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SYSTEMS FOR THE DEVELOPMENT OF THE GOAT REARING SECTOR FOR MILK PRODUCTION

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Abstract

Along with the increase in the number of animals, the number of animal farms specialized in the production of goat milk also increased, the number of farms equipped with mechanized milking systems, milk pasteurization lines, pasteurized milk bottling, combined slaughterhouses, etc. increased. The aim of the paper is to demonstrate sustainable development as one of the current requirements of the economic efficiency of livestock farms, by ensuring the complete value chain with complex and perfect inputs. The methods of observation, monograph and comparison were used in the elaboration of this work. The data presented in the respective work were accumulated from the statistical researches of the husbandry entities in the country, the official data of the National Bureau of Statistics of Moldova and from the dedicated works on this topic. The results pursued in this research point to the identification of the economic capacities of the goat breeding sector in the Republic of Moldova by making investments in the dimension of increasing the gross added value of the business. The research conclusions allow us to state the availability of reserves by tracking the quality and quantity of production determined by increasing the contribution to the value of production.

Keywords**:** *goat sector, profitability, commodity production, efficiency, breeds, fodder, processing*

INTRODUCTION

Despite being not as popular as cow's milk, goat's milk has different benefits and nutritional values that cow's milk has. In the recent past, the breeding of goats for milk has become a widespread economic activity, and many other farmers engage in this activity to sustain their existence. The advantages of raising goats over cows are that they are cheaper to maintain themselves and require less space compared to cows. Goats are mostly bred by low-income or middle-income individuals, and therefore bear the name of "poor cow". Although researchers claim that goat's milk contains large amounts of saturated fat that would lead to a rapid increase in body weight, the other benefits of goat's milk make it a product worthy of consumption. The world's largest milk producers are India (5 million metric tons), Bangladesh (2 616 thousand metric tons), Sudan (1,532 thousand tons metrics) andPakistan (801 thousand tons metrics) (Baltag, Rurac and Caisîn, 2021) [3].
In the Republic of Moldova, the goat sector is the only one of those of the livestock branch that registers positive increases of livestock. In the other sectors of the branch, the livestock shrinks and generally has a negative impact on the development of livestock yields. In this context, the purpose of the paper is to analyze sectoral development capacities in the context of business models inspired by current consumer requirements and increasing economic efficiency.

MATERIALS AND METHODS

The importance of this work is relevant through the applied research methods. The main analysis methods used were the monographic, descriptive and the factor decomposition method. Statistical data related to sectoral development from the sources of the National Bureau of Statistics of the Republic of Moldova were used to develop

the research. The developed materials serve as methodological support for startups in the fields of Moldovan animal husbandry businesses.

RESULTS AND DISCUSSIONS

The number of goats in the period 2018-2021 decreased due to the economic situation in the country and region, including pandemic restrictions. In the period 2010-2011 we find that the livestock has increased by about 30 thousand heads. This trend has been continuing over the last 30 years. In 1990 the number of goats was only 32 thousand (Table 1) and by 2000 the number of goats increased to 100 thousand.

Table 1. The dynamics of goat herd in the Republic of Moldova, thousands heads

Category	1990	2000	2010	2018	2019	2020	2021	2022
Agriculture enterprises	0.0	0.0	0.4	1.4	1.3	1.4	1.2	2.7
Households of the population	32.0	100.0	110.8	161.2	154.0	143.8	140.8	137.2
All categories	32.0	100.0	111.2	162.6	155.3	145.2	142.0	139.9

Source: author's calculations based on the data from National Bureau of Statistics [6].

In relation to the categories of entities, most of the animals were in households, only by 2010 we see the first registrations of goats in corporate agricultural entities. Thus, the evolution of the development of the goat breeding sector began in households and later, in economic evolution, it passed into the corporate one. The number of milking goats in the year 107.3 thousand heads. Traditionally, the sectors of the livestock branch were based on entities of a collective type from the Soviet period and later passed into the households near the house, which is not characteristic for the goat sector. The development of goat breeding farms in households is the basis of the current economic features of the business model. Most of the farms are of the family type, where the work is provided manually, and as employees are family members.

