

# METHODOLOGICAL AND SCIENTIFIC CONTRIBUTION TO THE DEVELOPMENT OF THE PIGMEAT SECTOR BASED ON STANDARD DEVELOPMENT PROJECTS

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***Abstract.** Starting a business requires a complex and thoughtful approach to everyone who wants business involvement. The deep attitude towards all elements of the business must be recognized by their importance to each founder. The business to be initiated cannot be achieved by a general approach or based on the current pace of evolution and so on. A business at the stage of knowledge, must be studied through its subtleties, specific technologies, links, and stages of operation, so that the investor is initiated and self-trained in the best way. To be capitalized, the business idea is transformed into a business through a plan developed by the investor, which establishes the investment stages, financing, employment processes and other elements, so that at the beginning of the technological process the stages of investment, construction, acquisition, and technical arrangements are solved and prepared. Only a good training from a theoretical point of view can ensure the success of an entrepreneur in developing the identified business. The investment project comes to the aid of all those interested in starting businesses in rural areas and is intended for the livestock branch. The project is dedicated to raising pigs for meat with the provision of good practices and environmental friendliness. In this investment project are described the basic peculiarities of the pig business, the technological elements of ensuring the technological process, the development factors and the economic results pursued. Through this project, investors and businessmen who want to start agricultural businesses can assess their economic capabilities and draw inspiration from factological content.*

***Keywords:** analysis; investment project; rural environment; technological process*

***JEL:** Q1, L1, O13, P33*

***UDC:** 631.15:636.4*

**Introduction.** Providing the population with meat from its own resources has become a problem for the country's economy. Meat import increases in the last three years had a growth rate of 80% annually, which is an alarming situation for the livestock branch and the pig breeding sector in the country. Even if the trend of increasing the number of pigs in the country is positive, increasing by about 14 thousand heads in the last three years, still production consumption is dominated by

massive production imports. Only through the development of viable and competitive economic models of animal farms will it be possible to revitalize the pork production sector in the country and boost domestic production.

In this context, our research is oriented to the technical-economic argumentation of the development of technological farms to produce pork. Technological farms have a future of development, ensuring the dynamism of the pig sector in the Republic of Moldova. The increased degree of production efficiency can ensure the positive dynamics of the sector. The basic purpose of the research – the economic argumentation of the pork production business in technological farms equipped and managed efficiently and rationally.

**Literature review.** In the preparation of the article, bibliographic sources of scholars established in the field of research in the field of agricultural development and animal husbandry were used, such as Bajura T., Stratan A., Zbancă A., Mașner O., Liuțcanov et al.

Another side of these research comes from the interest of the authors, who over several years devote their researches to the economic efficiency of the local animal husbandry branch. In recent years, about a monograph, 20 scientific and science popularization articles have been developed on this topic. During the last two years, he is requested to publish the researched materials in the national magazine for farmers "Agroexpert". The authors' extensive research contribution to the respective topic provides a depth and knowledge of the presented results.

**Research methodology.** The following methods were used to carry out these researches:

- The observation method, which will allow recording the phenomena studied in the meat production and processing sectors;
- The survey method allows obtaining the appropriate, objective and momentary opinion of the participant in the formation of the value chain of meat production and its processing;
- The monographic method, which will allow you to describe the results obtained as a result of the research;
- The comparison method will be applied to contrast the observed phenomena and processes with those known theoretically and methodologically;
- The method of division, will offer the possibility to disassemble a phenomenon and process studied into constituent parts;
- The factor decomposition method will provide the possibility of determining the influencing factors on the researched result and related to its degree of influence (first-degree factors and second-degree factors, etc.);
- The grouping method, the separation of accumulated data into homogeneous groups with determined characteristics;
- The method of deterministic (factorial) analysis, identification of the influence sizes of the factors on the analysis indicator (researched result).

Research methods are scientific methods that provide for the consecutive and systematic application of strictly determined elements. Only in such situations the conclusions related to the obtained results can be considered objective and justified.

