

ECONOMIC EFFICIENCY OF INVESTMENTS IN CATTLE PRODUCTION AT FAMILY FARMS¹

S. Ivanović²

Abstract: Using the models of family farms implementing cattle production, it has been analyzed how economic efficiency and financial feasibility of the cattle production investments is influenced by the size of family farms; the type of production; the way of securing of the land for the forage production, both under the safe and risky circumstances. During the analysis of economic efficiency the dynamical methods of investment evaluation have been used, as well as the appropriate method for risk estimation of investments. Besides, in the study has been analyzed an earlier development of the cattle production in the Republic of Serbia, its present conditions, as well as the prospective developments of the bovine production. Judging by the acquired data, it has been established that the family farms investments with a larger number of cows are more economically efficient and more financially feasible, as well as that these investments have a lower level of risk taking in the uncertain conditions of business undertakings.

Key Words: investments, cattle breeding, models, risk, family farms.

Introduction

Agriculture represents one of the key branches of economy in the development of the Republic of Serbia; for that reason, a special attention needs to be applied to it in the future. Within the agricultural production, livestock breeding takes up the most prominent spot, whereas within the livestock breeding a section of the bovine production is underlined with regard to economic and production results, as well as the total worth of assets having been involved in it.

Since more than 90% of the bovines in the Republic of Serbia have been raised on the family farms, these farms represent an exceptionally great potential

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for the bovine production. However, in order for the family farms to reach the most acceptable economical effects, a need has arisen for securing of a high level of investments. For that reason, a special deal of attention needs to be paid to the appraisal of economic efficiency of the bovine production. If we judge by the recent research, it is visible that domineering factors influencing the efficiency of these investments at the family farms have not been studied satisfactorily. Also, the evaluations of investments in the case of risky circumstances have been totally neglected.

The interest in the economic efficiency of investments on family farms has been enlarged due to the collapse of large, and state-owned economic systems, and with the growth of family farms significance as the foundation of agriculture in the Republic of Serbia. As of importance of the recent research, a certain number essays dealing with the investment analysis and costs of bovine production.

By utilizing the problems of economic efficiency of the investments in bovine production, G o g i ć (1996) has shown the possibility of selection of milking cows on the basis of present value of the annual net cash flows. This particular parameter can also be utilized in the selection of bovines of different breeds, and it is possible to establish it during the different periods of the utilization of milking cows. T i c a (1993 b) studies the same problem; respectively, he studies the possibility of the basic herd assessments, using the method of the present value of the annual net cash flows of the basic herd. I v a n o v i ć (2005) has been examining economic efficiency and financial feasibility of the investments in individual fixed assets in the bovine production: basic herd, buildings, equipment; he did this by implementation of the method of present value of the annual net cash flows. Apart from this, T i c a (1993 a) establishes the optimal time frame of the milking cows' utilization, by using different dynamic methods for investment review.

Using the model of milk production, G o g i ć (1995) studies the problems of value appraisal of the basic herd for different purposes appearing in everyday research. The author outlines the methodology of establishing the upper and lower borderline of milking cows' market value; respectively, the value of cows from the standpoints of the buyer and the seller. Also, the method of establishing optimal age of use of the milking cows, as well as the methods of establishing the border line of trades has been shown by using the dynamic methods of investment appraisals.

P o p o v i ć (2005) has utilized the profitability research of the bovine milk production in Vojvodina. The author studies in the detail the effects of production throughput over the costs, as well as the profitability of the milk production for different sizes of a basic herd. Besides, the cost functions of milk production have been established, by using the methods of cost functions and multiple non-linear regressions.

