓ Case and side boards in carbon steel.
- ✓ Wear-resistant plates in the spiral housing in 6 mm thick carbon steel.
- ✓ Min. diameter 300 mm diameter conveyor spiral, in thick carbon steel.
- ✓ Complete with supporting frame in coated carbon steel.

Optional: case and side boards wear plates and bearing support in s.s. AISI 304

CATEGORY 1 - COOKING AND PRESSING SECTION

Pos. 8

N° 1 receiving container

For a suitable feeding of the continuous cooker. Total storage capacity mc. 25 approx.

Construction:

- ✓ Front wall for supports and gear-motors in carbon steel
- ✓ Auger case and side boards in carbon steel
- ✓ External reinforced ribbing, with corner profiles
- ✓ N° 2 extracting spirals 300 mm diameter
- ✓ Carbon steel central tubular axis
- ✓ Support frame made of painted carbon steel
- ✓ Variable frequency drive to adjust the auger speed

Optional: case. side boards wear plates and bearing support in s.s. AISI 304

Pos. 9

N° 1 slope screw conveyor

Single auger conveyor for taking the product to the cooking section. Adequate length.

Construction:

- ✓ Bearings support head and gearmotor in carbon steel
- ✓ Case and side boards in carbon steel
- ✓ Wear-resistant plates in the spiral housing in 5 mm thick carbon steel
- ✓ Min. spiral diameter 300 mm diameter conveyor spiral, in thick carbon steel.
- ✓ Complete with supporting frame in coated carbon steel.

Optional: case. side boards wear plates and bearing support in s.s. AISI 304

Pos. 10

N° 1 batch cooker

Designed for the hydrolysis and sterilisation of the product, manufactured in accordance with EC laws with certified materials and qualified operators. Suitable for melting and pouring of slaughtered ABPs.

Capacity: not less than 5,000 lt with load capacity 2,500 – 3,000 lts.

Heating mean: saturated steam at 6 bars in the gap. Operating internal pressure 3 bar. Designed according to CE standards with certified materials and operators.

The machine is composed of:

- ✓ Internal and external painted carbon steel cylindrical walls.
- ✓ Central spinning shaft, internally heated with steam at 6 bars, provided of mixing and discharge heavy duty rotating blades.
- ✓ Condensate unloading device to recover the condensate.
- ✓ 6.5 Bar safety valve for the gap pressure.
- ✓ 3.5 safety valve for the control of the internal pressure.
- ✓ Temperature detector PT 100 for reading the working temperature.
- ✓ Pressure detector for reading the internal operating pressure.

- ✓ Upper cyclone of the evaporated fumes, entirely made of AISI 304 stainless steel.
- ✓ Resistant coated carbon steel support frame.
- ✓ Automatic condensate discharge
- ✓ Loading cells for loading the product.
- ✓ Inspection platforms, gangways and stairs for easy access to all parts of the cooker.
- ✓ Temperature and time regulation device to assure the full conformity with the EU regulations.

Pos. 11

N° 1 dripping tank

Suitable to receive and drain the cooked sterilized product discharged from the cooker.

Construction:

- ✓ Front wall for supports and gear-motors in carbon steel.
- ✓ Auger case and side boards in carbon steel.
- ✓ Transporting min. spiral 250 mm diameter.
- ✓ Extracting spiral min. 250 mm diameter.
- ✓ Carbon steel central tubular axis.
- ✓ S.s. AISI 304 bottom perforated metal sheet.
- ✓ Support frame made of painted carbon steel.
- ✓ Variable frequency drive to adjust the auger speed.
- ✓ Complete of carbon steel support frame.

Optional: case. side boards wear plates and bearing support in s.s. AISI 304

Pos. 12

N° 1 slope screw conveyor

Single spiral screw conveyor for conveying cooked and dripped product to the press feeding tank. Adequate length.

Construction:

- ✓ Bearings support head and gearmotor in carbon steel.
- ✓ Case and side boards in carbon steel.
- ✓ Wear-resistant plates in the spiral housing in 6 mm thick carbon steel.
- ✓ Min. 250 mm diameter conveyor spiral, in thick carbon steel.
- ✓ Complete with supporting frame in coated carbon steel.

Optional: case. side boards wear plates and bearing support in s.s. AISI 304

Pos. 13

N° 1 feeding tank

Suitable to properly feed the continuous press. Approximate volume: 4.5 c.m.

Construction:

- ✓ Front wall for supports and gear-motors in carbon steel.
- ✓ Auger case and side boards in carbon steel.
- ✓ Extracting spiral 250 mm diameter.

- ✓ Carbon steel central tubular axis.
- ✓ Support frame made of painted carbon steel.
- ✓ Variable frequency drive to adjust the auger speed.
- ✓ Complete of carbon steel support frame and side reinforcements.

Optional: case. side boards wear plates and bearing support in s.s. AISI 304

Pos. 14

N° 1 continuous press

For pressing the solid material coming from the cooker.

Characteristics:

- ✓ Base and frame in robust carbon steel, self-supporting and appropriately machined and bored for alignment with the various components.
- ✓ Parallel axis gearmotor.
- ✓ Cast steel pressing cage.

Pressing equipment (blades, slats, cone etc..) in special heat treated steel, the last pressing blade in highly resistant steel.

Pressure cone adjustment activated by the hydraulic control unit powered by means of an electric motor.

Complete with supporting structures.

- ✓ Coil on the liquid fat ejection base powered by a gearmotor.
- ✓ Inlet production 3,000 Kg/h.
- ✓ Fat leftover in the meal: 10-11%
- ✓ Command motor for central pressing shaft.
- ✓ Total installed power: approximately 90 Kw.

Pos. 15

N° 1 slope screw conveyor

Single auger conveyor to collect the pressed product.

Construction:

- ✓ Bearings support head and gearmotor in carbon steel.
- ✓ Case and side boards in carbon steel.
- ✓ Wear-resistant plates in the spiral housing in 6 mm thick carbon steel.
- ✓ Min. 250 mm diameter conveyor spiral, in thick carbon steel.
- ✓ Complete with supporting frame in coated carbon steel.

Optional: case. side boards wear plates and bearing support in s.s. AISI 304

CATEGORY 1 - GRINDING AND MEAL STORAGE SECTION

Pos. 16

N° 1 hammer mill feed balance tank

For storage of pressed material and dosing to the hammer mill. Total storage capacity c.m. 30 approx.

Construction:

- ✓ Front wall for supports and gear-motors in carbon steel.

- ✓ Auger case and side boards in carbon steel.
- ✓ External reinforced ribbing, with corner profiles.
- ✓ Extracting spiral 300 mm diameter minimum.
- ✓ Carbon steel central tubular axis.
- ✓ Support frame made of painted carbon steel.
- ✓ Variable frequency drive to adjust the auger speed.
- ✓ Complete with support frame.

Optional: front guards. side guards and conical bottom in s.s. AISI 304

Pos. 17

N° 1 slope screw conveyor

To transfer the pressed meal to the hammer mill.

Construction:

- ✓ Bearings support head and gearmotor in carbon steel.
- ✓ Case and side boards in carbon steel.
- ✓ Wear-resistant plates in the spiral housing in 6 mm thick carbon steel.
- ✓ Minimum 250 mm diameter conveyor spiral, in thick carbon steel.
- ✓ Complete of painted carbon steel supporting structure

Optional: case. side boards wear plates and bearing support in s.s. AISI 304

Pos. 18

N° 1 hammer mill

For grinding the pressed material. Grinding capacity 4,000/4,500 Kg/h.

- ✓ Made of thick, welded and bored carbon steel sheet.
- ✓ Frame in sturdy profiles supported by anti-vibration dampers.
- ✓ Internal, easily removable and heat treated, wear-resistant plates.
- ✓ Dynamically balanced disc rotor hammer holder.
- ✓ Easy replaceable perforated mesh.
- ✓ Heat treated, easily replaceable crushing hammers.
- ✓ Installed power approximately 55 Kw.
- ✓ Flexible joint connecting motor and rotor.
- ✓ Shock absorbers
- ✓ Complete with supporting structure.

Pos. 19

N° 1 slope screw conveyor

To bring the ground meal to the bucket elevator. Construction:

- ✓ Bearings support head and gearmotor in carbon steel.
- ✓ Case and side boards in carbon steel.
- ✓ Wear-resistant plates in the spiral housing in 6 mm thick carbon steel.
- ✓ Minimum 250 mm diameter conveyor spiral, in thick carbon steel.

Optional: case. side boards wear plates and bearing support in s.s. AISI 304

Pos. 20

N° 1 bucket elevator

Vertical bucket elevator for loading the ground meal into the storage silos.

- ✓ Made of painted carbon steel with external parts in hot galvanized steel.
- ✓ Nominal flow rate 5,000 kg/h powdered meal.
- ✓ Driving head with 1.1 kw gearmotor minimum
- ✓ Upper cover and front closure made of wear-resistant sheet metal.
- ✓ Return head with cage pulley.
- ✓ Screw belt tension system.
- ✓ Double emptying and cleaning hatch.
- ✓ Oil-resistant three-layer polyester tape with rubber lining.
- ✓ Molded steel cups.
- ✓ Inspection ladder with EC protection for access to the control head
- ✓ Maintenance walkway at the control head, with EC approved railings.

Pos. 21

N° 1 distributing screw conveyor

Single spiral, it receives the meal from the bucket elevator and loads the 2 storage silos.

Construction:

- ✓ Bearings support head and gearmotor in carbon steel.
- ✓ Case and side boards in carbon steel.
- ✓ Wear-resistant plates in the spiral housing in 8 mm thick carbon steel.
- ✓ Minimum 250 mm diameter conveyor spiral, in thick carbon steel.
- ✓ One end discharge opening plus 1 intermediate with pneumatically operated discharge valves.

Optional: case. side boards wear plates and bearing support in s.s. AISI 304

Pos. 22

N° 2 meal storage silos

Approximately 30 c.m. each, total storage capacity approximately 60,000 kg.

External dimensions 2.40 m.

Vertical unloading motorized system directly on the tankers.

Construction:

- ✓ Painted carbon steel sheets.
- ✓ Upper walkable end in carbon steel.
- ✓ EC approved upper perimeter railings.
- ✓ EC approved hooped ladder to access the top.
- ✓ Support structure in painted carbon steel heavy beams with support plates, anchors and bracing.
- ✓ Lower clearance 3.20 mt. H to allow vehicle transit.
- ✓ Possibility of downloading the meal directly into big bags
- ✓ Surface coatings suitable for external weather conditions.
- ✓ Complete of painted carbon steel supporting structure

CATEGORY 1 - FAT AND FAT STORAGE SECTION

Pos. 23

N° 1 group of 2 screw conveyors for recycling to presses

To recycle the powder unloaded from the dripping tank (11) back to the presses to improve the fat extraction yield.

Made up of:

- ✓ Horizontal Auger Screw with perforated double base to drain the liquid fat.
- ✓ Liquid fat collection tank incorporated in the auger screw, and connected to the centrifugal pump.
- ✓ Inclined screw conveyor to transport meal to the loading screw conveyor of the continuous presses.
- ✓ Spirals with minimum 200 mm diameter made of carbon steel.
- ✓ Perforated base for fat drain.

Pos. 24

N° 1 sloping screw conveyor

Single auger. To recover the powder unloaded from the decanter back to press it again.

Made up of:

- ✓ Horizontal Auger Screw with perforated double base to drain the liquid fat.
- ✓ Liquid fat collection tank incorporated in the auger screw, and connected to the centrifugal pump.
- ✓ Inclined screw conveyor to transport meal to the loading screw conveyor of the continuous presses.
- ✓ Spiral with 200 mm diameter made of carbon steel.

Optional: case. side boards wear plates and bearing support in s.s. AISI 304

Pos. 25

N° 1 dirty fat tank

To contain dirty fat coming from the batch cooker and the continuous press.

- ✓ Storage capacity approx. 6,000 kg.
- ✓ Tapered base for total emptying.
- ✓ Made of carbon steel plate, with steam circulation coils at 3 bar for fat heating.
- ✓ Central stirrer powered by gearmotor.

Optional: completely made of s.s. AISI 304

Pos. 26

N° 1 horizontal decanter/centrifuge

For fat cleaning (powder separation).

- ✓ Capacity 2,500/3,000 L/h.
- ✓ Main motor power 18.5 kw approx.
- ✓ Sludge scraper motor power 0.25 kw.
- ✓ With electrical control panel and accessories.
- ✓ AISI 304 stainless steel clean fat recycling tank.

Pos. 27

N° 1 clean fat tank

To store centrifuged, clean fat.

- ✓ Storage capacity approx. 6,000 kg.
- ✓ Tapered base for total emptying.
- ✓ Made of carbon steel plate, with steam circulation coils at 3 bar for fat heating.
- ✓ Central stirrer powered by gearmotor.

Optional: completely made of s.s. AISI 304

Pos. 28

N° 1 clean fat storage tank

- ✓ Construction in s.s. AISI 304, dimensions diam. 2.4 m, height 10.00, approximate capacity 50 c.m
- ✓ Support sleeve and lower cone 8 mm thick.
- ✓ Upper shells mm 5 and mm 4 thick.
- ✓ Inner heating coil with SS tubes 1” ¼.
- ✓ Inspection hatches.
- ✓ Max and min level indicator.
- ✓ Vehicle loading centrifugal horizontal pump kw 4 head from 6 to 20 m.
- ✓ Manual fat unloading valves.
- ✓ Compliant hooped ladder with access to the top made of hot-galvanized carbon steel.
- ✓ EC standard compliant upper walkway made of hot-galvanized carbon steel, length.

Pos. 29

N° 1 air condenser

Stainless steel tube nest condensers to condensate the fumes from the batch cookers. Condensing capacity 2,500 l/h.

Construction:

- ✓ Side bundles in galvanised sheet metal.
- ✓ Pipe plates and pipe bundle completely made of stainless steel AISI 304.
- ✓ Fume receiving chamber in AISI 304 stainless steel.
- ✓ Unloading chamber of the condensate in AISI 304 stainless steel.
- ✓ Fume receiving manifold and pipe bundle distribution.

Air ventilation unit and supporting structure in painted carbon steel. Made up of:

- ✓ Delivery duct to the pipe bundle.
- ✓ Air blower, total flow rate minimum 270,000 m3/hour.
- ✓ Centrifugal extraction fan with speed adjustment in stainless steel AISI 304 stainless steel.
- ✓ Supporting structure for the air-cooled condenser, height 2.00 m, made of robust painted carbon steel beams.

Pos. 30

N° 1 electric command board

To control and command the entire system of receiving – crushing – cooking – pressing – grinding - liquid fat processing.

Complete with N° 1 industrial color screen PC.

Series of frequency drive variators for the following components:

- ✓ Cooker feeding system.
- ✓ Cooker unloading system.
- ✓ Press feeding system.
- ✓ Mill feeding system.
- ✓ Flash condensate recovery pump.

Hydraulic material for steam and condensate piping

From the steam distribution collector to the batch cookers, with relevant adjustment valves.

Condensate drainage from the batch cookers to the condensate recovery device with relevant condensate drains and accessories.

All necessary material for the proper operation of the system.

Electrical connections form the electric command board to the use points complete with:

Galvanised cable ducts.

Galvanised cable pipes.

Cables for connection of the motors of each individual device.

Shielded and profibus cables for the industrial control and supervision equipment.

Electrical connections from the electrical panel to each individual use point.

Pos. 31

Series of N°5, 1.5 kw centrifugal pumps for the transport of fat with:

- ✓ N. 1 pump for fat delivery from the screw conveyors to the dirty fat storage tanks.
- ✓ N. 1 pump for fat delivery from the dirty fat storage tank to the decanter.
- ✓ N. 1 pump for delivery of clean fat from the decanter (35) to the clean fat storage tank.
- ✓ N. 2 pumps for delivery of clean fat from the storage tank to the vertical storage tank.

Pos. 32

N. 1 two stages chemical scrubbing pack tower

Capacity: 25,000 m3/hr. poly-propylene scrubber, with a static bed filling, operating with counter flow liquids with different reagents in order to neutralize pollutants. The installation consists of N.2 vertical washing scrubbers in succession for vapor removal carried by the air stream.

The treatment stages consist of:

Scrubber 1:

Fist stage to remove NH3, with sulphuric acid, with two separated chemical washing stages.

Total contact time > 3.5 sec.

Scrubber 2:

Second stage to remove H2S and odour, with caustic soda and sodium hypochlorite with two separated chemical washing stages.

Total contact time > 2.0 sec.

Final washing with industrial water.

Estimated pressure drop: 90 mm.w.c.

Construction material:

- ✓ External/internal material: P.P.
- ✓ Reinforcements / Supports: P.P.
- ✓ Spraying nozzles: P.V.C.
- ✓ Drop stopper: P.V.C.
- ✓ Washing ramp: P.P.
- ✓ Packing: P.P.

The following components of the vertical scrubber are included in the supply:

a) Electric pumps for washing solution recirculation.

b) Packing layers consisting of highly efficient random rings PP.

c) Spray nozzle header over static filling media support.

d) Demister for vertical flow placed after each bed stages.

e) Valves, electrovalves, control levels and other fittings necessary for the proper functioning of the scrubbers.

Chemicals Dosing System

In order to optimize the scrubber's operation, chemicals dosing is necessary to improve the pollutants adsorption.

The automatic dosing system is made up with:

- ✓ pH monitoring and regulation system.
- ✓ Dosing pumps operated by the pH monitoring system.

ITEM 2.2 – SPARE PARTS FOR 2 YEARS OF OPERATION

This list will be prepared once the ABP equipment supplier has been selected.

ITEM 2.3 – ROOM AIR HANDLING 50,000 M3/HR

N. 1 **Set Room Air Ducting**

Set of Room Air Ducting with connecting room air vent.

N. 1 **Centrifugal fan**

Capacity: 50,000 m3/hr. Constructed of stainless steel with electrical motor, coupled to the fan with V-belt drive arrangement, basement Mild steel, shaft seals, rubber shock absorber.

N. 1 **Butterfly valve with electro-pneumatic control**

Stainless steel butterfly valve, for control of vacuum at starting of the fan.

N.1 **Chemical Scrubbing Pack Tower (Single Stage)**

Capacity: 50,000 m3/hr. poly-propylene scrubber, with a static bed filling, operating with counter flow liquids with different reagents in order to neutralize pollutants. Scrubber is complete with:

- Integrated liquid storage tank.
- Fresh water automatic injection system.
- Level probe control 4 positions.
- Recirculation pumps for washing/oxidation liquids.
- Connecting piping.
- Poly-propylene packing.
- Demister package (loss of liquid for washing 0.4-0.5‰).
- Inspection/Filling ring loading/unloading door.
- Drain bottom valve.
- Valve for manual supply of the liquids.
- Electric valve for charging.
- Chimney expulsion poly-propylene for exhaust air.
- Sample opening.

Chemicals required: NaOH, NaOCl.

Chemical dosing pumps:

- 1 electromagnetic membrane metering pumps with pH instrument with following features:
  - automatic operation on/off, in accordance with the measured pH value;
  - manual operation with potentiometer;
  - pH glass probe with 5 m electrical wire;
  - 1 output 4-20 mA for the remote visualization of the pH value;
  - 1 regulator with 1 set point for the intervention of the pump.
- 1 electromagnetic membrane metering pump with Red ox instrument completed with the following features:
  - automatic operation on/off, in accordance with the measured mV value;
  - manual operation with potentiometer;
  - pH glass probe with 5 m electrical wire;
  - 1 output 4-20 mA for the remote visualization of the mV value;
  - 1 regulator with 1 set point for the intervention of the pump.

2.A.2.2.2. CAT. 3 ABP PROCESSING EQUIPMENT – GENERAL DESCRIPTION
(see Annex 2.A.2. dwg T01/03/01: Plant Layout)

The production line will have a capacity of 2.5 Tons/h of raw material, will work according to Method 1 and meeting the requirements as stated above. The processing line will be composed of 4 main sections:

1. receiving and crushing section
2. cooking and pressing section
3. grinding and meal storage section
4. fat and fat storage section

Construction material: Painted carbon steel. The supplier may offer stainless steel AISI 304 as an alternative to be evaluated by the Beneficiary.

The production line will be complete of air condenser to condensate the fumes from the batch cooker of proper capacity.

A chemical scrubbing pack tower of proper capacity, collecting the internal air, operating with different reagents in order to neutralize pollutants.

An electric command board To control and command the entire system of receiving – crushing – cooking – pressing – grinding - liquid fat processing. Complete with N° 1 industrial color screen PC.

Hydraulic material for steam and condensate piping

Electrical connections form the electric command board to the use points

Set Spare parts for two years of operation

Room air handling system to collect the internal air and to the chemical scrubbing pack tower.

ITEM 2.1 – ABP CAT. 3 PROCESSING EQUIPMENT

CATEGORY 3 EQUIPMENT - RECEIVING AND CRUSHING SECTION

Pos. 1

N° 1 receiving bin

Suitable to receive loose product from trucks, with free unloading with inclined coils.

Total storage capacity mc. 35 approx.

Construction: Base made up of:

N° 3 transport augers of diam. Not less than 450 mm

- ✓ Front wall for supports and gear-motors in 10 mm thick carbon steel.
- ✓ Auger case and conical base in carbon steel with anti-wear plates in the housings.
- ✓ Carbon steel vertical side walls to be bolted to the base and welded to the finished machine.
- ✓ External reinforced ribbing, with corner profiles.
- ✓ Unloading spirals in stamped sheet metal, of proper diameter.
- ✓ Carbon steel central tubular axis.
- ✓ Support frame made of hot galvanized material beams.

Optional: construction material stainless steel AISI 304

Pos. 1.a

N° 1 lid for receiving container

Of suitable dimensions for reception containers made of AISI 304, 3 mm thick stainless steel sheet with reinforcement ribbing.

No. 2 hydraulic cylinders for lid operation controlled by a hydraulic motorized control unit with solenoid valves.

Pos. 2

N° 1 slope screw conveyor

Single auger conveyor receiving from the container and conveying to the crusher.

Adequate length.

Construction:

- ✓ Bearings support head and gearmotor in carbon steel.
- ✓ Case and side boards in carbon steel.

- ✓ Wear-resistant plates in the spiral housing in 6 mm thick carbon steel.
- ✓ 450 mm diameter conveyor spiral, in thick carbon steel.
- ✓ Complete with supporting frame in coated carbon steel.

Optional: case and side boards wear plates and bearing support in s.s. AISI 304

Pos. 3

N°1 metal detector

To identify and reject metal pieces which could damage the equipment.

Control panel containing:

- ✓ Current rectifier.
- ✓ Transformer.
- ✓ On and off commands.
- ✓ Sloping made of AISI 304 Stainless Steel.

Optional: construction material in s.s. AISI 304

Pos. 4

N° 1 crusher

For chopping small parts of animal carcasses, other collected ABPs, in conformity with current standards and regulations.

- ✓ Self-supporting, robust coated carbon steel frame.
- ✓ Dynamically balanced rotating roller, with rotating blades with carry-over of anti-wear material.
- ✓ Double row of fixed blades for double crushing, made of heat-treated steel.
- ✓ Cast iron supports, bearing housing.
- ✓ Approximately 75 kw electric motor.
- ✓ Complete with carbon steel support frame.

Pos. 5

N° 1 slope screw conveyor

Single auger conveyor receiving from the container and conveying to the process and finishing crusher.

Adequate length.

Construction:

- ✓ Bearings support head and gearmotor in carbon steel.
- ✓ Case and side boards in carbon steel.
- ✓ Wear-resistant plates in the spiral housing in 6 mm thick carbon steel.
- ✓ Not less than 400 mm diameter conveyor spiral, in thick carbon steel.
- ✓ Complete with supporting frame in coated carbon steel.

Optional: case and side boards wear plates and bearing support in s.s. AISI 304

Pos. 6

N° 1 counter – rollers finishing crusher

For carrying out a second crushing in conformity with current standard and regulations.

Composed of:

- ✓ Crushing stars mounted on shafts with a diameter of 360 mm and thickness of 14 mm with 8 cutting points.
- ✓ Clearence 16 mm
- ✓ Cleaning combs mounted on the two side walls.
- ✓ Execution of the stars and combs in highly wear-resistant material.
- ✓ Electro-welded and bolted thick carbon steel sheet body.
- ✓ Control gearmotor, directly coupled to the primary roller, with parallel axes, suitable for 37 kW motor
- ✓ Primary roller speed 44 revolutions per minute
- ✓ Gear transmission, for secondary roller driven at 48 revolutions per 1 'mounted in a special box in an oil bath.

Pos. 7

N° 1 slope screw conveyor

Single auger conveyor to bring the product to the final crushing stage and start the cooking cycle. Adequate length.

Construction:

- ✓ Bearings support head and gearmotor in carbon steel.
- ✓ Case and side boards in carbon steel.
- ✓ Wear-resistant plates in the spiral housing in 6 mm thick carbon steel.
- ✓ Min. diameter 300 mm diameter conveyor spiral, in thick carbon steel.
- ✓ Complete with supporting frame in coated carbon steel.

Optional: case and side boards wear plates and bearing support in s.s. AISI 304

CATEGORY 3 EQUIPMENT -COOKING AND PRESSING SECTION

Pos. 8

N° 1 receiving container

For a suitable feeding of the continuous cooker. Total storage capacity mc. 25 approx.

Construction:

- ✓ Front wall for supports and gear-motors in carbon steel
- ✓ Auger case and side boards in carbon steel
- ✓ External reinforced ribbing, with corner profiles
- ✓ N° 2 extracting spirals 300 mm diameter
- ✓ Carbon steel central tubular axis
- ✓ Support frame made of painted carbon steel
- ✓ Variable frequency drive to adjust the auger speed

Optional: case. side boards wear plates and bearing support in s.s. AISI 304

Pos. 9

N° 1 slope screw conveyor

Single auger conveyor for taking the product to the cooking section. Adequate length.

Construction:

- ✓ Bearings support head and gearmotor in carbon steel
- ✓ Case and side boards in carbon steel
- ✓ Wear-resistant plates in the spiral housing in 5 mm thick carbon steel
- ✓ Min. spiral diameter 300 mm diameter conveyor spiral, in thick carbon steel.
- ✓ Complete with supporting frame in coated carbon steel.

Optional: case. side boards wear plates and bearing support in s.s. AISI 304

Pos. 10

N° 1 batch cooker

Designed for the hydrolysis and sterilisation of the product, manufactured in accordance with EC laws with certified materials and qualified operators.

Suitable for melting and pouring of slaughtered animal by-products.

Capacity: not less than 5,000 lt with load capacity 2,500 – 3,000 lts.

Heating mean: saturated steam at 6 bars in the gap. Operating internal pressure 3 bar. Designed according to CE standards with certified materials and operators.

