

ECONOMIC EFFECTS OF THE THERMAL WATER USE IN VEGETABLE PRODUCTION ON THE TERRITORY OF CENTRAL DANUBE REGION¹

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Summary

Investments in agricultural production due to modernization of production process, is one of the basic factors for agriculture and rural areas development generally, as well as the entire economy. In the existing business conditions, when domestic agriculture meets alarming problems in primary production sphere (as: work productivity, insufficient number of work places, low efficiency of instruments of labour etc.), increase of investments size can significantly affect competitiveness improvement, as on domestic, as well as on foreign market.

The investment in building the exploitation wells, out of which will get thermal water, which will serve for irrigation and heating of a glasshouse for production of early and late vegetables out of a season, represents the significant modernization of agricultural production. Such form of investment can be a good example, aiming to improve the production process and increase of income on a family agricultural husbandry.

Key words: *Investment, vegetable production, building well, thermal water, glass house.*

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Introduction

The middle Danube area encircles two biggest towns in the area of the Republic of Serbia, Belgrade and Novi Sad, besides this area comprises also the towns Pancevo and Smederevo and the municipalities along the river Danube: Beocin, Irig, Sremski Karlovci, Indjija, Ruma, Pecinci and Stara Pazova.

The agricultural land area, of around 540 thousand hectares, as this area is large, favourable land and climatic conditions for agricultural development, and besides also large population, as well as the market vicinity, represent a great starting point for development of intensive agricultural production.

As it was noted by some authors, family agricultural husbandries are usually dealing with vegetable production on small surfaces, by application of intensive way of production (Subić, Jeločnik, 2013).

In regard to the market vicinity and a number of populations, the middle Danube area is especially favourable for development of vegetable production (with special focus to vegetable production in protected space). As one of the conditions for development of such form of production, states sufficient amount of water for irrigation. For this reason, but also owing to a fact that this investment will provide, on one hand, heating of a glass house with thermal water, and on the other hand, out-of-a-season production of early and late vegetables, in the paper was made an evaluation of effects for building the exploitation wells in the middle Danube area in the Republic of Serbia (i.e. on the area of the city of Belgrade in the suburb named Vinca).

According to Massé (1959) the investment represents abandoning the existing and sure satisfaction of needs, which can be provided by available incomes and savings, in exchange for future expectations, which base exactly on the investment object, i.e. fixed capital.

Some domestic authors' cites (Andrić et al., 2005) that investments represent resources investment, primarily financial sources in purchasing necessary means of production with long-term use, aiming to use them in the production process, i.e. in a company's business.

According to Subić et al. (2006) in most of cases, the investments provide raising a technical level of agricultural production, through investments in new fixed assets, meant for development or modernization, with better technical-production characteristics. This represents one of the ways for introduction of scientific-technical progress in agriculture, through which ensures economic growth and higher work productivity.

With the investments in building the well will provide increase of the current enterprise yield and better utilization of already existing labour, as well as the production modernization.

Since the water management projects are capital intensive, they should ensure efficient use of land and waters, in order to make these projects justified. Economic analysis and evaluation of these projects should identify and involve all interests and costs in the project (Jovanović, 2000).

Opposite to instruments of labour in other business fields, the basic characteristic of land origins from a fact that it cannot spend, but, on the contrary, its structure permanently improves through the investments materialized in reclamation works (the most efficient are surely the investments in building an irrigation system). On this basis, there is a possibility for almost constant growth of agricultural production, year in and year out, without any enlargement of arable land (Subić, 2003).

Validity of the planned investment in fixed and working assets was perceived from technical-technological point of view, commercial point of view and, finally, financial-economic point of view. Accordingly, a final evaluation of the investment validity in fixed and working assets was proven through calculated eliminatory criteria of the project.