The consumption of goat's milk in the Republic of Moldova, according to National Bureau of Statistics of the Republic of Moldova, is increasing. The country population consumes goat's milk for its curative qualities. Along with this feature, dairy products are present in the daily food ration of the population. With the reduction of livestock of cows and sheep on farms, the production of goat's milk remains the one accessible from the point of view of location. According to our calculations goat milk production in the year 2022 accounted for 53,635 liters (Table 2).

Table 2. Dynamics of goat's milk yield in the Republic of Moldova, liters

Milk yield, thousands liters	2018	2019	2020	2021	2022
All categories	62,338	59,539	55,667	54,440	53,635
Households of the population	537	498	537	460	1,035
Agriculture enterprises	61,801	59,041	55,130	53,980	52,600

Source: author's calculations based on the data from National Bureau of Statistics [6].

Of the total volume of milk about 93% are from sources obtained in households. This demonstrates a high degree of concentration of livestock in the household sector. Such a high rate of production from those sources implies insufficient state intervention in the development of the sector. It has a number of drawbacks. Most of the goat farms of households are located in the built-up area of the town halls. Milk production is used for

current consumption both fresh and processed in the form of cheese. The degree of investment in these farms is rudimentary and insufficient. Animal productivity is reduced due to reduced genetic material. All these peculiarities disadvantage the development of the sector (Wilson, 2018)[10].

Under these conditions, part of the country's population prefers the consumption of goat's milk. Consumers of goat's milk prefer to consume fresh, especially those from the countryside, or in the form of cheeses.

Currently, cheeses, cheeses and other derivatives from milk production are sold on the shelves of super-market stores. The milk production of goats is also marketed on social networks in a rather intense way. This trend is observed from discussions with milk consumers. The rural population appreciates milk for its taste and health-regenerative qualities. This year, according to data from the National Bureau of Statistics, it is estimated that the average milk consumption in the calculation per person will increase from 14.5 to 14.9 liters. This consumption is provided from both internal and external sources. Goat farms in the country provide an average production of 12 liters per capita, the other 3 liters are insured on account of imported production (Table 3).

Table 3. Quantity of milk production imported into the Republic of Moldova

Indicator	**2019**	**2020**	**2021**
Quantity, tonnes	2,433	2,680	3,459
Value, thousands of dollars$	9,624	10,899	14,750
Average price per ton, thousand dollars$	3.96	4.07	4.26

Source: author's calculations based on the data from National Bureau of Statistics [6].

Goat's milk is consumed mainly in the form of cheese and cheeses. Most of the exported productions refer to the production of cheeses, which are sold in super-market stores. Goat milk is sold at an average price of 12-17 lei per liter. For processing milk is purchased at a price of 8-9 lei per liter. At the same time, goat cheese is also purchased on the market, which enjoys a stable demand. In 2021, the quantity of goat cheese produced by all categories of households in the country was about 4,827 tons (Table 4).

Table 4. Production and valorisation of goat cheeses in the Republic of Moldova

Indicator	**2020**	**2021**	**2022**
Quantity, tonnes	5,010	4,900	4,827
Value, thousands lei	445,893	445,866	448,926

Source: author's calculations based on the data from National Bureau of Statistics [6].

The potential of the local cheese petition is estimated at about 450 thousand lei. The price of one kg of cheese varies from 120 to 140 lei per kg at agricultural markets and shops. The wholesale price of cheese is estimated at 95-100 lei per kg. The cheese shall be sold at retail and wholesale. Retail sells farmers who sell their wares at stalls in agricultural markets.

Most of the farmers who market their own products at the agricultural markets additionally employ one person for sale, incur the costs of transporting the goods, packing costs and certification. The sense of marketing of retail products reveals from the higher price. Thus, farmers who manage to secure their marketing process through agricultural markets increase the profitability of their traded goods. Participation in various exhibitions with its own production increases the visibility of the company and revenues. During the exhibitions, visitors get acquainted with the exhibited production, taste the food products, thus becoming known the respective production.

Investment research is carried out based on milk production in relation to the goat breed. The research is aimed at exploiting the Saanen breed. This breed is of Swiss origin, has a waist of 80-90 cm in males and 74 -80 cm in

females, elongated body, suitable long and wide head with almost straight profile, deep chest, wide chest with good chest capacity, wide and tightly fastened back, long and relatively thin neck and with earrings under the jaw with resistant ongloans, Well developed udder with medium nipples tilted laterally and forward, and the hair is short, dense and silky.