The machine is composed of:

- ✓ Internal and external painted carbon steel cylindrical walls.
- ✓ Central spinning shaft, internally heated with steam at 6 bars, provided of mixing and discharge heavy duty rotating blades.
- ✓ Condensate unloading device to recover the condensate.
- ✓ 6.5 Bar safety valve for the gap pressure.
- ✓ 3.5 safety valve for the control of the internal pressure.
- ✓ Temperature detector PT 100 for reading the working temperature.
- ✓ Pressure detector for reading the internal operating pressure.
- ✓ Upper cyclone of the evaporated fumes, entirely made of AISI 304 stainless steel.
- ✓ Resistant coated carbon steel support frame.
- ✓ Automatic condensate discharge
- ✓ Loading cells for loading the product.
- ✓ Inspection platforms, gangways and stairs for easy access to all parts of the cooker.
- ✓ Temperature and time regulation device to assure the full conformity with the EU regulations.

Pos. 11

N° 1 dripping tank

Suitable to receive and drain the cooked sterilized product discharged from the cooker.

Construction:

- ✓ Front wall for supports and gear-motors in carbon steel.
- ✓ Auger case and side boards in carbon steel.

- ✓ Transporting min. spiral 250 mm diameter.
- ✓ Extracting spiral min. 250 mm diameter.
- ✓ Carbon steel central tubular axis.
- ✓ S.s. AISI 304 bottom perforated metal sheet.
- ✓ Support frame made of painted carbon steel.
- ✓ Variable frequency drive to adjust the auger speed.
- ✓ Complete of carbon steel support frame.

Optional: case. side boards wear plates and bearing support in s.s. AISI 304

Pos. 12

N° 1 slope screw conveyor

Single spiral screw conveyor for conveying cooked and dripped product to the press feeding tank.

Adequate length.

Construction:

- ✓ Bearings support head and gearmotor in carbon steel.
- ✓ Case and side boards in carbon steel.
- ✓ Wear-resistant plates in the spiral housing in 6 mm thick carbon steel.
- ✓ Min. 250 mm diameter conveyor spiral, in thick carbon steel.
- ✓ Complete with supporting frame in coated carbon steel.

Optional: case. side boards wear plates and bearing support in s.s. AISI 304

Pos. 13

N° 1 feeding tank

Suitable to properly feed the continuous press. Approximate volume: 4.5 c.m.

Construction:

- ✓ Front wall for supports and gear-motors in carbon steel.
- ✓ Auger case and side boards in carbon steel.
- ✓ Extracting spiral 250 mm diameter.
- ✓ Carbon steel central tubular axis.
- ✓ Support frame made of painted carbon steel.
- ✓ Variable frequency drive to adjust the auger speed.
- ✓ Complete of carbon steel support frame and side reinforcements.

Optional: case. side boards wear plates and bearing support in s.s. AISI 304

Pos. 14

N° 1 continuous press

For pressing the solid material coming from the cooker. Characteristics:

- ✓ Base and frame in robust carbon steel, self-supporting and appropriately machined and bored for alignment with the various components.
- ✓ Parallel axis gearmotor.
- ✓ Cast steel pressing cage.

Pressing equipment (blades, slats, cone etc..) in special heat treated steel, the last pressing blade in highly resistant steel.

Pressure cone adjustment activated by the hydraulic control unit powered by means of an electric motor.

Complete with supporting structures.

- ✓ Coil on the liquid fat ejection base powered by a gearmotor.
- ✓ Inlet production 3,000 Kg/h.
- ✓ Fat leftover in the meal: 10-11%
- ✓ Command motor for central pressing shaft.
- ✓ Total installed power: approximately 90 Kw.

Pos. 15

N° 1 slope screw conveyor

Single auger conveyor to collect the pressed product.

Construction:

- ✓ Bearings support head and gearmotor in carbon steel.
- ✓ Case and side boards in carbon steel.
- ✓ Wear-resistant plates in the spiral housing in 6 mm thick carbon steel.
- ✓ Min. 250 mm diameter conveyor spiral, in thick carbon steel.
- ✓ Complete with supporting frame in coated carbon steel.

Optional: case. side boards wear plates and bearing support in s.s. AISI 304

CATEGORY 3 EQUIPMENT - GRINDING AND MEAL STORAGE SECTION

Pos. 16

N° 1 hammer mill feed balance tank

For storage of pressed material and dosing to the hammer mill. Total storage capacity c.m. 30 approx.

Construction:

- ✓ Front wall for supports and gear-motors in carbon steel.
- ✓ Auger case and side boards in carbon steel.
- ✓ External reinforced ribbing, with corner profiles.
- ✓ Extracting spiral 300 mm diameter minimum.
- ✓ Carbon steel central tubular axis.
- ✓ Support frame made of painted carbon steel.
- ✓ Variable frequency drive to adjust the auger speed.
- ✓ Complete with support frame.

Optional: front guards. side guards and conical bottom in s.s. AISI 304

Pos. 17

N° 1 slope screw conveyor

To transfer the pressed meal to the hammer mill. Construction:

- ✓ Bearings support head and gearmotor in carbon steel.
- ✓ Case and side boards in carbon steel.

- ✓ Wear-resistant plates in the spiral housing in 6 mm thick carbon steel.
- ✓ Minimum 250 mm diameter conveyor spiral, in thick carbon steel.
- ✓ Complete of painted carbon steel supporting structure

Optional: case. side boards wear plates and bearing support in s.s. AISI 304

Pos. 18

N° 1 hammer mill

For grinding the pressed material. Grinding capacity 4,000/4,500 Kg/h.

- ✓ Made of thick, welded and bored carbon steel sheet.
- ✓ Frame in sturdy profiles supported by anti-vibration dampers.
- ✓ Internal, easily removable and heat treated, wear-resistant plates.
- ✓ Dynamically balanced disc rotor hammer holder.
- ✓ Easy replaceable perforated mesh.
- ✓ Heat treated, easily replaceable crushing hammers.
- ✓ Installed power approximately 55 Kw.
- ✓ Flexible joint connecting motor and rotor.
- ✓ Shock absorbers
- ✓ Complete with supporting structure.

Pos. 19

N° 1 slope screw conveyor

To bring the ground meal to the bucket elevator.

Construction:

- ✓ Bearings support head and gearmotor in carbon steel.
- ✓ Case and side boards in carbon steel.
- ✓ Wear-resistant plates in the spiral housing in 6 mm thick carbon steel.
- ✓ Minimum 250 mm diameter conveyor spiral, in thick carbon steel.

Optional: case. side boards wear plates and bearing support in s.s. AISI 304

Pos. 20

N° 1 bucket elevator

Vertical bucket elevator for loading the ground meal into the storage silos.

- ✓ Made of painted carbon steel with external parts in hot galvanized steel.
- ✓ Nominal flow rate 5,000 kg/h powdered meal.
- ✓ Driving head with 1.1 kw gearmotor minimum
- ✓ Upper cover and front closure made of wear-resistant sheet metal.
- ✓ Return head with cage pulley.
- ✓ Screw belt tension system.
- ✓ Double emptying and cleaning hatch.
- ✓ Oil-resistant three-layer polyester tape with rubber lining.
- ✓ Molded steel cups.
- ✓ Inspection ladder with EC protection for access to the control head
- ✓ Maintenance walkway at the control head, with EC approved railings.

Pos. 21

N° 1 distributing screw conveyor

Single spiral, it receives the meal from the bucket elevator and loads the 2 storage silos.

Construction:

- ✓ Bearings support head and gearmotor in carbon steel.
- ✓ Case and side boards in carbon steel.
- ✓ Wear-resistant plates in the spiral housing in 8 mm thick carbon steel.
- ✓ Minimum 250 mm diameter conveyor spiral, in thick carbon steel.
- ✓ One end discharge opening plus 1 intermediate with pneumatically operated discharge valves.

Optional: case. side boards wear plates and bearing support in s.s. AISI 304

Pos. 22

N° 2 meal storage silos

Approximately 30 c.m. each, total storage capacity approximately 60,000 kg.

External dimensions 2.40 m.

Vertical unloading motorized system directly on the tankers.

Construction:

- ✓ Painted carbon steel sheets.
- ✓ Upper walkable end in carbon steel.
- ✓ EC approved upper perimeter railings.
- ✓ EC approved hooped ladder to access the top.
- ✓ Support structure in painted carbon steel heavy beams with support plates, anchors and bracing.
- ✓ Lower clearance 3.20 mt. H to allow vehicle transit.
- ✓ Possibility of downloading the meal directly into big bags
- ✓ Surface coatings suitable for external weather conditions.
- ✓ Complete of painted carbon steel supporting structure

CATEGORY 3 EQUIPMENT - FAT AND FAT STORAGE SECTION

Pos. 23

N° 1 group of 2 screw conveyors for recycling to presses

To recycle the powder unloaded from the dripping tank (11) back to the presses to improve the fat extraction yield.

Made up of:

- ✓ Horizontal Auger Screw with perforated double base to drain the liquid fat.
- ✓ Liquid fat collection tank incorporated in the auger screw, and connected to the centrifugal pump.
- ✓ Inclined screw conveyor to transport meal to the loading screw conveyor of the continuous presses.
- ✓ Spirals with minimum 200 mm diameter made of carbon steel.
- ✓ Perforated base for fat drain.

Pos. 24

N° 1 sloping screw conveyor

Single auger. To recover the powder unloaded from the decanter back to press it again.

Made up of:

- ✓ Horizontal Auger Screw with perforated double base to drain the liquid fat.
- ✓ Liquid fat collection tank incorporated in the auger screw, and connected to the centrifugal pump.
- ✓ Inclined screw conveyor to transport meal to the loading screw conveyor of the continuous presses.
- ✓ Spiral with 200 mm diameter made of carbon steel.

Optional: case. side boards wear plates and bearing support in s.s. AISI 304

Pos. 25

N° 1 dirty fat tank

To contain dirty fat coming from the batch cooker and the continuous press.

- ✓ Storage capacity approx. 6,000 kg.
- ✓ Tapered base for total emptying.
- ✓ Made of carbon steel plate, with steam circulation coils at 3 bar for fat heating.
- ✓ Central stirrer powered by gearmotor.

Optional: completely made of s.s. AISI 304

Pos. 26

N° 1 horizontal decanter/centrifuge

For fat cleaning (powder separation).

- ✓ Capacity 2,500/3,000 L/h.
- ✓ Main motor power 18.5 kw approx.
- ✓ Sludge scraper motor power 0.25 kw.
- ✓ With electrical control panel and accessories.
- ✓ AISI 304 stainless steel clean fat recycling tank.

Pos. 27

N° 1 clean fat tank

To store centrifuged, clean fat.

- ✓ Storage capacity approx 6,000 kg.
- ✓ Tapered base for total emptying.
- ✓ Made of carbon steel plate, with steam circulation coils at 3 bar for fat heating.
- ✓ Central stirrer powered by gearmotor.

Optional: completely made of s.s. AISI 304

Pos. 28

N° 2 clean fat storage tanks

- ✓ Construction in s.s. AISI 304, dimensions diam. 2.4 m, height 10.00, approximate capacity 50 c.m each
- ✓ Support sleeve and lower cone 8 mm thick.

- ✓ Upper shells mm 5 and mm 4 thick.
- ✓ Inner heating coil with SS tubes 1” ¼.
- ✓ Inspection hatches.
- ✓ Max and min level indicator.
- ✓ Vehicle loading centrifugal horizontal pump kw 4 head from 6 to 20 m.
- ✓ Manual fat unloading valves.
- ✓ Compliant hooped ladder with access to the top made of hot-galvanized carbon steel.
- ✓ EC standard compliant upper walkway made of hot-galvanized carbon steel, length.

Pos. 29

N° 1 air condenser

Stainless steel tube nest condensers to condensate the fumes from the batch cookers. Condensing capacity 2,500 l/h.

Construction:

- ✓ Side bundles in galvanised sheet metal.
- ✓ Pipe plates and pipe bundle completely made of stainless steel AISI 304.
- ✓ Fume receiving chamber in AISI 304 stainless steel.
- ✓ Unloading chamber of the condensate in AISI 304 stainless steel.
- ✓ Fume receiving manifold and pipe bundle distribution.

Air ventilation unit and supporting structure in painted carbon steel. Made up of:

- ✓ Delivery duct to the pipe bundle.
- ✓ Air blower, total flow rate minimum 270,000 m3/hour.
- ✓ Centrifugal extraction fan with speed adjustment in stainless steel AISI 304 stainless steel.
- ✓ Supporting structure for the air-cooled condenser, height 2.00 m, made of robust painted carbon steel beams.

Pos. 30

N° 1 electric command board

To control and command the entire system of receiving – crushing – cooking – pressing – grinding - liquid fat processing.

Complete with N° 1 industrial color screen PC.

Series of frequency drive variators for the following components:

- ✓ Cooker feeding system.
- ✓ Cooker unloading system.
- ✓ Press feeding system.
- ✓ Mill feeding system.
- ✓ Flash condensate recovery pump.

Hydraulic material for steam and condensate piping

From the steam distribution collector to the batch cookers, with relevant adjustment valves.

Condensate drainage from the batch cookers to the condensate recovery device with relevant condensate drains and accessories.

All necessary material for the proper operation of the system.

Electrical connections form the electric command board to the use points complete with:

Galvanised cable ducts.

Galvanised cable pipes.

Cables for connection of the motors of each individual device.

Shielded and profibus cables for the industrial control and supervision equipment.

Electrical connections from the electrical panel to each individual use point.

Pos. 31

Series of N°5, 1.5 kw centrifugal pumps for the transport of fat with:

- ✓ N. 1 pump for fat delivery from the screw conveyors to the dirty fat storage tanks.
- ✓ N. 1 pump for fat delivery from the dirty fat storage tank to the decanter.
- ✓ N. 1 pump for delivery of clean fat from the decanter (35) to the clean fat storage tank.
- ✓ N. 2 pumps for delivery of clean fat from the storage tank to the vertical storage tank.

Pos. 32

N. 1 two stages chemical scrubbing pack tower

Capacity: 25,000 m3/hr. poly-propylene scrubber, with a static bed filling, operating with counter flow liquids with different reagents in order to neutralize pollutants.

The installation consists of N.2 vertical washing scrubbers in succession for vapor removal carried by the air stream.

The treatment stages consist of:

Scrubber 1:

Fist stage to remove NH_3, with sulphuric acid, with two separated chemical washing stages.

Total contact time > 3.5 sec.

Scrubber 2:

Second stage to remove H_2S and odour, with caustic soda and sodium hypochlorite with two separated chemical washing stages.

Total contact time > 2.0 sec.

Final washing with industrial water.

Estimated pressure drop: 90 mm.w.c.

Construction material:

- ✓ External/internal material: P.P.
- ✓ Reinforcements / Supports: P.P.
- ✓ Spraying nozzles: P.V.C.
- ✓ Drop stopper: P.V.C.
- ✓ Washing ramp: P.P.
- ✓ Packing: P.P.

The following components of the vertical scrubber are included in the supply:

a) Electric pumps for washing solution recirculation.

b) Packing layers consisting of highly efficient random rings PP.

c) Spray nozzle header over static filling media support.

d) Demister for vertical flow placed after each bed stages.

e) Valves, electrovalves, control levels and other fittings necessary for the proper functioning of the scrubbers.

Chemicals Dosing System

In order to optimize the scrubber’s operation, chemicals dosing is necessary to improve the pollutants adsorption.

The automatic dosing system is made up with:

- ✓ pH monitoring and regulation system.
- ✓ Dosing pumps operated by the pH monitoring system.

ITEM 2.2 – SPARE PARTS FOR 2 YEARS OF OPERATION

This list will be prepared once the ABP equipment supplier has been selected.

ITEM 2.3 – ROOM AIR HANDLING 50,000 M3/HR

N. 1 **Set Room Air Ducting**

Set of Room Air Ducting with connecting room air vent.

N. 1 **Centrifugal fan**

Capacity: 50,000 m3/hr. Constructed of stainless steel with electrical motor, coupled to the fan with V-belt drive arrangement, basement Mild steel, shaft seals, rubber shock absorber.

N. 1 **Butterfly valve with electro-pneumatic control**

Stainless steel butterfly valve, for control of vacuum at starting of the fan.

N.1 **Chemical Scrubbing Pack Tower (Single Stage)**

Capacity: 50,000 m3/hr. poly-propylene scrubber, with a static bed filling, operating with counter flow liquids with different reagents in order to neutralize pollutants.

Scrubber is complete with:

- Integrated liquid storage tank.
- Fresh water automatic injection system.
- Level probe control 4 positions.
- Recirculation pumps for washing/oxidation liquids.
- Connecting piping.
- Poly-propylene packing.
- Demister package (loss of liquid for washing 0.4-0.5‰).
- Inspection/Filling ring loading/unloading door.
- Drain bottom valve.

- Valve for manual supply of the liquids.
- Electric valve for charging.
- Chimney expulsion poly-propylene for exhaust air.
- Sample opening.

Chemicals required: NaOH, NaOCl.

Chemical dosing pumps:

- 1 electromagnetic membrane metering pumps with pH instrument with following features:
  - automatic operation on/off, in accordance with the measured pH value;
  - manual operation with potentiometer;
  - pH glass probe with 5 m electrical wire;
  - 1 output 4-20 mA for the remote visualization of the pH value;
  - 1 regulator with 1 set point for the intervention of the pump.
- 1 electromagnetic membrane metering pump with Red ox instrument completed with the following features:
  - automatic operation on/off, in accordance with the measured mV value;
  - manual operation with potentiometer;
  - pH glass probe with 5 m electrical wire;
  - 1 output 4-20 mA for the remote visualization of the mV value;
  - 1 regulator with 1 set point for the intervention of the pump.

2.A.2.3. LOT 3 SUPPLY AND INSTALLATION OF WASTE WATER TREATMENT EQUIPMENT

The waste water treatment plant will be built in order to receive and treat the waste water coming from the animal by-products processing plants (one common to Cat. 1 and Cat. 3 processing lines).

The proposed design solution must be developed to improve the insertion of the plant in the environment, to reduce the occupied area, to improve the management of the plant, to minimize operational costs, also allowing for an eventual future extension, maintaining the same type of treatment sections.

A completely biological treatment will be adopted in order to produce a sludge which can be re-usable and sufficiently stabilized to obtain an efficient dewatering.

DESIGN DATA

First attempt description of the characteristics of the water to be treated. The supplier will take full responsibility for the definition of the inlet and outlet water quality in order to comply with the applicable standards. The adopted data for the project are the following:

- Type of sewage water Industrial.
- Daily flow rate 100 m^3/d.
- BOD concentration 16,824 mg/l.
- COD concentration 30,049 mg/l.
- Suspended Solids 20,000 mg/l.
- TNK 600 mg/l.
- P 447 mg/l.
- FOG < 120 mg/l.
- Water temperature 15 – 25 °C.
- Altitude 2,000 m.a.s.l.

Required parameters of waste water.

The treatment plant is designed to respect the following outlet parameters:

- COD concentration ≤ 80 mg/l.
- BOD concentration ≤ 30 mg/l.
- Suspended Solids ≤ 40 mg/l.
- FOG ≤ 5 mg/l.
- P ≤ 2 mg/l.

The installation will be complete of sludge treatment section and electric command board.

General description of the water treatment process

The water treatment plant is MBBR biological type (or equivalent method) with denitrification and removal of phosphorous. The removal of phosphorous is carried out biologically and simultaneously operated with addition of chemical products.

Due to the very high biological loads at the inlet it will be provided a Dissolved Air Flotation pre-treatment in order to reduce the loads.

The excess sludge is digested aerobically, due to the elevated age of the sludge reached in the oxidation section, and subsequently is sent to a storage tank (to be built on site and at customer's care) and dewatered by centrifuge.

In short, the water depuration process consists of the following phases:

- Accumulation-equalization (tank excluded at Customer's care; equipment included);
- Fine screening;
- Dissolved Air Flotation;
- Denitrification;
- MBBR Biological oxidation;
- Mixed liquor recirculation;
- Phosphate removal;
- Dissolved Air Flotation;
- On line chlorination;
- Excess sludge extraction;
- Centrifugal Decanter;
- Technical room.

Sludge treatment

Due to the high content of suspended solids is expected a sludge daily production around 24 m3/d @ 4% of solid content. For this reason a sludge accumulation tank of at least 40 m3 will be built.

Tank will be realized on site in concrete above ground.

Level sensor for sludge level control.

The sludge treatment plant will include:

Mechanical sludge dewatering with centrifuge

Dewatering system is installed indoor inside a dedicated room.

Sludge conditioning during centrifugation including:

Automatic polyelectrolyte preparation and dosing plant.

Control Panel

All water treatment plant functions are controlled by a control panel that consists of a section of power and a section on automation.

The power section is primarily secured by a main circuit breaker which protects the entire control panel. The panel must be powered by low voltage.

The case is entirely realized in IP54 painted metal and the base is reinforced with steel sections as the top with a lifting bar.

Each user of the plant can be operated manually or automatically. For each user there is a switch with three positions, "0-Manual-Automatic". When the Automatic mode is selected, the plant is controlled by the PLC though a supervision program which is usually displayed on a touch screen monitor and installed on the electrical panel.

Electrical feed lines to electrical control panel are not included.

Technical characteristics:

- Voltage: three phase 400 V, 50 Hz + neutral.
- Installed Power: approx. 100 kW (included sludge dewatering).

2.A.2.4. LOT 4: CIVIL AND BUILDING WORKS, SUPPLY, INSTALLATION OF AUXILIARY PLANTS

The preliminary design of the plant for processing Cat. 1 and Cat. 3 ABPs has been realized according to the following basic criteria:

1. The ABP processing lines are delivered by a unique supplier, therefore, having similar geometrical features and occupying the same surface
2. The two ABP processing lines are separated and independent, according to the EU regulations, without the possibility of cross-contamination. This is obtained by relegating the flux of materials, vehicles, and operators to their respective areas. The two ABP processing lines have, therefore, distinguished entrances and exits for material vehicles and operators as well as separated territories.
3. The two ABP processing lines are deemed to be built in the same area even though their locations could be selected differently according to the availability of space.
4. The two ABP processing lines are designed, in this assumption, to be laid down symmetrically in order to keep the two boiler rooms as close as possible. This allows transferring of fat for burning from one room to the other with simple piping without any need to transfer it using vehicles and thus reducing the possibility of cross-contamination.
5. The raw ABP reception areas are opposite the office building to reduce the risk of perception of bad odors by operators and visitors
6. Under these assumptions the office building could be common to both ABP lines, allowing operators and visitors to the respective lines to proceed directly to their objectives without interfering with each other.

2.A.2.4.1. ITEM 4.1 CAT. 1 & CAT. 3 FACILITIES

(see Annex 2.A.3. dwg T02/01: Plant Layout)

The two processing units are basically designed identical and symmetrical. During the detailed design phase, this arrangement could be changed according to the Beneficiary requirements. The following description is giving a preliminary quality/quantity description of the rooms, spaces, roads and fencing need for the completion of a production site hosting the two ABP lines together.

Pos. 1, Pos. 30

N. 1 for Cat.1 , N. 1 for Cat. 3.

Automatic/manual transit gates for trucks downloading ABP raw material, uploading finished MBM and fat. Of suitable dimensions to allow coming and outgoing vehicles to drive through contemporarily.

Pos. 2 N°1

Parking area for operators and visitors, bitumen layer, partly shaded. Approximate surface area 500 s.m.

Pos. 3 N°1

Office building. Internal and external walls of concrete block or bricks, internal divisions and dimensions as per final design., paving with good quality tiles, locker walls protected with tiles. Common material ceiling. Good quality internal and external doors and windows. Dimensions: approximately 10 x 18 x 3 mts. Complete with perimetric concrete walkway, 900 mm width.

Pos. 4, Pos. 21

Locker and filter area for access to the plant through the Pressing Area, entirely made of concrete block walls protected with tiles up to 3 mt of height, complete of separation walls for w.c. and showers, same materials, heavy or light counter ceiling, tiles paving. N° 1 window, N° 2 entrance doors. Dimensions: approximately 5 x 5.5 x 3 mts.

Pos. 5, Pos. 20

N°1 work shop room, approx.. 5x5.5 mts, 5 mt height, external and internal walls of concrete blocks; ceiling not necessary. N°1, 3 x 3 access door.

Pos. 6, Pos. 19

N°1 electrical room, approx. 5x5.5 mts, 5 mt height, external and internal walls of concrete blocks; ceiling not necessary. N°1, 3 x 3 access door.

Pos. 7, Pos. 18

N°1 pressurized water and air compressor room, approx. 5x5.5 mts, 5 mt height, external and internal walls of concrete blocks; ceiling not necessary. N°1, 3 x 3 access door.

Pos. 8, Pos. 17

N° 1 boiler room, 15.5 x 5.5 mts, 5 mt height, external and internal walls of concrete blocks; ceiling not necessary. N°2, 3 x 3 access door.

Pos. 9, Pos. 16

Locker area for the Reception Area, entirely made of concrete block walls protected with tiles up to 3 mt of height, complete of separation walls for w.c. and showers, same materials, heavy or light counter ceiling, tiles paving. N° 1 window, N° 2 entrance doors. Dimensions: approx. 5 x 5.5 x 3 mts.

Pos. 10, Pos. 24

Reception area, approx. dim. 34.5 x 24 mts, 7 mts high, reinforced concrete structure, mesh 24 x 8 mts, brick or concrete block walls minimum thickness 250 mm, white painted, insulated panel roofing in precoated insulated panel 80 mm thickness; improved concrete floor; separation wall, stainless steel inspectionable drains. Two sides windows 4 x 5 x 1 mts, 30% openable, reinforced glass with aluminum frame. N° 2 fire resistant main doors 6 x 3 mt H, N°1 2.5 x 2.5H fire resistant internal door.

Pos. 11, Pos. 25

Pressing area, approx. dim. 30 x 24 mts, 7 mts high, reinforced concrete structure, mesh 24 x 8 mts, brick or concrete block walls minimum thickness 250 mm, white painted, insulated panel roofing in precoated insulated panel 80 mm thickness; improved concrete floor; separation wall, stainless steel inspectable drains. Two sides windows 4 x 5 x 1 mts, 30% openable, reinforced glass with aluminum frame. N° 2 fire resistant main doors 6 x 3 mt H.

Pos. 12, Pos. 22

N° 1 outdoor air condenser concrete platform, double reinforced concrete socket 20 mm thickness, approx. dim: 8 x 3 mt.

Pos. 13, Pos. 23

N° 1 outdoor scrubber concrete platform, double reinforced concrete socket 20 mm thickness, dim: 5 x 3 mt.

Pos. 14, Pos. 27

Outdoor MBM storage silos concrete platform, double reinforced concrete socket 30 mm thickness, approx. dim: 3 x 6 mt. Suitable to keep permanent and incidental loads according to local and international standards.

Pos. 15, Pos. 26

Outdoor clean fat holding tanks concrete platform, double reinforced concrete socket 20 mm thickness, approx. dim: 3 x 6 mt. Suitable to keep permanent and incidental loads according to local and international standards.

Pos. 32

N° 1 outdoor waste water collection tank, capacity 130 c.m. reinforced concrete walls and socket, dim: 8 x 8 x 2 mt provided with level meter, overfull discharge, inlet and outlet pipes, drain.

Pos. 33

N° 1 waste water treatment station command room, realized in pre-coated insulated panel, 80 mm thick, insulated roof same material, two windows, one access door, concrete floor. Dimensions 4 x 4 x 3 mt.

