

INVESTMENT IN CREATING THE VALUE ADDED IN LIVESTOCK PRODUCTION¹

Marko Jeločnik², Lana Nastić³, Božo Ilić⁴

Abstract

Livestock production is one of the most important sectors that generally increases overall profitability gained in agriculture. It could be a good alternative to farms that have available large areas under the crop production. Special segment of livestock growing is milk production and further gaining of value added through the milk processing. Locally, within the dairy production traditionally appears full-fat cow cheese. In performed research was tested the economic justification of initial investment in cow milk production and later milk processing into the full-fat cheese that will enable the sustainability and increase in gained profits at observed farm located in northern part of Montenegro. Investment analysis involves appliance of usual set of indicators, mainly NPV, IRR and DPBP. Gained results have been showed that the investment decision could be considered as fully justified for the farmer.

Key words: *investment, livestock production, value added, full-fat cow cheese production.*

Introduction

Within the structure of agriculture, the livestock production has great importance (Sere et al., 1996). Generally, it provides highly valuable products, as essential source of, above all, proteins and fats in human nutrition (Smith et al., 2013; MacRae et al., 2005). Gained primary livestock products serves as precious raw material in food processing industry, enabling increase in employ-

1 Paper is a part of research financed by the MSTDI RS, agreed in decision no. 451-03-47/2023-01/200009 from 3.2.2023.

2 Marko Jeločnik, Ph.D., Senior Research Associate, Institute of Agricultural Economics, Volgina Street no. 15, 11060 Belgrade, Serbia, Phone: +381 64 66 88 357, E-mail: marko_j@iep.bg.ac.rs

3 Lana Nastić, Ph.D., Research Associate, Institute of Agricultural Economics, Volgina Street no. 15, 11060 Belgrade, Serbia, Phone: +381 63 88 73 826, E-mail: лана_n@iep.bg.ac.rs

4 Božo Ilić, Ph.D., Associate Professor of Professional Studies, Director of Rico Training Centre, Belgrade, Serbia, Academy of Professional Studies Šumadija, Department in Aranđelovac, Josifa Pančića Street no. 11, 34300 Aranđelovac, Serbia, Phone: +381 64 614 83 05, E-mail: ilicdirektor@gmail.com

ment and obtained profitability in rural space and overall agriculture (Deventra, Thomas, 2002; Negassa et al., 2012). So, regardless the observed economic system, the processing of livestock products and by products (such are milk, meat, eggs, honey, animal fat, feather, leather, bones, etc.) in several industries (food, feed and textile industry, pharmacy and cosmetology, light chemical industry, etc.), (Shen et al., 2019; Jayathilakan et al., 2012) empowers food security, industrial progress, level of gained GDP, employment, export or touristic offer, etc., at the macro level (Wilkinson, 2012; Rais et al., 2013), as well as it provides the creation of value added, increase in use of disposed production capacities, higher profits and overall sustainability at the farm level (Sharma et al., 2014; Gill et al., 2009).

Globally, the main segments of livestock production are milk and meat production (Salter, 2017; Smith et al., 2013). Despite their large presence in human nutrition as raw, or fresh products, generally due to expressed perishability they are usually processing into the valuable dairy and meat products (Prakash et al., 2017).

From the farmer's side, processing activity could be equalized with value added creation and increase in farm incomes and sustainability (Cucagna, Goldsmith, 2018; Clark, 2020). Basically, mentioned comes from the one of definitions that considers the value added as the change in product features into more desirable, or more attractive for the final consumers (Kogut, 1985; Coltrain et al., 2000). Through the processing, farm is capturing the larger segment of the value-added created in previously formed value chain in certain line of production, i.e. it is cutting the larger part of the final price of certain product at the local market (Jeločnik et al., 2020).