The Saanen breed can be used with good crossbreeding results, with the Carpathian breed. The average weight is 65 kg, prolificacy – 2-3 kids per goat, the average annual productivity – 800 liters/goat and the maximum productivity – 1,800 liters per goat.

The total number of milking goats will be 300 heads.

The livestock on a holding shall be determined on the basis of the investment capacities, on the one hand, and the profit sought.

The capitalization of the research also results from the current policies of the Government in relation to the development of agriculture. According to the National Strategy for Agricultural and Rural Development for the period 2023-2030 [7], it is planned to stimulate the opening of about 120 goat farms throughout the country. Each farm must have at least 250 milking animals on the farm.

This policy is in line with the revitalization of the sheep and goat breeding sector in the country.

Our guidance is apparent from those reasonings in agricultural policies.

Based on goat herds at farm level, we are still determining the production capacities of the research. The calculations were made based on the current production rules, the average annual milk productivity, the transfer coefficients of the processed production.

The areas required for the farm and the rooms for processing, the slaughterhouse, etc., were determined on the basis of the veterinary rules for the maintenance of a goat and those for compliance with the veterinary requirements for the primary processing of production.

Based on the data from Table 5, we determine the capacities of the production of pasteurized milk and other dairy products. The productions will be obtained within the entity, with the availability of purchasing the respective equipment.

Table 5. Estimated production capacities of the farm with a herd of 300 goats

Indicator	Values
The average annual amount of milk, liters	240,000
Average annual number of live products	525
Average annual number of hides and skins obtained	499
Average annual quantity of slaughtered meat, kg	4,909
Average annual quantity of manure, tonnes	200

Source: author's calculations based on the data from National Bureau of Statistics [6].

Table 6. Capacities of dairy products obtained on the goat farm

Product types	Milk, l	Product, kg
Pasteurized milk	96,000	93,120
Salted cheese	120,000	10,000
Sweet cheese	24,000	2,400

Source: author's calculations based on the data from National Bureau of Statistics [6].

Based on the production norms, in Table 6 we present the processed productions that will be obtained within the livestock farm.

Of the average annual quantity of milk to be recovered, 40% of the production will be marketed in the form of pasteurized milk, 50% in the form of cheese and 10% in the form of fresh curd.

Such a structure is quite rational, thus it will ensure the diversification of sources of income, goat cheese and pasteurized milk being basic.

Table 7. Area of land sown and forecasted harvest

Culture	Surface, ha	Yield, kg
Corn grains	3.6	23,400
Peas	4.5	18,000
Autumn wheat	6	22,800
Barley	5.4	17,280
Lucerne	6	90,000
Oats	4.5	13,500

Source: author's calculations based on the data from National Bureau of Statistics [6].

Production capacities also refer to the land resources of research. As mentioned above, the management of 30 ha of arable land is planned to provide its own forage base. For

the first year of activity, a structure of 5 soles is proposed (Table 7).

On that area, crops are to be sown, the production of which will be used in the food ration of goats. Part of the harvested production, the surplus, will be marketed. In this respect, we mention that the existence of its own feed base contributes significantly to the reduction of operational risk in relation to the evolution of prices on the feed market (Parliament of the Republic of Moldova, 2017) [8].

The availability of ownland demonstrates a sufficient level of assurance with its own forage base. Also, harvested crop production can also be a source of additional income along with basic production (Table 8).

Table 8. Required quantities of own feedingstuffs for the maintenance of animals in average annual consumption

Forage type	Internal consumption	Own production	Degree of insurance, %
Corn grains	20,756	23,400	113%
Peas	16,605	18,000	108%
Autumn wheat	14,945	22,800	153%
Barley	16,605	17,280	104%
Lucerne	55,627	90,000	162%
Oats	14,114	13,500	96%
Weighted average, %	123%		

Source: author's calculations based on the data from National Bureau of Statistics [6].

The calculations in the table above demonstrate that the volume of production for internal consumption on most crops grown in the first year of activity is lower than the harvest obtained (own production). Thus, the average degree of insurance of goats' food ration from domestic sources is about 123%. The largest surplus is recorded in the production of alfalfa, which is slightly a product with high demand. Through these calculations we demonstrate the efficiency of investment research with the management of agricultural land. The availability of agricultural land must become a business principle in the livestock branch. Agricultural land ensures the prevention of risks as a result of climate change (heat, frosts, etc.). For this purpose, breeders of large animals, cattle, pigs, goat sheep, etc. should be directed. According to scientific norms, one hectare of agricultural land provides with feed 7-9 goats or sheep. In our case the ratio is 1:10.