**Main results.** Pig breeding is a sector of the livestock branch within the national economy. The sector is also known by suiniculture, namely at Romanian sources. The domestication of the pig by man occurs with the dog, and the period dates back almost 9 thousand years ago. In the third century BC in the Cucuteni civilization the pig was raised for meat and bacon. The breeding of these animals from those times until today has evolved a lot, and the distribution area has become everywhere, except for arid and arctic areas. The breeding of pigs for meat has shown significant capabilities alongside the evolution of the branch. Currently, about 150 species of pigs are known with different fattening periods and degree of adaptation to climatic conditions. Most breeds are for obtaining meat and bacon but breeds for the campaign are also found in smaller numbers. Therefore, the pig has become a true friend of man and a source of providing meat in the feed system.

Pork is predominantly consumed by most peoples of the world, with some exceptions. The pig breeding sector has diversified its animal selection and breeding technologies. Visually increased the yield of feed use and slaughter of animals. The quality of pork, according to its albumin content and degree of assimilation, is close to that of other animal species, and by caloric content much higher. New capital investments are being made in the sector in modernizing production and organizing work.

Pigs are distinguished from other animal species not only by prolificacy and precocity, but also by increased slaughter yield and use of feed. They reach mating age at 8 – 9 months, have a small gestation period (114 days), compared to sheep and cattle (152 and 285 days, respectively), at one birth 10 – 12 piglets are obtained. For comparison, annually from one sow is obtained 1800 – 2200 kg of meat (taking into account the growth of piglets to the optimal weight for slaughter), from a cow – 300 kg. To obtain one kilogram of pork, an average of 4-5 kg of nutritional units (UN) is consumed, compared to 8-9 UN in cattle and 6-7 UN in sheep. The slaughter yield in swine is 75-85%, while in sheep it is 45-55%, and in cattle 55-60% (Балтар & Баранов, 2013).

Pork and its fat are considered of high nutritional value. From pork prepare various culinary dishes and easily undergo preservation.

According to the directions of production, pig breeding farms are of several types: 1) for obtaining breeding young; 2) for growth and fattening; 3) mixed; and 4) combined. The concerns of farmers in the sector are related to optimizations of the growth and fattening period to slaughter weight, feed yield per kg of live weight, prevention and avoidance of contamination of animals with communicable diseases. In recent years, swine fever has considerably affected the world's pig herd. In 2017, in some EU countries (Romania, Hungary, Germany), about 340 thousand heads were sacrificed, in 2018 China slaughtered 915 thousand heads and by 2019 the number of animals slaughtered and perished exceeded one million, and in Vietnam - 2.5 million.

Due to the existing problems in the sector and the epidemic outbreaks that have broken out in recent years, the swine herd is among the most numerous of the domestic animals, being surpassed by that of cattle, sheep and goats. In the last 25 years, the swine herd has increased by about 10%. Currently, the sector counts about 978,332,119 heads.

**Table 1. Dynamics of pig herd in the Republic of Moldova, thousand heads**

Categories	Year					2023 change from 2022 (±)
	2019	2020	2021	2022	2023	
All categories	397,3	396,6	339,5	347,9	340,0	-7,9
Agricultural enterprises and peasant households	206,2	229,4	196,6	217,5	216,3	-1,2
Households	191,1	167,2	142,9	130,4	123,7	-6,7

*Source: elaborated by the author based on NBS data*

In the Republic of Moldova, the number of pigs in farms of all categories of households (Table 1), including households, is 340 thousand heads at the beginning of 2023. Of the total number of animals, 64% are concentrated in economic agents, which carry out commercial activities and are oriented towards commodity production. However, the livestock rate in farms near the house remains quite high, in other words, 4 pigs out of 10 are raised in the yards next to the house. This entails several problems, first of all environmental pollution, food safety route, market, etc. We consider that this aspect remains an open issue from the point of view of public policies, the Ministry of Agriculture having the mission to develop levers and measures to attract into the business circuit farms that are not registered economically, which are attached to households.

During the elaboration of the paper, the entire range of indicators was addressed, starting with the design of the livestock farm and up to the indicators of economic efficiency of the business. The project presents a financial analysis based on the results of the investment and operational activity carried out.