Material and working method

Introduction of new technologies and modernization of production, as in agriculture, as well as in the economy as a whole, are of great significance for further development of the existing production, its enlargement and increase of incomes which realize. A reason more for taking as a goal of the paper the evaluation of economic validity for building the exploitation wells, as a form of the production modernization, is also a cite of domestic authors that, without adequate size and thought-out structure of investments cannot be provided a growth of fixed and working assets, increase of work places' number, increase of instruments of labour's efficiency, better work productivity, diversity of production, etc. (Subić, 2007).

In terms of highly variable environment, which carries a high risk of uncertainty and risk, the changes are more dynamic and, as such, require from producers to change the previous method of work, in order to make the production more competitive (Bošnjak, Rodić, 2010). Accordingly, in the paper were used dynamic methods for evaluation of economic effects, in order to determine the validity of the investment in building the exploitation wells on the family farm. As it was already stated, water from newly-constructed wells will serve for grown cultures irrigation and for heating already existing glasshouse in which will produce vegetables out of a season. During this paper's preparation were surveyed development-oriented family agricultural husbandries, not only in the suburb Vinca on the city of Belgrade area, but also on wider region of the middle Danube area, aimed to collect as many necessary data and a comparative analysis of their validity.

Research results and discussion

The investment refers to building the exploitation wells in the family agricultural husbandry (deepness 287 m and 165 m), as well as providing necessary working assets for undisturbed realization of the planned size of production and the vegetable products assortment. By its character, the investment is reconstruction and modernization of the existing facility. The husbandry already uses well water from two private wells, which quality is satisfying, from chemical, mechanical and micro-biological point of view. This investments should provide, besides water for irrigation, also heating of the existing facility (with thermal water), and in

that way to provide the production of vegetable cultures out-of-a-season. The production has been based on growing the most profitable thermophilic vegetables which implies, first of all, growing cucumbers and tomato. With out-of-a-season vegetable production, the husbandry will make significantly higher incomes, in regard that prices of vegetables, especially cucumbers and tomato, are significantly higher in regard to the prices of seasonal vegetables. The vicinity of the biggest towns' markets in the middle Danube area (more concrete, Belgrade and Novi Sad) represents a pre-condition for safe placement and favourable prices of vegetable produced in the glasshouse.

In accordance to the intended investment, it has been followed by next elements:

- High accumulation,
- Safe placement,
- Opening perspectives for future investments.

The total investments are 231,000 EUR, of which investments in fixed assets are 207,000 EUR and 24,000 EUR of investments in working assets (Table 1). In the structure of the total investments, new investments realize a share of 20.8%, while entered assets participate with 79.2%.

Table 1. Total investments (000 EUR)

No.	Description	Entered assets	New investments	Total investments	% of share	
					Entered in the total investments	New in the total investments
I	Fixed assets	798.48	207.0	1,005.48	79.41	20.59
1.	Land	47.13	-	47.13	-	-
2.	Building facility	645.76	207.0	852.76	-	-
3.	Equipment	100.74	-	100.74	-	-
4.	Orchards	4.85	-	4.85	-	-
II	Working assets	83.15	24.0	107.15	77.60	22.40
TOTAL		881.63	231.0	1,112.63	79.24	20.76

Source: Family agricultural husbandry (Tomislav Simonovic – Vinca).

Investments in fixed assets comprise building two exploitation wells, with deepness of 287 m and 165 m and of total value of 207.000 euro (Table 2).

Table 2. Investments in fixed assets (000 EUR)

No.	Name of fixed assets (equipment/herd/plantation)	Pcs.	Price per pcs. without VAT	Value with VAT
1.	Well 165 m	1	72.8	87.36
2.	Well 287 m	1	99.7	119.64
TOTAL			172.5	207.00

Source: Family agricultural husbandry (Tomislav Simonovic – Vinca).

Due to lack of equity for purchase of fixed assets, their *financing* is done by borrowed funds, while providing necessary working assets for undisturbed realization of the planned production size and the vegetable products assortment, fund with the equity (Table 3).