Carrying out the structuring of the sown areas gives the opportunity to the entrepreneur to model according to the capacities the cultivation of basic feed individually. We cannot say with certainty that the structure presented in Table 8 is the most rational, but the availability of such a model contributes to a good exploitation of agricultural land on livestock farms. This method is recommended as a methodological title for all those interested in business development in the livestock branch.

The production capabilities of an investment project require a multilateral approach. The development of a business in agriculture today can take place through a consistent and sustainable approach. The accomplishment of technological and economic tasks by the entrepreneur in relation to investment research can take place by identifying viable solutions for trade, production and acquisition. Determining and planning actions in this context is absolutely necessary. The development of investment research must be approached in the complex, by consolidating actions and strengthening products according to supply and demand. Thus, investment research provides for the diversification of income, the use of auxiliary production as additional income, the exploitation of manure as organic fertilizers, etc.

Operational costs are the items of consumption of materials, services and labor used in the production process. In the investment research, the costs were deducted according to the materials and resources consumed during the operational period. The prices for the materials and resources consumed are presented on 01/07/2022. The purchased materials are necessary to ensure the development of the processes of initiation of the livestock farm.

In this context, we determine the costs of production carried out in the context of the marketing of production on the domestic market. Factors of influence of the necessary

elements are provided by the main indicators of development.

Investment research is organized to process production in full. The production to be determined in order to succeed in carrying out the processing procedures in full. For this, in the project we present the costs of production related to the production process (Table 9).

Table 9. Production cost items

Types of production	Total, lei
1. Milk	864,000
2. Piei	200
3. Meat	122,719
4. Agriculture	170,094
5. Corn	35,100
6. Peas	23,400
7. Wheat	36,480
8. Barley	22,464
9. Lucerne	37,800
10. Oats	14,850
11. Pasteurized milk	297,984
12. Salted cheese	326,000
13. Sweet cheese	46,320
14. Total costs of processed production	670,304
15. Exceptional costs	18,273
Farm's costs	**1,845,589**

Source: author's calculations based on the data from National Bureau of Statistics [6].

The following elements shall be included in the costs of production:

-Costs related to the remuneration of work;

-Feed costs;

-Costs for zoo-veterinary products;

-Costs of mechanized works;

-Other exceptional costs and costs (Baltag and Popescu, 2018)[2].

The systematized costs are the totality of the entity's costs related to the operational process of the research.

The costs presented refer to the period of one year. Thus, for the first activity, based on the investments made and the planned productions, it reaches the level of about 1.8 million lei. The value of the costs results from the tariffs executed for the current year, the productivity of the work, the level of remuneration, the prices of inputs, etc. Another side of the operational activity of the enterprise relates to the investment expenses.

The expenses include materials and resources that do not directly participate in the production process. The reference period for expenditure shall relate to the financial year. In the investment research, there were provided expenses necessary for the management activity, such as secretarial, travel, etc.

General and administrative expenses are the assurance of the activities of administrative staff in relation to the external environment of the entity. Communication and development of the enterprise is vitally necessary for the project. Thus, the stringent actions related to the forecasted expenditures were forecasted. Their value in the current year is forecasted at the level of 39.5 thousand lei.

The basic element in capitalizing on the results of the operational activity of the research is the sales revenues. Revenue is the total value of marketed productions and relates to a unit of time, usually one year of activity. Sales revenue is the product of the volume of marketed production and the price for the realization of a unit. In this way, when determining the revenues from the marketing of production of investment research, current prices on the domestic market, including retail ones, were taken into account. According to the research, it is expected that the investment will be made by marketing the production at the local agricultural markets, including the district ones. The sale of animal production in agricultural markets is regulated by the Law no.257/2006 on the organization and functioning of markets for agricultural and agro-food products (Ministerul Economiei, 2006) [5] and others.

The modern algorithm related to the evaluation of investment projects is based on the methodological guide "Methodology of elaboration and evaluation of investment projects for the agro-food sector and the practical guide "Investments in agricultural business", author Stratan A. and Bajura T. [9].