As we can see, reflects the production to be marketed in the operational process. In addition to animal products, crop production is also included in the list. The aim of the project is also to promote business sustainability. One of the principles of the development of livestock farms is to ensure the fodder base at the expense of own land. In conditions of climate change, the profitability of production can be ensured including at the expense of own feed production. Many agricultural households have low profitability of production, one of the causes being the total or partial lack of feed base from their own sources. We consider this peculiarity for the business environment of the livestock branch to be of principled importance (Gary, DeeVon & Capps, Linda, Hudson, 2008).

In the first part of the investment project are presented the organizational-legal components that can be selected by potential investors for the establishment of such an orchard model. Strengths and weaknesses in administration will also be exposed. Emphasis will be placed on the necessity and importance of providing a skilled workforce, as well as the level of remuneration of employed workers. An important

point is devoted to the marketing plan, data on markets, market prices and main competitors, etc.

The second part of the project covers the economic and financial aspects of potential investments. There will be presented the investment costs, the financial-investment dimension, the economic structure of potential investments that will contain: the necessary investment costs; current consumption in the production process; valuation of cash flows; the payback period for investments; internal return on investment; identification and assessment of potentially existing risks.

**Analysis of sales spots.** Pork in the Republic of Moldova is a current consumer product, with a high level of demand. The consumer market for pork has stable demand. Domestic meat production results only from the current capacities of commodity production farms.

Global meat production in the Republic of Moldova as commodity production has a stable trend, volumes varying around 80 thousand tons, of which the ratio between that obtained in households and that of agricultural holdings is proportional. About 50% of the commodity production of pork is still obtained in households (Table 2 **Ошибка! Источник ссылки не найден.**).

**Table 2. Dynamics of pork production sold in live mass in the Republic of Moldova, thousand tons**

<b>Meat production</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2023</b>
All categories	84,0	82,7	80,9	77,5	81,2
Agricultural enterprises and peasant households	33,1	36,6	46,0	46,3	42,7

*Source: elaborated by the author based on NBS data*

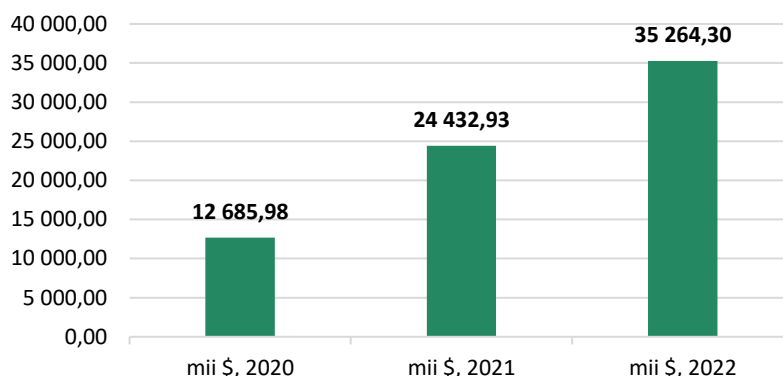
By the beginning of this year, the volume of pork production reached the level of 81.2 thousand tons. The quantity of production per inhabitant of domestic production is about 30 kg in live mass. The quantity of domestic pork production ensures minimum meat consumption from the point of view of food security. It should be noted that maintaining the high rate of pork production in the category of households is not the most effective. The potential of the pig-breeding sector for meat is dispersed, and the high concentration of production in the category of households does not allow the development of the economic capacities of the sector.

Another aspect of the market peculiarities of the domestic pork sector is related to foreign trade. It should be noted that the country's export capacities with pork are quite limited.

The export of chilled or frozen pig meat shall be governed by the veterinary requirements imposed by the importing country.

The import of pig meat covers three main categories of products – live animals, chilled and frozen meat and bacon and fat. Imported meat and fat production is demanded by domestic sausage producers. Live animals are mostly imported to supplement the gene pool and as breeding material for breeding farms in the country.