Z o r i c a V a s i l j e v i ć (1995) examines the methods of economic efficiency appraisals. Besides the investments in plant production, she analyzes the necessary investments in the bovine production. A special deal of care has been

devoted to the problems of investments in the family farms. Besides the investments analysis, a great deal of attention has been paid to the problems of the bovine production competitiveness. Using the model of family agricultural farms, Gogić (2005) investigates the economic efficiency and financial feasibility of steer breeding and sheep breeding, as well as their co-competitiveness. The dynamic methods of investment analysis have been used for the examination of the investments' economic efficiency. Krstić & Tomić (1993) examine the competitiveness of different systems of bovine production by implementing a larger number of bovine production models. Krstić *et al.* (1995) analyze economic efficiency and financial feasibility of the investments in the bovine production at family farms located in the lowland areas. Besides the bovine production, the authors examine the costs and investments on the models of the sheep, swine and poultry farms.

Arsenović & Krstić (2002), Gogić (2006), Krstić (2000), and Krstić & Tomić (1988) concern themselves with the problems of investments and competitiveness of family farms; co-competitiveness of certain branches of agricultural production, represented at the specified family farms; as well as the factors influencing the co-competitiveness of family farms and the branches of production.

Besides the specified papers, there exists other numerous research on the investments in the bovine production at the family farms (in the individual fixed assets, as well as in the whole farms); on the expenses of bovine production; on the effects of the transition toward ecologically acceptable production; on the adequate objects and equipment; on the throughput productivity, etc.

Taking into the account the results reached by the former authors, as well as the object being studied, this research aims to:

1. Analyze the earlier bovine production developments in Serbia, and analyze the present conditions;
2. Form the models of investments in the bovine production which accommodate the existing conditions of production; using these models, analyze economic efficiency and financial feasibility of the investments in the bovine production.

Also, one needs to analyze the possibility of selection of the economically most acceptable investment by applying different dynamic methods, as well as to establish mutual relationship and connectivity of the dynamic methods being analyzed.

1. Establish the causal relationship between the economic efficiency and financial feasibility of the bovine production investments with the different factors: the type of bovine production; the farm size; the method of securing of land areas; the sources and conditions of loan - both in the expected and in the uncertain conditions of business enterprise.
2. Analyze the broader social and economic effects of investing into the bovine production.

Material and Methods

A larger number of data processing methods have been used in this research. Mathematical and statistic methods have been applied for the analysis of condition and development of the bovine production: comparative analysis, graphical and tabular representations.

The investment models of the family farm bovine production have been formed, aiming at the analysis of economic efficiency and financial feasibility. Beside the models formed, the followed research methods have been used:

1. Calculative methods (Direct Costing Method, determination of net cash flows of family farms),
2. Dynamical methods for investment evaluation (Net Present Value, Internal Rate of Return, Payback Period),
3. For the economic efficiency of investments with risk management, the application possibilities for the use of Risk-adjusted Discount Rate.

A larger number of resources have been used in this research. These sources can be categorized in several groups. The first one makes up the available statistical data on the bovine production.

The second one represents the survey results undertaken at the family agricultural farms, specializing in the bovine production.

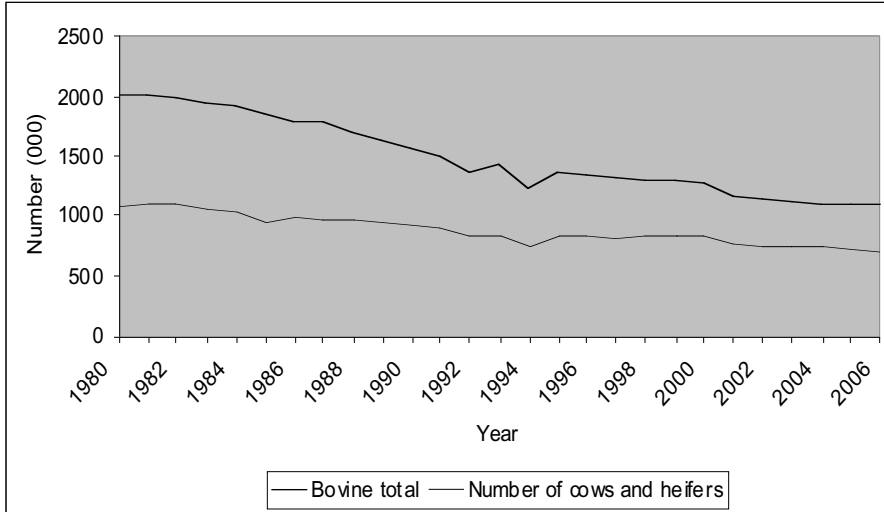
The third groups of sources make up the research results of multiple authors, originating in organizational-economic and bio-technical areas.