Pos. 34

N° 1 outdoor sludge accumulation tank, capacity 40 c.m. reinforced concrete walls and socket, dim: 10 x 10 x 2 mt provided with level meter, overfull discharge, inlet and outlet pipes, drain.

Pos. 35, Pos. 36

Truck and containers sanitation sheds, approx.. dim. 8 x 12 mts, 7 mts high, reinforced concrete structure, no walls, white painted, insulated panel roofing in precoated insulated panel 80 mm thickness; improved concrete floor suitable for transit of heavy vehicles; inspectable drains.

Pos. 28

N° 2 outdoor truck wheels washing platforms, double reinforced concrete socket 20 mm thickness, dim: 3 x 8 mt each, provided with drain.

Pos. 31

N° 2 outdoor weighbridge concrete platform, double reinforced concrete socket 20 mm thickness, dim: 3 x 8 mt.

Pos. 37

Roads and squares for heavy vehicles transit, covered with bitumen, approx. 8,500 s.m. for each plant

Pos. 38

Fencing protecting and keeping separated the Category 1 and Cat. 3 processing areas, protecting the whole perimeter from intruders, height 3 mts., length approx. 750 mts, provided with access gates as described above.

Pos. 39

Green area, approx. 1,500 s.m. of surface.

2.A.2.4.2. ITEM 4.2 - WEIGHBRIDGE

N. 2, one for each plant. Able to meet the EU standards for such equipment.

Assembling: underground, constructed using modules of variable size buried flush with the floor.

Main features

The platform consists of 4/6 standardized modules, which can be easily assembled in work with monolithic structure consisting of IPE / HE beams electro-welded with embossed sheet metal sheared and trimmed on 4 sides.

The modules are bolted to crosspieces, covered with removable hatches for inspection load cell groups.

The breakdown of the bridge into a few elements facilitates handling and allows the transport on open top vehicles, making installation simple and very fast.

In the underground version there are no limits to transverse transit.

Supporting structure

Dimensioning of the load-bearing structures and the choice of electronic sensors holds account of the EC standards, as well as a significant overload on the maximum masses of fully loaded vehicles provided for by the highway code, to the full advantage of the reliability and duration of the system weighing.

Surface Treatment

Surface treatment of the carpentry with gray paint RAL 7031, thickness 90/120 micron, fast drying synthetic finish, single layer with high protection anticorrosive, performing a "one-coat" function of antirust and covering (compatible with any type of paint for future further coating).

Complete with connection cable and display

Dimensions: 8 x 3 meters.

Capacity: 40 Tons.

Division: 10 kg.

2.A.2.4.3. ITEM 4.3 - STEAM GENERATION INSTALLATION

N. 2 sets, one for each plant. Power station for the production of steam for the ABP plant.

Main features:

- ✓ N. 1 Steam boiler wet back, three pass design, passing flame, having the following main features: steam output 5,000 kg/h, rated pressure 12 bar.
- ✓ Flanged tube plates not angle welded.
- ✓ 1 Automatic blow down system.
- ✓ N. 2 By-pass pumps installed.

GAS BURNER

N. 1 Modulating Animal fat Burner complete with electronic cam and steam atomisation.

Steam collector with drainage system in black pipe of proper diameter complete with:
N ° 1 floating drain;
N ° 2 shut-off globe valves;
N ° 1 passage indicator;
N ° 1 check valve;
N. 2 Water softeners, 2 x 250 (250 + 250 litres of resins), automatic and volumetric, by pass installed on a stainless steel skid;
N. 1 Metering pump;
N. 1 Feed water tank, cylindrical, vertical design, with a capacity of 5,000 litres, made of black steel;
N. 1 Water preheating system;
N. 1 Supporting frame;
N.1 Chimney.

2.A.2.4.4. ITEM 4.4 - WATER PUMPING STATION

N. 2 sets, one for each plant.

The system is used to supply drinking water to production lines, sanitary services, and equipment, building sanitary services, outdoor wheel washing points and lawn irrigation.

It is composed as follows:

- ✓ Pressurized group composed of a galvanized tank, assembled electro-pump group with discharge and suction manifolds, fittings, valves on base.
- ✓ Flow rate and water head to be defined during the design phase. Series of galvanized steel pipes, special parts and supports.
- ✓ Series of pipes and special parts in high density polyethylene tube PN16 in various diameters for distribution to buildings.
- ✓ Flow rate from 30 m3 / h to around 4 bars, 3,000 liter tank, N ° 3 pumps of 7.5 HP each.

2.A.2.4.5. ITEM 4.5 - COMPRESSED AIR INSTALLATION

N.2 sets, one for each plant.

Used to operate the processing line valves and motors in the production area, workshop, steam generation cabin, waste water treatment plant.

Type: air compressor, stationary, electric motor, piston complete with buffer tank.

Description:

- ✓ Compact structure thanks to the direct connection between the engine and the compressor block.
- ✓ Particularly durable thanks to pistons coated with Teflon and at low speed (1,500 rpm).
- ✓ Tank with internal lining.

Dual cooling system

Efficient cooling system with double air flow; the internal cooling of the housing allows a maximum pressure of 10 bar.

Direct output.

Compact structure thanks to direct drive units. They are maintenance-free and operate without transmission losses.

Characteristics to be defined during the design phase.

Characteristics:

- ✓ Lubrication: oil free.
- ✓ Other features: compact, direct-drive, vertical, horizontal.
- ✓ Pressure: 7 bar, 10 bar (101.53 psi).
- ✓ Capacity: Min: 59 l / min (15.59 us gal / min); Max: 920 l / min (243.04 gal / min).
- ✓ Power: Min: 1.5 kW (2.04 hp); Max: 8 kW (10.88 hp).

2.A.2.4.6. ITEM 4.6 - COMPRESSED AIR DISTRIBUTION LINE

N.2 sets, one for each plant.

Made of seamless galvanized steel pipes and supports of proper diameter, complete of special pieces and fittings. The compressed air must be available at all points of the processing equipment as required by Customer specifications, in the work shop room and in at least 5 locations inside the processing building.

2.A.2.4.7. ITEM 4.7 - STEAM DISTRIBUTION AND CONDENSATE RECOVERY PIPELINES

N.2 sets, one for each plant.

The steam distribution system will be designed to feed the batch cooker sand all the dirty and clean fat tanks. The condensate is completely recovered.

Composed of black pipe SS EN 10255, MEDIA series (unless differently specified during the design phase) of proper size, insulated with cupels in phenolic resin and aluminum coating, minimum thickness 20 mm. The network is equipped with an end-of-line drainage system.

2.A.2.4.8. ITEM 4.8 - CLEAN WATER DISTRIBUTION LINE

N.2 sets, one for each plant.

Made of:

- ✓ 1 set of seamless galvanized steel tubes of proper size in the center, divided into different diameters, complete with fittings, curves and special parts.
- ✓ 1 set of valves.
- ✓ PE piping to ensure high pressure UNI 7611 Type 312 p 50 (unless differently specified during the design phase) complete with special parts, with proper diameters - series of interception valves.
- ✓ Series of adjustable flow nozzles with brass body and head.
- ✓ 1 set of washing nozzles.
- ✓ 1 set of supports.

2.A.2.4.9. ITEM 4.9 - FIREFIGHTING EQUIPMENT

N.2 sets, one for each plant.

To protect the production premises, especially the MBM storage, the dirty and clean fat storage, the steam power station, the electrical cabinet and offices. It will be composed of:

- ✓ Wheeled fire extinguishers powder - from 25 to 150 kg powder or foam - from 25 to 150 l. at permanent pressure or pressurizable at the time of use by means of an external N2 or CO2 cylinder for high fire load points.
- ✓ MED portable powder extinguishers of different sizes.

2.A.2.4.10. ITEM 4.10 - ELECTRIC POWER DISTRIBUTION

N.2 sets, one for each plant. The electric power distribution system of each ABP plant, shall be able to supply the following items (details shown below):

- ✓ Main ABP processing equipment,
- ✓ Ventilation system
- ✓ Chemical scrubber tower
- ✓ Steam production plant.
- ✓ Water pumping station
- ✓ Air compressor
- ✓ Plant indoor lightening
- ✓ Plant outdoor lightening
- ✓ Office and other services

Electrical cabinet suitable to host a 1,000 KVA transformer.

The waste water treatment station will have its own electric cabinet or, alternatively, incorporated in one of the two other cabinets.

Prepared for MT supply with painting by M.T. the cabinet will be provided of lighting, grounding network.

All material suitable for current CEI standards, with constant rated power of 1,000 KVA, primary voltage to be defined and secondary 380V / 220V with neutral. Complete with accessories such as acoustic alarm for high temperature.

Supply of new framework for power factor correction, placed in a cabinet, with protection equipment of the LT line outgoing and plant equipment power factor correction. Complete with voltmeters, disconnectors, fuses, control unit adjustment, warning lights.

Transformers and force distribution drive, with copper bars, cables power inside the panel, terminals and required terminal blocks, circuits auxiliaries, all with the necessary grades of protection required.

Realization of general network for distribution and control of lighting and small driving force, with 30% free space for unexpected additions.

Earthing system, with collector ring dispersant around the building, connected to dispersing pits. Connection of the same in several points.

Ring connection, by bare copper rope, of all external metal structures, by means of clamps or other to ensure electrical continuity. Connecting the ring to the earthing network of the other buildings.

Power supply, building framework and distribution to the utilities

The building's power supply will be derived from the general distribution panel, located in the cabin. This power supply will be placed under a switch housed within the general distribution network.

The cables must be of adequate section, type.

For crossing areas subject to passage of vehicles heavy cables will be placed within a suitable plastic tube section placed in excavation and protected with concrete slabs, or within a conduit placed in an inspectable tunnel, prefabricated or built on site.

Automatic diesel generator

N.2 sets, one for each plant. Main characteristics: Self-supporting canopy capable of guaranteeing 70 dB (A) @ 7 meters in free field,

- ✓ structure and sheet in cold galvanized steel laser cut and bent, assembled with steel bolts and bearing rivets; can be dismantled and inspected in all its sides;

- ✓ base and structure are completely free of welds to avoid rusting and surface deterioration with time which makes it particularly suitable and resistant for outdoor installations and use;
- ✓ the painting is made with high resistance epoxy powder;
- ✓ insulation with sound-absorbing materials with Euroclass A1 fire resistance degree.

Power for continuous duty P.R.P. - ISO 8528: 480 kw equal to 600 kVA at 0.8 cosfi10% overloadable for 1 hour every 12.

Power for emergency service L.T.P. - ISO 8528: kW 528 equal to kVA 660 at cosfi 0.8 not overloadable.

Voltage V400 / 220 Frequency 50 Hz.

Rpm: 1,500.

These last parameters are to be confirmed during the design phase.

2.A.2.4.11. ITEM 4.11 - ASSISTANCE TO MAIN EQUIPMENT ASSEMBLING AND START UP

The Works Contractor will provide assistance to the process equipment and waste water equipment suppliers during the equipment reception, installation and start up phases.

The main Contractor will take care of the transport of the equipment from CIF to the site location, will locate the equipment in a guarded and repaired place wait for the installation to take place, provide lifting and transportation means and the workmanship of assistance. The technical specifications of the lifting means will be put at disposal by the equipment Suppliers.

2.A.3. LIST OF CONSUMPTION

This installation has been designed to have a very low environmental impact on the basis of the following criteria:

1. The steam needed to cook the raw material and to keep in temperature the dirty and clean fat tanks, is self generated. The fat obtained from the process is used to provide 100% of the energy required for heating.
2. The use of potable/well water is reduced to the minimum by recovering 100% of the condensate from the cooker and the heated oil tanks. Only a small make up is needed from time to time to integrate the losses along the pipelines. Almost 100% of the clean water is used for cleaning the equipment, the production premises and the wheels of the incoming and outcoming vehicles.
3. The air inside the production premises is always very much polluted and bad smelling. Therefore this installation foresees the use of ventilation system to collect the air inside the industrial premises (of 10 volumes/h capacity approximately) and to take it to a double column scrubber that, by means of circulated clean water and some chemicals, purifies it before discharching it. The pollutants and bad odors are retained by the waste water that is led to the waste water treatment system.
4. The use of clean water is reduced to the minimum and practically only the cleaning and sanitizing water is required to be treated. The average estimated amount of water to treat is 100 cubic meters per day. The treatment system is conceived in a manner that the outgoing clean water and solid waste can be used for agricultural purposes and irrigation.

Table 2.A.20. List of consumption Cat. 1 ABP plant

	Denomination	Installed power	Steam	Water	Compressed air
		kW	*kg/h*	*mc/h*	*Nl/1'*
1	Main ABP processing equipment	370	4,000		300
2	Ventilation system	10			
3	Chemical scrubber tower	30		5	150
4	Steam production plant	35			
5	Water pumping station	20			50
6	Air compressor	8			
7	Plant indoor lightening	10			
8	Plant outdoor lightening	20			
9	Office and other services	15			
10	Cleaning operations			20	
	Totals	**518**	**4,000**	**25**	**500**

Table 2.A.21. List of consumption Cat. 3 ABP plant

	Denomination	Installed power	Steam	Water	Compressed air
		kW	*kg/h*	*mc/h*	*Nl/1'*
1	Main ABP processing equipment	340	4,000		300
2	Ventilation system	10			
3	Chemical scrubber tower	30		5	150
4	Steam production plant	35			
5	Water pumping station	20			50
6	Air compressor	8			
7	Plant indoor lightening	10			
8	Plant outdoor lightening	20			
9	Office and other services	15			
10	Cleaning operations			20	
	Totals	**488**	**4,000**	**25**	**500**

Table 2.A.22. List of consumption of the waste water treatment station

	Denomination	Installed power	Steam	Water	Compressed air
		kW	*kg/h*	*mc/h*	*Nl/1'*
	Waste water treatment station	100		10	250
	Totals	**80**	**0**	**10**	**250**

Table 2.A.23. List of consumption: Recapitulation table

	Denomination	Installed power	Steam	Water	Compressed air
		kW	*kg/h*	*mc/h*	*Nl/1'*
	Cat. 1 ABP plant	518	4,000	25	500
	Cat. 3 ABP Plant	488	4,000	25	500
	Water treatment station	80	0	10	250
	Totals	**1,086**	**8,000**	**60**	**1,250**

2.A.4. CLASSIFICATION OF PRODUCTION AREAS

In such plants the risk of cross contamination of the finished products and transfer of contaminants to other service areas is very high and it must be contained.

In order to do so, the risk areas have to be classified and keep separated by establishing filtering areas to get through before passing from one area to the other.

This particularly affects:

a) The reception of raw material;

b) The delivery of finished products;

c) The movement of operators and visitors.

According to the attached drawing, the areas are identified into two different classes:

1. Low care area
2. High care area

The **Low care area** is where people, materials and products are supposed to be free from pollutants and the risk to harm people health is low.

The **High care area** is where people, products and materials are exposed to high contamination risk that could harm people health.

Therefore the two different areas are kept isolated one from the other by physical barriers (fences, rooms, doors) and the passage of materials and people from one area to the other are prohibited and strictly controlled.

For example, according to the drawing, the incoming product track is isolated from the delivery one and it is not permitted to a truck carrying raw product, to make use of the low care track without being preliminarily sanitized.

On the top of it, incoming and outcoming trucks in both areas, must undergo a wheel cleaning procedure before being weighed in the platforms.

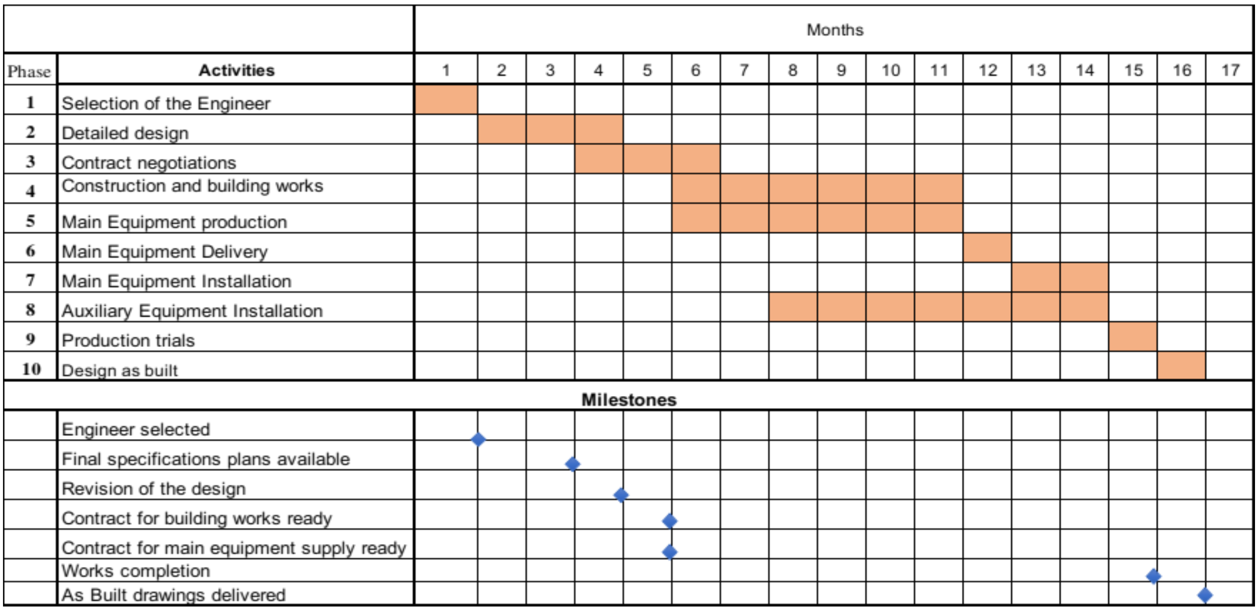
As a rule, the truck drivers in the low care area, should not be allowed to leave the vehicle at all time.

The plant operators and visitors will have access to the production premises only from the office area, considered low care, reach the premises on foot, change dress and shoes in the filtering area, and only after that they are allowed to enter the high care area. On their way back, they will be obliged to change dresses and shoes again in the filtering room; only in such a case, they are allowed to come back to the office.

The area classification and the paths for vehicles and personnel is clearly indicated in the drawing (Annex 2.A.4).

2.A.5. GANTT DIAGRAM OF THE PROJECT ACTIVITIES AND MILESTONES

Figure 2.A.4. GANTT Diagram



The total timeframe necessary to the completion of the construction works is estimated in 16 months starting from the selection of the Engineer from the side of the Contracting Authority.

This evaluation may be revised during the Contract finalization phase and it has to be kept continuously updated during the Construction Works by the Engineer after consultation with the Contractor, the suppliers and the Contracting Authority itself.

SECTION 2.B

ANALYSIS ON THE POSSIBILITY TO CONSTRUCT A BIOGAS PLANT

2.B.1. INTRODUCTION

Biomass is a generic term for different types of organic feedstock that can be used in a number of technological conversion processes to produce direct energy or secondary energy sources such as bio fuels and biogas that are applied further downstream in the energy supply chain.

A feasibility study for the construction of the Unit for the Processing of Animal By-Products (ABP) not intended for human consumption has been developed. Following a specific request of the beneficiaries, the team of experts prepared the report on the technical solutions for ABP processing of cat. 1 and 2 in a line and cat. 3 in a separate line. In addition, the team of experts has been asked to prepare a preliminary analysis on the possibility to construct a Biogas Unit, in order to generate alternative sources of heat and electricity to ensure the operability and sustainability of the system.

The preliminary analysis has been drafted on the basis of data provided by beneficiaries, in relation to type and amount of material available for the biogas plant.

2.B.2. PRELIMINARY ANALYSIS

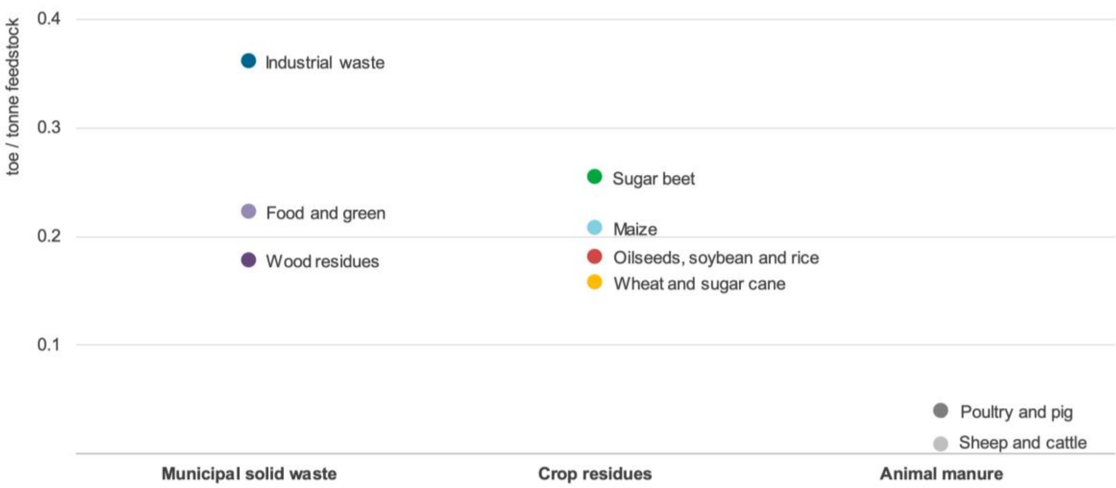
2.B.2.1. AMOUNT OF MATERIAL

1) The biogas facility shall be based on the inflow of the following input materials (feedstock): Biodegradable waste from food waste from retailers in the quantity of 15 thousand tons annually. No other Cat. 3 animal by products, “ABP’s”, shall be foreseen as biogas input material “feedstock”. All ABPs obtained from slaughterhouses and food processing plants will go to the rendering plant(s) of Cat. 1-2 and Cat. 3 to be built.

2) The Project team have estimated 15 thousand tons/year of food waste from retailers and catering to be processed in this biogas plant for the preparation of this pilot study.

3) According to official data presented in the Moldovan National Waste Management Program for 2022-2027, the total amount of municipal waste generated in 2020 was 1,066.5 thousand tons, and biodegradable waste, including food waste is about 30% or 320 thousand tons. Approximately 5% of biodegradable waste is accounted for by food waste from retailers, this sector can generate about 15 thousand tons per year, especially having in mind the comparatively high AD (Anaerobic digestion) yield of such sources, as shown on figure 2.B.1, below.

Figure 2.B.1. Average biogas production yield by tonne of feedstock type



2.B.2.2. LEGISLATION IN MOLDOVA

In the Republic of Moldova, the basic documents in the field of waste management are the Law on waste No. 209 of 29.07.2016 and the Waste Management Strategy for the years 2013-2027. The National Waste Management Program for the years 2022-2027 was elaborated in order to implement the Government Action Plan for the years 2020-2023, and approved by the Government Decision no. 636/2019.

In accordance with the Law on Waste No. 209 of 29.07.2016 waste producers, regardless of the legal form of organization (enterprise, organization, public institution and socio-cultural purpose), which have more than 10 employees, are obliged to develop and implement actions to prevent waste generation and to apply their management hierarchy, including by setting up separate collection actions generated by their own activity.

Also, in accordance with the amendments made since 2016 to the Law on Internal Trade no. 231 of 23.09.2010, food products that have become non-compliant with the applicable regulations in the food sector, including the expiration of the expiry date / date of their minimum durability, cannot be returned to the supplier. Thus, traders are obliged to dispose food that does not comply with applicable food regulations.

The policies of the Government of the Republic of Moldova are aimed at planning investments in developing an efficient integrated waste management infrastructure, stimulating the transformation of waste into resources and taking action towards the circular economy, as well as raising awareness of the benefits of environmental actions in addressing global waste management challenges.

One of the priorities of the Program is to promote the production of energy from renewable sources (solar, wind and biomass) and energy efficiency, including the regulation of the use of plastic bags, and the implementation of extended producer responsibility, being transposed into national law.

2.B.2.3. EU POLICY BASIC DRIVING GUIDELINES

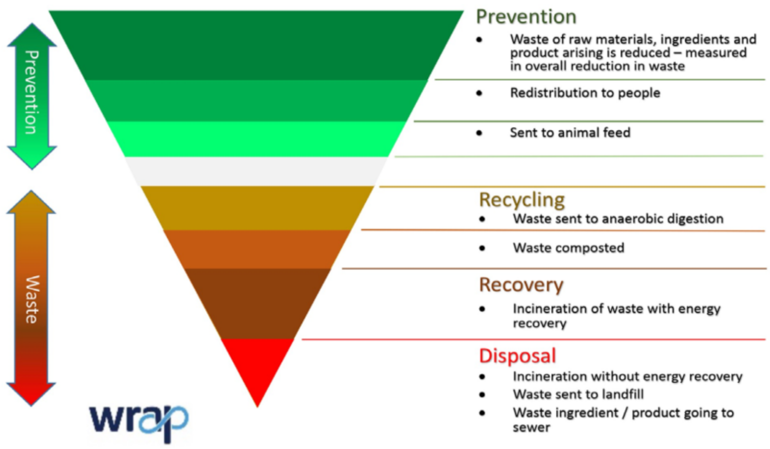
- European Directive (EU) 2018/851, Economy Package', mandates the introduction of separate collection of bio-waste as of 1 Jan 2024. Updating art. 22 of the Waste Framework Directive, it stipulates an obligation at the EU level to implement bio-waste collection.
- EU targets (65% "preparation for reuse and recycling", i.e. net recycling including organic recycling, by 2035).
- Circular Economy vision and strategy, are propelling interest in separation, processing and recovery of bio-waste; in summary, they are:
    i. It is estimated that almost half of European soil has low organic matter content. Collected bio-waste generates compost, which may be a useful source of stable organic matter;
    ii. To mitigate climate change.
- The revised Waste Framework Directive and other regulations require EU Member States to promote the use of materials produced from bio-waste.

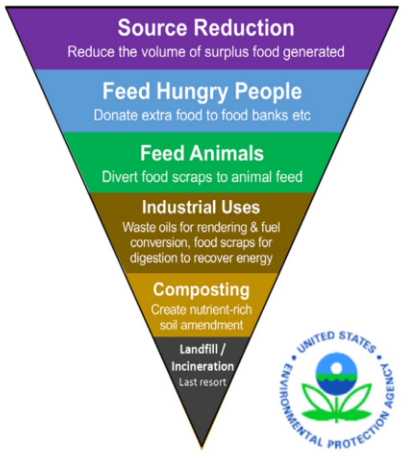
2.B.2.4. FOOD WASTE HIERARCHY

Figure 2.B.2 shows schematics from the UK and USA.

While there is a degree of consensus between the many available versions, there are also differences, for example in distinguishing between aerobic composting and anaerobic digestion (AD) at different scales of operation.

Figure 2.B.2. Examples of Food Waste Hierarchy p





2.B.3. BIOGAS PRODUCTION

A vast variety of organic waste and residue are suitable for use as feedstock for biogas production. Among others, the water content and degradability of the biowaste are particularly important factors when choosing the right preparation treatment. For example, catering waste and other digestible wastes that may be too wet and lack structure for composting, are actually excellent feedstock for anaerobic digestion. The **methane yield** of each feedstock depends on its composition and how much protein, fat and carbohydrate it contains. For example, the high proportion of carbohydrates found in stale bread provides a very high CH4 output per tonne of fresh biomass. Feedstock composition therefore significantly influences the viability of a biogas plant.

