



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
<http://ageconsearch.umn.edu>
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*



**UNIVERSITY OF BELGRADE
FACULTY OF AGRICULTURE**



Book of Proceedings

The Seminar

AGRICULTURE AND RURAL DEVELOPMENT - CHALLENGES OF TRANSITION AND INTEGRATION PROCESSES

50th Anniversary

DEPARTMENT OF AGRICULTURAL ECONOMICS



Belgrade-Zemun, 2013.

Book of Proceedings

The Seminar
Agriculture and Rural Development -
Challenges of Transition and Integration Processes

Published by Department of Agricultural Economics,
Faculty of Agriculture, University of
Belgrade

For the Publisher Prof Milica Petrović, dean
Faculty of Agriculture, University of
Belgrade

Edited by Prof Natalija Bogdanov
Prof Simo Stevanović

Prepress Prof Simo Stevanović

Copyright 2013 by authors. All rights reserved.
Readers may make verbatim copies of this
document for non-commercial purposes by any
means, provided that this copyright notice appears
on all such copies.

ISBN: 978-86-7834-181-6

ECONOMIC AND FINANCIAL ANALYSIS OF INVESTMENTS IN RASPBERRY PLANTATIONS¹

Petar Gogić², Sanjin Ivanović³

Summary

Raspberries are one of very important agricultural products of the Republic of Serbia and this production offers a lot of possibilities for employment in rural areas. Therefore, the goal of this paper is to analyze various aspects of economic efficiency and financial feasibility of investments in establishment of raspberry plantations. Models of investments in raspberry plantations are formed using real technological, organizational and economical conditions at rural households. These investment models considered different dynamics of investments in raspberry plantations. Besides, there were assumed various financing conditions for these investments. For evaluation of economic efficiency of the investments are used appropriate capital budgeting methods – net present value, modified internal rate of return and payback period.

The analysis proved that establishment of raspberry plantations is economically efficient for both assumed dynamics of investments. It is economically more acceptable to establish raspberry plantation simultaneously on the entire available surface intended for that purpose, than to do it gradually. It is also determined that investments will be financially feasible if participation of borrowed funds in structure of financial sources is less than 41.07%.

Key words: raspberry plantation, investment models of rural households, capital budgeting methods, financial feasibility of investments

JEL classification: Q14

¹ This paper is the part of research activities on the project No. 179028, financed by Ministry of Education and Science of the Republic of Serbia, titled: Rural Labor Market and Rural Economy of Serbia - Income Diversification as a Tool to Overcome Rural Poverty.

² Petar Gogić, Ph.D., Full Professor, Faculty of Agriculture, Belgrade University, Nemanjina 6, 11080 Zemun, +38111/2615-315, e-mail: petar.gogic@agrif.bg.ac.rs.

³ Sanjin Ivanović, Ph.D., Assistant Professor, Faculty of Agriculture, Belgrade University, Nemanjina 6, 11080 Zemun, +38111/2615-315, e-mail: sanjinivanovic@agrif.bg.ac.rs.

1. Introduction

Raspberry production has great socio-economic significance for the Republic of Serbia. This significance is reflected primarily in the fact that export of fresh and frozen raspberries is important source of foreign currency for Serbia. According to Nikolić et al. (2008), the biggest part of production is frozen, and only small part of raspberries is exported fresh or in some higher level of processing. That fact is not adequate for Serbian economy because it reduces economic effects of raspberry production.

Veljković et al. (2008) stated that the best climatic conditions for raspberries were on the area of Arilje, Valjevo, Ivanjica, Kopaonik, Šabac and Zlatar. In these areas are achieved good yields and high quality fruits.

Due to high demand for human labor raspberry production offers a lot of possibilities for employment. This could significantly contribute to solving socio-economic problems especially in rural areas. Furthermore, raspberry production is market for many industries and their products such as fertilizers, fuel, plant protection means, agricultural machinery etc.

To maintain raspberry production at the same level in the Republic of Serbia (or to increase it) there is need for significant investments in fixed and working assets. On the other hand, there is not enough research regarding economic effects of raspberry production and investments in raspberry plantations in Serbia. Petrović et al. (2004) analyzed raspberry production costs in agro ecological conditions of Arilje in year 2003. Authors determined that high income and profit rate were achieved in this production. Denić et al. (2002) analyzed various aspects of investments in raspberry production with and without irrigation. Amount of investments in raspberry plantations, level of production costs and profit in raspberry production were subject of research conducted by Veljković et al. (2006). Other analysis (Mišić et al., 2004) pointed out that it was necessary to conduct prior research regarding the most important natural and economical conditions. After such research should be determined location of raspberry plantation, cultivar, production technology etc. According to these authors this is the only way to have profitable and long lasting raspberry plantation.