Results and Discussion

With the analysis of the present condition in the bovine production in the Republic of Serbia, it has been established that it is in very poor economic conditions. The bovine production suffers from very low financial results due to the unfavorable relationship of the price input and output; the unsettled steer market; the limited possibilities of bovine products' export; the shortage of fixed assets and working capital; the unfavorable crediting conditions; the undeveloped agricultural advisory and veterinary service; the small number of cows; and, small arable land of family farms, etc.

The total number of cattle has considerably decreased during the twenty year analysis period (Graph 1); thus, the number of cattle in the year 2006 represents only 54.88% of the cattle population in 1980.

Graph. 1. – Bovine totals, number of cows and heifers, in the Republic of Serbia, excluding Kosovo and Metohija, during the period of 1980 – 2006.

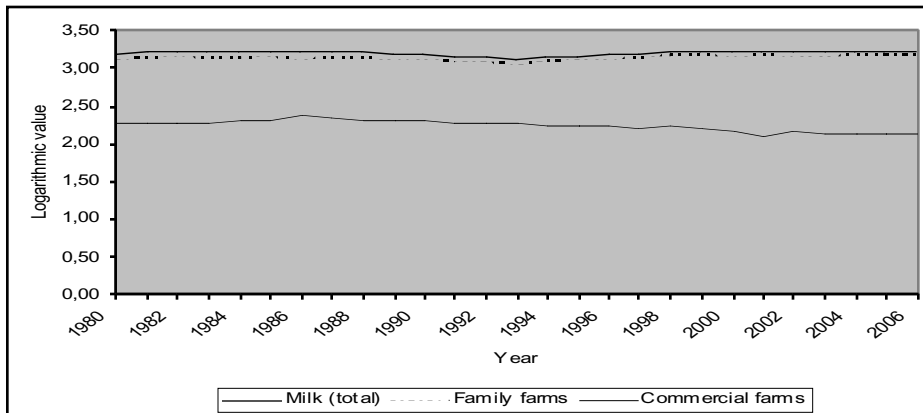


Source: The Livestock Breeding and Fishery Statistical Bulletin (1979 – 1998), SZS, Beograd; the Annual Statistic Reports of the Republic of Serbia, for 2002 and 2006, RZS, Belgrade.

However, the total amount of milk produced has kept nearly the equal flow because of milk production per cow, primarily at the family farms (Graph 2). This milk production tendency should be anticipated also in the future.

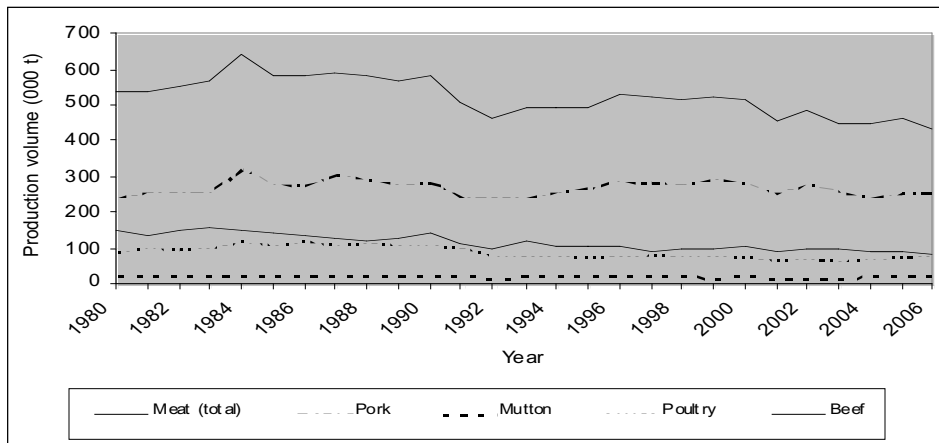
As far as the total volume of beef production, it has declined even 43.54% during the analyzed period, and its further decline can be anticipated (Graph 3).