Biogas production is a biological process where carbohydrates, proteins and fats in organic material are consumed and broken down in a series of stages by bacteria. This process involves several different bacteria working in series to convert the material step-by-step, all in the absence of oxygen. Inside an anaerobic digester, long-chain organic molecules are broken down into their simple repeating monomer units before conversion into Volatile Fatty Acids or VFAs. Then, the VFAs are split into acetic acid, carbon dioxide and hydrogen before being recombined into methane. As the organic material is decomposed in the digester by the bacteria, biogas is produced and continually drawn off from the digester. Generally, the gas is cleaned to remove any dangerous or volatile chemicals before being burned to create heat or electricity.

2.B.3.1. OUTLINE OF A BIOGAS PRODUCTION SYSTEM

- The food waste will go through a pre-treatment process to remove items unsuitable for the process and shred it into pieces of a similar size.
- Water will be added and the mixture will pass through a series of tanks.
- The food waste will be broken down by micro-organisms in the absence of oxygen to produce:
  - ✓ a biogas, a methane rich gas which will be used to generate electricity in a gas engine and generator that will be supplied to the national grid;
  - ✓ digestate; excess water will be removed from this to create an organic, compost like material that can be used on farmland to replace artificial fertilisers.

Due to the substrates used, biogas plants are divided into:

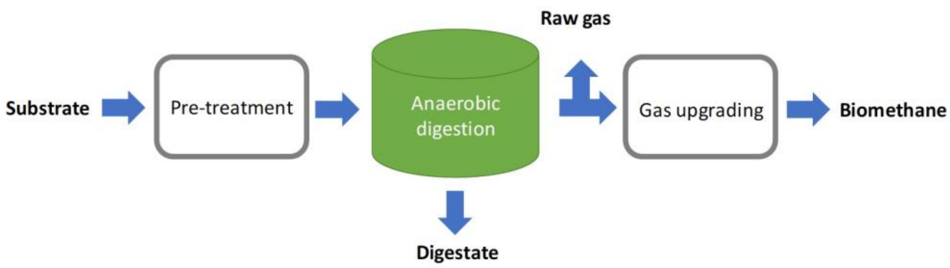
- agricultural--using biomass from target crops, manure from farm animals,
- waste from the agri-food industry,
- in sewage treatment plants using organic waste separated from municipal sewage,

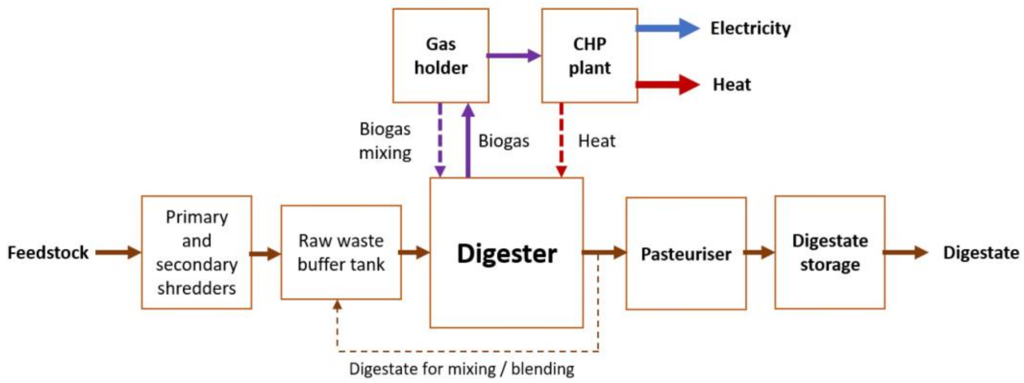
- on landfills collecting biogas generated in landfills,
- municipal--processing selectively collected biodegradable municipal waste,
- mixed (other).

Biogas is produced when organic materials are degraded by microorganisms in an anaerobic environment. Biogas mainly consists of methane (CH4) (50-75 %) and carbon dioxide (CO2) (25-50 %) (Wellinger et al., 2013). Other components of biogas are water (H2O), oxygen (O2), sulphur (S2) and hydrogen sulphide (H2S).

The digestion takes place in four different stages; hydrolysis, acidogenesis, acetogenesis and methanogenesis (Sarker et al., 2019). To maintain a stable anaerobic process, these four stages should all be present at the same time. The energy carrier in biogas is methane and it is produced during the methanogenesis stage (Wellinger et al., 2013). In Figure 2.B.3, a simplified overview of a biogas production system is shown.

Figure 2.B.3. Schematic overview of a biogas production system





Anaerobic digestion can be performed at different temperatures, most commonly at mesophilic (35-40˚C) or thermophilic (55-60˚C) temperatures. The temperature influences the degradation of the organic material as well as the stability of the process (Wellinger et al., 2013). A thermophilic process has a higher degradation rate and a shorter retention time may therefore be required. However, a higher temperature could imply a higher sensitivity to changes in temperature and pH, and thus a more sensitive process (Wellinger et al., 2013). A higher temperature may also result in a higher energy demand. However, the surrounding climate also affect the energy demand. In a warm climate, it may be necessary to cool the digester, whilst other climates involve a need to heat the digester, in order to maintain the required temperature for the process.

The produced biogas can be used as it is (raw) in a gas turbine to generate electricity, in a boiler to generate heat, or in a combined heat and power plant to generate both heat and electricity (Scarlat et al., 2018). Biogas can also be upgraded to have the same properties as natural gas (98% methane). Upgraded biogas is usually referred to as biomethane. Biomethane can be injected into natural gas grids or used as a vehicle fuel (Scarlat et al., 2018). Biomethane can also be cooled down to a liquid state, liquefied biogas (LBG). LBG has a higher energy density than upgraded biogas and can be used for heavy road transport as well as sea transport (Benjaminsson and Nilsson, 2009). Raw biogas, biomethane and LBG can be used for different industrial applications, for example as replacements for fossil gases such as natural gas and liquefied petroleum gas - LPG (Johansson and Söderström, 2011).

2.B.3.2. SUBSTRATE (FEEDSTOCK)

The biogas production varies between different feedstocks depending on the composition of the feedstock. The biogas production figures in the table 2.B.1, below, are determined in laboratory scale and therefore higher than expected during continuous operations in full scale.

Table 2.B.1. Biogas production vs various feedstock input. (TS: Total Solids content)

Substrate	TS	Biogas production		Methane concentration
	[%]	[m³/ton TS]	[m³/ton wet weight]	[%]
Sludge from waste-water treatment plants	5	300	15	65
Fish waste	42	1 279	537	71
Straw	78	265	207	70
Sorted food waste	33	618	204	63
Liquid cattle manure	9	244	22	65
Potato haulm	15	453	68	56
Slaughter house waste	16	575	92	63
Liquid pig slurry	8	325	26	65

Sources: Substrathandbok för biogasproduktion, SGC 2009
Den svenska biogaspotentialen från inhemska restprodukter, 2008
Ökad biogasproduktion vid Henriksdals reningsverk, 2009

The composition of biogas depends on a number of factors such as the process design and the nature of the substrate that is digested. The main components are methane and carbon dioxide, but several other components also exist in the biogas. The table below lists the typical properties of biogas from landfills and digesters as well as a comparison with Danish natural gas.

Table 2.B.2. Comparations of properties: Landfill gas Biogas from Anaerobic Digestion (AD) Natural gas

		Landfill gas	Biogas from AD	Natural gas
Lower calorific value	MJ/Nm³	16	23	39
	kWh/Nm³	4.4	6.5	11.0
	MJ/kg	12.3	20	48
Density	kg/Nm³	1.3	1.1	0.82
Relative density	-	1.1	0.9	0.63
Wobbe index, upper	MJ/Nm³	18	27	55
Methane number		>130	>135	73
Methane	Vol-%	45	65	90
Methane, range	Vol-%	35–65	60–70	85–92
Heavy hydrocarbons	Vol-%	0	0	9
Hydrogen	Vol-%	0-3	0	—
Carbon dioxide	Vol-%	40	35	0.7
Carbon dioxide, range	Vol-%	15–40	30–40	0.2–1.5
Nitrogen	Vol-%	15	0.2	0.3
Nitrogen, range	Vol-%	5–40	—	0.3–1.0
Oxygen	Vol-%	1	0	—
Oxygen, range	Vol-%	0–5	—	—
Hydrogen sulphide	ppm	<100	<500	3.1
Hydrogen sulphide, range	ppm	0–100	0–4000	1.1–5.9
Ammonia	ppm	5	100	—
Total chlorine as Cl^-	mg/Nm³	20–200	0–5	—

Sources: *Energigaser och miljö*, SGC 2006.
Energinet.dk, www.energinet.dk, 2011-02-15

Different organic materials can be used as substrate (inputs) for the biogas production process. Common substrates are food waste from households and restaurants, industrial waste from the food processing industry and slaughterhouses, sludge from wastewater treatment plants, manure and other residues from the agriculture sector (Wellinger et al., 2013).

Depending on the composition of the substrate used, different pre-treatment technologies are needed, to prepare the substrate for digestion in the digesters at the biogas plants. Pre-treatment can include crushing or grinding to reduce the size of the material, diluting to make the substrate more volatile, and removal of unwanted material such as plastics, textile, metals or gravel (Wellinger et al., 2013).

Potential for the production of biogas, electricity, and heat from 1 ton of biodegradable waste is shown on the table below.

Table 2.B.3. Potential for the production of biogas, electricity, and heat from 1 ton of biodegradable waste.

Substrate		Biogas Yield [m^3]	Methane Content [%]	Biomethane Yield [m^3]	Electricity Yield [kWh]	Amount of Heat [kWh]		
						Produced	On Fermentation	For Sale
Cattle slurry		27	60	16.20	52.73	82.86	24.86	58.00
Pig slurry		45	65	29.25	95.21	149.61	44.88	104.73
Cattle manure		45	60	27.00	87.89	138.11	41.43	96.67
Pig manure		60	60	36.00	117.18	184.14	55.24	128.90
Chicken manure		80	60	48.00	156.24	245.52	73.66	171.86
Maize silage		185	55	101.75	331.20	520.45	156.14	364.32
Grass silage		185	55	101.75	331.20	520.45	156.14	364.32
Food remnants and expired food products:	Min.	50	55	30.00	97.65	153.45	46.04	107.42
	Max	480	55	264.00	859.30	1350.36	405.11	946.25
Grocery store waste	Min.	45	65	29.25	95.21	149.61	44.88	104.73
	Max.	110	65	71.50	232.70	365.72	109.72	256.01
Stomach content of pigs		40	65	26.00	84.63	132.99	39.90	93.09
Content of the rumen of cows		40	60	24.00	78.12	122.76	36.83	85.93
Mown grass		175	60	105.00	341.78	537.08	161.12	375.95

2.B.3.3. DIGESTATE

Another product from the biogas process is the digestate. The digestate is the remaining solid material after anaerobic digestion. The digestate is rich in nutrients and can be used as a fertilizer on farmlands, thus leading to the recirculation of nutrients. The digestate has the potential to replace mineral fertilizer, if it is of a high quality. This means that it must be free from impurities, be safe for the environment and living organisms and have a declared content of dry matter and organic dry matter, nutrients and pH (Al Seadi and Lukehurst, 2012).

The substrate and the anaerobic process parameters influence the composition of the digestate (Drosg et al., 2015). The digestate is rich in nitrogen, phosphorus, potassium and sulphur, as well as other micronutrients, which enables the use of digestate as a fertilizer (Drosg et al., 2015). Digestate can improve the microbiology of the soil, and thereby increase respiration and organic carbon (Hagman and Eklund, 2016).

Digestate may also contain heavy metals, making it problematic to use on farmland. The EU has announced recommended limit values for concentrations of heavy metals in soil (European Parliament 2018) and many member states have their own limit values (Al Seadi and Lukehurst, 2012).

According to the Regulation (EC) No 1069/2009 of the European Parliament and of the Council of 21 October 2009 laying down health rules as regards animal by-products and derived products not intended for human consumption and repealing Regulation (EC) No 1774/2002, animal by-products must be sterilized before used for biogas production, to ensure that transmissible diseases are not spread through the digestate.

In Sweden, a specific National legislation demand that substrates containing animal by-products are sterilised. This can be done by heating the substrate to 70˚C for one hour, or, if the process is thermophilic, by heating the substrate to at least 55˚C for six hours (Swedish Board of Agriculture, 2014).

2.B.4. MOLDOVA BIOGAS PROJECT

2.B.4.1. AVAILABLE SUBSTRATE (FEEDSTOCK)

As presented in the overview the available feedstock in Moldova which is foreseen is the 15,000 tons/year of food waste from retailers and catering.

The retailers and catering estimates, in terms of % and qualities, have not been performed so far, therefore the estimates should be based on similar EU measurements end estimations.

Some estimates for feedstock composition are shown in the tables and figures below.

Table 2.B.4. Food waste stream estimate for 2018 (in tonnes). Republic of Serbia

	HORECA - total	TOTAL	Restaurants	Hotels	Catering
(1)	**Input**	**123,422**	**90,868**	**19,765**	**12,789**
(2)	-Kitchen waste	24,684	18,174	3,953	2,558
	of what avoidable	*0*	*0*	*0*	*0*
(3=1-2)	=Served food	98,738	72,695	15,812	10,231
(4)	-Plate waste	14,811	10,904	2,372	1,535
	of what avoidable	*2,934*	*0*	*1,399*	*1,535*
(5=2+4)	**=Total waste**	**39,495**	**29,078**	**6,325**	**4,092**
	of what avoidable	*2,934*	*0*	*1,399*	*1,535*
(6)	- Landfilled	39,100	28,787	6,262	4,051
(7=5-6)	**=Recovered waste**	**395**	**291**	**63**	**41**
(8)	Animal feed	20	15	3	2
(9)	Biogas	171	138	20	13
(10)	Composting	171	138	20	13
(11)	Food banks	33	0	20	13

Figure 2.B.4. Food waste composition from four UK collection schemes based on a one-day sample (VALORGAS, 2011)

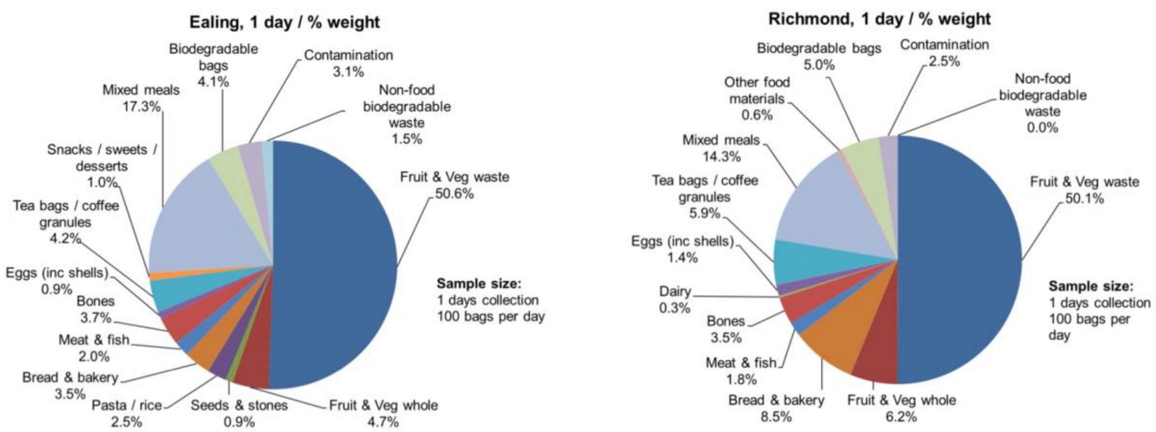


Figure 2.B.5. Composition of food waste in the retail sector in commodity groups (without further processing). Lebersorger S. and Schneider F., 2014.

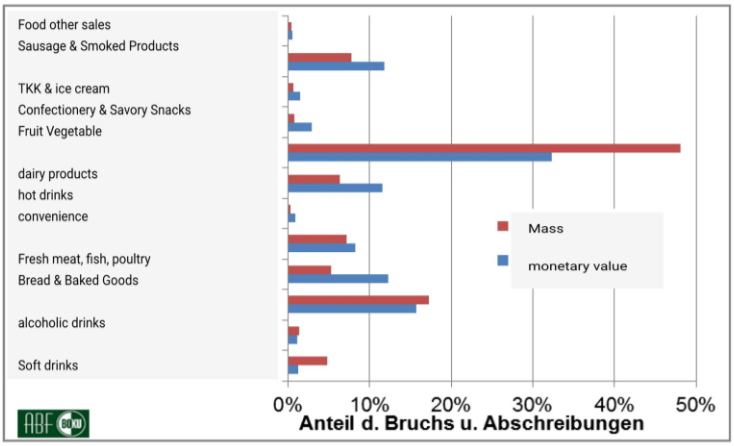


Table 2.B.5. Compositional analysis for sorted biowaste for Kifissia & Attica Municipalities (Greece), average values for Greece and other countries

Type	*Average Kifissia (1)*	*Average Athens (1)*	Greece *(2)*	Finland	UK	Portugal	Italy
Fruits & Vegetables	*72,3%*	*54,8%*	60,2%	44,5%	60,9%	59,2%	69,0%
Bread & Bakery	*2,3%*	*8,9%*	5,1%	3,8%	9%	3,1%	2,8%
Meals	*2,4%*	*0,0%*	1,2%	6,3%	12,3%	29,0%	1,4%
Spaghetti/rice/flour/cereals	*0,0%*	*0,0%*	0,0%	0,4%	1,5%	0,2%	12,4%
Meat & Fish	*2,1%*	*4,6%*	3,1%	4,3%	6,1%	7,3%	6,2%
Dairy & Eggs	*0,5%*	*1,0%*	0,5%	2,0%	1,7%	0,7%	1,4%
Cake, Desserts, Confectionery & Snacks	*0,0%*	*1,2%*	0,6%	3,2%	0,7%	0,3%	0,0%
Drinks (Coffee, tea bags)	*0,6%*	*0,4%*	0,5%	27,5%	7,1%	0,2%	0,0%
Rest food *(3)*	*19,9%*	*29,2%*	28,8%	8,0%	0,2%	0,0%	6,9%

(1) Data are normalised average values from the respective WACs. During the normalisation paper, green waste and impurities were excluded.

(2) Data are average values of the average values of Kifissia and the average values of Athens.

(3) Rest food is the former Rest biowaste

The estimations of available feedstock must be finalised and determined before the preliminary design of a biogas project, since there are multiple factors influencing anaerobic digestion as:

- Oxidation-reduction potential of feedstock
- Temperature
- pH
- Hydrogen partial pressure
- Feedstocks containing poisonous and hazardous substances, etc.

Therefore, the final proposal for the project in Moldova must take into consideration additional feedstock (liquid and solid), available in the country which shall be suggested by the technology provider which might improve the retailers and catering estimates already available.

2.B.4.2. POSSIBLE TECHNOLOGIES FOR MOLDOVA BIOGAS PROJECT

The proposed anaerobic digestion technologies which can be applied shall depend primarily on the feedstock composition as well as on the CAPEX and OPEX study which must be performed in relation to the energy needs of the proposed rendering plant solution.

Anaerobic digestion is one of the most eco-friendly solutions for food wastes management, energy, and nutrient production, which can contribute to world's ever-increasing energy requirements and increasing need for green energy production.

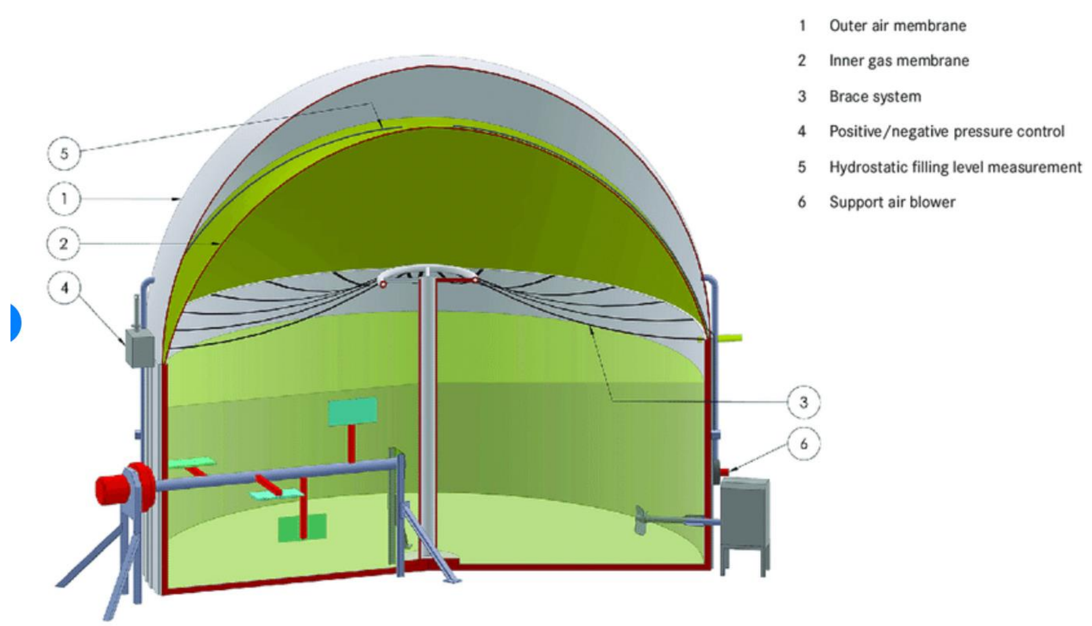
Advantages and disadvantages of anaerobic digestion are presented in the table below.

Table 2.B.6. Advantages and disadvantages of anaerobic digestion

Advantages	*Disadvantages*
Energy production by producing high quality soil fertiliser	Less heat released, resulting in lower and less efficient destruction of pathogens as in aerobic composting
No need for additional power to turn the pile of waste for the purpose of obtaining oxygen	Unsuitable for waste containing less organic matter
Closed system allows the use of all produced gas	Requirement for waste separation to improve decommissioning efficiency
Monitoring of greenhouse gas emissions	Pre-treatment is essential
No unwanted odours, rodents and flies	Temperature sensitivity
The modular construction of the plant and closed process require smaller land (footprint) areas	Post processing is required
Net positive environmental gains	2-4 months of start-up time
Possible implementation on a small scale	
Low power consumption	
Almost complete retention of nutrients in the fertiliser	
Possibility to store sludge for a longer period	
Construction costs are relatively low	
Low sludge production	
Low nutrient demand	
High organic removal	

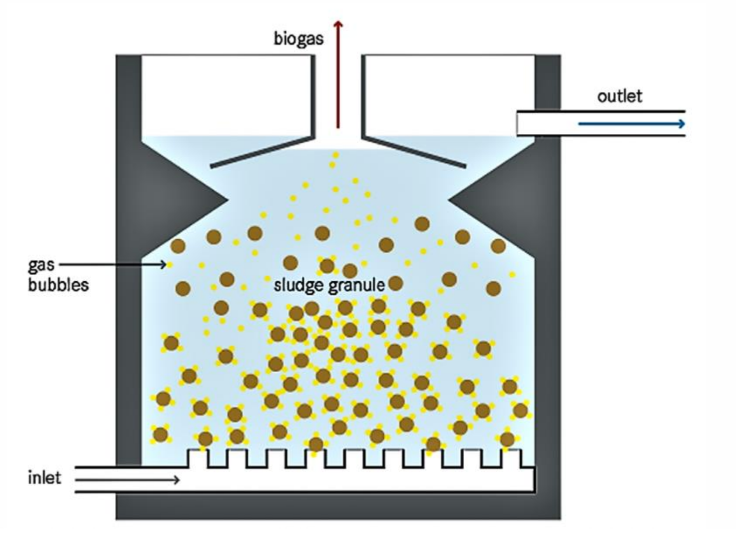
Advancement in anaerobic digesters such as continuous stirred-tank reactor (CSTR), used in Moderate-rate, complete-mix, anaerobic digestion process based on a semi-continuous flow of fresh biomass as input in the digesters at a controlled temperature and mixed.

Figure 2.B.6: Structure continuous stirred-tank reactor (CSTR) with integrated double membrane gas storage, source: adapted from (Liebetrau et al. 2015)



Up-flow, Plug Flow Reactor is needed for higher biogas production at different commercial scales of operation based on the diversity and complexity of organic residue.

Figure 2.B.7. Cross-section of an Upflow Anaerobic Sludge Blanket (USB) reactor. Source: TILLEY et al. (2014)



Similarly, different pre-treatment processes for the conversion of the complex organic residue such as those based on microbial or chemical pre-treatment for higher biomethane yield can be applied for optimised large-scale applications.

Gas cleaning and upgradation techniques such as membrane purification, pressure swing adsorption, and water scrubbing can also be applied in order to remove carbon dioxide and hydrogen sulfide to increase the methane content up to 99% Renewable Natural Gas (RNG) or Compressed Biogas (CBG).

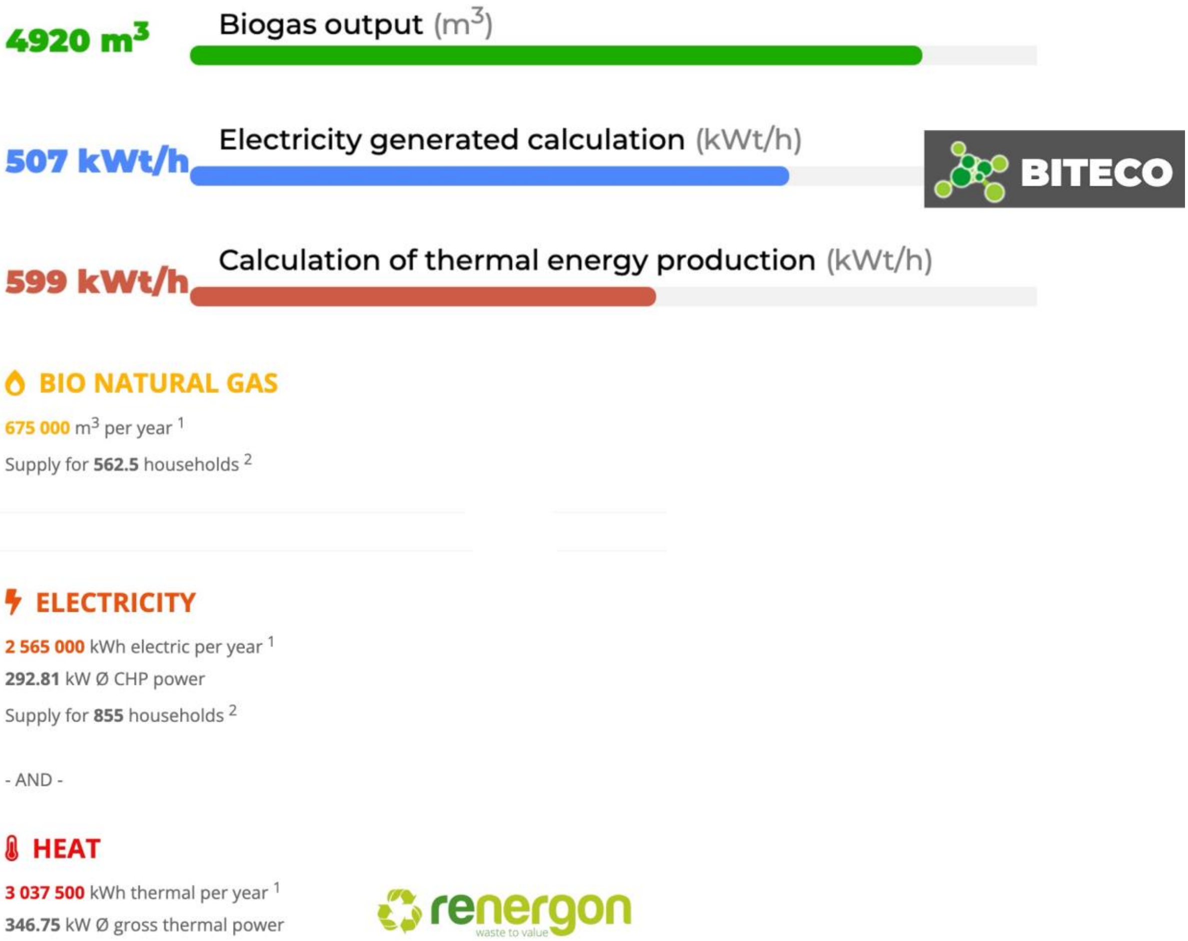
2.B.4.3. BIOGAS OUTPUT

The following preliminary estimates are based on the present knowledge and feedstock input available. The preliminary presumption based on the aforesaid is that an amount of minimum 500,000 m3 of biogas produced might be a safe prediction (based on 15,000 t of retailers and catering waste).