Trade partners in pork imports are Poland, Spain, Germany and Hungary. In 2022, refrigerated and frozen meat production was imported in a total value of \$ 28.5 million. The production of bacon and pork fat imported in the reporting year was worth about \$ 2.6 million, the import countries being the same countries - Germany, Poland, Spain, Hungary, but also Denmark, France, Italy, Romania.



**Figure 1. Dynamics of import of pork production**  
*Source: elaborated by the author based on NBS data*

Imports of sectoral productions are worth a potential of \$ 35 million, and as we can see, the dynamics of import evolution is increasing (*Figura 1 Юшибка! Источник ссылки не найден.*). The increase in imports occurs both due to inflation and due to a growing demand for imported meat. In 2022, the quantity of imported pork increased by about 3 thousand tons compared to 2021.

The main markets for marketing livestock products for small and micro farmers remain agricultural markets, located in district centers and municipalities. The overwhelming share of food is sold in these agricultural markets. Access to agricultural markets for livestock farmers is important, including those who sell wholesale products, whose products reach this market through intermediaries (Люцканов & Машнер, 2012).

One of the essential peculiarities of business in agriculture is interaction with living organisms and compliance with biological periods of plants and animals. Production processes and technological stages must rally to decades of organism growth, care and treatment. The investment project starts especially from these particularities and aims to comply with them at all links of project development. At the stage of hypothesis elaboration of the reference project, the number of sows to be procured to ensure the process of breeding and raising pigs for fattening was considered. Based on these aspects, the project provided for the total investment expenses for ensuring the animal welfare environment in the maintenance halls, the production costs of veterinary products, the equipment necessary to maintain sows and fattening pig breeding groups (Data Inteligente, 2016).

The hypothesis of the investment project consists in the purchase of 10 pregnant sows for subsequent calving on the farm. This assessment is the basic part of the project hypothesis. The number of piglets born (produced live) is to be left for

fattening, thus constituting the basic component of the business – raising pigs for fattening and selling live mass. In this project, two calving of sows is planned, two production cycles lasting 24 weeks and the disinfection period of the hall of 1-2 weeks. The project is calculated based on the average number of 10 piglets born per sow and a mortality rate of 3%. The annual number of pigs delivered to the slaughterhouse and marketing points is 194 at a varied average weight of 110 kg live weight. The total quantity of expected live meat production is estimated at 21 tons annually.

The project calculates the quantity of animal manure and its recovery capacities. It is expected to obtain revenues from the recovery of manure obtained based on natural standards. The average daily manure is 6 kg of semi-liquid manure calculated for one pig when growing and fattening. The calculated annual amount of manure varies per 200 tons.

The construction works and installations comply with the design requirements, which provide for earthworks, constructions, insulation, electrical and thermal installations, heating, ventilation and air conditioning installations. For the storage of animal manure, it is planned to build a platform for storing semi-liquid pig manure worth 110,500 lei, value without VAT. For such a project, it is important to have platforms for storing animal manure, to ensure animal biosecurity and environmental requirements. The manure will be used as organic fertilizers that will be transformed in the storage process. According to calculations, because of the operation of the farm at full capacities, manure in volume of about 220 tons per year will accumulate. Their marketing will be carried out twice a year, as organic fertilizers obtained from manure after fermentation. The material in the construction will be suitable for storing semi-liquid manure. It should be noted that the ratio of the liquid and solid part of the manure is 3 to 2.

A relevant important aspect of the investment project is the elaboration of the list of equipment to be purchased for the operation of the farm. The author of the project systematized all the basic elements of the equipment to be purchased. The value of the equipment to be purchased is worth over 800 thousand lei at the initial stage.

The number of places created represents the social potential for business development. Within the investment project, 3 permanent jobs will be created, one as veterinarian on 0.5 position salary and zoo-engineer 0.5 position salary and two animal caretakers. The average net monthly salary of an employee is 12 thousand lei.

All investment expenses were calculated in national currency and euro currency, to be clearer and of greater utility for beneficiaries. To ensure the complete form of presentation of prices, VAT is also presented in the structure of investments. These particularities aim to increase the understanding and good planning of investment expenses.