Graph. 2. – Cow milk production volumes in the Republic of Serbia, excluding Kosovo and Metohija, during the period of 1980 – 2006 (half-logarithmic graph)



Source: The Livestock Breeding and Fishery Statistical Bulletin (1980 – 2001), SZS, Belgrade, the Annual Statistic Reports of the Republic of Serbia, for 2006 and 2007, RZS, Belgrade, as well as the author's calculations.

Graph. 3. – Beef production in the Republic of Serbia, excluding Kosovo and Metohija, during the period of 1980 – 2006 (half-logarithmic graph)



Source: The Livestock Breeding and Fishery Statistical Bulletin (1980 – 1998), SZS, Belgrade; The Annual Statistic Reports of the Republic of Serbia for 2002, 2006 and 2007, RZS, Belgrade, as well as the author's calculations.

With a purpose of considering the actual conditions on the family farms which are primarily directed towards the bovine production, we polled 42 of the family farms, by the analysis of organizational and economic characteristic of business deals. It has been established that the investments in the fixed assets of bovine production grow considerably with the rise of cow population on the family farms. With the rise of bovine population there comes a rise of investments per cow, per hectare of plowed land, and per the active household's member who aides in the running of the family farm. This rise of investments in the bovine production is desirable, since it brings the improvements of effects of economic business deals.

Using the available poll data, the 21 models of the family farms have been formed, in order to analyze the economic efficiency of investments in the bovine production at the family farms. These models are mutually different: by the projected number of cows (15, 25, or 50); by the method of securing necessary land areas (owned, leased, and purchased); and by the type of bovine production.

Three types of the bovine productions have been projected in models, in agreement with the results of the family farms polls:

Type 1 – Milk production, heifer breeding for replacements, and the sale of remained bull calves and heifer calves, aged 7 days.

Type 2 – Milk production, heifer breeding for replacements, and fattening of remained steers and heifers.

Type 3 – Milk production, heifer breeding for replacements, fattening of remained steers and heifers, and fattening of purchased steers.

The following possibilities were foreseen, depending on the method of securing of land areas necessary for the fodder production:

1. A family farm already manages land areas, necessary for the fodder production;
2. A family farm rents land areas necessary for the fodder production;
3. A family farm will invest in to purchasing of the land area necessary for the fodder production.

Based on the noted presumptions, the following models have been formed:

I 15 Cow Family Farm Models:

- type 1 production
- type 2 production
- type 3 production

II 25 Cow Family Farm Models:

- type 1 production
- type 2 production
- type 3 production

III 50 Cow Family Farm Models:

- type 1 production

For all models certain parameters were anticipated, such as height of investments, (into buildings, equipment, milking cows, additional working capital and lend), annual incomes and outcomes, annual net cash flows, salvage value, height of discount rate, etc. All necessary parameters were established on the basis of structural unit, which is primarily formed on the basis of represented types of the bovine production. Aiming to establish the economic effectiveness of the investments into the bovine production of family farms, the methods of dynamical investment evaluation (Net Present Value, Internal Rate of Return and Payback period) have been applied. As the most important indicator of economic efficiency of the investments Net Present Value has been used, whereas the other investment evaluation methods were employed as additional indicators, with the aim of better interpretation of the results received.