Electricity generated calculation (kWt/h); Calculation of thermal energy production (kWt/h)

This is a preliminary calculation and shall be updated and confirmed by acceptable technology providers.

Figure 2.B.8. Sources: biogas calculator



Calculation of possible digestate production and market value

The residue of organic waste after anaerobic digestion is known as digestate. Digestate mainly consists of three parts: undigested feedstock, microbial organisms, and microbial metabolites. The solid part of digestate after mechanical solid-liquid separation or natural sedimentation is called solid digestate, while the liquid part is called liquid digestate. In general, solid digestate is rich in organic matter, humic acid, and many other components that are suitable as base fertilizers, whereas liquid digestate is rich in soluble nutrients that are suitable as topdressing.

Digestate used as a soil fertiliser substitute for a farm-fed Anaerobic Digestion (AD) unit. The digestate production value is the fertiliser it replaces, though this is difficult to determine without on-site data as it would depend on the minerals available in the final calculation of the feedstock material for the Moldova biogas project. Also, it is very difficult to estimate a financial value of the digestate, that is rarely sold above its cost-recovery price (Saveyn & Eder, 2014). This is attributed to the limited market for the digestate is valued in the amount of fertiliser it replaced on the farm, which is country dependent.

2.B.4.4. FINANCIAL ESTIMATES

The chosen feedstock and quantity to be processed are the principal design parameters that determine both the likely technical performance and financial success of an Anaerobic Digestion (AD) project, determine the suitability of the process technology and plant configuration and the overall treatment capacity.

Use of solid/liquid food wastes, either household (mixed or source segregated), or commercial (catering waste, post-production and out of date products) wastes, serves to both divert organic wastes from landfill and to return to land the nutrients inherent in the digestate. While these sources can have good/very good biogas, handling such food wastes in the EU also requires specific process and operational requirements that have to be added to both the Capex/Opex costs. The need for a fully closed reception hall (shredding and conveyor equipment) for accepting waste deliveries and pasteurisation of either the food waste or digestate, in accordance with the Animal By-Products Regulations, are added costs compared to processing manures and energy crops only.

The pre-feasibility and/or feasibility study must determine the following initial project parameters:

- Capacity of influent,
- Digester volume,
- Capacity of sludge output,
- Type of feedstock for biogas,
- Type of digestion,
- Staging of digestors,
- Anaerobic Lagoon,
- Retention time in digester,
- Dry matter content,
- Process temperature.

The CAPEX and OPEX estimations, hereafter, are based on values presented in 2.B.4.3.

- Annual feedstock (total tonne per annum - design feedstock capacity): 15,000
- Minimum of 500,000 m3 of biogas produced (70 m3/h., approximately 2,500,000,000 Kcal/year)
- 0.599 MWh (2,043 Mbtu) of thermal energy produced

Other, important assumptions:

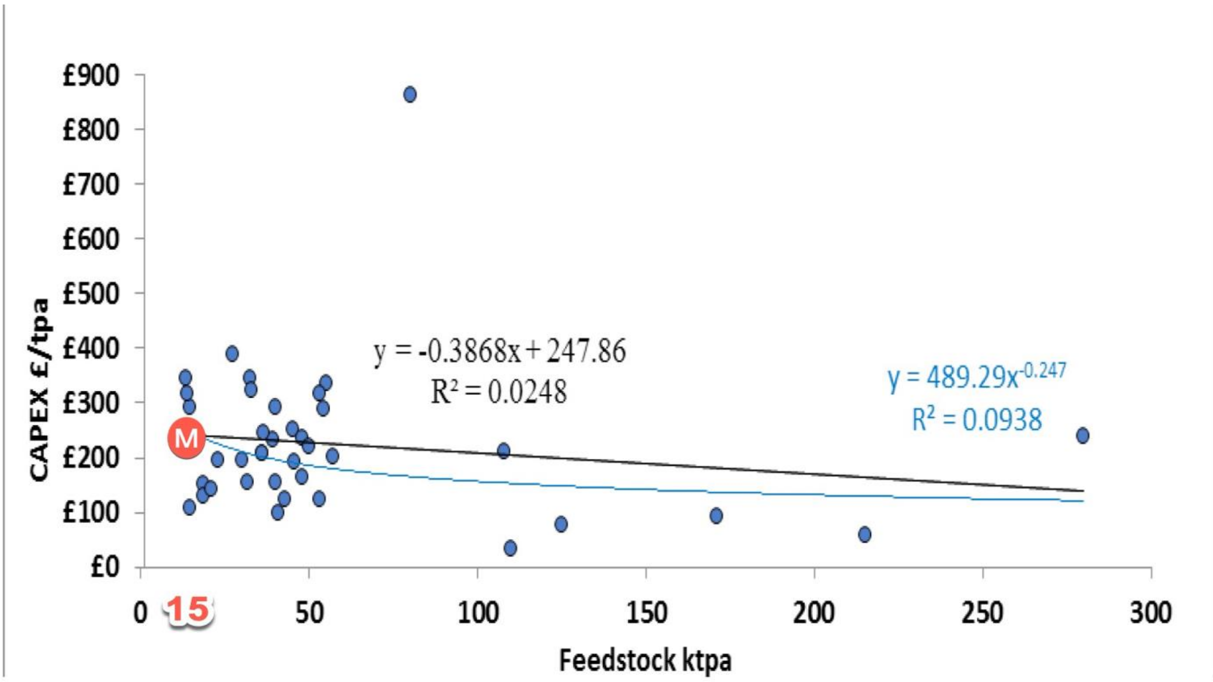
- Land property for the project is provided by the Government of Moldova;
- Connections to utilities shall be shared, plant offices and labs as well, with the nearby rendering plant(s);
- The biogas produced can be used for:
  - Power generation,
  - In Combined Heat and Power units (CHP units) for producing electricity combined with heat recovery or purely heat recovery, as well as
  - An alternative fuel for the boilers of the envisaged Rendering plants;
- No biomethane clarification (Biogas Upgrading Facility), thermal (CHP, Combined heat and power boilers) equipment is foreseen;
- Feedstock, gate-fee and transport cost, is considered to be zero in “value”.

Initially, when approaching any assumption with limited available data it is difficult to obtain any accuracy which can and shall be reached upon the feasibility study, as explained above.

Typical available data show that the available feedstock quantity places the Moldova biogas plant in the group of smaller biogas plants.

As can be seen from the figure below the CAPEX is higher for the smaller installations, when determined by feedstock annual availability compared to large power generating or large municipal units using complex, optimised, feedstock.

Figure 2.B.9. Overview of Anaerobic Digestion and Power and Gas to Grid Plant CAPEX and OPEX Costs. McKendry P (2019)



The figures above have been correlated to comparable existing installations (note: no identical/similar feedstock quantity/quality installation were found), all leading to a high probability of determining CAPEX price, for the Moldova biogas project in the range between **2,500,00 EUR to 3,500,00 EUR,** depending on technology applied and particularly the digestor type which is in the approximate value of 40% of the investment.

Again, it is important to emphasise that each project has a unique set of feedstocks and site-specific factors that impact on the final capital cost.

OPEX costs consist of fixed and variable components. Fixed costs typically comprise the following:

- Labour (management and plant operators);
- Machinery and equipment;
- Purchased power;
- Administration (including laboratory testing, accountants, permitting/licensing fees, additives etc.).

The variable component of the OPEX usually comprises:

- Operations i.e. staffing and maintenance costs;
- Additional feedstock purchase (if any);
- Waste disposal costs and loan repayments/interest etc.

It is safe to assume that the yearly operating cost of the Moldova biogas plant yearly shall be close **8 to 10%** of the CAPEX cost.

2.B.4.4. CONCLUSIONS

The Republic of Moldova is highly dependent on energy imports. Whereas petrol and coal sources have been slightly diversified, natural gas, the main source for heating, is almost 100% imported from Russia. Import prices are rising towards world levels, and currently there is no clear forecast even on its further availability which might impose a severe burden on the population and the economy.

Bio-waste is a valuable resource for recycling and energy generation and Biogas production has been shown to be a resource efficient way to treat waste from the food industry, based on the conditions of the performed systems analyses.

The Moldovan government has already announced its intention to diversify energy sources. The energy chapter of its government programme European Integration i.a. support for the identification of alternative energy sources by promoting investments in renewable energy, which foresees gradual convergence with EU policies and rules.

The project of utilising retailers and catering waste for the rendering plants, by examining a possibility of constructing a biogas plant and utilising the methane produced, is in line with the above stated.

High processing costs and the heterogeneous nature of bio-waste create challenges for industrial-scale biogas production, therefore an proper choice of feedstock combination OPEX/CAPEX detail analysis can determine the success of the project.

As a final conclusion, after CAPEX/OPEX discussion, it is important to emphasise that including the biogas plant as an addition of the planned rendering plants, advantages and additional potentials are the following:

- The foreseen biogas plant would contribute as follows (***minimal/conservative values indicated***):
  - Production of approximately 500 kW/h, electric or
  - Production of approximately 600 kW/h, thermal or
  - By replacing, approximately. 12% of annual fossil fuel cost of the rendering plants fuel requirements.
- The waste collection and elimination would **reduce the greenhouse gas** emissions associated with the disposal of organic wastes to landfill, while simultaneously producing renewable heat. The actual gain in green house gas emissions when replacing fossil fuels with biogas depends on the substrate used. It is possible to reduce the greenhouse gas emission by more than 100% by including for example the decreased need of fertiliser.
- Key to a successful biomethane AD project is the combination of available types/quantities of feedstocks, process technology, government regulations, fiscal incentives and importantly, capital and operating costs.
- For this project, it is worth considering the **enlargement of feedstock input** to increase biogas yields:
  - Inclusion of manures, usually cow-based manure but chicken and pig manures can also be also used;
  - Energy Crops, purpose grown crops such as silage maize, sugar beet pulp, rye, grass silage etc.;
  - Sewage Sludge from wastewater treatment;
  - Bakery or brewery wastes;
  - Grass clippings/garden waste;
  - Industrial Feedstock from: Food/beverage processing, Dairy industry, Starch industry, Sugar industry, Pharmaceutical industry, Cosmetic industry, Biochemical industry, Pulp and paper etc.;
  - Remaining organic waste from municipalities collection, as previously mentioned in this study (1066.5 thousand tons, and biodegradable waste, including food waste is about 30% or 320 thousand tons).

  All in the aim to expand the biogas production and closing the gap between the energy need of the proposed rendering plants energy requirements, on one side and environmental benefits on the other.

SECTION 2.C

TASK 3

ASSESSING LOCATION

In the first phase of the project, a plot identified by the Ministry of Agriculture and Food Industry of the Republic of Moldova (plot number 31011010.138, letter n. 20-07/3313 of 5th October 2021) was considered adequate for the construction of an ABPs processing plant where all ABPs (cat. 1, 2 and 3) would be processed. Indeed, the identified plot has a surface of 96.82 ha, as shown in figure 2.C.1. In the first phase of the project it was estimated that for the construction of the ABPs plant an area of 120 m. x 150 m. would be needed. A detailed view of the plot is presented at figure 2.C.2.

This plot shall be considered also adequate for the construction of two separated ABPs processing establishments, one for cat. 1-2 ABPs and one for cat. 3 ABPs. Indeed, for the construction of the two ABPs processing plants an area of 158 x 143 meters will be needed (the estimated total surface needed is m^2 23098), and therefore it would be possible to slightly increase the dimension of the area to be dedicated to the construction of the ABPs plants.

Figure 2.C.1: Plot number 31011010.138, surface of 96,82 ha

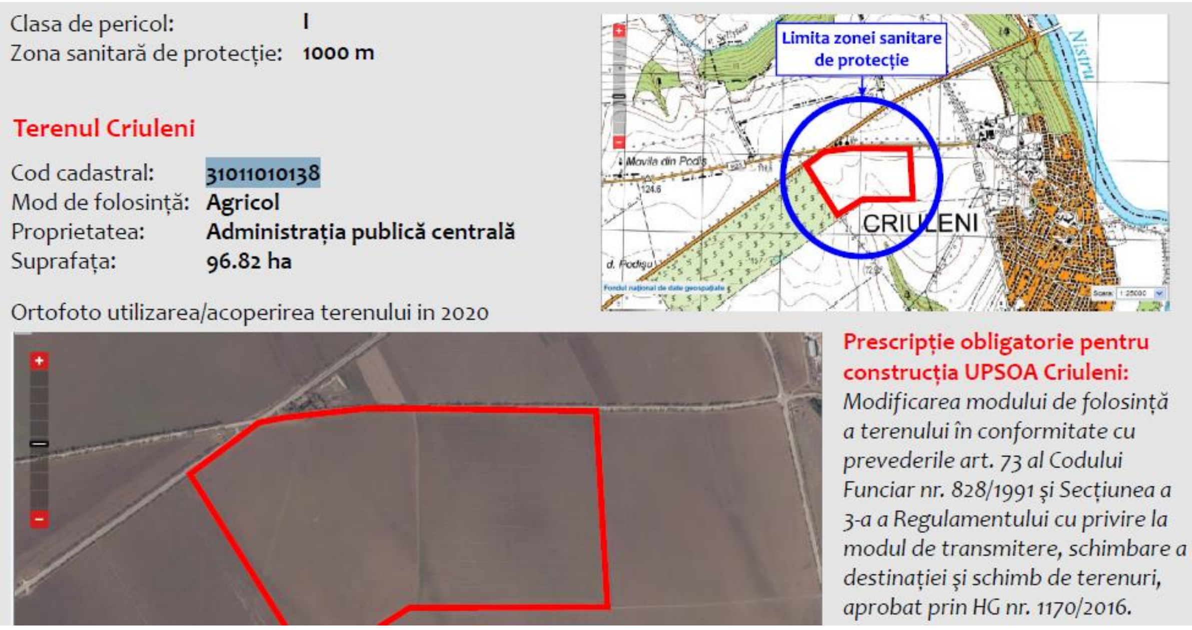
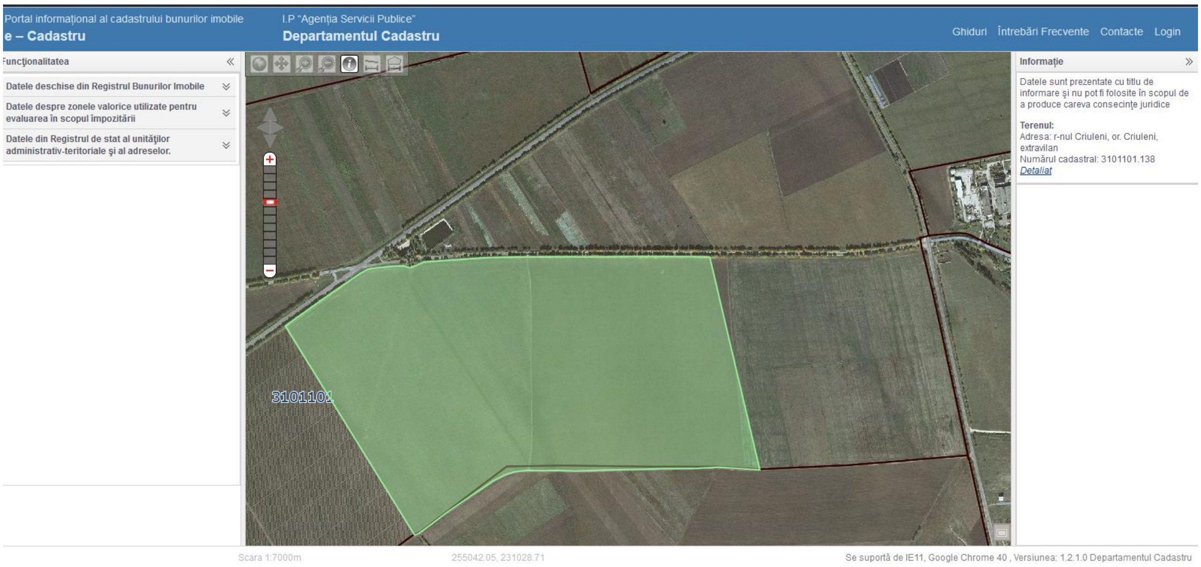


Figure 2.C.2. Detailed view of the plot



SECTION 2.D

TASK 4

TRAFFIC STUDY

The construction of two separated ABPs processing plants will imply that Cat. 1-2 ABPs shall be collected separately from Cat. 3 ABPs.

However, in the traffic study prepared in the first phase of the project it was already foreseen to collect and transport fallen stock separately from all the other ABPs (different trucks), therefore there will be no impact on the traffic study in relation to the collection and transportation of fallen stock.

Concerning the ABPs collection from retail, catering and food processing establishments, dedicated containers could be used respectively for cat. 1-2 and for cat. 3. This is foreseen in the EU applicable legislation; Annex VIII, Chapter I, Section I of Regulation 142/2011 defines the requirements for vehicles and containers used for ABPs transportation.

According to this Regulation, reusable containers must be dedicated to the carriage of a particular animal by-product or derived product to the extent necessary to avoid cross-contamination. However, reusable containers may be used, provided the competent authority has authorised such use:

(a) for the carriage of different animal by-products or derived products provided that they are cleaned and disinfected between the different uses in a manner which prevents cross-contamination;

(b) for the carriage of animal by-products or derived products, following their use for the carriage of products intended for human consumption, under conditions which prevent cross-contamination.

In few words, a single truck could be used for transporting different categories of ABPs, providing that each category is collected and transported separately, in a way which avoids cross-contamination. Therefore, no significant impact is foreseen on the traffic study.

Once the logistic will be defined and in place, it could be considered to collect cat.1-2 from large slaughterhouses with dedicated trucks. However, on the basis of data collected in the first phase of the project, the number of such establishments is very limited.

As a conclusion, the separated collection of Cat. 1 and 2 ABPs from one side, and Cat. 3 ABPs on the other side, would not have an impact on the traffic study and on the cost estimation for the logistic prepared in the first phase of the project. This is due to the fact that, providing that adequate separation of different categories of ABPs when collected and transported is guaranteed, all ABPs can be transported in the same truck. This separation can be guaranteed using different containers.

SECTION 2.E

TASK 5

FINANCIAL PLAN

2.E.1. INTRODUCTION

For purposes of Part 2 of this Feasibility Study, an estimation of the investments required for all implementation stages for proposed Project has been made, starting from the availability of ABPs, aspects regarding the location of the ABPs processing plant and technical regulation, forecast of ABPs processing costs and market requirements, structure and value of the investment project and identification of the necessary financial sources for project implementation.

This new option considers the construction of a processing plant of ABPs in two separate processing units: one for processing category 1 and 2 of ABPs together, and the second unit for separate processing of the category 3 ABPs.

For the management of the plant, an enterprise will be created, with the legal status of a state enterprise. The state assets, will be transferred for management with free of charge, based on a contract between the State and the Enterprise.

The company's staff includes 41 staff units, from which 32 units will be employed in the 2 processing units and 9 staff unit will be engaged for general administration of plant.

2.E.2. BASIC DATA

Estimation of ABP processing capacity

At the stage of data collection and evaluation of ABP flows and volumes generated by slaughterhouses in Moldova, the meat processing industry and the percentage of animal falls, the annual volume of ABP produced by categories in Moldova was estimated (Table 2.E.1).

Table 2.E.3. Amount of ABPs produced in Moldova and estimated for processing, tons/year

ABPs	*Slaughtering, deboning 2020*	*Fallen stock (5% mortality, 2020)*		*Food of AO processing plants*	*Others*	*Total ABPs produced in Moldova*	*ABPs already processed in existing ABPs plants*	*Total ABPs to be disposed of*
		Bovines, ovines, caprines	*Pigs, horses, poultry*					
Cat 1	1,076	3,316	0	0		**4,392**	**0**	**4,392**
Cat. 2	800	0	1,995	0	100*	**2,895**		**2,895**
Cat. 3	19,082	0	0	157	50**	**19,289**	**11,000**	**8,289**
Total	**20,958**	**3,316**	**1,995**	**157**	**150**	**26,576**	**11,000**	**15,576**

The capacity of the processing lines was estimated based on the nominal hourly processing capacity for each line (table 2.E.2).

Table 2.E.4. Assumptions regarding capabilities of the processing ABPs plant

Indicators	*Units*	*Processing Line 1 Cat.1&2*	*Processing Line 2 Cat. 3*
Annual working days		250	250
Daily shifts		2	2
Working hours per shift		8	8
Annual working hours		4,000	4,000
Nominal line capacity per hour	kg/h	2,500	2,500
Production efficiency	%	85.0	85.0
Estimation capacity of ABPs	**kg/year**	**8,500,000**	**8,500,000**

Derived products

Derived products represent the final result of processing the categories of ABPs. Processing line of ABPs cat.1&2, will produce fat and meal category 1, and the processing line 2 will produce fat and meal of category 3. The expected production volume of the derived products of the two lines are reported in the following table.

Table 2.E.3. Estimation production volumes of the Fat and Meal by products categories.

Indicators	*Units*	*Production line 1 derived products cat. 1*	*Production line 2 derived products cat. 3*
Processing plan of ABPs	kg/year	8,500,000	8,500,000
Nominal line capacity per hour	Kg/hour	2,500	2,500
Production efficiency	%	85	85
Water content	**%**	65	65
Extracted fat per hour	kg/h	345	345
Daily extracted fat	kg/day	5,525	5,525
Annual volume of Fat production	**kg/year**	**1,381,250**	**1,381,250**
Extraction level of the fat from a ton of ABPs	%	16.3	16.3
Extracted Meat and Bone Meal	kg/h	400	400
Daily extracted MBM	kg/day	6,402	6,402
Annual volume of MBM production	kg/year	**1,600,550**	**1,600,550**
Extraction level of MBM from a ton of ABPs	%	18.8	18.8

The equipment will extract about 16.3% animal fat and 18.8% meat and bone meal from 1 ton of ABPs.

The fat coming from processing line 1 will be used to generate steam required for both production lines.

Volume of internal needs, for fat category 1, was estimated taking into consideration the capacity of the thermal plants and their operational efficiency.

Table 2.E.4. Estimated volume of fat used as fuel for internal use and for selling

Items	*Unit*	*Production Line 1 Fat cat.1*	*Production Line 2 Fat cat.3*
Annual volume of fat production	**kg/year**	**1,381,250**	**1,381,250**
Thermal plant capacity	Kcal/h	2,400	2,400
Burning efficiency	%	90%	90%
Consumption per hour	kg/h	314	314
Annual fat used for fuel	kg/year	1,256,000	1,256,000
Amount of fat remaining after use as fuel		126,348	126,348
Volume of fat cat.1 used as fuel for line 2	kg/year	(126,348)	126,348
Volume of fat for selling	kg/year	**-**	**252,696**

Unused volume of fat cat.1 as fuel by unit 1, may be used as fuel in production process of unit 2, that will release an additional volume of fat category 3 for selling.

Forecasted derived products intended for sales

The produced volume of fat cat 1 would be 100% used as fuel for internal use, and fat cat.3 would be 80% used as fuel. The volume of fat cat.3 dedicated for sales will be 20%, expected for export to biodiesel producers, members of the European Biodiesel Committee (EBB).

Total produced volume of meal would be sold to cement factories in Moldova, Romania and Ukraine.

Cat. 3 fat will be delivered in bulk and the MBM cat. 1&3 will be packed in the large bags of 1,000 kg each.

In order to estimate the sales volume of fats and meal, it was assumed that the volume of the stocks will equal to 9 days' storage for meal and 15 days for fat.

Table 2.E.5. Volume of production, storage capacity and stocks of derived products

Category of products	*Production volume, kg*	*Stocks of derived products*		*Storage capacity, kg*
		Days	*Kg*	
Fat cat. 1	1,381,250	-	-	40,000
Fat cat. 3	1,381,250	15	57,552	80,000
MBM cat .1	1,602,250	9	40,014	60,000
MBM cat .3	1,602,250	9	40,014	60,000
Total	**5,966,999**		**137,580**	**200,000**

The products stocks will influence the volume of sales in the first year of the enterprise activity. Estimated annual volume of derived product, intended for sales, are presented in the table below.

Table 2.E.6. Forecasted volume of products for sale, kg

Product	*Y1*	*Y2*	*Y3*	*Y4*	*Y5*	*Y6*	*Y7*
Fat cat. 1	-	-	-	-	-	-	-
Fat Cat. 3	242,197	252,696	252,696	252,696	252,696	252,696	252,696
MBM Cat. 1	1,562,193	1,602,250	1,602,250	1,602,250	1,602,250	1,602,250	1,602,250
MBM Cat. 3	1,562,193	1,602,250	1,602,250	1,602,250	1,602,250	1,602,250	1,602,250
Total to sale	**3,366,554**	**3,457,195**	**3,457,195**	**3,457,195**	**3,457,195**	**3,457,195**	**3,457,195**

Table 2.E.7. Annual production amount and sales volumes, kg

Category of products	*Amount of the finished products, kg*	*Amount for sale, kg*	*% of sales*
Fat cat. 1	1,381,250	-	-
Fat cat. 3	1,381,250	252,696	18.3
MBM cat .1	1,602,250	1,602,250	100.0
MBM cat .3	1,602,250	1,602,250	100.0
Total	**5,966,999**	**3,457,195**	**57.9**

The estimated sales level of the finished products will be on average 57.9% from the total amount of the produced Fat and MBM. Around 81.7% of the fat produced will be used for self-consumption and only 18.3% will be destined for sale. Fat amount for self-consumption is forecasted per year in the amount of 2,500 tons.

Market price of one liter of diesel has been estimated at Eur 1,5, which being converted in 1kg of diesel (converting k=0,88) results in a price of 1,32 euros. Production cost for 1 kg of fat was estimated at Eur 0.38. Replacing diesel consumption with fats will reduce the processing costs of 0,94 euros for each kg of ABPs.

