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Economic Efficiency of Investment in Facilities and Equipment for Grains Storing

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Abstract. *Serbia disposes with strong tradition in crop production, followed by significant natural resources and favorable climate conditions. Despite the good results in grain production, farms are in general economically so weak to possess and use the storing facilities, while they sell the products immediately after the harvest. After reconsidering the lack of storing facilities and consequences it affects, strategic strivings in strengthening of farm competitiveness initiate in previous period public support turned to building of storage capacities and purchase of necessary equipment.*

In paper was presented the assessment (by the use of dynamic and static methods) of economic effectiveness of investment in storing capacities, i.e. silos, showing that this investment (supported by public incentives) could represent the economically justified business decision for certain farms turned to crop, specifically grains production.

Key words: grain storing facilities, investment, economic assessment, MatLab, Serbia.

Introduction

Generally, Serbia is agrarian country (Jelocnik, Ivolga, 2012), that is mostly covered with rural areas (Bogdanov et al., 2008). Disposing with favorable natural (soil and water) potentials and climatic conditions (Dragovic, 2012), as well as experienced and skillful human capital (Zubovic et al., 2009), Serbia could organize exceptionally good crop production. Producing annually in average almost 7 M t of corn and over the 2.5 M t of wheat and similar cereals (oat, barley, rye, triticale, etc.), it represents one of the leading grains (including legumes too) producer and exporter within the Europe (Udovicki et al., 2018). Grains are mainly produced and used in human and animal nutrition, as raw, or as processed products (Glamočlija et al., 2018). Besides, they are used in other sectors of industry as are pharmacy, cosmetics, or light chemistry (Stevanović et al., 2012), construction (Kulshreshtha et al., 2017) and biofuel production (Mojović et al., 2009), etc.

In grain production small family farms dominate (Tagarakis et al., 2018). Grains are mostly selling directly after the harvest (Zakić et al., 2014), while some quantities are stored in various types of storing capacities, while delaying the selling moment in some future moment (Novkovic, Mutavdzic, 2009).

As storing capacities usually appear concrete, steel or wooden silos, grain tanks, storage cells, warehouses, barns, etc. (Jakšić et al., 2012; Jovičić et al., 2014; Djuric, 2014). Besides some exceptions at large agro-enterprises, available storing capacities are characterized by limited size of capacities, outdated facilities, obsolete equipment for grains manipulation, inadequate elements of physical infrastructure (access roads, water or electricity supply), etc. (Ionel, 2005; Zelenović et al., 2018). Regarding the agricultural products, Serbia generally lacks the capacities towards produced quantities.

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Some estimations from 2012 show that Serbia has available storage capacities for almost 4.5 million t of agro-products, whit real shortage is around 5.5 million t of storing capacities. Specifically, at that time there were almost 5,700 silos, while around 400 of them were with large capacity. Also, there were over the 10,500 drying kilns and over the 2,150 cold storages (Stanojević et al., 2017).

In line to mentioned, one of measures within the strategic approach to strengthening of farm competitiveness at national level recognized the building of missing capacities for grain storing (Kovacevic et al., 2021; Atanasijević, Danon, 2014; Birovljev et al., 2013). Last several years there are adequate public support for this purpose throughout the IPARD or national funds (Zekić et al., 2016; Paraušić, Kovačević, 2015). Unfortunately, farmers are still not sufficiently encouraged to use the offered public support and invest in storing capacities.

In line to previously mentioned, the main goal of paper is to present the assessment of economic effectiveness of investment in storing capacities for grains (silos), by the use of the MatLab software package.

Methodology

Methodological framework considers the use of general methods for assessment of economic efficiency of investment (static and dynamic methods, and methods for assessment under conditions of uncertainty), (Jeločnik, Subić, 2020; Subić et al., 2020; Subić et al., 2017a). As in some previous research (Subić, Jeločnik, 2020; Subić et al., 2017b) the evaluation was done by the use of the MatLab software package.