In general, milk processing at the farm level (establish in cows, sheep, goats, etc. growing) usually involves production of one or few dairy products such are cheese (differing from soft to hard full-fat cheese), sour cream, yogurt, kaymak, butter, ice cream, etc. (Singh, Bennett, 2002), and by-products, such is a whey (Arsic et al., 2018). Contrary to fact that initiates the increase in farm incomes or better use of available farm capacities, establishment of processing at the farm requires certain level of investment (Subic et al., 2014).

Technologically, milk processing is quite a complex activity (Babyna, Babyn, 2022), as it requires advanced organization and logistic, perfect hygiene, as well as smooth linkage of engaged labor, animal bio-cycles and capacities of equipment. Investing in milk processing usually involves investment in basic herd

(milking cows), stables, milk production and processing facilities and equipment, storing capacities, etc. (Subić et al., 2020b).

No matter to final dairy product, in essence, milk production depends on to farm available natural conditions, or availability and price of feed and other used inputs, grown animal species and kinds, price of final products, used financial incentives, etc. (Nastić et al., 2012; Ivanović et al., 2020). Observed globally, cow milk production dominates (Britt et al., 2021). Cow milk production is dominantly organized at the small family farms that have limited herds, while the milk processing involves both the small farms and large processors (Lyson, Gillespie, 1995; Gogić et al., 2012).

Investment in such an activity, depending to primary dairy product, volume of processed milk, size of batch, level of professionalism in processing approach, involved technology, etc., could be very expensive business venture for a farm or agricultural enterprise. It could be financed by own, external (e.g. credit lines or donations) or common (e.g. cooperative) financial assets.

The main goal of the paper is to assess the economic justification of one investment alternative suitable for the farm involved in hard cheese production.

Methodology

In line to research focus, in paper was done the analysis of investment in completing the required elements for full-fat cow cheese production, i.e. purchasing the herd of heifers, building and equipping the facilities for heifers growing, as well as building and equipping the facilities for milk production and processing (production of full-fat cow cheese). Observed livestock farm is located in the northern part of Montenegro, while it has available all preconditions for producing and storing adequate volume of hi-quality feed for cattle growing, along with mostly skillful internal labor.

Like in some previous author's researches, investment analysis implies appliance of usually used package of economic indicators for economic assessment of investment effectiveness, i.e. calculation of static (Total output-total input ratio, Net profit margin, Accounting rate of return, and Simple payback period), as well as dynamic indicators (Net present value (NPV), Internal rate of return (IRR), and Dynamic payback period (DPBP)), (Ivanović et al., 2015; Subić et al., 2017; Jeločnik, Subić, 2020; Subić et al., 2020a; Jeločnik et al., 2022).

Analysis involves more conservative approach, as the used discount rate (7%) is in some extent higher than the current one, striving to adequately cover more pronounced risks in animal production. Although in one part, investment implies purchasing the production and processing facilities and equipment, observed investment period is 5 years, what is linked to usual period of utilization of heifers in milk production. All values are presented in EUR, by adequate tables, and explained by proper comments.

Results with Discussion

Farm, mainly oriented to crop production and partly to livestock production, is planning to go deeper into the milk production and further milk processing in the full-fat cheese under the traditional receipt, assuming that the regional recognizability and increase in demand for cheese produced from this location, will secure cheese realization and additionally strengthen the farm profitability and sustainability. In line to mentioned farm will invest in purchasing the basic herd (70 high quality heifers), as well as in building and equipping the stable for their growing, and facilities that will be used in milk, and later full-fat cow cheese production (Table 1.). Used facilities and equipment will technologically trace the step forwards in cheese production, harmonizing the tradition and technological achievements.

Table 1. Initially planned investment (in EUR)

No.	Description	Total
I	Facilities	
1.	Stables for heifers / cows	
2.	Trench silo	
3.	Facility for dry-feed storing	
4.	Storage for solid manure and slurry pit for liquid manure	
5.	Facilities for milk production and processing	
6.	Facility for cheese production and storing	
		191,888.83
II	Equipment and cold storage	
1.	Milking system	
2.	Binding frames	
3.	Watering system	
4.	Equipment for feed preparation	
5.	Lacto-freeze (milk tank)	
6.	Centrifugal pump	
7.	Filters for pump	
8.	Duplicator tank	
9.	Prepress for cheese	
		114,202.12

No.	Description	Total
10.	Cold storage with compressor	114,202.12
11.	Manure scraper system	
III	Basic herd	161,000.00
1.	Pregnant heifers (70 heads)	
Total (I+II+III)		467,090.95

Source: IAE, 2023.