**Table 3. General investment framework**

Width	Valoare (fără TVA)		TVA	Valoare (inclusiv TVA)	
	mii lei	mii euro	mii lei	mii lei	mii euro
Expenses for land improvement	19,720	1,016	3,944	23,664	1,220
Expenses for providing utilities necessary for the objective	53,665	2,766	10,733	64,398	3,318
Design and technical assistance expenses	30,400	1,566	6,108	36,508	1,882
Hala stops pigs	1 003,234	51,713	200,647	1 203,881	62,055
Manure basin	116,820	6,022	23,364	140,184	7,226
Purchase of pregnant sows	80,000	4,124	16,000	96,000	4,948
Other expenses	9,763	0,504	1,600	11,363	0,586

*Source: data elaborated by the author*

The total value of investments is about 1.5 million lei with VAT, the equivalent of 81 thousand euros (Table 3). The pig breeding hall is the most expensive investment among all the objectives of the investment project. Also, expenses are expected for spatial planning, ensuring the necessary utilities for the objective, design and technical assistance, etc.

Investment expenses can be modified depending on the objectives to be achieved by the beneficiary, but also the oscillations of prices for equipment, raw materials and construction materials.

Modern methodological concepts in the field of agricultural entrepreneurship state that the most effective models for starting businesses, especially related to animal husbandry, are those with initiation potential coupled to farm biosecurity regulatory requirements. The described investment project emphasizes this approach by presenting investment expenses in a perfect and integrated form, primarily focusing on the projection and construction of objectives to ensure technological processes, biosecurity, and food safety requirements. According to the proposed investment concept, it is proposed to build the pig breeding hall, manure basin, purchase gilts for breeding, etc.

The investment project hypothesis consists of the following aspects:

1. Project implementation period of 24 months;
2. Construction of the pig breeding hall on an area of 300 m<sup>2</sup> production space and 50m<sup>2</sup> technical space;
3. Construction of purine basin for storage of natural manure;
4. Purchase of technological equipment necessary to ensure production processes for growth and fattening, for example: silos for storing compound feed, electric converter, fans, refrigeration installation, water drinkers, etc.
5. Production cycle duration of 2 weeks;



6. 2 production cycles per year;
7. The period of disinfection of the hall of 1-2 weeks;
8. 10 breeding sows;
9. The average number of piglets calving per sow of 10;
10. Average live weight of a commercial pig of 110 kg;
11. Capacity of an estimated fattening cycle of 100 pigs;
12. Average annual accumulated manure of 215 tons;
13. Expenses for land improvement, utilities insurance and design and technical assistance.

Another construction objective necessary in the context of ensuring the technological process and animal biosafety is the manure basin. To ensure the qualitative preservation of pig manure, it is recommended to build purine base platforms with a capacity of 250m<sup>3</sup> to ensure the storage of manure for a period of 10-12 months. The storage of manure is aimed at fermenting it and converting it into organic fertilizers, as the vegetable branch is necessary. The annual quantity of organic fertilizers obtained is estimated at about 220 tons and will be sold to neighboring farms. The expected income from the sale of organic fertilizers is estimated at 40 thousand lei annually, based on the price of 200 lei per ton.

The value of the investment project is about 1.5 million lei. To initiate a successful development of the farm for pork production, complex provision of the technological process with necessary animals and machinery is required. We believe that part of the value of the investment will be rewarded from the National Fund for the Development of Agriculture and Rural Environment through subsidy measures. The value of the investment per head of animal is about 7.7 thousand lei.

The investment project is organized to strengthen technological processes in meat pig breeding. The output to be determined is estimated in the context of correlation with promotion and marketing (delivery) activities. For this, in the project we present the production costs related to the production process.