Table 3. Funding resources (000 EUR)

No.	Description	Entered assets	New investments	Value	%
1.	Equity	881.63	24.0	905.63	81.4%
1.1.	Fixed assets	798.48		798.48	
1.2.	Working assets	83.15	24.0	107.15	
2.	Borrowed funds	0	207.0	207.0	18.6%
2.1.	Fixed assets		207.0	207.0	
TOTAL		881.63	231.0	1,112.63	100%

Source: Family agricultural husbandry (Tomislav Simonovic – Vinca).

In the total structure of a new investment, funding with borrowed funds participates with 89.6%, while the equity participates with 10.4%.

In the glasshouse was planned the production of early cucumber and late tomato. Planting cucumbers was planned in the first half of February, and first picking of cucumbers was expected in the beginning of April and was planned to last for three months. The average cucumber production per m² was projected to 20 kg, which was implying the total production of 190,000 kg of cucumbers. Planned average price of early cucumbers would amount one euro (Table 4).

The production of late tomato in the total area of the glasshouse (9,500 m²), due to production of 18 kg/m², was planned on the level of 171,000 kg of tomato. Planting was planned from the 1st September, and first tomato picking was expected for the 1st October and was expected to last for three months. The planned average price of tomato would be 0.85 EUR.

Except cucumber and tomato production in the glasshouse in husbandry also produces potato. Besides, the husbandry deals with fruit production (i.e. it has plantations of cherry, peach and apricot), which also participate in the total income forming in the husbandry.

Table 4. Forming total income (EUR)

No.	Description of products/services	U.M.	PROJECT DURATION														
			1			2			3			4			5		
			Price per u.m.	Annual quantity in u.m.	Total income (3x4) 000 EUR	Price per u.m.	Annual quantity in u.m.	Total income (3x4) 000 EUR	Price per u.m.	Annual quantity in u.m.	Total income (3x4) 000 EUR	Price per u.m.	Annual quantity in u.m.	Total income (3x4) 000 EUR	Price per u.m.	Annual quantity in u.m.	Total income (3x4) 000 EUR
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	Cucumber	kg	1.00	190.000	190.0	1.00	190.000	190.0	1.00	190.000	190.0	1.00	190.000	190.0	1.00	190.000	190.0
2	Tomato	kg	0.85	171.000	145.3	0.85	171.000	145.3	0.85	171.000	145.3	0.85	171.000	145.3	0.85	171.000	145.3
3	Potato	kg	0.23	600.000	138.0	0.23	600.000	138.0	0.23	600.000	138.0	0.23	600.000	138.0	0.23	600.000	138.0
4	Cherries	kg	1.41	10.000	14.1	1.41	10.000	14.1	1.41	10.000	14.1	1.41	10.000	14.1	1.41	10.000	14.1
5	Peaches	kg	0.50	6.000	3.0	0.50	6.000	3.0	0.50	6.000	3.0	0.50	6.000	3.0	0.50	6.000	3.0
6	Apricots	kg	0.50	9.000	4.5	0.50	9.000	4.5	0.50	9.000	4.5	0.50	9.000	4.5	0.50	9.000	4.5
7	TOTAL				494.9			494.9			494.9			494.9			494.9

Source: Family agricultural husbandry (Tomislav Simonovic – Vinca).

The depreciation period for wells, which are built by the investment, is 20 years, i.e. annual depreciation rate for new investments in fixed assets is 5%, in a way that annual depreciation amount in all years of investment use and the project duration is equal and amounts 10.35 thousand EUR (Table 5).

Table 5. Depreciation (000 EUR)

Description	Purchase value	Depreciation rate	Years of the project					Non-depreciation value
			1	2	3	4	5	
Well, new	207.0	5.0%	10.35	10.35	10.35	10.35	10.35	155.3
Depreciation for new investments	207.0	5.0%	10.35	10.35	10.35	10.35	10.35	155.3

Source: Family agricultural husbandry (Tomislav Simonovic – Vinca).