Assessment analysis considers certain assumptions, as the model observes just 10 years, what overlaps the usual duration of credit used for that purposes (in case if farm uses besides the public support the credit line but not its own assets). Built storing facilities (silos) could be used for 40 years, while the purchased equipment could be used for 10 years (main arguments for determing the value of depreciation). Used calculative interest rate is in line with their current values at the national capital market, and values 5%.

Used data are obtained through the in-depth interview with the director of the selected cooperative that plan to invest in storing capacities supported by public incentives. All prices of purchased material, equipment, labor, and production input and output relay to those one active in 2022. All data are presented in MatLab designed graphs and tables, while all values are in EUR.

Results with Discussion

Agricultural cooperative is located in Jabuka settlement (South Banat District). It is mainly involved in production and repurchase of crop products (grains, legumes and oilseeds). Currently, cooperative has indoor floor storage with capacity of 3.000 t, as well as outdoor storage with capacity of 1.000 t. Besides, cooperative has dryer for crops (required in storing of crops of higher humidity than allowed).

In order to enlarge current storing capacities, and to start to offer storing services to third persons, cooperative plans to invest in new storing capacities (5 silos with individual capacity of 1,500 t of grain) and equipment that will be used for grains (Table 1.). All equipment and tools will be purchased at the national market from the local distributors, including the construction and installation.

Table 1. Investment in fixed assets (in EUR)

No.	Element	Value	VAT (20%)	Total value
I	**Equipment**	**337.735,00**	**67.547,00**	**405.282,00**
1.	Silos' equipment	337.735,00	67.547,00	405.282,00
II	**Storing capacities and other**	**500.095,00**	**34.920,00**	**535.015,00**
1.	Installation of silos (local labor)	196.450,00	0,00	196.450,00
2.	Dryer "Lalika 15" (drying capacity of corn grains 15 $^{t/h}$ from 20 to 14% moisture)	152.000,00	30.400,00	182.400,00
3.	Substructure for grain purifier (capacity 60 t/h)	22.600,00	4.520,00	27.120,00
4.	Installation of silos' equipment (local labor)	67.545,00	0,00	67.545,00
5.	Underground work and foundation building (local labor)	61.500,00	0,00	61.500,00
Total (I+II)		**837.830,00**	**102.467,00**	**940.297,00**

Source: IAE, 2022.

Total investment amounts over the 940 thousand EUR and has following structure (Table 2.). Within the investment slightly higher sum is needed for storing capacities. Specificity of storing activity in practice does not require permanent working capital.

Table 2. Structure of total investment (in EUR)

No.	Element	Total investment	Share in total investment (%)
I	**Fixed assets**	**940.297,00**	**100,00**
1.	Equipment	405.282,00	43,10
2.	Storing capacities and other	535.015,00	56,90
II	**Permanent working capital**	**0,00**	**0,00**
Total (I+II)		**940.297,00**	**100,00**

Source: IAE, 2022.

Intention of cooperative management is to apply for public support grant (incentives of the Ministry of Agriculture) in order to finance the 50% of total investment. Rest will be financed by own financial assets (Table 3.).

Table 3. Sources of financing (in EUR)

No.	Element	Total investment	Share in total investment (%)
I	**Own assets (50%)**	**470.148,50**	**50,00**
1.	Fixed assets	470.148,50	50,00
2.	Permanent working capital	0,00	0,00
II	**Other sources (public grant), (50%)**	**470.148,50**	**50,00**
1.	Fixed assets	470.148,50	50,00
Total (I+II)		**940.297,00**	**100,00**

Source: IAE, 2022.

As in wider area there are no free storing capacities for grans, while there is many interested farmers in their use, intention of cooperative management is to rent the newly established facilities and equipment. Facilities are usually renting on annual basis (contracted renting), so on that way, cooperative will reach certain incomes that will be initially in function of investment repayment and later in enlargement of cooperative earnings from offered services to third persons (Table 4.)