There are planned investment in fixed assets and permanent working capital (PWC). All invested values are presented without VAT. Total investment values 560,509.14 EUR. In its structure (Table 2.) dominates fixed assets.

Table 2. Composition of the initially planned investment (in EUR)

No.	Description	Total investment	Share in total investment (in %)
I	Fixed assets	467,090.95	83.33
1.	Facilities	191,888.83	34.23
2.	Equipment	114,202.12	20.37
3.	Basic herd	161,000.00	28.72
II	PWC	93,418.19	16.67
Total (I+II)		560,509.14	100.00

Source: IAE, 2023.

The most of investment (entire fixed assets) will be financed by farm own sources, while PWC will be financed from short term credit line (Table 3.).

Table 3. Source of financing (in EUR)

No.	Description	Total investment	Share in total sources (in %)
I	Own sources	467,090.95	83.33
1.	Fixed assets	467,090.95	83.33
II	Other sources	93,418.19	16.67
1.	PWC	93,418.19	16.67
Total (I+II)		560,509.14	100.00

Source: IAE, 2023.

Forming of total income (Table 4.) assumes at market realized full-fat cheese and whey, sold calves, value of unused heifers and excluded cows, sold manure and used subsidies.

Table 4. Forming of total income (in EUR)

Description	Years				
	I	II	III	IV	V
Sale incomes	286,629.00	299,009.00	299,009.00	293,507.21	303,086.21
Total	286,629.00	299,009.00	299,009.00	293,507.21	303,086.21

Source: IAE, 2023.

In next table (Table 5.) are presented overall costs (material and intangible) that follow the investment exploitation, separately for each observed year and in total.

Table 5. Overall costs (in EUR)

No.	Description	Years				
		I	II	III	IV	V
I	Material costs	67,857.87	69,908.06	69,908.06	68,996.94	70,583.27
1.	Direct material	47,467.17	49,517.35	49,517.35	48,606.23	50,192.56
2.	Energy	8,295.40	8,295.40	8,295.40	8,295.40	8,295.40
3.	Other material costs	12,095.31	12,095.31	12,095.31	12,095.31	12,095.31
II	Intangible costs	129,051.76	126,560.58	126,560.58	126,560.58	126,560.58
1.	Depreciation	48,417.43	48,417.43	48,417.43	48,417.43	48,417.43
2.	Insurance	3,711.47	3,711.47	3,711.47	3,711.47	3,711.47
3.	Labor	73,811.11	73,811.11	73,811.11	73,811.11	73,811.11
4.	Interest	2,491.18	0.00	0.00	0.00	0.00
5.	Other intangible costs	620.57	620.57	620.57	620.57	620.57
Total (I+II)		196,909.63	196,468.64	196,468.64	195,557.51	197,143.84

Source: IAE, 2023.

After determining overall costs and income derived by exploitation of investment, there could be calculated farm financial success of implemented business activity (Table 6.).

Table 6. Profit-loss statement (in EUR)

No.	Description	Years				
		I	II	III	IV	V
I	Total revenues	286,629.00	299,009.00	299,009.00	293,507.21	303,086.21
1.	Sale incomes	286,629.00	299,009.00	299,009.00	293,507.21	303,086.21
II	Total expenditures	196,909.63	196,468.64	196,468.64	195,557.51	197,143.84
1.	Business expenditures	194,418.45	196,468.64	196,468.64	195,557.51	197,143.84
1.1.	Material costs	67,857.87	69,908.06	69,908.06	68,996.94	70,583.27