In *material costs* structure, the most important item is raw material and materials, which share is 47.2%, then follow other material costs, fuel and lubricants. While participation of other costs is under 5% and is not of greater significance while forming material costs (Table 6).

As the most significant items in *non-material costs* appear costs of salaries (which share is 32.5%) and depreciation costs (with share of 28.8%).

Table 6. Total costs (000 EUR)

Ordinal number	Elements	Project duration				
		1	2	3	4	5
I	Material costs					
1	-raw material and materials	58.9	58.9	58.9	58.9	58.9
2	-fuel	16.8	16.8	16.8	16.8	16.8
3	-electrical energy	4.0	4.0	4.0	4.0	4.0
4	-lubricants	0.4	0.4	0.4	0.4	0.4
5	-other material costs	44.6	44.6	44.6	44.6	44.6
TOTAL I		124.8	124.8	124.8	124.8	124.8
II	Non-material costs					
1	Costs of salaries	93.1	93.1	93.1	93.1	93.1
2	Costs of daily wages, business trips and specialized trainings	2.1	2.1	2.1	2.1	2.1
3	Costs of production services	29.8	29.8	29.8	29.8	29.8
4	Costs of depreciation	82.6	82.6	82.6	82.6	82.6
5	Costs of non-production services	56.7	56.7	56.7	56.7	56.7
6	Financial expenditures (interest on loan)	22.0	20.3	15.4	10.1	4.1
TOTAL II		286.4	284.6	279.8	274.4	268.4
TOTAL		411.1	409.4	404.6	399.2	393.2

Source: Family agricultural husbandry (Tomislav Simonovic – Vinca).

In the *total costs* structure is dominant a share of non-material costs (cca. 70%), while the material costs are less represented (cca. 30%).

The profit and loss account of the husbandry's business without the project and with the project, during the project implementation, is shown in the Table 7. On the other hand, the project's income statement, i.e. the new investments, is shown in the Table 8.

Table 7. Income statement (000 EUR)

No.	Elements	Project duration					
		Profit and loss account without the project	1	2	3	4	5
I	TOTAL INCOME:	373.0	494.9	494.9	494.9	494.9	494.9
II	TOTAL EXPENDITURES (1+4)	322.0	411.1	409.4	404.6	399.2	393.2
1	OPERATING EXPENDITURES (2+3)	322.0	389.1	389.1	389.1	389.1	389.1
2	-material costs	145.9	124.8	124.8	124.8	124.8	124.8
3	-non-material costs (without interest)	176.1	264.3	264.3	264.3	264.3	264.3
4	-financial expenditures	0	22	20.3	15.4	10.0	4.0
5	GROSS PROFIT (I - II)	51.0	83.8	85.5	90.3	95.7	101.7
6	TAX	5.1	8.38	8.55	9.03	9.57	10.17
7	NET PROFIT (5 - 6)	45.9	75.42	76.95	81.27	86.13	91.53

Source: Family agricultural husbandry (Tomislav Simonovic – Vinca).

Table 8. Income statement of the project (000 EUR)

No.	Elements	Years of the project				
		1	2	3	4	5
I	TOTAL INCOME:	121.9	121.9	121.9	121.9	121.9
II	TOTAL EXPENDITURES: (1+4)	89.1	87.4	82.5	77.1	71.1
1	OPERATING EXPENDITURES (2+3)	67.1	67.1	67.1	67.1	67.1
2	-material costs	-21.1	-21.1	-21.1	-21.1	-21.1
3	-non-material costs (without interest)	88.2	88.2	88.2	88.2	88.2
4	-financial expenditures (interest on loan)	22.0	20.3	15.4	10.0	4.0
5	GROSS PROFIT (I - II)	32.8	34.5	39.4	44.8	50.8
6	TAX	3.28	3.45	3.94	4.48	5.08
7	Difference in net profit	29.52	31.05	35.46	40.32	45.72

Source: Family agricultural husbandry (Tomislav Simonovic – Vinca).