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Table 4. Total incomes formation (in EUR)

No.	Products and services	UM	Years																	
			I			II			III			IV			V			VI-X		
			Price per UM	Quantity Per UM*	Total	Price per UM	Quantity Per UM*	Total	Price per UM	Quantity Per UM*	Total	Price per UM	Quantity Per UM*	Total	Price per UM	Quantity Per UM*	Total	Price per UM	Quantity Per UM*	Total
0	1	2	3	4	5=3x4	6	7	8=6x7	9	10	11=9x10	12	13	14=12x13	15	16	17=15x16	15	16	17=15x16
1.	Storing services	t	1,45	90.000	130.500	1,45	90.000	130.500	1,45	90.000	130.500	1,45	90.000	130.500	1,45	90.000	130.500	1,45	90.000	130.500
2.	Incentives - Grant**	EUR	418.915	1,00	418.915	0,00	1,00	0,00	0,00	1,00	0,00	0,00	1,00	0,00	0,00	1,00	0,00	0,00	1,00	0,00
Total					**549.415**			**130.500**			**130.500**			**130.500**			**130.500**			**130.500**

Source: IAE, 2022.

Note: * Five silos with individual capacity of 1.500 t for 12 months of storing. ** Without VAT.

Table 5. Total costs of storing (annually), (in EUR)

No.	Element	Years									
		I	II	III	IV	V	VI	VII	VIII	IX	X
I	**Material costs**	**10.228,65**	**10.228,65**	**10.228,65**	**11.251,52**	**11.251,52**	**11.251,52**	**11.251,52**	**11.251,52**	**11.251,52**	**11.251,52**
1.	Energy	10.228,65	10.228,65	10.228,65	10.228,65	10.228,65	10.228,65	10.228,65	10.228,65	10.228,65	10.228,65
2.	Other material costs	0,00	0,00	0,00	1.022,87	1.022,87	1.022,87	1.022,87	1.022,87	1.022,87	1.022,87
II	**Immaterial costs**	**53.939,34**	**53.939,34**	**53.939,34**	**53.939,34**	**53.939,34**	**53.939,34**	**53.939,34**	**53.939,34**	**53.939,34**	**53.939,34**
1.	Depreciation	37.573,50	37.573,50	37.573,50	37.573,50	37.573,50	37.573,50	37.573,50	37.573,50	37.573,50	37.573,50
2.	Labor	15.342,98	15.342,98	15.342,98	15.342,98	15.342,98	15.342,98	15.342,98	15.342,98	15.342,98	15.342,98
3.	Other immaterial costs	1.022,87	1.022,87	1.022,87	1.022,87	1.022,87	1.022,87	1.022,87	1.022,87	1.022,87	1.022,87
Total (I+II)		**64.168,00**	**64.168,00**	**64.168,00**	**65.190,86**	**65.190,86**	**65.190,86**	**65.190,86**	**65.190,86**	**65.190,86**	**65.190,86**

Source: IAE, 2022.

Table 6. Economic flow (in EUR)