No.	Description	Years				
		I	II	III	IV	V
1.2.	Intangible costs without depreciation and interest	78,143.14	78,143.14	78,143.14	78,143.14	78,143.14
1.3.	Depreciation	48,417.43	48,417.43	48,417.43	48,417.43	48,417.43
2.	Financial expenditures	2,491.18	0.00	0.00	0.00	0.00
2.1.	Interest	2,491.18	0.00	0.00	0.00	0.00
III	Gross profit (I-II)	89,719.37	102,540.36	102,540.36	97,949.70	105,942.37
IV	Income tax	7,766.32	9,304.84	9,304.84	8,753.96	9,713.08
V	Net profit (III-IV)	81,953.0	93,235.5	93,235.5	89,195.7	96,229.28

Source: IAE, 2023.

Then was established the economic flow for planned investment (Table 7.). It is positive in each observed year.

Table 7. Economic flow (in EUR)

No.	Description	Zero moment	Year				
			I	II	III	IV	V
I	Total revenues (1+2)	0.0	286,629.0	299,009.0	299,009.0	293,507.0	621,508.0
1.	Total incomes	0.0	286,629.0	299,009.0	299,009.0	293,507.0	303,086.0
2.	Salvage value	0.0	0.0	0.0	0.0	0.0	318,422.0
	2.1. Fixed assets	0.0					225,004.0
	2.2. PWC	0.0					93,418.0
II	Total expenditures (3+4)	560,509.0	146,001.0	148,051.0	148,051.0	147,140.0	148,726.0
3.	Value of investment	560,509.0					
	3.1. In fixed assets	467,091.0					
	3.2. In PWC	93,418.0					
4.	Costs without depreciation and interest	0.0	146,001.0	148,051.0	148,051.0	147,140.0	148,726.0
5.	Income tax	0.0	7,766.0	9,305.0	9,305.0	8,754.0	9,713.0
III	Net income (I-II)	-560,509.0	140,628.0	150,958.0	150,958.0	146,367.0	472,782.0

Source: IAE, 2023.

Currently there are all preconditions for determining and assessing the selected static indicators for each year of analyzed period. As was previously mentioned, selected indicators involve: Total output-total input ratio, Net profit margin, Accounting rate of return, and Simple payback period.

a) Total output-total input ratio

Investment exploitation could be considered economically justified as the ratio between the total incomes and total costs derived from its use is above 1 (Table 8.) in each observed year.

Table 8. Total output-total input ration (in EUR)

Year	Total incomes	Total expenditures	Value of indicator
I	286,629.00	196,909.63	1.46
II	299,009.00	196,468.64	1.52
III	299,009.00	196,468.64	1.52
IV	293,507.21	195,557.51	1.50
V	303,086.21	197,143.84	1.54

Source: IAE, 2023.

b) Net profit margin,

Established investment is considered economically justified in case when the value for Net profit margin (the share of profit within the overall income derived from the use of planned investment) is higher than the presumed discount (interest) rate (7%) in each observed year (Table 9.).

Table 9. Net profit margin (in EUR, %)

Year	Profit	Total incomes	Value of indicator
I	81,953.05	286,629.00	28.59
II	93,235.52	299,009.00	31.18
III	93,235.52	299,009.00	31.18
IV	89,195.74	293,507.21	30.39
V	96,229.28	303,086.21	31.75

Source: IAE, 2023.

c) Accounting rate of return

Like with previous indicator, established investment is considered economically justified if the value for Accounting rate of return (the ratio between the gained profit and totally invested assets) is higher than the presumed discount (interest) rate (7%) in each observed year (Table 10.).

Table 10. Accounting rate of return (in EUR, %)

Year	Profit	Overall investment	Value of indicator
I	81,953.05	560,509.14	14.62
II	93,235.52	560,509.14	16.63

Year	Profit	Overall investment	Value of indicator
III	93,235.52	560,509.14	16.63
IV	89,195.74	560,509.14	15.91
V	96,229.28	560,509.14	17.17

Source: IAE, 2023.

d) Simple payback period

According to calculated value for the Simple payback period (Table 11.), investment could be considered economically justified as the initial investment will be paid off in 3.81 years, or 3 years and 9.67 months, what is shorter than the period of possible investment utilization, or the usual period of credit line expiration.