According to the respective sources, the market value of an investment object, as well as the efficiency of making investments as such, must be calculated on the basis of net cash flows (Net Cash Flow – NCF), insured through the respective investment activity.

Obviously, both cash inflow flows and cash outflow flows must be taken into account.

It is necessary to mention that any investment activity can be carried out both in the conditions of the "inflationary" economy, as well as the "deflationary" one, and, even, in the conditions of the economy with the so-called "zero - inflation", which, as a rule, is in the middle, usually – a relatively short period of time and which still has to be taken into account (Baltag, 2020)[1].

The economic specificity of the period of "zero - inflation" of a national economy is the fact that it maintains during this period, both the stable purchasing capacity of money and the absolute stability of prices, as such.

Being ascertained the fact of the functioning of the national economy under the conditions of "zero - inflation", all cash flows (both cash inflows and outflows) can be taken into account in their absolute sizes (without any change in order to adapt them to market conditions).

As the main indicator in terms of establishing the economic effect of investments made under the (even imaginable) conditions of the economy with "zero - inflation" serves the term of recovery of investments (Tp.p.), which is identified by the formula:

$$\boldsymbol{Tp.p.} = \frac{\mathbf{IC}}{\mathbf{Pm.a.}} (\boldsymbol{ani}) \qquad \text{……..(1)}$$

where:

IC – initial cost, lei;

Pm.a. – profit,insured by the exploitation of the respective investment object, lei/year.

But this formula occurs to be in the case when the annual profit is constant throughout the duration of the investment research.

However, if the profit (NET income) is not equal over time, then the sum of the profits per period will be used:

$$\boldsymbol{Tp.p} = \boldsymbol{IC} - \sum_{h=1}^{T} \boldsymbol{Phi} \qquad \text{….(2)}$$

In the case of the analyzed investment research, the size of the profit is not evenly distributed throughout the duration of the investment research and for a clearer convenience it can be represented graphically (Figure 1).

The size of the cash flow of the investment research demonstrates the return on investment for the 7th year of activity. Towards this period the development of the farm must be ensured. During the recovery period, in parallel, the goat-breeding farm must develop in terms of a permanent investment process.

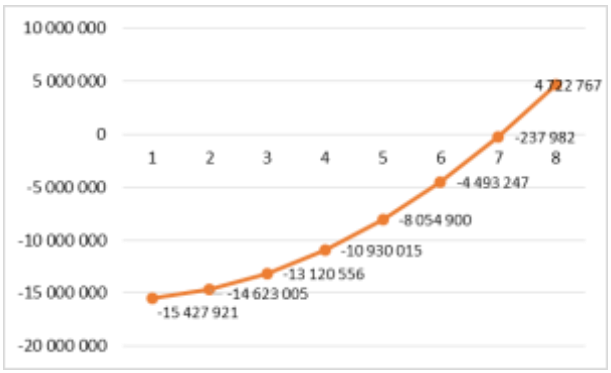

Fig. 1. Recovery period (years) in relation to the amount of cash flow (Lei)
Source: Own design.

This envisages improving the geno-fund of animals, replacing the basic farm with young animals, maintaining the quality of production and increasing promotion actions, etc. The realization of current and operational investments will result in the entity's net profit. Being a basic indicator in terms of evaluating investment research, the size of Tp.p., however, does not inform us at what cost we obtain this result. It is only not excluded that other (alternative) projects may achieve the same result with lower expenditure in the form of initial investments (Baltag and Baranov, 2013)[4].

In order to overcome these deficiencies, along with the Tp.p. indicator, the Accounting Rate of Return (ARR) must also be calculated, which is calculated according to the formula:

$$ARR = \frac{\text{AAP}}{\text{IC}} \times 100\% = \frac{4\,312\,798}{15\,427\,921} \times 100\% = 28{,}0\% \qquad (3)$$

where:

AAP –average annual profit.

IC – initial cost.

That value (28%) proves that for each leu of investment, the average annual profit will be about 28 bani. Such a result can be qualified

quite good and adjustable for investment activity in such a field of activity.