No.	Element	Zero moment*	Years									
			I	II	III	IV	V	VI	VII	VIII	IX	X
I	**Total revenues (1+2)**	**0,00**	**549.415,00**	**130.500,00**	**130.500,00**	**130.500,00**	**130.500,00**	**130.500,00**	**130.500,00**	**130.500,00**	**130.500,00**	**261.450,00**
1.	Total incomes	0,00	549.415,00	130.500,00	130.500,00	130.500,00	130.500,00	130.500,00	130.500,00	130.500,00	130.500,00	130.500,00
2.	Salvage value	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	130.950,00
	2.1. Fixed assets	0,00										130.950,00
	2.2. PWC	0,00										0,00
II	**Total expenditures (3+4)**	**837.830,00**	**99.381,55**	**36.544,30**	**36.544,30**	**37.413,73**	**37.413,73**	**37.413,73**	**37.413,73**	**37.413,73**	**37.413,73**	**37.413,73**
3.	Total investment	837.830,00										
	3.1. In fixed assets	837.830,00										
	3.2. In PWC	0,00										
4.	Costs without depreciation	0,00	26.594,50	26.594,50	26.594,50	27.617,36	27.617,36	27.617,36	27.617,36	27.617,36	27.617,36	27.617,36
5.	Income tax	0,00	72.787,05	9.949,80	9.949,80	9.796,37	9.796,37	9.796,37	9.796,37	9.796,37	9.796,37	9.796,37
III	**Net Cash Flow (I-II)**	**-837.830,00**	**450.033,45**	**93.955,70**	**93.955,70**	**93.086,27**	**93.086,27**	**93.086,27**	**93.086,27**	**93.086,27**	**93.086,27**	**224.036,27**

Source: IAE, 2022.

Note: * As investor (cooperative) has the right on VAT exemption, values are presented without VAT.

Annual operation of storing activities by third person require certain costs. Observing the structure of required operation costs, it could be seen that immaterial costs dominate, primarily related to required sum of depreciation (Table 5). Used energy mainly involves electricity for equipment functioning, lightening, heating, aeration, etc. Other material costs involve costs of facility and equipment maintaining and small repairs (firs three years there are no these costs as the equipment and facilities are subjected to legally guaranteed warranty). Labor involves one fully employed person on the activities of maintaining and using the installed equipment and storing facilities for grains (mainly wheat and corn).

In later steps, assessment analysis of investment and determination of static and dynamic indicators requires forming of cash and economic flows). Cash flow is not presented, but it indicates that investment use is liquid during the entire observed period. From year to year, values of net cash flow from economic flow (Table 6.) are pretty much unified, while first and last observed years are much higher related to awarded public grant in first year and amount of salvage value of depreciated investment in the last observed year.

Now there are all elements necessary for development of indicators of investment assessment. Better visibility and interpretation of gained results are enabled by the use of MatLab software package (Pictures 1-6.). Firs two pictures (Picture 1. and 2.) represent the introductory screens after starting the MatLab application for certain business plan development. They enable easy navigation of user within the tools for establishing the desired or requested economic indicators towards the assessed business idea.

Picture 1. Introductory screen

As it could be seen (Picture 1.), in any moment user could access the graphics (Graphic Display button) derived from assessment, if he needs adequate visibility of gained indicators in process of decision making. Also, it could approach to main info related to idea of business plan (Business Plan button), or just to skip to main static and dynamic indicators of investment assessment (Static and Dynamic Indicators button). In any moment user could print the needed parts or entire established business plan.