The breakeven point, according to Subic (2010), shows critical and minimal values of production size and income from sale, under which the investment project is no longer justified.

Table 9. Breakeven point (000 EUR)

No.	Description	Years of the project				
		1	2	3	4	5
1	Total income from sold products	121.9	121.9	121.9	121.9	121.9
2	Variable costs	10.7	10.7	10.7	10.7	10.7
3	Fixed costs total	78.5	76.8	71.9	66.5	60.5
4	Contribution margin (incomes-variable costs)	111.2	111.2	111.2	111.2	111.2
5	Breakeven point (fixed costs/ contribution) x100	70.59	69.06	64.66	59.80	54.41

Source: Family agricultural husbandry (Tomislav Simonovic – Vinca).

According to the breakeven point can see that, the highest risk of the investments in building the wells, is in the first year of the project and then the production size must not fall under 70.59% (Table 9).

The cash flow of the project for building the exploitation wells in the husbandry and provision of necessary working assets for undisturbed realization of the planned production size and the assortment of vegetable products, result with a positive amount of net cash revenues (Table 10).

Table 10. Cash flow of the project (000 EUR)

No.	Elements	0 year	Years of the project					
			1	2	3	4	5	
I	TOTAL CASH REVENUES	231.0	121.9	121.9	121.9	121.9	121.9	301.2
1.	Total income		121.9	121.9	121.9	121.9	121.9	121.9
2.	Funding sources	231.0						
	-equity	24.0						
	-borrowed	207.0						
3.	Salvage value							179.3
	-fixed assets							155.3
	-working assets							24.0
II	TOTAL EXPENDITURES		82.1	104.1	109.5	115.5	122.1	
1.	Investments	231.0						
	-in fixed assets	207.0						
	-in working assets	24.0						
2.	Operating expenditures (without interest and depreciation)		56.8	56.8	56.8	56.8	56.8	56.8
3.	Profit tax		3.28	3.45	3.94	4.48	5.08	
4.	Interest		22.0	43.9	48.8	54.2	60.2	
III	NET CASH REVENUES	-	39.8	17.8	12.4	6.4	179.1	

Source: Family agricultural husbandry (Tomislav Simonovic – Vinca).

Net cash revenues of the project's economic flow for building the wells realize positive values, except in the beginning of the investment when makes investment of the entire needed amount (Table 11).

Table 11. Economic flow of the project (000 EUR)

No.	Elements	0 years	Years of the project				
			1	2	3	4	5
I	TOTAL CASH REVENUES	0	121.9	121.9	121.9	121.9	301.2
1.	Total income		121.9	121.9	121.9	121.9	121.9
2.	Salvage value						179.3
	-fixed assets						155.3
	-working assets						24.0
II	TOTAL EXPENDITURES	231.0	82.1	80.5	76.1	71.3	65.9
1.	Investments	231.0					
	-in fixed assets	207.0					
	-in working assets	24.0					
2.	Operating expenditures (without depreciation)		78.8	77.1	72.2	66.8	60.8
3.	Profit tax		3.28	3.45	3.94	4.48	5.08
III	NET CASH REVENUES (I-II)	-231.0	39.8	41.4	45.8	50.6	235.3

Source: Family agricultural husbandry (Tomislav Simonovic – Vinca).

In accordance to the net cash revenues got from net economic flow and their discounting, i.e. further analyses which make according to their values, was determined that the investment was economically justified.

The net present value of the project is higher than zero (i.e. it amounts 54.46), which means that the investment in building the wells for irrigation and heating of a glasshouse is economically justified (Table 12).