As a rule, this indicator can be compared with the average annual interest rate of bank deposits, and in the case when its size exceeds the average size of bank deposits for legal entities the investment is considered efficient and rational. On 15/09/2022, the average interest rate for deposits of legal entities is at the level of 12.5% annually. Therefore, the coefficient of investment effectiveness in the amount of 28% is much more rational. Thus, the investor becomes interested in the given investment compared to the placement of the financial resources on the deposit.

Within an inflationary economy there are several phenomena that make it important to have an amount of money that is available as more valuable compared to the same amount of money but over a period of time. Taking into account the phenomenon of inflation (in a popular aspect – the phenomenon of devaluation of money over time), the results of the exploitation of investment objects (income or gross receipts), must be sufficient not only to cover current expenses (variable and fixed), but also the level of devaluation of money over time, or the possibility of investment research to compete with other projects, as an example of depositing the available financial resources on a bank deposit that offers a any interest rate or opt for another, more attractive investment project or with lower risks.

Therefore, in the conditions of the inflationary economy, it is not the absolute amounts of receipts with the volume of investments that are compared, but the updated amounts of revenues, that is , the amounts without the effect of inflation.

The present amount of net cash fluctuations (Net Cash Flow), being at the same time the current (present) market value of the investment object at the stage of putting it into operation in the future time, is called the present value of the investment research (Present Value – PV) and is calculated according to the formula:

$$PV = \sum_{n=1}^{n} \frac{P_n}{(1+r)^n} \qquad (4)$$

where:

P_1; P_2; P_3 … P_n –Net Cash Flow, MDL;

r –discount rate – embodies in itself several factors such as: 22% - the cost of capital invested, 4% - estimated profit, 2% - the risk premium (risks that have not been taken into account but may occur).

n –the number of calculation periods (in our case – the number of years since the establishment of the investment research n = 11).

Being calculated on the basis of future cash receipts, the present value (present value) is a basic criterion for deciding on whether to make investments in the respective investment research. Based on the calculation of the previous data, the present value of the research given to the investment:

$$\text{PV} = \sum_{n=1}^{11} \frac{32\,012\,854}{(1+0{,}28)^{12}} = 52\,251\,130{,}06 \text{ lei} \qquad (5)$$

We emphasize once again that at the initial stage of exploitation of the investment object, its present value, which also constitutes the market price of this object, is equal to MDL 52,251,130.06 (if for the entire exploitation period the discount rate will be constant, amounting to 28% annually).

Along with the market price for investors it is important to know the comparison of PV with IC. As a consequence, another important indicator appears, called – net present value (NPV). It should be emphasized that any investment project, being evaluated in advance by the investor, should not have its market price lower than the initial cost of the investment (StratanAlexandru, Bajura Tudor, 2017)[9].

So, any investment project will be accepted by the investor if PV >IC and will not be accepted in case PV<IC. For investment research of a super intensive apple orchard the size of the NPV is equal:

$$NPV = \sum_{n=1}^{n} \frac{P_n}{(1+r)^n} - IC = 29\,105\,028{,}78\ lei$$

We therefore come to the conclusion that PV (Present Value) exceeds IC (Investment

Costs) and NVP (Net Present Value) as a value significantly exceeds zero at a discount rate of 28%. For these reasons, the research can be accepted by potential investors.
Although the discount rate selected by the authors (28%) is a relatively high one, because it includes in itself several aspects, such as inflation, possible risks, etc., the term of repayment of the investment is 7 years.

CONCLUSIONS

The proposed investment research appreciates the approach of goat milk production with the processing of dairy products in the agricultural farm by ensuring the level of quality self-control.
-The general approach to research 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;
-The research provided from a technical and technological point of view, such as the one presented, ensures a recovery period of about 7 years;
-Investment research is a technological and business guidance for all those interested in start-ups of this kind;
-Through the calculations offered, the research offers the opportunity to conduct a business in the field with the subsequent processing of the obtained animal productions;
-The research is carried out based on the provision of the feed base from own sources, managing agricultural land, which increases its profitability index;
-The profitability of production in the first activity is about 30%;
-The recovery of the invested capital attracted from internal sources for the financing of the given research constitutes 13.5%;
-The market price of this object is 52,251,130.06 lei;
-The demand for goat's milk production in the Republic of Moldova is increasing, the market of this segment is in formation;
-About 50 intensive-type farms, according to the standard research, would provide about 12 million liters of goat's milk, which would completely cover the level of internal consumption of production in the Republic of Moldova.

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