2.E.3. FORECAST OF ABPs PROCESSING COSTS

The costs for ABPs processing and the production of derived products, generated in the processing of ABPs will include:

(i) the cost of transporting ABPs to the processing plant,

(ii) the cost of labor of employees in the production process,

(iii) the cost of utilities that participate and are consumed to obtain derived products, such as electricity and water.

2.E.3.1. ABPs TRANSPORTATION COSTS

The transportation of ABPs will be performed with specialized means of transport, which will be authorized to carry out this specific load. The project includes 2 trucks with a capacity of 9-10 tons for the collection of ABPs category 1&2, and 6 trucks with the same capacity for the transport of ABPs category 3, generated by slaughterhouses and the meat processing industry. The number of transport units and their technical capacities were estimated in the Logistics Plan and the traffic study.

The cost of transporting ABPs to the processing plant was estimated in relation to the loading capacity of a route, the mileage of a route planned and optimized for each area of the North, South and Center regions. The annual cost deducted for transporting ABPs according to the planned routes to the processing plant is shown in the table below.

Table 2.E.8. Transportation costs by type of ABPs, Euro

Items	*M.un*	*Volumes of ABPs Cat. 1-2*	*Volumes of ABPs Cat 3*	*Total*
Annual mileage	km	93,690	426,132	519,822
Number of trucks	units	2	6	8
Fuel Consumption	L/100km	30	30	30
Annual quantity of fuel	l	28,107	127,840	155,947
Fuel price/L	Eur/l	1.5	1.5	1.5
Fuel costs	***Euro***	***42,161***	***191,759***	***233,920***
Drivers	Num.	2	6	8
Monthly gross salary	Euro	1,000	1,000	1,000
Gross salary cost for drivers	***Km***	***24,000***	***84,000***	***108,000***
Frequency of maintenance	Km	10,000	10,000	10,000
Maintenance/year	Nr interv.	9	43	52
Maintenance cost for each intervention	Euro/interv.	500	500	500
Total maintenance cost	***Euro***	***4,685***	***21,307***	***25,991***
Annual transportation costs	**Euro**	**70,845**	**297,066**	**367,911**
Cost of a Km of route	Euro/Km	0.76	0.70	0.71

The transportation cost of collected ABP cat.1&2 is supposed to be covered by disposal fee. As regards to the transportation of the ABP cat 3, it may be paid by the ABPs producers for the services provided. In the P&L forecast, transportation services are not included as revenue, and the cost of the services provided is attributed to the cost of production.

2.E.3.2. LABOUR COSTS

The salary was calculated in accordance with the Labor Code of the Republic of Moldova and the corresponding qualification. The calculated annual salary is reflected in the table below.

Table 2.E.9. Costs of labor for ABPs processing plant

Employees	*Processing Line 1*					*Processing Line 2*					*Total*	
	#	Monthly gross salary per employee	Social fund, 24%	Monthly labour cost	Annual labour cost, Euro	#	Monthly gross salary per employee	Social fund, 24%	Monthly labour cost	Annual labour cost, Euro	#	Annual Labour cost
Production	**16**	**5,550**	**1,332**	**6,882**	**229,152**	**16**	**5,550**	**1,332**	**6,882**	**229,152**	**32**	**458,304**
Production manager	1	1,500	360	1,860	22,320	1	1,500	360	1,860	22,320	2	44,640
Lift truck drivers	4	900	216	1,116	53,568	4	900	216	1,116	53,568	8	107,136
Unskilled workers	8	850	204	1,054	101,184	8	850	204	1,054	101,184	16	202,368
Steam boiler operator	2	1,200	288	1,488	35,712	2	1,200	288	1,488	35,712	4	71,424
Maintenance sector	1	1,100	264	1,364	16,368	1	1,100	264	1,364	16,368	2	32,736
Administration	**9**	**7,900**	**1,896**	**9,796**	**148,800**	**0**	**0**	**0**	**0**	**0**	**9**	**148,800**
General director	1	2,500	600	3,100	37,200					0	1	37,200
Deputy General Director	1	1,800	432	2,232	26,784					0	1	26,784
Chief Accountant	1	1,500	360	1,860	22,320					0	1	22,320
Secretary	1	800	192	992	11,904					0	1	11,904
Administrative workers	2	500	120	620	14,880					0	2	14,880
Security guards	3	800	192	992	35,712					0	3	35,712
Total	**25**	**13,450**	**3,228**	**16,678**	**377,952**	**16**	**5,550**	**1,332**	**6,882**	**229,152**	**39**	**607,104**

2.E.3.3. COSTS OF UTILITIES

Energy consumption cost

The energy consumed in the ABPs processing was based on the information presented by the expert engineer. The tariff for one kW/hour delivered by the supplier was assumed to increase and reach the value of 0.13 euro/kW. The amount of electricity consumed by each production unit and administrative energy consumed is shown in the tables below.

Table 2.E.10. Annual consumption energy for main and ancillary's equipment of line 1

Electricity consumption units	*Installed power kW*	*Electric power utilization rate,%*	*Absorbed power kW*	*Working hours per year*	*Annual consumption kW/year*	*Supplier price, EUR/kWh*	*Energy cost per year, EUR*
Main equipment for processing line 1, ABPs cat.1&2	350	95	333	4,000	1,330,000	0.14	172,900
Water treatment station	50	95	48	4,000	190,000	0.14	24,700
Ancillaries equipment for processing line 1, ABPs cat.1	45	95	133	4,000	532,000	0.14	69,160
Total	**445**		**513**		**2,052,000**		**266,760**

Table 2.E.11. Annual consumption energy for main and ancillary's equipment of line 2 and administrative consumption

Electricity consumption units	*Installed power kW*	*Electric power utilization rate,%*	*Absorbed power kW*	*Working hours per year*	*Annual consumption kW/year*	*Supplier price, EUR/kWh*	*Energy cost per year, EUR*
Main equipment for processing line 2 of ABPs cat.3	350	95	333	4,000	1,330,000	0.14	172,900
Water treatment station	50	95	48	4,000	190,000	0.14	24,700
Ancillaries equipment for processing line 2 of ABPs cat.3	45	95	43	4,000	171,000	0.14	22,230
Total	**445**		**422.75**		**1,691,000**		**219,830**
Administrative energy consumption	15	95	**14**	4,000	57,000	0.14	7,410

Estimation cost of water consumption

The amount of water consumed was estimated from the capacity of the water treatment plant, and it is assumed that this quantity complements the water supply network in the centralized network. The tariff for one cubic meter of water is one set for Chisinau.

The annual quantity of water is estimated at volume 25,500 m3/year, and the applied tariff per cubic meter is 1.3 Euro. The cost of the of water consumed annually is reflected in the table below.

Table 2.E.12. Estimate cost for water consumption

Indicators	*Unit.*	*Processing Line 1 for cat.1&2*	*Processing Line 2 for cat.3*	*Total*
Working hours per day treatment water station	h/day	16	16	
Flow rate of treatment station	m3/day	100	100	
	m3/h	6	6	
Hours per year	h/years	4,000	4,000	
Flow rate of water treatment station per year	m3/year	25,000	25,000	
Pumping capacity of station	m3/h	30	30	
Feeding the processing system with mains water	m3/year	**25,000**	**25,000**	**50,000**
Price per one cubic meter of water	Euro/m3	1.3	1.3	
Cost of annual water consumption	**Euro/year**	**32,188**	**32,188**	**64,375**

2.E.3.4. PRODUCTION COST STRUCTURE

The structure of production costs generated in the process of processing ABPs into derived products includes:

(i) transporting ABPs from collection centers to the plant,

(ii) payroll of employees in the production process,

(iii) electricity consumed, water and chemicals used for water treatment.

The costs were estimated based on the technical consumption parameters of the transport used, processing equipment, water and steam treatment installations, separately per each processing line.

The estimated annual production costs are presented in the table below.

Table 2.E.13. Forecasted production cost for each processing line

Items	*Unit*	*Processing cat. 1&2 Line 1*	*Processing cat.3 line 2*	*Total production cost in two lines*
ABPs transportation costs	Euro	70,845	297,066	367,911
Production labour costs	Euro	229,152	229,152	458,304
Energy consumption for ABPs processing	Euro	266,760	219,830	486,590
Water consumption	Euro	32,188	32,188	64,375
Chemicals for water treatment	Euro	5,000	5,000	10,000
Total production cost	Euro	**603,945**	**783,236**	**1,387,180**

The total processing cost was allocated for each type of products in relation to the produced amount of derived products. The cost per kg of finished product is shown in the table below. The cost of sales will be deducted by applying the unit cost per product type to quantity of products intended for sale.

Table 2.E.14. Forecasted unit production cost by type of derived products

Items	*Unit*	*Production cost cat.1*	*Production cost cat.3*	*Total*
Production cost of derived products	Euro	603,945	783,236	1,387,180
Total amount of derived products	kg	2,983,500	2,983,500	5,966,999
Fat	kg	1,381,250	1,381,250	2,762,500
Meat and Bone Meal	kg	1,602,250	1,602,250	3,204,499
Unit cost per Kg of derived products	Euro/kg	0.20	0.26	0.23

2.E.4. FORECASTING THE ANNUAL FINANCIAL RESULTS

2.E.4.1. COMPANY REVENUES

The revenues will include income from sales of cat.1 of meal and cat.3 fat/meal and income from payment of the disposal fee for animal by-products categories 1&2 and in the other option will includes income from all categories 1,2 and 3.

Table 2.E.15. Forecasts on Income from sales

Products category	*Qty for sale, kg*	*Market price Euro/kg*	*Income for sale, Euro*
Fat Cat. 1	0.00	0.20	0.00
Fat Cat. 3	252,696	0.60	151,618
Meat and Bone Meal Cat. 1	1,602,250	0.05	80,112
Meat and Bone Meal Cat. 3	1,602,550	0.20	320,450
Total Income from sales	**3,457,195**		**552,180**

Sale prices are fixed by the market. The adopted values in projection are in line with the current prices in Western countries.

The profitability of the company's activity can be ensured by introducing a tax on the elimination of animal by-products not intended for human consumption, generated as a result of the fall of animals, their slaughter and in the result of meat processing by processing plants in Moldova. The legislation in force does not provide for such a fee. The disposal fee is set for a 1 kg of ABP collected, transported and disposed through a processing plant. The purpose of introducing the disposal fee for categories of ABP is to make the Company activity profitable.

Assumed income from the disposal fee are presented in the table below.

Table 2.E.16: Estimated value of income from disposal fee

Items	*Qty of ABPs, kg*	*Disposal fee value*	*Income from disposal fee*
Income from disposal fee applied for volumes of ABPs cat. 1&2	8,500,000	0.20	1,700,000
Income from disposal fee applied for volumes of ABPs cat. 1,2,3	17,000,000	0.18	3,060,000

Cost of goods sold

The quantities of processed by-products differ from the quantities intended for sales, by the quantities remaining as stocks and by the quantities used for internal consumption.

The cost of sales includes the direct production cost.

Table 2.E.17. Cost of sales

Items	*Unit*	*Y1*	*Y2*	*Y3*	*Y4*	*Y5*	*Y6*	*Y7*
Fat Cat. 1	Euro	-	-	-	-	-	-	-
Fat Cat. 3	Euro	63,574	66,338	66,338	66,338	66,338	66,338	66,338
MBM Cat. 1	Euro	316,232	324,341	324,341	324,341	324,341	324,341	324,341
MBM Cat. 3	Euro	410,111	420,627	420,627	420,627	420,627	420,627	420,627
Total sale costs	**Euro**	**789,918**	**811,306**	**811,306**	**811,306**	**811,306**	**811,306**	**811,306**

The cost of transportation was attributed to the cost of sales.

Two options have been proposed for transporting finished products to buyers:

- Hiring an outsourcing company that will provide animal fat transportation services.
- Purchase two unit of vehicles with a capacity of 9-10 ton, intended for transporting MBM at distances not exceeding 300 km.

Based on the annual volume of fat predicted for sale, the list of potential buyers and the capacity of the transport tank, it was estimated that the company will transport 10 tanks annually at an average distance of 1,590 km. The possible price of outsourcing companies is assumed to be 2.0 euros/km. Until the increase in fuel prices, the companies offered 1.2 euros/km.

Table 2.E.18. Estimated annual transport costs, assigned to sale of the fats

Items	*M.un*	*Outsourced cost*
Annual sales volume	Tn	250.50
Capacity of oil tank	Tn	26
Number of tanks	unit	10
Number of tour per year		10
Mileage per tour	Km	1,590
Estimative price, tn/km	Eur/km	2.00
Cost a tour	Eur	3,180
Annual transportation cost for fat sales	**Eur**	**30,638**

Also, it was estimated the cost of transportation for each category of MBM. The MBM will be transported, with a transport unit that is expected to be purchased by the company. Cost of one ton of transported MBM at a distance no more than 300 km, was estimated at 1.17 euros per km for MBM cat.1 and for MBM cat.3.

Table 2.E.19. Estimated annual transport costs, assigned to MBM

Items	*M.un*	*Cat. 1*	*Cat 3*
Annual transportation volume of MBM	Tons	1,601	1,601
Average loading of trucks	Tons	9	9
Number of tour	unit	184	184
Number of trucks	unit	1	1
Fuel price/L	Eur/l	1.5	1.5
Consumption	L/100km	30	30
Average mileage per tour	Km	300	300
Annual mileage	Km	55,191	55,191
Total fuel need	L	16,557	16,557
Fuel cost/year	Eur	24,836	24,836
Salary and taxes/driver salary	Eur/month	1,000	1,000
Annual salary cost	Eur	12,000	12,000
Frequency of maintenance	Km	10,000	10,000
Maintenance/year	Nr interv.	6	6
Maintenance cost (each intervention)	Eur	500	500
Total maintenance cost	Eur	2,760	2,760
Estimated annual transportation cost for MBM sales	*Eur*	*39,596*	*39,596*
Estimation cost for 1 km	*Eur/km*	*0.72*	*0.72*

The cost of goods sold includes the cost of transporting goods to the buyers. The annual cost of goods sold per each type of products are presented in the table below.

Table 2.E.20: Cost of goods sold

Type of product	*Unit*	*Y1*	*Y2*	*Y3*	*Y4*	*Y5*	*Y6*	*Y7*
Fat Cat. 3	Euro	93,193	97,245	97,245	97,245	97,245	97,245	97,245
MBM Cat. 1	Euro	340,249	348,357	348,357	348,357	348,357	348,357	348,357
MBM Cat. 3	Euro	434,128	444,643	444,643	444,643	444,643	444,643	444,643
Total	**Euro**	**867,570**	**890,246**	**890,246**	**890,246**	**890,246**	**890,246**	**890,246**

The table below shows the market price and the cost of sales for a unit of product intended for sale.

Table 2.E.21. Cost benefit analysis

Type of products	*Market price Euro/kg*	*Unit cost of goods sold Euro/kg*	*Profit/losses per unit of product*
Fat Cat. 1	0.20	0.00	0.00
Fat Cat. 3	0.60	0.38	0.219
Meat and Bone Meal Cat. 1	0.05	0.22	(0.168)
Meat and Bone Meal Cat. 3	0.20	0.28	(0.078)

2.E.4.2. OPERATIONAL EXPENSES

Administrative and maintenance costs are allocated to operating expenses.

The investments allocated in the construction of the ABPs processing plant are public investment. The asset that will be built represent the property of the state and will be administered by the state institution.

The State institution responsible for the assets put into operation may transfer these assets into the management of an enterprise. The legal organizational would be a state-owned company. The asset can be transferred free of charge in the management of the state-owned company.

The value of the transmitted asset will be held in accounts of the state institution, decreasing yearly the value invested with the value of the depreciation calculated annually.

The amount of the maintenance cost was deducted for the maintenance of the assets managed by the company, as 2% of the total value of the fixed assets.

Table 2.E.22. Maintenance costs

Items	*Assets value, Euro*
Equipment	4,812,638
Building	4,911,200
Trucks	1,300,000
Total fixed assets cost	**9,723,838**
2% of fixed assets cost - for their maintenance	194,477

2.E.4.3. GENERAL AND ADMINISTRATIVE EXPENSES

The structure of general and administrative costs included the management salary and the estimated value of the cost for detergents, which will be used to maintain sanitary norms in the administrative spaces and the related administrative infrastructure.

Table 2.E.23. General & Administrative costs per year

	Unit	*Y1*
Wages for administration employees	Euro	148,800
Detergents	Euro	5,000
Energy consumption	Euro	7,410
Total	**Euro**	**153,800**

2.E.5. STRUCTURE AND VALUE OF THE INVESTMENT PROJECT

The estimated value of the land allocated for construction would be Eur 500,000, based on the market value of a plot. The market value of the allocated land is indicated for informative purposes and is not considered in the investment plan.

Until the start of the construction works, it is foreseen to contract a company that will provide engineering services related to the design, supervision and expertise of the construction, in the commissioning process and in the period established for defect notification.

The Engineer will manage the Contractor's activities, approve the Contractor's work schedules, technologies applied in construction, calculation and technical specifications, procurement of equipment and materials, will supervise the works and the quality, will check the Contractor's plan regarding occupational health and safety and will approve the Contractor's insurance policies and guarantees until the plant is put into operation and during the period of notice of defects.

The supervision and expertise services offered by the Engineer during the design, construction, commissioning and also during the period of notification of defects, was estimated by the Opera expert, amounting to Euro 700,000.

The estimated value, provided by the expert engineer, for the civil and construction works is worth about Euro 4,911,200. The works are expected to be procured from Moldova.

Most of the equipment in the processing line will be imported. The value of the planned import is estimated at Euro 3,877,638 CIF, the value includes the cost of loading, transport before and after loading and all related taxes up to the border of Moldova including the cost of insuring the goods.

The transport units, 10 specialized trucks, intended for the transport of different types of ABPs and for sales, represent 11.1% in relation to the investment value or Euro 1,300,000.

The investment value of the Project also includes the cost of working capital in the amount of Euro 70,881 deducted as value of working capital for a month of activity, and which is intended to ensure the start-up of the company's activity.

Table 2.E.24. Project Investment Plan, Euro

nr	Investment categories	Total Investments Euro	Distribution in accordance with scope of works			Procurement provisions	
			ABPs cat.1&2	ABPs cat.3	Wastewater Treatment Unit	Imported	Local procurement
I	Land allocated area	-	-	-	-	-	-
II	Engineering Services and Work Supervision	700,000	322,000	322,000	56,000	-	700,000
III	Civil and building works	4,911,200	2,527,600	2,383,600		-	4,911,200
IV	ABP processing line and auxiliary equipment, CIF	3,932,638	1,992,819	1,939,819		3,932,638	-
VII	Wastewater Treatment Unit	880,000			880,000	880,000	
VIII	Establishment of the ABPs management system	-	-	-			
IX	Truck for ABPs collecting	1,040,000	260,000	780,000		1,040,000	
X	Truck 9-11 tons for MBM	260,000		260,000		260,000	
XI	Working capital	151,200	75,600	75,600		-	152,200
	TOTAL INVESTMENT COSTS	**11,875,038**	**5,178,019**	**5,761,019**	**936,000**	**6,112,638**	**5,763,400**
INVESTMENT STRUCTURE, %		100.0	43.4	48.7	7.9	51.2	48.8

2.E.6. SOURCES OF FINANCING

Following the adoption of law 129/2019 on animal by-products and derived products not intended for human consumption, the Government of the Republic of Moldova has concluded a financing agreement with the World Bank on the establishment of a comprehensive animal by-products management system in line with EU requirements.

The investment cost of the project is estimated at Euro 11,745,404, of which 100% is expected to be financed from the World Bank's loan resources.

The World Bank will provide the loan as described in the table below.

Table 2.E.25. Loan from World Bank

Indicators	m/unit	Values
Loan amount	Euro	11,875,038
Interest rate	%	2.20
Payment period	years	25
Grace period	years	5
Loan Ratio	%	100%

It is important to note that the revenues generated are not enough to cover the repayment of the loan principal (Annex 2.E.1. Forecast results - Profit and Loss. Scenario 1).

The introduction of a fee for ABPs disposal services will institutionalize the responsibility of meat producers and processors and bring their activities in line with EU requirements. This provides Food Business Operators in the industry with the opportunity to take advantage of the provisions of the Free Trade Agreement and the opportunity to export their products to EU countries.

In the Republic of Moldova, the law no. 1347/1997 on production and household waste provides the rules and method of calculation of the payment for the storage of production waste, according to which the company, depending on the degree of pollution, pays a coefficient related to the minimum wage established in the country.

The mentioned law does not stipulate the destination of the payment, as well as the Fiscal Code do not provide such information. Thus, a regulation as regards to the payment/tax (disposal fee) for animal by-products disposal would be the source, which will allow the Republic of Moldova to repay the loan provided by the World Bank.

Three scenarios were compared:

(i) Recovering investment from the sale of derived products,

(ii) Covering the negative cash flow from disposal fee, which will be paid by the producers of ABPs categories 1&2 collected and transported for processing.

(iii) Covering the negative cash flow from disposal fee, which will be paid by the producers of all ABPs categories 1,2 and 3.

The feasibility indicators of the investment planned for the construction of the APBs processing plant for the above-mentioned scenarios are presented in the table below.

Table 2.E.26. Efficiency of project scenarios

Feasibility indicators	Scenario 1 (annex 2.E.2) *Revenues from sale the derived products*	Scenario 2 (annex 2.E.4) *Revenues from sale the derived products and revenues from disposal fee 0.20 Euro/kg applied to categories 1&2 of ABPs*	Scenario 3 (annex 2.E.6) *Revenues from sale the derived products and revenues from disposal fee 0.18 Euro/kg applied to all categories of ABPs*
IRR	**negative**	**1.1%**	**16%**
NPV (10%)	**(22,850,173)**	**1,963,480**	**5,806,296**
ROI	**-6%**	**4%**	**15%**
Payback period	**31.0**	**27.0**	**6.0**

The investment project shall be considered feasible, if the internal rate of return (IRR) of the project is higher than 12.5% and the net present value is positive. The IRR of 12.5% corresponds to the current country risk of the Republic of Moldova, according to the Moody's rating agency (B3). The table above represents the results of 3 distinct scenarios.

Scenario 1, implies **no disposal fee**, the profits being exclusively provided by the sales of the products on the market without any subsidy. Thus, in this scenario the project is not feasible, registering a negative IRR and NPV. Sales do not cover processing costs and the business is not feasible.

Scenario 2, in addition to the revenue generated by sales, involves additional revenue from the disposal fee for category 1&2 of animal by-products. Disposal fee was estimated at 0.20 Euro per one kilogram of collected and transported categories 1&2 for processing. Under the conditions of this scenario, the project will achieve the following results: IRR (01.1)%, NPV 1.9 million Euro, with payback period 27 years.

Scenario 3, in addition to the revenue generated by sales, involves additional revenue from the disposal fee applied to all categories of animal by-product. Disposal fee was estimated at 0.18 Euro per one kilogram of ABPs collected and transported, the 1&2 categories to be processed separately from category 3. In this case, the project will achieve the following results: IRR 16%, NPV (10%) of 5.8 million euro, with a payback period of 6 years.

Under the conditions of scenario three, the investment project can be considered feasible for finance from the World Bank's resources.

SECTION 2.F

FINANCING THE SYSTEM AND MANAGEMENT MODELS

2.F.1. ANALYSIS OF POTENTIAL NEEDS FOR GOVERNMENTAL FINANCIAL SUPPORT

2.F.1.1. COST FOR ABPs DISPOSAL IN THE MEMBER STATES

Cost for disposal of ABPs can be extremely variable, depending on several parameters like the cost of life in the Country, the possibility to reuse MBM and fat obtained from processing, the availability of establishment where to dispose of MBM, the technology of the processing plant(s), the amount of ABPs to be collected and processed, the geographical characteristics of the Country and relevant easiness of ABPs collection, etc.

The amount of the fee for collection of ABPs should be set on the basis of actual costs incurred, i.e. on the basis of the cost of service of by-products collection and disposal.

ABPs from slaughterhouses and food processing plants

A few years old EU study has estimated the average cost for collection, utilisation and disposal to be about € 115 per ton category 3 waste. This is an average figure and a range of € 95 - 145 per ton seems likely.

In Italy the cost of ABPs collection, including disposal costs, is estimated around € 100.00/ton in a distance range of Km. 250, where each transport is 14 tons; from butcheries and retail shops the fee is established on the basis of the number of collection/month: 4 collections/month are charged € 200.

In Croatia, the price of collection, processing and incineration of the ABPs Category 1 and 2 except dead bodies is € 0.19/kg or €190/ton. Category 3 of the ABPs is commercial and the price is negotiated by ABPs producers and the processing facilities.

Fallen stock

The disposal fees for the slaughterhouses and farmers for animal by-products of category 1 and 2 vary a lot in the different Member States. This mainly depends on the different national supporting schemes for the disposal of these materials. In some countries ABPs producer has to pay the whole cost for collection and treatment whereas in other Member States the costs are partly borne by local authorities (animal diseases funds, etc.). Table 2.F.1 provides some examples of the fees adopted in some Member States for collection and disposal of dead animals (bovines).

Table 2.F.1. Fallen stock collection fees in selected EU Member States (2014)

Country	*Region*	*ABPs*	*Cost/animal (€)*	*Travel cost (€)*	*Source*
Germany	Rhineland Palatinate	Bovine >12 m.	86.45	39.2	Staatsanzeiger Rheinland Pfalz [2]
Germany	Saxony	Bovine >12 m.	22.20	-	TBA-Sachsen [3]
Denmark	Whole country	Bovine >12 m.	65.19	-	SecAnim DK [4]
Spain	Asturias	Bovine	260 [5]	-	Agrosecuro [6]
Spain	Castilla la Mancha	Bovine	110 [7]	-	Agrosecuro
United Kingdom	Whole country	Bovine 12-23 m.	95 £	-	National Fallen Stock Company [8]

Source: IFEU - Institut für Energie- und Umweltforschung Heidelberg GmbH. Analysis of allocation approaches of animal by-product treatment in the context of life cycle assessments

2 Staatsanzeiger Rheinland Pfalz 22.04.2014

3 www.tba-sachsen.de/leistungen/img/Gebuehrenverzeichnis_Stand_010112.pdf

4 www.secanim.dk/fileadmin/user_upload/secanim_dk/downloads/Indsamling_forarbejdning_ enhedspris.pdf

5 In the source the price is listed with 0.52 €/kg. The price in the table is based on an average weight of a cattle 500 kg.

6 web.unionduero.es/agroDocs/pdf/agroDocs/732.pdf

7 In the source the price is listed with 0.22 €/kg. The price in the table is based on an average weight of a cattle 500 kg.

8 http://www.iwight.com/azservices/documents/2477-Defra-NFSCo-Letter-to-farmers-on- IOW-wef30.11.11.pdf

In Croatia, the cost of harvesting dead bodies is € 0.19/kg or € 190/t. The price of processing and incineration of dead bodies is € 0.16/kg or € 160/t. This results in a total of € 350/t. The price of harvesting and processing of dead bodies was prescribed every year by the order of the minister and the price list for carrying out veterinary services, and was:

- Processing € 0.06/kg or € 60.00/t
- Collection and transport € 0.217/kg or € 217.00/t

Croatia considered appropriate to co-finance from the State budget ABPs producers with disposal, and to fully finance the disposal of dead bodies.