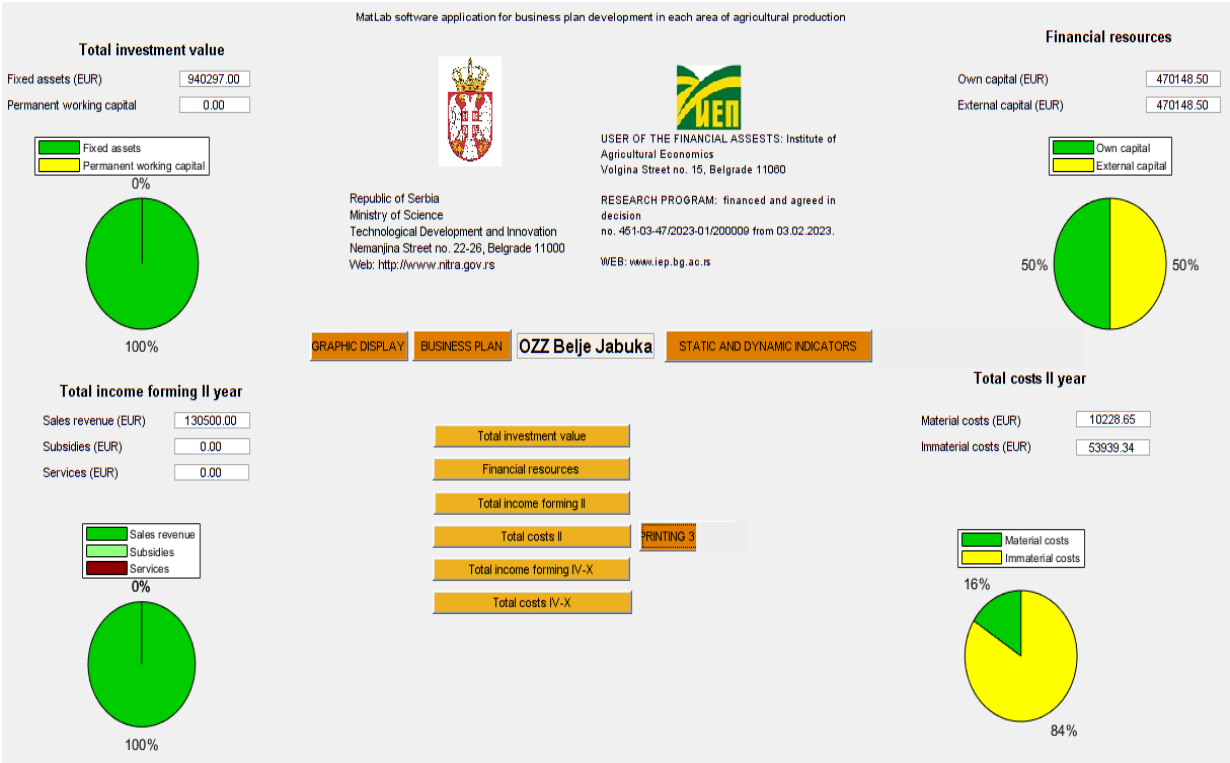
Picture 2. Introductory screen - continuation

Approaching to main business plan info (Picture 2.), user have possibility to separately consider some segments of investment assessment, such are structure of total value of investment (including the fixed assets and PWC), structure of required financial assets required for investment financing (including internal and external assets), segment towards the forming of incomes and costs that derive from investment exploitation (for all or some specific year of investment exploitation).