Investments in raspberry plantations as well as investments in all permanent crops are not made in one moment but during longer period. It takes 2 – 3 years to establish raspberry plantation. Afterwards the plantations are used between 10 and 12 years. This is why it is very hard to correct mistakes made in choosing cultivar of raspberry or mistakes in planning purpose of raspberry production. Such mistakes could significantly affect economic and financial effects of raspberry production.

Therefore, the objective of this paper is to examine various aspects of economic efficiency and financial feasibility of investments in raspberry plantations.

2. Materials and methods

The research used a number of methods. Models of investments in raspberry plantations are established having in mind different dynamics of establishment of plantations.

Apart from determination of models (in order to analyze economic effectiveness and financial feasibility of investments) in the research are used the following methods:

- Enterprise budgeting,
- Determination of net cash flows,
- Capital budgeting methods (Net Present Value, Modified Internal Rate of Return, Payback Period).
- Analysis of financial feasibility of investments (it was performed comparing net cash flow with principal and interest payments).

Methods used in the paper are in accordance with subject and goal of the research. These methods provide a lot of information concerning economic efficiency and financial feasibility of investments in raspberry plantations.

Realistic technical and technological data from a family farm located in south Serbia (at the area of Kopaonik) were used to establish investment models.

3. Results and discussion

3.1. Defining investment models for establishment of raspberry plantations

Different models of raspberry plantation establishment are formed for economical and financial evaluation of investments in raspberry production. These models of investments are defined on the basis of technological and organizational characteristics of one really existing family farm in the Republic of Serbia.

The farmer who plans to establish raspberry plantation possesses in total 6 ha of agricultural land as well as some livestock (cattle, pigs and poultry). The farm is traditionally directed towards fruit and grapes production, but also produces some wheat, corn and barley. Fruit and grapes products are mostly sold on market, and this is the main source of the income for the farm. On the other hand livestock products are intended for farmhouse consumption.

Farmer possesses equipment necessary for fruit and grapes processing, as well. Three family members work at the farm. Casual paid labor is used when it is needed.

On one hectare farmer has an old vineyard, which has to be cleared. On that area will be established new raspberry plantation. Other agricultural areas will be used in the same way as before. Farmer will invest in raspberry plantation and additional working capital needed for plantation, but it will not be necessary to invest in other additional fixed assets.

Raspberry plantation establishment will last for two years. On the beginning of first year land will be prepared (old vineyard will be cleared, land will be plugged and fertilized etc.) and planting will be done. During two years of establishment period costs of care and protection of young plantation will occur, as well as some other costs. Having in mind that investment period lasts for two years interest will be calculated on invested money and added to total investment. In such a way total investment will increase while economic efficiency of investment decreases.

Evaluation of economic efficiency of investments will be performed using various models of raspberry plantation establishment. Models are formed on the basis of realistic organizational and economical data regarding raspberry production. Modes of investments in raspberry plantations differ in the dynamics of plantation establishment:

Model I – raspberry plantation is established (after the vineyard is cleared) at the same time on the entire surface (1 ha).

Model II – Raspberry plantation is established (after the vineyard is cleared) gradually in two phases. The first phase on the surface of 0.5 ha, and the second phase on the remaining 0.5 ha starting next year.

For both models are assumed the same amounts of investments per hectare (for growing of raspberry plantation and additional working capital). For Model I cash revenue in last year of economic life of plantation consists of two elements – the first one is income from raspberry production and the second one is salvage value (which is value of additional working capital). Salvage value of Model II contains not only value of additional working capital but also terminal value of plantation which is not depreciated.

Discount rate of 8% is used to determine net present value of the investments and payback period (the same rate is used to calculate interest costs during period when plantation was established). Discount rate is determined as weighted average cost of capital (investments are financed 50% by equity and 50% by borrowed capital - loan). Equity opportunity cost is estimated at 4.5% while interest rate for loan is 11.5%.

3.2. Economic efficiency of investments in raspberry plantations

Starting from investments needed to establish raspberry plantations, dynamics of investments, cash revenues and cash expenses, net cash flow is determined for both models of plantation establishment (table 1). It is assumed that economic life of raspberry plantation is 10 years.