In the UK, prices applied in January 2019 (excluding VAT) by a private Company registered with the National Fallen Stock Company (Douglas Brothers Ltd) are summarized at table 2.F.2.

Table 2.F.2. Prices applied for dead bodies collection and disposal, January 2019, Douglas Brothers Ltd (UK)

Bovines		*Sheep*		*Pigs*	
24-48 months	£ 105.00	> 12 months	£ 18.50 each	over 150 Kg (breeding)	£ 75.00
13-23 months	£ 74.00	> 12 months (3 or more)	£ 12.00 each	30-150 Kg (finishing/fattening)	£ 65.00
7- 12 months	£ 61.00	Lambs 2-12 months	£ 17.00 each	7-30 Kg (growing/weaners)	£ 40.00
4-6 months	£ 38.75	Lambs 0-1 months	£ 10.00 each	0-7 Kg (piglets, suckling)	£ 20.00
2-3 months	£ 15.75				
0-1 months	£ 7.25				

Source: http://www.douglasbros.uk/index.php/prices

2.F.1.2. FINANCIAL SUPPORT IN THE MEMBER STATES

In the Member States, farmers and slaughterers consider production “waste” differently.

Slaughterers (and companies in the food of animal origin processing sector) tend to consider their waste as by-products and, as such, are inclined to find a system for removing these materials that is not too complex and costly. The cost of disposal is thus "spread" on the price of the products placed on the market and, in fact, paid by downstream users and consumers. This is generally the case throughout Europe.

The "waste" of breeding (dead animals, fetuses, animals killed due to epizootic diseases) are not considered as "accidents" falling within the cost of production (business risk) because the farmers believe that the public system must bear these costs because agriculture and livestock benefit from significant public support (about half of the EU budget). This culture, although motivated and supported by extensive consultations on the usefulness of supporting activities that promote the environment, animal welfare and food safety by restoring pleasant landscapes and territorial protection, has rooted in the agricultural world / zootechnician the belief that the cost of managing agricultural and livestock waste must fall partly on the downstream supply chain and partly on public budgets.

Perhaps for this reason too, “mutual” choices aimed at compensating the costs between companies operating in marginal areas and industrial-type companies have struggled to establish themselves.

This brief synthesis allows us to understand the reasons for which in many Member States, the public administration support farmers to cover partially or totally the cost of disposal of dead animals, in order to motivate the animal keepers to report dead animals.

A survey was carried out in 2009 by DAFF (Ireland), collecting information on collection, rendering/processing and incineration/disposal of fallen animals in some EU Member States (UK, Belgium, the Netherlands, France, Hungary, Finland, Estonia, Luxembourg, Portugal, Norway, Denmark and Austria).

At that time, Belgium, the Netherlands, Finland, Luxembourg, Portugal, Denmark and Austria subsidised the collection, rendering/processing and incineration/disposal of fallen animals. Norway subsidised the collection only of fallen animals, while Estonia and France only subsidised their rendering/processing. Hungary provided subsidies for collection and incineration/disposal.

In the case of bovines, except for Denmark, which subsidised over 24 months bovines only, all Member States who replied to the survey, subsidised bovines regardless of age. The only other species supported by Denmark, besides bovines, were sheep and goats. Norway and Finland did not provide aid for the disposal of fallen horses and Portugal did not subsidise poultry. A limited number of Member States supported the disposal of fish.

Austria, Norway, Luxembourg, Estonia, Hungary, France, Portugal, Belgium administered the subsidy directly to the collector and/or directly to the renderer/disposal agent. Denmark, Finland and the Netherlands paid directly to the farmer.

Austria provided 100% of the costs of collection for all animals and 75% of the costs for rendering and disposal. Luxembourg paid 100% of the collection and rendering costs. Hungary paid 75% to 100% of the collection costs, depending on whether the animal was TSE tested or not, and 75% of disposal costs. In Belgium, 50% of the costs of collection and rendering were paid by the State and in the Netherlands, 45% of the costs of collection were State aided and 65% of the rendering costs.

In Estonia, Finland, the Netherlands and Belgium, the farmer paid his/her contribution directly to the collector. Contributions by farmers in Austria, France, Norway and Portugal were mainly through the use of State levies. The collection, processing and destruction of fallen animals was organised as a public contract in France.

It is clear that all Member States recognised how serious the challenge of dealing with fallen stock was and that State intervention has been essential in order to establish proper systems of collection and disposal.

Unlike other countries in the Balkans, Croatia had an established system for processing by-products of animal origin, which are not for human consumption even before EU membership and provided additional fees for each collected tone of the by-products. Namely, the “Rulebook on the amount of the fee for the collection and thermal processing of by-products of animal origin not for human consumption”(OG 99/08), which prescribed a single price to be paid by the ABPs producers to the concessionaire for all categories of by-products, was in force in Croatia since 2008. The price of processing by-products of all categories was 0.06€/kg or 60.00€/t, and the price of collection and transport depended on the quantity when loading:

Up to 1,000 kg per load	0.08€/kg or 80.00 € / t
From 1,001 kg to 3,000 kg per load	0.06€/kg or 60.00 € / t
From 3,001 kg to 10,000 kg per load	0.03€/kg or 30.00 € / t
More than 10,000 kg per load	0.013€/kg or 13.00 € / t

In addition to the amount of the prescribed fee, the Ministry of Agriculture paid to the concessionaire an additional fee in the amount of 30% of the prescribed fee to the legal or natural person who performed the collection and thermal processing of by-products.

The price of collection and processing of dead animals was prescribed every year by the Order of the Minister and the price list for service was: i) for processing 0.06 € / kg or 60.00 € / t, ii) for collection and transport 0.217 € / kg or 217.00 € / t.

Current fees for the collection, processing and incineration of animal by-products not for human consumption in Croatia have been in force since August 2013. The collection, processing and incineration of animal by-products not for human consumption is performed by authorized concessioner[14] with whom competent body has signed the concession agreement. The producers of the animal by-products (category 1 and category 2) are paying directly to the concessioner the amount of 1.45 kn/kg[15]. The State subsidizes the costs of collecting, processing and incinerating dead animals during the implementation of measures to control infectious diseases, as well as dead animals originating from ungulate farms with less than 1,000 conditional heads[16], or poultry farms with less than 300 conditional heads. In these cases, the concessionaire is paid from the State budget: i) for the collection of dead animals 1.40 kn / kg of animal products, ii) 1.25 kn / kg of animal products for processing and incineration of dead animals[17].

The current situation (from 2015) in Croatia is such that the disposal, which includes all dead bodies of ungulates, solipeds and poultry farms, is financed from the state budget. Other producers of animal by-products of cat. 1 and cat. 2 (eg. slaughterhouses) pay the concessionaire for their disposal (collection, transport, heat treatment and incineration) 1.40 kn / kg of ABP.

Based on the presentation of practice in EU Member States, in the case of Croatia and before joining the EU, it is clear that the treatment of animal waste requires State support. In the case of the collection and treatment of non-human animal waste, three approaches are possible. The first, when the State fully subsidizes this process, the second, when the State partially subsidizes, and the third when the State does not participate at all in covering the costs of industry. In the event that the State does not participate in the financing of costs or does so only partially, the cost is transferred to the end customer through the selling price of the final product.

Having in mind the size of Moldovan agriculture as well as the fact that in this case the goals of environmental protection and human health exceed all other goals, it is recommended co-financing from the State budget of by-product producers and full financing of collection and disposal of dead animals. Direct co-financing of the ABP management (collection, transport, processing) is preferable.

Co-financing of relevant FBO would create an administrative burden. Local or central government should also subsidize all farmers (for example financing the purchasing of animals to replace those animals that died) since they already have a loss of future revenues, due to the loss of live animals.

When it comes to the collection and treatment of dead animals from individual and small farmers, the practice is for the State to subsidize these costs. In this case, it is necessary to determine the maximum number of conditional heads for farms that then fall into this category of subsidized animal waste producers.

2.F.1.3. INSURANCE SYSTEMS FOR DEAD ANIMALS' DISPOSAL

The Italian experience

From an analysis of the options that have been chosen in the Member States to reduce the burdens for farmers, we have identified an additional opportunity, that has been chosen in Piedmont Region, an Italian region with 800,000 bovines and 1,100,000 pigs, where on average 17,000-18,000 dead bovines have to be disposed of yearly.

The Italian public administration decided to identify, promote and co-finance forms of cooperation aimed at making the collection and disposal of dead animals homogeneous and accessible on the territory of competence.

[14] the authorised concessioner is a company to which the government has concessioned the collection and processing of ABPs

[15] Which is 0.19125 € / kg or 191.2 € / t, source: www.oanda.com, as of March 30 2021.

[16] Conditional heads is an animal or group of similar animals (eg. dairy cows) weighing 500 kg

[17] Which is 0.18455 € / kg or 184.5 € / t and 0.164871 € / kg or 165 € / t, respectively.

No similar initiatives were adopted for the collection and treatment of waste from the slaughtering industry and food processing establishments.

Throughout Italy, the public support for the collection and treatment system for dead animals was limited to the use of CAP (Common Agricultural Policy) resources intended to co-finance the insurance systems promoted and managed by the “Defense Consortia” (Condifesa) already operating in agriculture for the damage from adverse weather conditions and natural disasters (hail, floods, drought, damage caused by wild animals, etc.).

This choice, however, had major limitations due to the poor "specialization" of Condifesa and the lack of an accurate risk analysis (essential for defining insurance premiums) and the low reliability of corporate mortality data (in some regions the high reports of livestock theft probably concealed peaks in farm mortality with possible concealment of communicable diseases).

Piedmont Region, at the beginning of the new century, approved a law that established a mandatory consortium for all livestock breeders: COSMAN (Consortium for the disposal of dead animals). Every livestock breeder was obliged to join the consortium, which main role was to establish a system of insurance to cover the cost of disposal of dead animals.

Since 2005, the Consortium COSMAN has gathered, with mutual aid purposes, the farmers that operated in the region, protecting the risks of economic losses in livestock farms with specific insurance coverage.

The objectives were clear: the correct disposal of dead animals and their traceability, the facilitation of health checks, the streamlining of the burdens for farmers, the administrative and economic efficiency, the containment of costs, the rationalization of relations with all those involved, mutuality and risk selection, the protection of small farmers, support for farmers in particular situations such as mountain pastures.

The functioning of the COSMAN, implemented along the lines of consortia already active for the disposal of hazardous waste (e.g. exhausted oils) was ensured by a membership fee for farmers (defined amount based on the species and number of animals reared). In this way the operating costs of the Consortium were insured by the breeders themselves but the Piedmont Region made available to the Consortium a small regional property and an annual loan of about 2 million € to partially cover the insurance costs.

The choice of the broker, the insurance company, the recognized disposal companies, any intermediate services were the responsibility of COSMAN and the regional contribution was paid by the Regional Agency for payments in agriculture on the basis of the operating rules established by the Consortium and approved by the Piedmont Regional Council.

The insurance system operates for the following cases:

- ordinary mortality,
- disposal of animals that have to be killed in case of epizootic diseases (in these cases, national law allows compensation for the loss of animals killed but not for the costs of disposal),
- BSE test at the rendering plant (where applicable),
- collection and treatment of abortions and foetal rites,
- collection and disposal of damaged (or predated) animals in marginal areas (eg mountain pastures).

Voluntary insurance provides guarantees for compensation of:

- the costs of dead animals’ disposal following the so-called “ordinary mortality”;
- the value of the animals and the loss of income following the loss of animals in the event of natural disasters and other similar atmospheric adversities, as well as adverse weather conditions in general;
- the value of animals in the event of forced killing or convenience following the implementation of disease eradication plans including genetic value;
- loss of income as a result of health measures.

Adherence to the insurance policy with the regional contribution on the premium, entails the exclusion from the right to a direct contribution related to the cost of disposal.

The COSMAN worked very well for over 10 years to the full satisfaction of the farmers who paid the lowest rates in Italy and therefore had the convenience of keeping the Consortium alive.

In 2014, a new Regional Law, in addition to providing for the termination of the activity of the mandatory regional Consortium, traced the route to allow the transition of the consortium operating in Piedmont towards operational solutions shared with the member companies in order not to interrupt the services provided to Piedmontese breeders.

As a result, the damage related to mortality in livestock farms was equated with the damage caused by adverse weather conditions to agricultural crops, tracing the entire package to the agricultural insurance systems managed by the Defense Consortia (Condifesa).

From 2014, Piedmontese breeders are no longer obliged to take out insurance (as provided for by the mandatory regional consortium until 2014). The insurance costs, previously borne by the regional budget, have been shifted to the Community funds of the CAP under the national insurance plans.

On the occasion of this change, a risk of misalignment emerged between insured subjects (and therefore beneficiaries of community resources) and subjects registered in the zootechnical databases, which can only be partially explained by possible human errors and most likely attributable to improper forms of disposal or to the recovery of parts of animals for food destinations.

For these reasons, in agreement with the regional veterinary service, a system for crossing the Condifesa databases with the regional livestock database was made available, activated by a Call Center that carries out this activity in the name and for account of the Condifesa.

This organization has made it possible to significantly reduce the travel of the veterinary staff of the Local Health Unit for the assessment and certification of mortality in farms in order to authorize the disposal of dead animals in plants authorized for the treatment of category 1 and 2 ABPs. A procedure made possible because European legislation provides for the possibility of waiving the obligation of health certification if the traceability of the dead animals is guaranteed throughout the disposal process.

The adopted system allows to verify through the available databases:

- the presence of the animal in the stable,
- ownership of the animal by the applicant / insured party,
- the absence of veterinary reasons that prevent the transport of the dead animal or that require a clinical or pathological examination on the farm.

This system ensured low and transparent costs, with attention to the prevention of the spread of any infectious / diffusive diseases and with perfect alignment between animals indemnified by the insurance system and animals cancelled from the national livestock register.

Breeders who do not intend to insure (now a legitimate choice) do not use the tools and technologies developed with the insurance systems but, burdening the organization of the veterinary services of the Local Health Units, are required to pay the service (inspection and certification) on the basis of the amounts established by the "Regional Tariff for services provided in the interest of individuals" (50 €).

The farmer can therefore choose whether to pay 50 € for the services requested by the Local Health Unit or to join the insurance system which, for small farms and low-value animal species, provides rates compatible with the management of the farm.

It should be emphasized that the payment of the certification does not exclude the responsibilities of the farmer or the control tasks of the veterinary service because the choice not to join an insurance system does not exempt the farmer from the obligation to dispose of the dead animals in the forms permitted by law (verifiable by the veterinary service at the authorized facility that disposed of the dead animal) and from the obligation to cancel the dead animal from the national zootechnical database.

Agricultural trade unions and producer associations agree in supporting and defending the advantages and opportunities offered by the insurance system but the individual farmer who does not intend to insure is free to do so knowing that his choice may involve variable costs that may even exceed those incurred by insured breeders.

How the current system works:

1. one or more animals die on the farm,
2. the farmer calls the call center,
3. the call center queries the regional livestock database (interoperable with the national one),
4. if the animal (s) are present on the farm, have registered ear tags, there are no veterinary restrictive measures in the farm or in the area where it operates, the Call Center informs the farmer that he may request the intervention of one approved processing establishment,
5. the establishment that collects the dead animals returns the notification of the treatment to the Call Center,
6. the Call Center notifies the farmer of the disposal of the dead animals so that the animals are deleted from the regional / national registry.

With this system, the number of dead animals withdrawn from farms and deleted from the database coincides perfectly with the animals compensated through the insurance system (checks by the regional paying agency and the EU Commission).

In essence: the insurance achieves the objective of covering the costs of collection and disposal, and at the same time provides a guarantee of public health with full alignment between what is "downloaded" from the National Database in terms of dead animals and what is disposed of in the rendering facility.

Moreover, the system allows to increase controls over companies where there may be a health problem. In this way, targeted controls are possible, analyzing the risk more precisely with lower costs.

The Spanish experience

Another experience related to insurance schemes is reported from Spain, which has apparently used widespread agricultural insurance for the past thirty years, with the intention of covering as many risks as possible. Insurance schemes are agreed in consultation with all stakeholders.

Public bodies have been established by the Ministry for Agriculture and the Ministry for Finance to facilitate such schemes. While uptake varies widely, it is apparently high for dead animals' removal. State aid accounts for between 37% to 45% of all costs.

Insurance is voluntary, and it is provided by a wide range of companies who also provide normal insurance such as house, car, holiday etc. Over 90% of farmers are covered for fallen animals.

The system of insuring fallen animals is complex, involving central, regional and private funding. Each region in Spain decides on the level of support that they will provide. The share farmers have to pay is steadily increasing.

2.F.1.4. THE IRISH EXPERIENCE: "FALLEN ANIMALS COLLECTION SCHEME"

Another interesting experience is the "Fallen Animals Collection Scheme", which was introduced in Ireland in July 2001 and provides for the subsidised collection of fallen bovines and the destruction of ruminant and non-ruminant fallen animals. Even if this experience started almost 20 years ago, we consider it quite interesting also because the initial situation in Ireland was similar to the current situation in Moldova, as far as dead animals' collection and disposal is concerned. Prior to the introduction of the Fallen Animals Scheme, collection and disposal facilities for dead animals were poor in Ireland.

The strategic objective was to offer increased environmental and animal health controls by ensuring that the maximum number of animals that die on farm are collected and sent to a dedicated plant for rendering and destruction.

The Scheme had the following specific objectives:

- to facilitate the TSE testing of fallen bovines and ovines;
- to ensure all fallen bovines are collected for proper disposal;
- to minimise the illegal disposal of fallen stock.

Environmental improvement and improved animal welfare and traceability were implicit objectives of the Fallen Animals Scheme.

Under the Scheme, the Irish Department of Agriculture, Fisheries and Food (DAFF) pays Category 1 plants and collectors for collection services provided to herd owners, also referred to as keepers, in respect of dead bovines. Keepers make a contribution to the cost of this service directly to the collector. The Department also pays a number of contracted rendering companies for the rendering and destruction of fallen stock. The Department's contributions are 100% State funded.

In relation to the collection of fallen bovine animals from farms, the Scheme subsidises three categories of bovines. Payment rates are shown in table 2.F.3. (referred to 2009).

Table 2.F.3. Contributions payable by the DAFF and Keepers to collectors for the collection of fallen bovines, per category of bovine (with effect from June 2007)

	Contribution payable by DAFF			*Keepers contribution*		
Category	Fee	VAT %	Total	Fee	VAT %	Total
0-6 months	€ 17.00	13.5	€ 19.30	€ 12.70	13.5	€ 14.41
6-24 months	€ 57.00	13.5	€ 64.70	€ 19.05	13.5	€ 21.62
> 24 months	€ 60.00	13.5	€ 68.10	€ 31.74	13.5	€ 36.02

Source: DAFF. Value for money review - The Fallen Animals Collection Scheme. 2009

The State pays 100% of rendering costs for ruminants and approximately 63% for non-ruminants. In 2009, the rates payable to each rendering company for rendering, removal and incineration services were:

- €180 per ton of ruminant raw material;
- €116.52 per ton of non-ruminant raw material.

In the initial phase, the Fallen Animals Scheme was to be subsidised at a total annual cost to the State budget of approximately € 9 million. The Scheme was based on the subsidised collection of fallen cattle from farms and transport to the rendering plant and the complete funding of the costs of rendering and destruction of the resultant MBM and animal fat.

The second phase was launched on 1 July 2001 and was linked with the Cattle Movement and Monitoring System (CMMS), the national cattle database. As with the first phase of the Fallen Animals Scheme, the operation of this phase was based on the subsidised collection of fallen bovine animals from farms and transportation to a dedicated plant by licensed collectors, with the cost of rendering and the subsequent destruction of dead animals being entirely funded by the State.

From July 2001, the Scheme was extended to include the subsidised rendering and destruction of all other fallen farm animals, such as sheep, goats, pigs, poultry, horses and deer.

Generally, forty percent of the Scheme's annual costs go towards the collection of bovines and the remaining sixty percent are for the costs of rendering and disposal of ruminant and non-ruminant by-products. Table 2.F.4. shows the amount of money paid out to rendering plants and collectors from 2001 to 2007.

Table 2.F.4. Expenditure on Fallen Animals Scheme (Source: Department of Agriculture, Fisheries and Food)

Year	*Amount paid to collectors*	*Amount paid to Cat. 1 plants*	*Total expenditure*
2001	€ 1,293,450	€ 1,192,534	€ 2,485,984
2002	€ 6,840,577	€ 17,038,247	€ 23,878,824
2003	€ 8,536,263	€ 15,706,183	€ 24,242,446
2004	€ 8,114,043	€ 12,178,708	€ 20,292,751
2005	€ 8,684,529	€ 13,398,418	€ 22,082,947
2006	€ 9,573,852	€ 12,729,345	€ 22,303,197
2007	€ 10,150,144	€ 13,643,824	€ 23,793,968
Total	*€ 53,192,858*	*€ 85,887,259*	*€ 139,080,117*

Source: DAFF. Value for money review - The Fallen Animals Collection Scheme. 2009

The State's share of collection costs is generally 70%, with the farmer paying the remaining 30%. In the case of rendering, the State pays 100% of the costs. Following the implementation of the Scheme, the percentage of fallen bovines buried on farm decreased significantly (table 2.F.5).

Table 2.F.5. Percentage of fallen bovines buried on farm and percentage delivered to cat 1 plants

Year	*% of fallen bovines buried on farm*	*% of fallen bovines delivered to cat 1 plants*
2002	8.30	91.70
2003	3.70	96.30
2004	1.30	98.79
2005	2.40	97.60
2006	2.0	98.0
2007	1.60	98.40
2008	0.60	99.40

Source: DAFF. Value for money review - The Fallen Animals Collection Scheme. 2009

The quantities of non-ruminant and ruminant by-products rendered and destroyed under the Fallen Animals Scheme are reported at table 2.F.6.

Table 2.F.6. Quantities of non-ruminant and ruminant by-products rendered and destroyed under the Fallen Animals Scheme from 2003 to 2007

Year	*Non-ruminant ABPs rendered and destroyed (tonnes)*	*Ruminant ABPs rendered and destroyed (tonnes)*	*Total ABPs rendered and destroyed under the scheme (tonnes)*
2003	8,729	50,120	58,849
2004	10,158	56,417	66,575
2005	9,768	56,580	66,348
2006	10,493	60,967	71,460
2007	10,185	52,095	62,279
Total	*49,333*	*276,179*	*325,511*
Mean	*9,866*	*55,235*	*65,102*

Furthermore, the EU Single Payment Scheme (SPS), which replaced all Livestock Premia schemes and was introduced in Ireland in 2005 as part of the reform of the Common Agricultural Policy, includes a cross compliance obligation on all participants. Under these cross compliance duties all farmers receiving direct payments must respect all EU legislation on the environment, food safety, animal health and welfare and plant health and must keep his/her farm in good agricultural and environmental condition.

To ensure that all farmers adhere to the Animal By-Products requirements in relation to fallen animals, the Single Farm Payment (SPS) has been linked to proper disposal of fallen animals and failure by a keeper to show proof of proper disposal of dead bodies, may carry a penalty on their Single Farm Payment.

The Scheme commenced at a time when the support services for animal collection and disposal were extremely poor and underdeveloped and in some areas of the country very sparse to non-existent. In the eight years since the commencement of the Scheme a very good support service was developed.

The point was made by a number of stakeholders that sheep farmers do not really benefit from the Scheme due to remote and/or hard to access locations and on-going mortality issues which make the cost of calling out collectors prohibitive.

The overall conclusion is that the Fallen Animals Scheme was extremely important in facilitating the collection of fallen animals in areas that previously not had a service and had relied exclusively on burial. The Scheme has provided value for money in the delivery of its objectives and made a significant contribution to the collection and disposal of fallen bovines.

2.F.1.5. STATE SUPPORT FOR ABPs DISPOSAL IN MOLDOVA

The death of farmed animals, particularly cattle, constitutes significant damage to farmers, both for the loss of the animal and for the costs incurred for the disposal of dead animals.

On the other hand, considering the situation in Moldova and the relevant amount of ABPs, the activity of ABPs disposal cannot be profitable and it is a real cost that should be supported by the State or by the ABPs producer, or shared between the State and the ABPs producer, according to the system that will be chosen.

As it is in the interest of meat industry, farmer's organisations and the country as a whole, the organization of safe disposal should be on a non-profit base. This is the case for example in the Netherlands and in Belgium, where the fee system for the collection and disposal is based on that principle. Fees are set by the government after consultation of stakeholders each year. The government subsidises the collection and disposal.

It could be suggested the possibility for provision of funds from the budget for co-financing of by-product producers and for full financing of collection and disposal of dead animals. This is justified, and it is also the experience of EU Member States, where at the beginning of the establishment of an ABPs management system compliant with the EU legislation, animal keepers received subsidies or it was directly paid to the ABP plant, for each dead animal reported, in order to motivate the animal keepers to report dead animals. However, it would be important to prioritize direct co-financing of the ABP management (collection, transport, processing) instead of co-financing of by-product producers, since co-financing of relevant FBOs would create administrative burden.

It could also be considered the option of subsidies for establishments producing by-products (slaughterhouses, meat cutting and meat processing facilities). Considering that probably these operators are already paying for the service of by-products disposal to public utility companies, a possible difference in price of this service might be subsidised especially if all by-products would be disposed of as Category 1.

In the second phase, if ABPs will be separated by categories (at the production, collection and processing), it would be justified to review the situation and possibly suspend the co-financing of Food Business Operators producing ABPs (slaughterhouses, meat processing facilities, other food of animal origin processing facilities).

To alleviate the economic burden that ABPs producers would have to bear for the disposal of dead animals and other ABPs, the State could intervene in different ways. For example:

- Providing subsidies to ABPs producers: animal keepers would receive subsidies to cover partially or totally the cost for each dead animal reported as well as full costs of treating the waste (collection, transport and processing), while slaughterhouses, cutting plants, meat processing plants and other establishment processing food of animal origin would receive subsidies to cover partially the cost for ABPs collection and disposal;

- If a public enterprise would be established (joint stock company, limited liability company under State ownership or as a form of a public-private partnership), financing directly, with the State budget, the public enterprise in charge for the ABPs management (collection, storage and processing). In this case there would be no cost (or a limited cost) charged to the ABPs producers for collection and processing of ABPs.

As previously mentioned, direct co-financing of the ABP management is preferred option, as co-financing of relevant FBOs would create an administrative burden. In addition, local or central government should also subsidize all farmers since they already have a loss of future revenues.

At a further stage, consideration could be given to reducing the State's share of the costs. This would be in line with the 'polluter pays' principle, also referred to as 'extended polluter responsibility', a key principle of environmental law which strives to transfer the responsibility for dealing with waste to those producing it.

However, as the problem of fallen animals impacts on so many areas and could pose a significant risk to biosecurity, it is important that any shift in the share of costs takes account of the public good, so that the correct balance is struck between the latter and the polluter pays principle.