By application of the quoted methods, we have come to the following conclusions:

- Out of the total of 21 models having been analyzed, only 7 investment models in the bovine production at the family farms have been economically profitable.
- The farms owning 15 cows have established very low indicators of the investments economic efficiency, since no investments on the 9 models which have been deliberated, were economically profitable.
- At the 25 cow family farms, the investments into 4 models have been profitable (out of 9 analyzed models).
- The investments into all 3 of the analyzed 50 cow family farms' models have been economically profitable.
- With the rise of cow population on family farms, the economic efficiency of investments into the bovine production rises also.

As scrutinized primarily by height of the Net Present Value, the 50 cow family farms have accomplished the highest economic investment efficiency, with the 25 cow family farms trailing behind (Table 1).

A higher financial compensation has been reported at the family farms owning a larger number of cows; thus, the investments are more financially acceptable. Respectively, family farms with a higher number of cows have a possibility to finance a greater part of the investments through the use of loan, which does not cause them any problems with liquidity (Table 2). This means that it takes a relatively smaller investment lump from an owner to finance formation of larger farms. Thus, to invest into a 50 cow farm takes much less starter funds from an owner that it does for a 25 cow farm.

Tab. 1. – Investments Ranking of Bovine Production at Family Farms by Using the Method of Net Present Value

Models	Cattle Totals	Net Present Value (EUR)	Internal rate of return (%)	Payback period (years)
Type 1* – own land	50	198,157.91	14.63	7.62
Type 1 – rented land	50	149,324.39	12.67	8.74
Type 1 – purchased land	50	118,798.69	9.79	12.47
Type 2** – own land	25	34,159.28	9.22	11.25
Type 3*** – own land	25	23,740.13	8.14	12.31
Type 1 – own land	25	16,730.16	7.98	12.64
Type 2 – rented land	25	11,557.69	7.44	13.53

* Milk production, heifer breeding for replacements, and the sale of remained bull calves and heifer calves, aged 7 days.

** Milk production, heifer breeding for replacements, and fattening of remained steers and heifers.

*** Milk production, heifer breeding for replacements, fattening of remained steers and heifers, and fattening of purchased steers.

Tab. 2. – Bovine Production Investment Financing Possibilities by the Use of Available Credit

Models	Number Of Head	Net Present Value (EUR)	Requested Investments (EUR)	The Highest Loan Participation (EUR)	The Lowest Possible Share of Private Finances (EUR)
Type 1* Owned Land	50	198,157.91	396,283.66	87.38% 346,272.66	12.62% 50,011.00
Type 1 Rented Land	50	149,324.39	396,283.66	78.61% 311,518.58	21.39% 84,765.08
Type 2** Owned Land	25	34,159.28	213,688.47	65.56% 140,094.16	34.44% 73,594.31
Type 3*** Owned Land	25	23,740.13	254,418.19	61.68% 156,925.13	38.32% 97,493.06
Type 1 Purchased Land	50	118,798.69	566,108.66	61.17% 346,288.66	38.83% 219,820.00
Type 1 Owned Land	25	16,730.16	194,264.23	60.64% 117,801.82	39.36% 76,462.41
Type 2 Rented Land	25	11,557.69	213,688.47	58.03% 124,003.41	41.97% 89,685.06

* Milk production, heifer breeding for replacements, and the sale of remained bull calves and heifer calves, aged 7 days.

** Milk production, heifer breeding for replacements, and fattening of remained steers and heifers.

*** Milk production, heifer breeding for replacements, fattening of remained steers and heifers, and fattening of purchased steers.