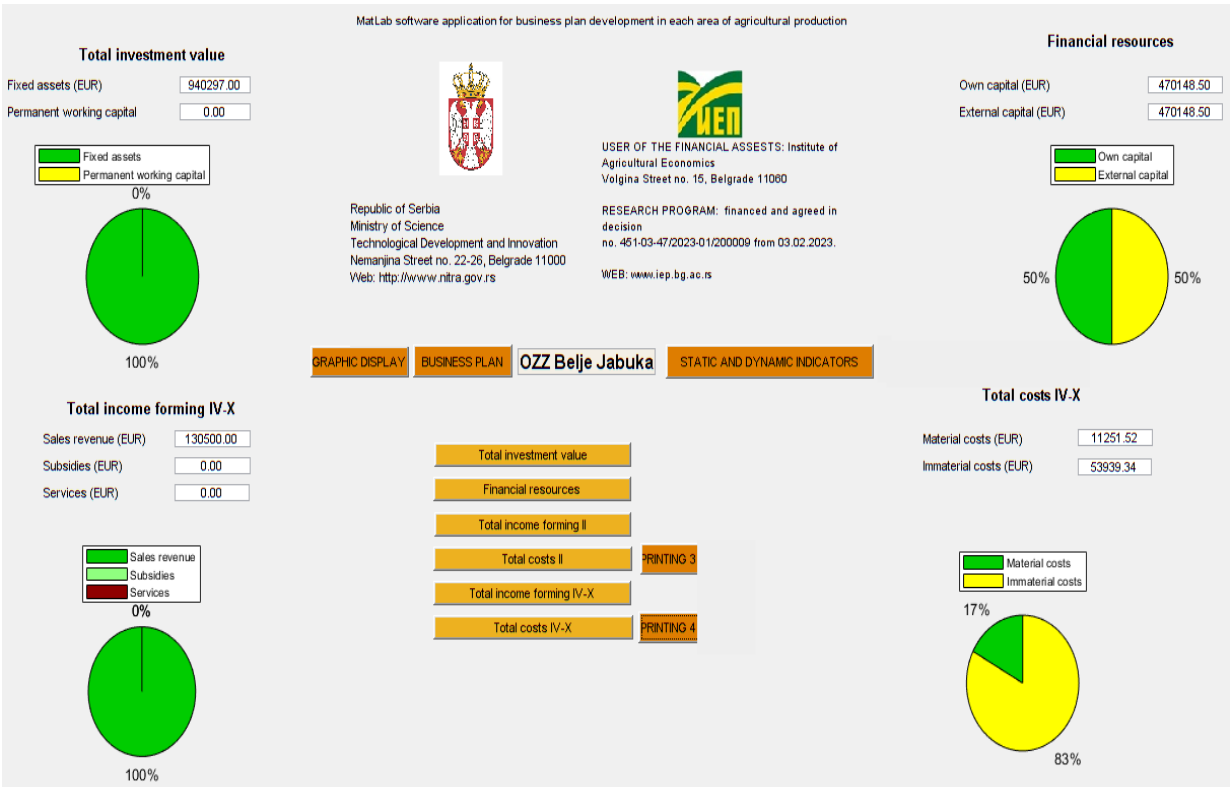
Approaching to formation of total incomes in second year of investment life cycle (Picture 3.), there could be visible information linked to total investment value, value of income formed in second year, used financial resources for investment and derived costs in second year of investment use. By the purpose, the first year of investment use is avoided, as initial year is burdened with public grand and does not provide realistic strength of assessed business idea.

Same is visible on Picture 4. for the period from fourth (this year is considered as the year of full investment exploitation) to tenth year of investment exploitation. As in previous case, in any moment certain screen or its part could be printed and make ready for decision making process (underlying the screens are data from the Excel sheets, that could be sometimes confusing for short decision-making meetings, while MatLab screens make an easy overview of relevant information required for adequate business decision).