Table 11. Simple payback period (in EUR)

Years	Net incomes from economic flow	Cumulative net incomes
0	-560,509.14	-560,509.14
I	140,627.99	-419,881.16
II	150,957.79	-268,923.36
III	150,957.79	-117,965.57
IV	146,367.13	28,401.57
V	472,781.78	501,183.34

Source: IAE, 2023.

As to farm available financial assets currently have a higher value than in upcoming future, investment analysis implies calculation of dynamic assessment indicators, such are Net present value (NPV), Internal rate of return (IRR) and Dynamic payback period (DPBP).

a) Net present value and Internal rate of return

According to gained results (Table 12.), there are strong belief that the farm will initiate the growth (NPV) in its production base (summarized to zero moment by assumed discount rate of 7%) for 274,747 EUR with the exploitation of planed investment in next five years. In same manner, based on the obtained value for the IRR (20.63%), the investment is considered economically justified, as the value of indicator is higher than assumed discount rate (7%).

Table 12. NPV and IRR

No	Description	Zero moment	Year					Cumulat.
			I	II	III	IV	V	
0	1	2	3	4	5	6	7	8
1.	Net income from economic flow	-560,509.0	140,628.0	150,958.0	150,958.0	146,367.0	472,782.0	1,061,692.0
2.	Discount rate (%)	7.0	7.0	7.0	7.0	7.0	7.0	
3.	Discount factor $(1+i)^{-n}$ while $i =$ discount rate; $n =$ years	1.0	0.935	0.873	0.816	0.763	0.713	
4.	Current value of the net income	-560,509.0	131,428.0	131,852.0	123,227.0	111,663.0	337,087.0	835,257.0
5.	NPV		274,747.0					
6.	Relative NPV		0.49					
7.	IRR		20.63%					

Source: IAE, 2023.

b) Dynamic payback period

According to calculated value for the Dynamic payback period (Table 13.), investment could be considered economically justified as the initial investment will be paid off in 4.18 years, or 4 years and 2.22 months, what is shorter than the utilization period of the investment, or the usual period of credit line expiration.

Table 13. Dynamic payback period (in EUR)

Years	Current net incomes from economic flow	Cumulative net incomes
0	-560,509.00	-560,509.00
I	131,428.00	-429,081.00
II	131,852.00	-297,229.00
III	123,227.00	-174,002.00
IV	111,663.00	-62,339.00
V	337,087.00	274,747.00

Source: IAE, 2023.

Conclusion

At the current global scene, where the agriculture is among the economy sectors which are particularly under the strong pressure of economic and climate trends, sustainability of small farmers is especially endangered. In these circumstances, creating the value added and additional incomes is highly important for them, while the food processing could occur as very welcomed alternative. In livestock growing, in line to increased demand, one of processing possibilities could be the production of cheese, in this case specifically full-fat cow cheese.

Right decision towards the investment in milk processing into the full-fat cow cheese (purchasing the basic herd of heifers, as well as the building and equipping the production and processing facilities) requires adequate investment analysis. According to gained values for the static and dynamic evaluation indicators, there is strong belief that the planned investment is considered economically justified. Specifically, making the positive investment decision could be based on:

- a) Values of static indicators, i.e. Total output-total input ratio (1.54, gained in fifth year of project implementation), Net profit margin (31.75%, gained in fifth year of project implementation), Accounting rate of return (17.17%, gained in fifth year of project implementation) and Simple payback period (3 years and 9.67 months).
- b) Values of dynamic indicators, i.e. Net present value (274,747 EUR), Internal rate of return (20.63%), and Dynamic payback period (4 years and 2.22 months).

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