Table 12. Net present value of the investment project (000 EUR)

No.	Elements	“0”	Years of the project					Cumulative
			1	2	3	4	5	
0	1	2	3	4	5	6	7	9
1.	Net cash revenues from economic flow	-231.0	39.8	41.4	45.8	50.6	235.3	412.9
2.	Discount rate (%)		10	10	10	10	10	
3.	Discount factor		0.909091	0.826446	0.751315	0.683013	0.620921	
4.	Present value of net cash revenues		36.18	34.21	34.41	34.56	146.1	285.46
5.	Net present value of the project	$285.46 - -231.0 = 54.46$						
6.	Relative net present value							

Source: Economic flow of the project

In accordance to an indicator value of relative net present value can be seen that, during the project’s duration, was covered a price of funding sources and that was realized a specific value through this value.

Internal rate of return was calculated according to trial rates. As domestic authors cite (Ivanović, 2013), the internal rate of return shows a real rate on return on investment, i.e. the internal rate of return is the one discount rate where the net present value of investment is equal to zero.

The internal rate of return, for building the exploitation wells on the husbandry, is 20.06%. The investment is profitable regarding that the discount rate (10.00%) is lower than the stated investment's internal rate of return (20.06%).

Pay-back period of investments, is between four and five years. We have the following investment's recovery term $T = 4.63$ years = 4 years and 7.56 months. The investment is economically justified, while the return term is shorter than 5 years, i.e. than the project duration.

Conclusion

Evaluation of the investment in building the exploitation wells in an individual producer's husbandry, who already owns the glasshouse, was made by dynamic methods for investments evaluation. For funding the fixed assets were used borrowed funds, and as a source of working assets were used the equity. Duration of the project is five years, as well as the borrowed funds from commercial banks.

By the investments evaluation were got the following results:

- Net present value of the investment is 54.46 and the investment is economically justified regarding that the net current value is higher than zero,
- Internal rate of return, i.e. the internal rate of interest in the husbandry is 20.06%. In regard to the discount rate (10.00%) is lower than the internal rate of return of the stated investment, the investment is profitable and economically justified,
- Funds invested in building the exploitation wells in the husbandry and providing necessary working assets for undisturbed realization of the planned production size and the assortment of vegetable products will return in four years and two months. As duration of the project is 5 years, the investment is economically justified according to this indicator, too.

With dynamic methods for investments evaluation were determined that investment, which perform in building the examining – exploitation wells in the husbandry and providing necessary working assets for undisturbed realization of the planned production size and the assortment of vegetable products, is economically justified.

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EKONOMSKI EFEKTI UPOTREBE TERMALNE VODE U PROIZVODNJI POVRĆA NA PODRUČJU SREDNJEG PODUNAVLJA⁵

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Apstrakt

Investiciona ulaganja u poljoprivrednu proizvodnju radi modernizacije procesa proizvodnje, jedan je od osnovnih faktora razvoja poljoprivrede i ruralnih područja, kao i privrede u celini. U trenutnim uslovima poslovanja, kada se domaći agrar susreće sa alarmantnim problemima u sferi primarne proizvodnje (kao što su: produktivnost rada; nedovoljan broj radnih mesta; nizak učinak sredstava za rad i sl.), povećanje obima investicija u značajnoj meri može uticati na jačanje konkurentnosti, kako na domaćem, tako i inostranom tržištu. Investiranje u izradu istražno-eksploatacionih bunara, iz kojih će se dobijati termalna voda koja će služiti za navodnjavanje i zagrevanje staklenika za proizvodnju ranog i kasnog povrća van sezone, predstavlja značajnu modernizaciju poljoprivredne proizvodnje. Takav vid ulaganja, može biti dobar primer u cilju unapređenja procesa proizvodnje i povećanje prihoda na porodičnom poljoprivrednom gazdinstvu gazdinstvu.

Ključne reči: *investicije, povrtarska proizvodnja, izgradnja bunara, termalna voda, staklenik*

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- 5 Rad je deo istraživanja na projektu III 46006 - Održiva poljoprivreda i ruralni razvoj u funkciji ostvarivanja strateških ciljeva Republike Srbije u okviru dunavskog regiona, finansiranog od strane Ministarstva prosvete, nauke i tehnološkog razvoja Republike Srbije. Projektni period 2011-2014.
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