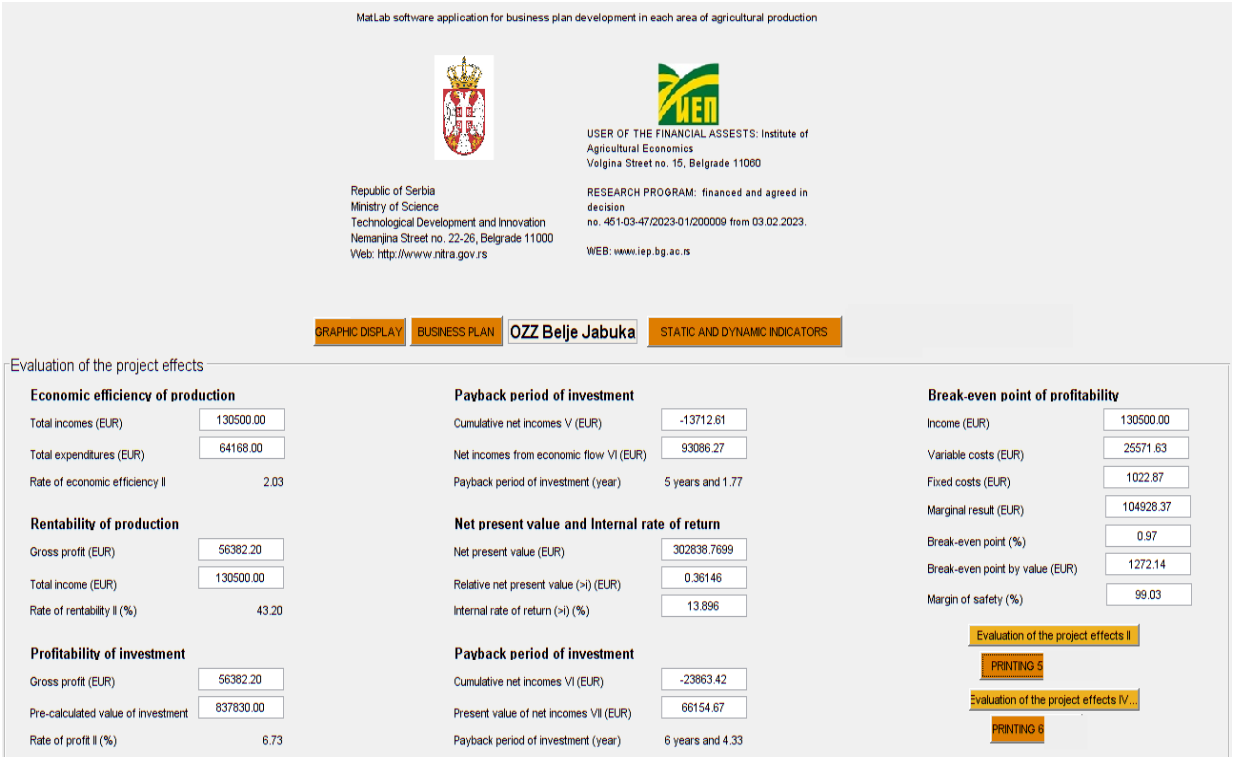
On pictures 5. and 6. are presented the static and dynamic assessment indicators, as well as indicators derived from the analysis of investment use under the uncertainty. Basic difference between these two screens is in values of static indicators, while the dynamic one is the same.



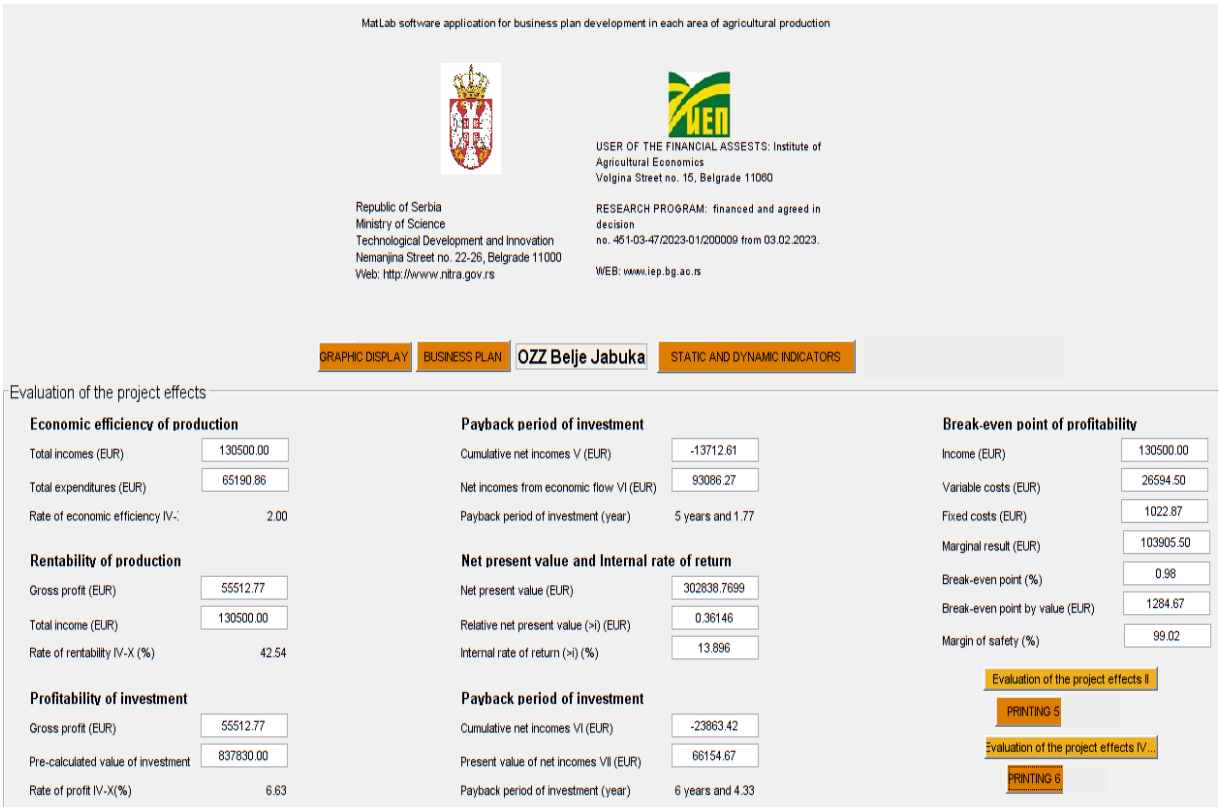
Picture 3. Formation of total income in II year