We also analyzed the economic efficiency of investments into the bovine production at risky circumstances. Therefore, method of risk-adjusted discount rate has been applied. It is established that the higher number of cows at the family farm the lower the risk of investments into the bovine production. That is indicated by results of application of above mentioned method (Table 3)

Tab. 3. – Internal Rate of Return of some bovine production models

Models	Number of Head	Internal rate of return (%)	Discount rate (%)	Deviation (%)	Possible increase of discount rate (%)
Type 1* – owned land	50	14.63	6.50	8.13	125.08
Type 1 – rented land	50	12.67	6.50	6.17	94.92
Type 1 – purchased land	50	9.79	6.50	3.29	50.62
Type 2** – owned land	25	9.22	6.50	2.72	41.85
Type 3*** – owned land	25	8.14	6.50	1.64	25.23
Type 1 – owned land	25	7.98	6.50	1.48	22.77
Type 2 – rented land	25	7.44	6.50	0.94	14.46

* Milk production, heifer breeding for replacements, and the sale of remained bull calves and heifer calves, aged 7 days.

** Milk production, heifer breeding for replacements, and fattening of remained steers and heifers.

*** Milk production, heifer breeding for replacements, fattening of remained steers and heifers, and fattening of purchased steers.

If we examine the future trends of bovine production in the Republic of Serbia in detail, we can expect a further downfall of the number of cattle, the rise of milk production per cow, and the decrease of family farms dealing with the bovine production. It will also be necessary to establish specialization and mergers of the family farms. With this in mind, the process of securing of fodder can be a limiting factor for the bovine production.

To secure the development of bovine production in Serbia, we also need to secure complementary social and economic conditions: fair crediting conditions; change of the bovine production technologies; proceedings of the extension service and veterinary service, etc.

Conclusion

On the basis of all criteria we have analyzed so far, (degree of economic efficiency of investments, financial feasibility of investments, and the degree of economic efficiency in the case of risky conditions), it has been established that both economically efficient and financially feasible investments in the bovine production are those into the production with a larger number of cows.

With regards to the type of production, only the type of milk production in the case of large family farms has been analyzed because of large financial investments; the smaller family farms rate best with the combined types of the milk pro-

duction and fattening of their own steers. Family farms should be using modern way of cow breeding (which exist at large family farms), which is much more beneficial than traditional manner. If the family farms do not own its own land, it is economically more acceptable to rent the land, instead of purchasing it.

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EKONOMSKA EFEKTIVNOST INVESTICIJA U STOČARSKOJ PROIZVODNJI NA PORODIČNIM GAZDINSTVIMA¹

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Rezime

U radu su formirani modeli porodičnih gazdinstava koja su usmerena na govedarsku proizvodnju na bazi rezultata anketnog snimanja i rezultata dosadašnjih istraživanja. Na modelima je analizirano kako na ekonomsku efektivnost i finansijsku prihvatljivost investicija u govedarskoj proizvodnji utiče veći broj faktora, kao što su: veličina gazdinstva izražena brojem krava, tip govedarske proizvodnje i način obezbeđenja zemljišnih površina za proizvodnju stočne hrane. Analize su urađene kako za sigurne, tako i za rizične uslove poslovanja.

Korišćene su dinamičke metode za ocenu investicija – neto sadašnja vrednost, interna kamatna stopa i metod roka povraćaja. U cilju analize ekonomske efektivnosti investicija u uslovima neizvesnosti primjenjena je metoda prilagođavanja visine diskontne stope visini rizika.

Pored toga, u radu je analiziran dosadašnji razvoj govedarske proizvodnje u Republici Srbiji, njeno trenutno stanje, kao i perspektive investiranja i daljeg razvoja. Dobijeni rezultati potvrdili su veću ekonomsku efektivnost investicionih ulaganja u gazdinstva sa većim brojem krava, njihovu finansijsku prihvatljivost i nizak nivo rizika u neizvesnim uslovima poslovanja.

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Istovremeno, rad predstavlja deo istraživanja na projektu broj 20012 pod nazivom: "Primena i razvoj savremenih tehničko-tehnoloških sistema smeštaja, ishrane, izdubavanja i muže krava u cilju povećanja proizvodnje mleka visokog kvaliteta", koji finansira Ministarstvo nauke Republike Srbije.

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