It is certain that the establishment and first years of operation of the rendering plant require State support in order to achieve environmental goals and ensure regular operations. In the case of animal waste producers, subsidies may be reduced over time until they are completely abolished. When it comes to farmers, sustainability can be achieved by introducing an appropriate insurance scheme. It would be based on a fixed price and theoretically could cover all the farmed species. Namely, a suitable voluntary insurance scheme could be drawn up in consultation with all major stakeholders and private insurance companies. This type of insurance system is approved by the EU. In the long term, this might be a very good option for dealing with the permanent problem of fallen animals. It could take the form of a mutual fund into which all livestock farmers make contributions and which pays for the collection and disposal of fallen animals. This approach would require intensive public awareness campaign about importance of insurance in agriculture and its benefits.

Incentives for a fully operational ABPs management system

The sustainability of a fully operational ABPs management system will be, in our opinion, strictly connected with the establishments of an incentive system. Past experiences of other countries demonstrate the difficulties to establish a fully operational ABPs management system. For example, in Serbia, in 2010, a Belgian company established the ABPs processing plant "Energo-zelena" in Indjija, with an investment of 21.5 Mil €. The plant was operating for several years with a very low capacity, the expected profit has never been reached and the facility was out of function for few years. This was essentially due to the fact that ABPs producers (farmers, slaughterhouses in first instance) didn't deliver ABPs as expected.

Therefore, we recommend the establishment of an incentive system, that should not be limited to a minimization of the costs for ABPs collection and disposal, even if this can be considered somehow as a prerequisite for the functioning of the whole system. Rather, additional reward mechanisms should be introduced, as experienced in some Member States.

For example, fiscal allowances, a reduction of taxation connected with an amount of ABPs delivered in line with the expectations could be foreseen. Other measures could be connected with a conditionality mechanism for the granting of funds foreseen according to CAP (Common Agricultural Policy)-like measures.

This should be sided, of course, by the establishment of an effective control system to guarantee a strict enforcement of the rules. Penalties applicable to infringements of the Regulation should be effective, proportionate and dissuasive.

2.F.2. OPTIONS FOR INVOLVEMENT OF THE PRIVATE SECTOR

Moldova will use the available funds of international institutions[18] for the establishment of the system of collection of ABPs and construction of the ABPs processing plant. Therefore, the ownership of the plant and system will be of the State.

Concerning the management of the system, different models can be applied. When choosing the appropriate model, it should be considered that the ABPs processing plant is run for the benefit of the animal and public health and as such the broader national economy preventing outbreaks of serious diseases. Its objective is to facilitate an efficient nationwide service for the collection and disposal of ABPs and fallen stock. In order to achieve the objectives, it is necessary to organise a system of enforcement of ABP declaration and control rules, efficient by-products collection and processing. According to the preliminary estimations, taking into account the quantities and manner of treatment of by-products at the initial stage, this activity cannot be profitable.

The rationale for Government investment into the ABP collection and processing has been carefully analysed while approving the investment project "Establishing the ABP management system in Moldova in accordance with EU reference directives and international best practices". Among important considerations for government investment were:

- Lack of interest from private investors in tackling categories 1&2 of ABPs;
- Absence of a system of collection of ABPs that would feed raw material into a private processing plant;
- Small estimated ABP quantities to justify private investment;
- Urgency of solving the ABP management issues for national animal and human health and for meeting EU requirements in the area of food safety and waste management in the context of access to EU markets for Moldovan products of animal origin;
- Environmental considerations;
- Etc.

However, the possibility to involve the private sector shall be considered for the overall ABPs management system (processing plant, collection system).

First, because for efficiency reasons, the Government should not overburden the public administration with functions that could be partially or entirely performed by the private sector. Second, because there is international experience when countries have successfully attracted private sector players for managing public health functions, including in ABP processing.

This feasibility study considers several options of involving the private sector into the implementation and management of the ABP collection and processing system. It is important to note that the modality in which private sector is involved also depends on the technical model to be chosen for 3 different categories of ABPs.

2.F.2.1. PUBLIC COMPANY- DIRECT MANAGEMENT BY THE STATE

In this option, the whole ABPs system is managed directly by the State via a Public Institution (PI) structure or a State-Owned Company (SOE). This means that the activities of collection, management of the any eventual storage establishment(s) and of the processing establishment are carried out by staff recruited and paid by the PI or SOE. Once the costs for management of the system are established, the State will allocate annually the relevant budget to finance the system and will establish fees to be charged to the operators (animal owners and FBOs).

[18] World Bank and Government of Moldova investment project "Establishing the ABP management system in Moldova in accordance with EU reference directives and international best practices"

Advantages

- Day to day control of the plant and of the sanitary conditions, full public control over the ABP management system and risks;
- No need to compensate for private risks and commercial profits, as break-even operations could be a business model satisfactory for a government-run model;
- Lower prices to the ABP generators, better competitiveness of the meat sector in the country.

Disadvantages

- Lack of know-how in the public sector on the ABPs management systems and especially of the ABPs processing;
- Lack of know-how in the positioning of the products in the market;
- Limited motivation for innovation, efficiency and technology improvement;
- Negative implications for competition in the ABP sector in case the Government also covers processing of Category 3 ABPs.

2.F.2.2. PARTNERSHIP WITH PRIVATE SECTOR

2.F.2.2.1. PUBLIC PRIVATE PARTNERSHIP

Public-Private Partnership (PPP) is a mechanism for government to procure and implement public infrastructure and/or services using the resources and expertise of the private sector. Where governments are facing ageing or lack of infrastructure and require more efficient services, a partnership with the private sector can help foster new solutions and bring finance.

Fundamentally, PPPs introduce, as a minimum, private management into public service through a long-term contractual bond between operator and a public authority. It secures all or part of the public service, so delegated by private funding and calls upon private sector know-how. The distinctive feature of a PPP is the transfer of risks to the private partner.

PPPs combine the skills and resources of both the public and private sectors through sharing of risks and responsibilities. This enables governments to benefit from the expertise of the private sector, and allows them to focus instead on policy, planning and regulation by delegating day-to-day operations.

Through these partnerships, the benefits of the private sector—dynamism, access to finance, knowledge of technologies, managerial efficiency, and entrepreneurial spirit—are combined with the social responsibility, environmental awareness, local knowledge and job generation concerns of the public sector.

In order to achieve a successful PPP, a careful analysis of the long-term development objectives and risk allocation is essential. The legal and institutional framework in the country also needs to support this new model of service delivery and provide effective governance and monitoring mechanisms for PPPs.

A well-drafted PPP agreement for the project should clearly allocate risks and responsibilities.

PPP is anchored on the principles of shared responsibilities, resources, risks, and benefits, towards the attainment of common goals and interests. All critical factors must be taken into account to prevent misuse or failure of private sector participation. The advantages and disadvantages of involving the private sector strongly depend on the manner in which the tasks and services are contracted out and on the way the daily operational procedures of collaboration between public and private sector are handled and ensured. The general advantages of PPPs are flexibility, managerial and technical know-how, contestability and operational accountability.

The National legal framework on PPPs provides for several forms of PPPs that can be formed for the execution of public functions or provision of public services with the help of the private sector.

The involvement of the private investor in the realization of the project at the “design-construction” phase cannot be foreseen. Thus, the capital investment in construction of the plant should come from Public Partner.

At present, no investment in ABP management has materialized in Moldova. The Moldovan business community does not perceive the activity of eliminating animal by-products as a business activity. A deterrent factor to private investment in this sector would be the technical and operational complexity of doing business in this area.

Given the lack of interest from private investors, relatively poor financial performance of the project, the source of funding for the ABPs facility construction will come from the Public Partner side (government investment financed by World Bank loan).

2.F.2.2.2. FIDUCIARY ADMINISTRATION DESIGN-BUILD-AND-OPERATE CONTRACT

One of the forms that can be discussed at this stage of the creation of the system is the opportunity to tender to the private sector a contract that would cover the design-build-operate of the plant and collection system. The core difference of this contract from classic PPP contract is that the private sector would not finance the construction from commercial funding but the public partner would provide concessional finance (WB loan). In essence, the private partner would be responsible for detailed technical design of the plant according to the technical specifications provided by the Government, building the processing unit, and providing the operation of the system for a period of time specified in the contract. Assets created under this contract remain public property.

The advantages of such contract for the government include:

- One procurement package for design & building and subsequent operation – easier to administer;
- Lower investment cost compared to the case when the private sector finances the investment and makes the assets available to the Government (classic PPP);
- Transfer of the operational and commercial risks of the ABP management system to the private partner;
- Execution by the private partner of the public service (function) of biohazardous waste management, and of the respective animal and human health concerns.

The risks of this approach for the Government include:

- Risk of losing the assets, owned by Public Partner. As mentioned before the fiduciary administrator is responsible, in relations with third parties, within the limits of the powers conferred by the fiduciary administration contract. Liability is limited to assets received in fiduciary administration, thus the plant. After the termination of the fiduciary administration and transfer back of the assets to Public Partner, these assets can be further pursued for the claims arising in connection with the terminated fiduciary administration.
- It may be difficult to find/attract a single vendor who would possess specific technical expertise for both construction and operation of ABP processing units
- Higher investment cost compared to the case when the Government (PIU) undertakes the design & build part on the non-profit basis;
- Need to carefully consider the structuring of commercial revenues, collection fees, enforcement efforts and subsidy schemes given the low commercial attractivity of the project;
- Need to ensure proper contract administration and monitoring to make sure that the public service is provided according to the performance indicators established for the system.

Depending on the term of operation, the contract may also cover maintenance, replacement and development of the public assets.

2.F.2.2.3. FIDUCIARY ADMINISTRATION OPERATE-MAINTAIN-(REPLACE)-(DEVELOP)

As mentioned above, given the technical complexity of the project and limited commercial attractiveness, the Government may opt to tended separately the design & building works as originally intended by the investment project. In this case, a possible way of involving the private sector is on an operate-maintain-(replace)-(develop) contract. Functions indicated in parentheses are optional therefore several variants of their combination can be considered by the Government. Under this contract, the Government builds the ABP system and tenders to the private sector the functions to operate and maintain the assets. Depending on the terms of the contract, the Government may include into the contract the replacement of the assets if the term of the contract equals or exceeds the useful operational lifetime of the assets (or separate groups of assets). Furthermore, the contract can provide for the development of additional assets that can be made part of the processing unit/collection system, for example this could be the biogas generation installation.

Assets created under this contract remain public property.

The advantages of such contract for the government include:

- Easier to identify a private operator with specialized technical knowledge for assets administration;
- Lower investment cost compared to the case when the private sector finances the investment and makes the assets available to the Government (classic PPP);
- Transfer of the operational and commercial risks of the ABP management system to the private partner;
- Execution by the private partner of the public service (function) of biohazardous waste management, and of the respective animal and human health concerns;
- Opportunity to transfer to the private partner the replacement and further development of the system.

The risks of this approach for the Government include:

- Risk of losing the assets, owned by Public Partner. As mentioned before the fiduciary administrator is responsible, in relations with third parties, within the limits of the powers conferred by the fiduciary administration contract. Liability is limited to assets received in fiduciary administration, thus the plant. After the termination of the fiduciary administration and transfer back of the assets to Public Partner, these assets can be further pursued for the claims arising in connection with the terminated fiduciary administration.
- Need to carefully consider the structuring of commercial revenues, collection fees, enforcement efforts and subsidy schemes given the low commercial attractivity of the project;
- Need to ensure proper contract administration and monitoring to make sure that the public service is provided according to the performance indicators established for the system.

2.F.2.2.4. LEASE/CONCESSION WITH OR WITHOUT SUBSEQUENT BUY-OUT

Provided that the Government builds the ABP collection and processing system, the assets created by the Government can be offered for private operation under a lease/concession arrangement. Under a lease/concession contract, the public authorities transfer the right to exploit government-owned assets to private sector against a fee, and generate commercial revenue from the provision on services to the public. The private partner also assumes the commercial risk of service provision. The feasibility of this option requires additional confirmation due to the following variables:

- the enforcement by public authorities of ABP separation, declaration and collection rules for private ABP generators to generate stable flows of raw materials;
- the yet unknown structure of collection fees and government subsidies in the ABP sector to quantify revenues;
- the yet unclear financial structure of the assets to be offered for lease (balance sheet liabilities including or excluding debt contracted to build the assets).

Usually the assets offered for lease/concession remain in public ownership given their strategic importance. However, for some categories of assets, these can be offered for buy-out to the private sector, and ABP management seems to be a sector where this option may become feasible/possible in the future[19]. If the lease/concession option proves feasible, it may be considered with a buy-out condition under which the private partner would have the opportunity to buy-out the assets by the end of the contract.

The advantages of such contract for the government include:

- Easier to identify a private operator with specialized technical knowledge for assets administration;
- Lower investment cost compared to the case when the private sector finances the investment and makes the assets available to the Government (classic PPP);
- Transfer of the operational and commercial risks of the ABP management system to the private partner;
- Execution by the private partner of the public service (function) of biohazardous waste management, and of the respective animal and human health concerns;
- Opportunity to recover from lease payments the initial investment made into the assets offered for lease, with the condition that assets are leased without WB loan repayment obligation.

The risks of this approach for the Government include:

- Need to additionally validate the option considering the financial structure of the assets;
- Need to carefully consider the structuring of commercial revenues, collection fees, enforcement efforts and subsidy schemes given the seemingly low commercial attractivity of the project;
- Need to ensure proper contract administration and monitoring to make sure that the public service is provided according to the performance indicators established for the system;
- The eventual buy-out option carries the risk of loss of control over the availability of the Category 1&2 ABP management services and return to the current situation in the sector.

2.F.2.3. PRIVATE SECTOR LEAD SOLUTIONS

Private sector-led models are those in which the private sector holds the majority of full ownership of the ABP management system. However, the inexistence of private ABP management services for Categories 1&2 indicates that this model is not currently attractive. Private sector could assume this function in the future if the Government ensures proper enforcement of ABP management rules by private ABP originators, and provides the right mix of incentives for separation, declaration, collection and processing of Cat. 1&2 ABPs. In these conditions, the Government can create a joint venture or entirely sell the ABP processing unit to a private partner.

The private partner could be a commercial business entity or eventually a for-profit entity created by the ABP-generating industry, including meat producing and processing sector.

The advantages of such contract for the government include:

- Full transfer to the private sector of the ABP management functions, including investment, operation, commercial risks and biohazardous waste management. This would significantly release public sector from contract administration responsibilities;
- Opportunity to recover, at least partially, the investment costs for the creation of the ABP management system and avoiding such costs in the future.

The risks of this approach for the Government include:

- Considering the current lack of private investors that would be interested in processing Cat 1&2 ABPs, it is not guaranteed that private sector-led solutions are currently feasible;

[19] As clarified in the next sub-section

- Loss of government control over the public function, particularly its availability and coverage. Under the private sector-led option, it is at the discretion of the private operator to provide Cat 1&2 processing and the function may be discontinued given no commercial attractiveness. That could return the country to the current lack of proper ABP management system.

The risks associated with this option is particularly high because there is no positive and long-term history of enforcement by the pubic authorities of the separation, declaration and collection of ABPs by producers. Moreover, there is no system of official collection/processing fees, nor a system of government incentives for producers to develop best practice. Because of lack of such history and uncertainty of its development and functioning, private investors would not accept the full risks of investing into the sector, as proven by the current situation.

In the future, when the ABP management system is established and functioning, it may become feasible to switch to private-sector led solutions. European experience indicates that mature industries are able to develop and provide the ABP management services to the meat processing sector. However, the government continues to ensure enforcement of the rules and provide incentives for the industry to comply.

2.F.3. CONCLUSIONS AND RECOMMENDATIONS

Having in mind all the specifics of the project (primarily, the prioritization of the ecological benefits against financial performance of the project company), the following is recommended:

- Funds from the State budget should be allocated for co-financing of by-product producers and for full financing of collection and disposal of dead animals. Direct co-financing of the ABP management (collection, transport, processing) is preferable. Co-financing of relevant FBO would create an administrative burden.
- Local or central government should also subsidize all farmers since they already have a loss of future revenues.

In addition:

- An insurance scheme could be drawn up in consultation with all major stakeholders and private insurance companies, as an approach to gradually replace the direct subsidies for the farmers.
- An incentive system, that should not be limited to a minimization of the costs for ABPs collection and disposal, should be established, for example conditionality mechanism for the granting of funds foreseen according to CAP-like measures, and/or reduction of taxation.

The future rendering plant should be owned and managed by the State, in order to provide optimal functionality and the most favourable subsidized price.

With the beginning of the construction of the establishment, it is necessary to start creating contacts with potential clients in Moldova and in the region, in order to ensure a secure placement for the derived products intended for sale.

2.F.4. SWOT ANALYSIS

2.F.4.1. MANAGEMENT MODELS OF THE ABPS PROCESSING PLANT

Public company - Direct management by the State

	Positive	Negative
Internal	*Strengths*	*Weaknesses*
	• Official control is facilitated: day to day control of the plant and of the sanitary conditions	• Lack of know-how on the ABPs management system and especially of the ABPs processing • Lack of know-how in the positioning of the products in the market
External	*Opportunities*	*Threats*
	• Employees are directly responsible to the Government	• Usual procedures adopted in the public sector could determine delays in the adoption of necessary actions (i.e. urgent maintenance)

Public Private Partnership: Fiduciary administration contract for Design –Build—Operate Contract

	Positive	Negative
Internal	*Strengths*	*Weaknesses*
	• One control point for the design, construction and commissioning of the processing plant • Lower investment cost compared to the case when the private sector finances the investment and makes the assets available to the Government	• It can be difficult to find a company that has the expertise for both the construction and operation of ABP processing units. • Unclear if there is interest from private partners given low commercial attractiveness • Lack of an adequate monitoring system.
External	*Opportunities*	*Threats*
	• Transfer of operational and commercial risks of the Design - Build-Put into operation	• Misuse of resources for purposes other than those stipulated in the contract. • Lower incentives to maintain the assets

Public Private Partnership: Fiduciary administration contract Operate - Maintain – Replace- Develop

	Positive	Negative
Internal	*Strengths*	*Weaknesses*
	• Know-how of the rendering process • Know-how in the positioning of the products on the market	• Lack of an adequate monitoring system. • Unclear if there is interest from private partners given low commercial attractiveness
External	*Opportunities*	*Threats*
	• The more dynamic management could easily identify new market opportunities.	• .

Public Private Partnership: Concession contract with or without subsequent buy out

	Positive	Negative
Internal	*Strengths*	*Weaknesses*
	• Know-how of the rendering process • Know-how in the positioning of the products on the market	• Lack of an adequate monitoring system from the Public Partner. • Unclear if there is interest from private partners given low commercial attractiveness
External	*Opportunities*	*Threats*
	• Dynamic and skilful management regarding the organization of an efficient operational activity. • Lease payment used to payback the investment	• Continuous existence of Cat 1, 2 processing capacity fully at the discretion of the private sector.

2.F.4.2. FINANCING THE SYSTEM

State support for dead animals' disposal

	Positive	Negative
Internal	*Strengths*	*Weaknesses*
	• Reduction of the economic burden that farmers would have to bear for the disposal of dead animals • Animal keepers are motivated to report dead animals • Reduction of the risk of ceasing activity of small farmers, with consequent positive effect on the local economy • Possible concealment of communicable diseases is prevented • Improper forms of disposal or recovery of parts of animals for food destinations would be prevented • Official controls on animal health are facilitated, because a high percentage of dead animals are reported • Veterinary controls can be carried out timely, to prevent spread of animal disease and public health problems • Spread of infectious disease is prevented • Dead animals would not enter in the food chain	• Cost for the State budget • Low awareness of animal by-product generators about their impact
External	*Opportunities*	*Threats*
	• The National Database would be reliable, as a high percentage of dead animals would be reported	• If the system will not guarantee adequate official controls, there is space for frauds

State support for ABPs disposal

	Positive	Negative
Internal	*Strengths*	*Weaknesses*
	• Reduction of the economic burden that ABPs producers would have to bear for disposal • The cost of disposal is not "spread" on the price of the products placed on the market and, in fact, paid by downstream users and consumers • The amount of the elimination fee is much lower than the cost covered by the state budget for animal health and protection from infectious diseases	• Cost for the State budget
External	*Opportunities*	*Threats*
	• ABPs producers are probably already paying for the service of by-products disposal to public utility companies • In the future, if ABPs will be separated by categories, it would be possible to suspend the co-financing of FBOs producing ABPs	• If the system will not guarantee adequate official controls, there is space for frauds

Insurance systems for dead animals disposal

	Positive	Negative
Internal	*Strengths*	*Weaknesses*
	Same as described in "State support for dead animals disposal", additionally: • The risk of economic losses in livestock farms is protected • Protection of small farmers, support for farmers in particular situations such as mountain pastures • Disposal of animals that have that have to be killed in case of epizootic diseases could be covered • The loss of income following the loss of animals in the event of natural disasters could be covered • Reduced cost for the State budget • Responsibility for disposal of fallen animals gradually moving over to the private sector • Possibility to better target official controls in the farm	• Membership fee to be covered by the farmers • Farmers are obliged to be part of the consortium
External	*Opportunities*	*Threats*
	• The National Database would be reliable, as a high percentage of dead animals would be reported • Rationalization of relations with all the involved subjects (farmer, ABPs processing plant, veterinary service, ABPs transporter) • Possibility to reduce the travel of the official veterinarian staff for the assessment and certification of mortality in the farm, in order to authorize the disposal of dead bodies in the rendering plant • Possibility to waive the obligation of health certification if the traceability of the dead animals is guaranteed throughout the disposal process • This type of insurance system is approved by the EU	• Weakness of the farmers' associations • It might need lengthy engagement with all stakeholders • It would be a long-term option

RECOMMENDATIONS

On the basis of the collected documentation and information, after the implementation of the project's activities, following the analysis of advantages and disadvantages, weaknesses and strengths, threats and opportunities, and considering comments provided by beneficiaries, the following recommendations can be made.

- The construction of a ABPs processing plant is recommended, for processing undifferentiated ABPs (categories 1, 2 and 3). Alternatively, the construction of two separate ABPs processing establishments could be considered, as analysed in the Phase 2 of the project. The two separate ABPs processing establishments would be dedicated respectively to process Cat.1-2 ABPs and Cat. 3 ABPs.
- The opportunity to export part of ABPs should be taken in consideration only in case market fluctuations would render such an option really advantageous.
- In case one ABPs processing plant would be built, it should have a capacity of 15,000 tons/year of ABPs. In case two ABPs processing establishments would be built, each of them should have the capacity of 8,000 tons/year. This would satisfy the needs of the country as far as ABPs disposal is concerned, and in case of disease control situations requiring the emergency disposal of the animals killed as a measure to control an outbreak of a serious transmissible disease.
- The suggested processing method is Method n. 1 (pressure sterilization). Indeed, the use of other methods could lead to possible limitations for exporting derived products to EU Member States, considering that Competent Authorities of EU Member States have the possibility to impose special conditions for the import of derived products.
- We recommend establishing an ABPs management system without storage plant, at least until the processing plant(s) will be in operation and an adequate logistic will be in place. This will allow to assess properly the eventual need for a storage plant in Moldova.
- It is recommended to assign the overall responsibility for the ABPs management system in the Country to a unique subject, that will be in charge for ABPs collection, transportation and processing.
- If the private solution for the management of the ABPs processing plant will be chosen it is strongly suggested that a prior specific experience in the ABPs sector will be required to tenderers.
- Target results of the ABPs management system should be established.
- Contacts with cement plants and biodiesel companies in the neighbour countries should be established as soon as possible to investigate on possible destinations of derived products.
- The action plan drafted in the framework of this project should be finalised by beneficiaries, officially approved and implemented, to guarantee that when the processing plant will be built, the whole ABPs management system will be in place and functioning.
- A comprehensive awareness campaign shall be developed, targeting different stakeholders, with the objective to make aware every subject of the relevant obligations and responsibilities as far as ABPs management is concerned.
- The register of ABPs producer should be included in the Veterinary Information System.
- To facilitate the implementation of common and correct practices, it is recommended the preparation of specific guidelines, especially in the sector of slaughtering, collection and transportation of ABPs. Guidelines should provide indications and instructions about the enforcement of EU legislation related to ABPs management to protect public health, animal health and environment.
- Procedures and templates for the establishment of a record-keeping system (ABPs production, transportation, processing) should be drafted, and guidelines on ABPs traceability should be prepared.
- It is suggested to adopt adequate rules for the application to land without processing of the

gastrointestinal contents; this would reduce significantly the amount of Cat. 2 ABPs to be processed.

- Funds from the State budget should be allocated for co-financing of by-product producers and for full financing of collection and disposal of dead animals. Direct co-financing of the ABP management (collection, transport, processing) is preferable. Co-financing of relevant FBOs would create an administrative burden.
- An insurance scheme could be drawn up in consultation with all major stakeholders and private insurance companies. An incentive system, that should not be limited to a minimization of the costs for ABPs collection and disposal, could be established, for example conditionality mechanism and/or reduction of taxation.
- A preliminary condition for the establishment of an effective ABPs management system is the proper implementation of the legislation concerning Animal Identification and Registration. Indeed, the amount of ABPs to be processed, as calculated in this project, will be guaranteed only if dead animals (especially ruminants) will be properly declared by owners, and this can be guaranteed only if an effective Animal Identification and Registration system is in place, including adequate official controls carried out by relevant Competent Authorities.
- In relation to the needs for official control, the existing MANCP should be integrated with an official control plan specifically dedicated to the ABPs sector. The Official Control Plan should be risk based and therefore appropriate tools for risk classification will have to be developed.
- SOPs for Official Control on ABPs management should be included in the National Official control plan on ABPs management.
- Training of inspectors on ABPs sector, ABPs management and relevant official control should be organised and carried out; the training should focus on the National Official control plan, procedures and instructions.

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LIST OF RELEVANT LEGISLATION

EU Legislation

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- Commission Regulation (EU) No 142/2011 of 25 February 2011 implementing Regulation (EC) No 1069/2009 of the European Parliament and of the Council laying down health rules as regards animal by-products and derived products not intended for human consumption and implementing Council Directive 97/78/EC as regards certain samples and items exempt from veterinary checks at the border under that Directive.
- Regulation (EU) 2017/625 of the European Parliament and of the Council of 15 March 2017 on official controls and other official activities performed to ensure the application of food and feed law, rules on animal health and welfare, plant health and plant protection products.
- Commission Implementing Regulation 2019/627 laying down uniform practical arrangements for the performance of official controls on products of animal origin intended for human consumption.
- Regulation (EC) No 999/2001 of the European Parliament and of the Council of 22 May 2001 laying down rules for the prevention, control and eradication of certain transmissible spongiform encephalopathies.
- Directive 2000/76/EC of the European Parliament and of the Council of 4 December 2000 on the incineration of waste.

National legislation

- Government Decision No. 11 of 12-01-2022 for the approval of the Sanitary-Veterinary Rules on Animal By-Products and derivative products not intended for human consumption.
- The Republic of Moldova Law No. 129 of 19-09-2019 on Animal By-Products and derived products not intended for human consumption.
- The Republic of Moldova Parliament Code No. 828. from 25-12-1991 art.36.