**Table 4. Items of production costs**

<b>Cost items</b>	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Year 5</b>
<b>Production costs</b>	<b>384 113</b>	<b>403 318</b>	<b>419 451</b>	<b>448 813</b>	<b>471 253</b>
- biological replacement material (sows)	30 000	31 500	32 760	35 053	36 806
- sows	5 600	5 880	6 115	6 543	6 870
- litter for pigs	1 848	1 940	2 018	2 159	2 267
- compound feed	174 647	183 379	190 714	204 064	214 268
- antibiotic	2 750	2 888	3 003	3 213	3 374
- Vaccines	49 500	51 975	54 054	57 838	60 730
- Hall disinfection materials	840	882	917	981	1 031
- Equipment/facilities for hall personnel	2 520	2 646	2 752	2 944	3 092

<b>Cost items</b>	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Year 5</b>
- Utilities	116 408	122 228	127 118	136 016	142 817
<b>Other pays</b>	<b>44 640</b>	<b>47 318</b>	<b>49 211</b>	<b>51 672</b>	<b>55 289</b>
- salaries, personnel, productive activities;	44 640	47 318	49 211	51 672	55 289
<b>TOTAL costs related to production activity</b>	<b>428 753</b>	<b>450 637</b>	<b>468 662</b>	<b>500 484</b>	<b>526 542</b>

*Source: data elaborated by the author*

The costs presented relate to the period of 5 years. According to the data presented in the table, the value of the costs related to the production process in the first activity of the farm is worth about 428 753. Compared to a production unit, it is estimated a cost of 41 lei per kg of meat in live mass. Calculations are carried out for the period of 5 years, the first years of development of the farm. The main cost items include compound feed, replacement sows and vaccines to ensure the functioning of the production process. These cost items are fundamental in ensuring the process of growing and fattening pigs. According to the initial data of the project, it is estimated that about 10,340 kg of live meat will be produced annually. In the farm will be employed 3 animal caretakers with permanent work regime with a calculated average monthly salary of 12 thousand lei. The costs related to labor remuneration and mandatory social and medical insurance are estimated at about 44,640 lei per month. For the following periods, the size of costs was calculated considering the level of inflation and the evolution of prices in the retrospective periods.

In Table 5 we present the revenues related to the commercialization of the project's production.

**Table 5. Revenue forecast by quantity of marketed production**

<b>Cost items</b>	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Year 5</b>
<b>Total revenue</b>	<b>1 110 142</b>	<b>1 219 00</b>	<b>1 280 855</b>	<b>1 369 546</b>	<b>1 452 737</b>
Pork carne	1 067 000	1 173 700	1 232 385	1 318 652	1 397 771

*Source: data elaborated by the author*

The estimated value of sales of investment project productions amounts to about 1.1 million lei. The main source of income of the project is meat delivered in live mass. The clientele are slaughterhouses and pork traitors in the country. The entity does not have its own slaughterhouse, as irrational in terms of the volume of production generated annually. As secondary income, the marketing of manure is foreseen. The revenues generated by this product are estimated at about 43 thousand lei for an annual quantity of 216 tons at a price of 200 lei per ton.

For the analyzed period, the value of a percentage of sales is about 11,700 lei, which is a basic index for the period following the current one. The farmer's commitment must be aimed at increasing sales in the current period compared to the previous one, by applying timely and efficient means.

**Discussions and conclusions.** The proposed investment project appreciates the approach of goat's milk production with the processing of dairy products on the agricultural farm by ensuring the level of quality self-control.

1. The general approach of the project demonstrates that a business in the production and processing of livestock production can be profitable under the conditions of a sufficient investment level and a degree of complete insurance with means of production;
2. The sufficiently provided project from a technical and technological point of view, such as the one presented, ensures a recovery period of about 3 years;
3. The investment project represents a technological and business guidance for all those interested in start-ups of this kind;
4. Through the calculations provided, the project offers the opportunity to conduct a business in the field with subsequent processing of the obtained livestock productions;
5. The project is carried out based on ensuring the feed base from own sources, managing agricultural land, which increases its profitability index;
6. The profitability of production in the first activity is about 44%;
7. The recovery of invested capital attracted from internal sources to finance this project is 24.5%;
8. The market price of this object is 14 895 678 lei;
9. The demand for pork production in the Republic of Moldova is increasing;
10. About 30 intensive farms, according to the standard project, would provide about 448.1 tons of fresh pork.

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