Picture 4. Formation of total income IV-X year



Picture 5. Value of investment assessment indicators (according to II year)



Picture 6. Value of investment assessment indicators (according to IV-X year)

Coming from the values of gained static and dynamic indicators, as the indicators for the investment assessment under uncertainty, it could be concluded that the proposed business idea (investment in facilities and equipment for grains storing) could be considered as economically justified. Besides, in circumstances of lack of storing facilities at national level, this could be also socially justified decision. We want to underline again that look to MatLab screens could facilitate decision making process towards the use of conservative Excel sheets, having in mind that contemporary business environment requires quick but relevant decision making.

Conclusions

Regionally observed, Serbia is a prominent grain (cereals, legumes and oilseeds) producer. Despite favorable natural and climate preconditions, one of limitation that jeopardize full competitiveness of grain production at national level is a lack of adequate storing capacities. There are certain public measures that financially support implementation of storing facilities and equipment. In article is economically considered one business idea focused to mention segment of production logistic. According to gained values of indicators of assessing the economic efficiency of investment (static, dynamic and under uncertainty), by cooperative proposed business idea could be considered economically justified.

All values are displayed in MatLab software package, possibly adequate tool in decision making process, as it provides essential economic information derived from investment analysis in format that could facilitates decision making process. In this research, there are derived next indicators' values:

a) Among static indicators (values linked to fourth year of investment exploitation – use of full capacity) there are gained next values: Rate of economic efficiency (2,03) is higher than 1, showing that obtained incomes during the investment use are above made costs. Value for indicator of Rentability of Production is 42,54, that is higher than assumed price of capital at national market (5%). Value for indicator of Profitability of Investment is 6,63%, meaning that during the investment use is covered the price of sources of financing (5%) and above that made certain earnings. Static Payback Period is 5 years and 1,77 months.

b) Among dynamic indicators it could be underlined that investment in ten years period could enable to investor increase in gained profit (in line to 5% discount rate calculated to zero moment) in value of 302.838,77 EUR (Net Present Value). Investment could be assumed profitable as the Internal Rate of Return is above discount rate (13,9% > 5,0%). Dynamic Payback Period is 6 years and 4,33 months.

c) Related to part of analysis turned to investment use under uncertainty, in years of investment exploitation in full capacity the volume of services must not fall below 0,98%, while gained incomes from services have not be under 1.284,67 EUR. Allowed fall of service's volume could be maximally 99,02%.

Further research could be turned to assessment of investment economic effectiveness in case that there is no public support, or in case that cooperative use the external financial assets for co-financing. General suggestion is that competent ministry should go further with supporting of this kind of measure, while it could additionally support weak farmers or cooperatives with covering part of interest payed to commercial banks in case they do not have enough amount of own assets.

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