Table 1: Net cash flows for investments in raspberry plantations (EUR)

Model I				
Year	Cash revenues	Investments	Cash expenses	Net cash flow
1	2	3	4	5[2-(3+4)]
0	0	9,335.00		-9,335.00
1	0	6,036.80		-6,036.80
2	0	6,953.79		-6,953.79
3	10,200.00		6,277.00	3,923.00
4	12,000.00		7,168.00	4,832.00
5	12,000.00		7,168.00	4,832.00
6	12,000.00		7,168.00	4,832.00
7	12,000.00		7,168.00	4,832.00
8	12,000.00		7,168.00	4,832.00
9	12,000.00		7,168.00	4,832.00
10	12,000.00		7,168.00	4,832.00
11	10,200.00		6,277.00	3,923.00
12	14,511.09		5,683.00	8,828.09
Total	118,911.09	22,325.59	68,413.00	28,172.50
Model II				
0	0	4,667.50		-4,667.50
1	0	7,685.90		-7,685.90
2	0	6,495.29		-6,495.29
3	5,100.00	3,476.89	3,138.50	-1,515.39
4	11,100.00		6,722.50	4,377.50
5	12,000.00		7,168.00	4,832.00
6	12,000.00		7,168.00	4,832.00
7	12,000.00		7,168.00	4,832.00
8	12,000.00		7,168.00	4,832.00
9	12,000.00		7,168.00	4,832.00
10	12,000.00		7,168.00	4,832.00
11	11,100.00		6,722.50	4,377.50
12	15,951.82		5,980.00	9,971.03
Total	115,251.80	22,325.59	65,571.50	27,354.72

Source: authors' calculations

Evaluation of economic efficiency of investments in both models of raspberry growing was analyzed using capital budgeting methods (table 2).

Table 2: Capital budgeting indicators for the investments in raspberry plantations

Indicators of economic efficiency of investments	Model I	Model II
1. Net Present Value	7,386.66 EUR > 0	6,918.19 EUR > 0
2. Modified Internal Rate of Return	10.76% > 8%	10.89% > 8%
3. Payback period	7.02 < 10 years	7.52 < 10 years

Source: authors' calculations

According to the results of capital budgeting methods investments in establishment of raspberry plantations would be economically efficient for both models, because net present value is greater than zero, modified internal rate of return is greater than discount rate and payback period is shorter than the economic life of plantation.

When choosing more favorable economic model for plantation establishment, for investors would be more acceptable Model I, because its net present value is greater than the net present value of the Model II, and payback period is shorter for Model I than for Model II. Although Model II has higher modified internal rate of return it is more appropriate for an investor to choose investment Model I because it has greater net present value (Model I will increase investors' wealth more than Model II).

3.3. Financial feasibility of investments in raspberry plantations

Apart from determination of economic effectiveness of investments in raspberry production it is necessary to evaluate financial feasibility of the investments.

Financial sources for investments are usually limited and require certain financial obligation such as principal and interest payments. Therefore it is necessary to determine if the cash flows will be sufficient to make the required principal and interest payments (loan payments). This problem should be deliberated to determine which model is more acceptable for investors. Therefore, it is necessary to analyze financial feasibility for different dynamics of investments in raspberry plantations, for different structure of financial sources and different interest rates. Therefore annuity (loan payment) has been compared to net cash flow for various combinations of financial sources (variants of financing).

Evaluation of financial feasibility of investments in raspberry plantations will be done for following variants of financing:

Variant A: It is assumed that investments in raspberry plantation are financed only with equity funds (100%). Principal and interest payments will not be calculated. It is possible only if investor possesses sufficient equity funds to make a purchase. The drawback of this approach is that interest on equity funds is not calculated (as opportunity cost).

Variant B: Investments are financed 100% with equity funds, but principal and interest are calculated. Interest rate for equity funds is 4.5% (this is estimated equity opportunity cost). Equity funds could be used for 10 years, which is equal to economic life of the projects.

Variant C: Investments are financed 100% by loan. Interest rate for loan is 11.5% and loan repayment period is 5 years.

Variant D: Structure of financial sources for the investments in raspberry plantation is 50% equity funds and 50% loan. Principal and interest payments are calculated on borrowed funds. Loan payments will not be calculated on equity funds, which is usually the case in practice.

Variant E: Investments are financed 50% with equity funds and 50% with borrowed funds. Unlike the version D, here are calculated principal and interest payments not only for borrowed funds, but also for equity funds (as an opportunity cost).

Table 3: Difference between the annual net cash flow and loan payments for Model I (EUR)

Year	Variant of financing				
	A	B	C	D	E
0	0	0	0	0	0
1	0	0	0	0	0
2	0	0	0	0	0
3	3,923.00	1,101.52	-2,193.80	864.60	-546.14
4	4,832.00	2,010.52	-1,284.80	1,773.60	362.86
5	4,832.00	2,010.52	-1,284.80	1,773.60	362.86
6	4,832.00	2,010.52	-1,284.80	1,773.60	362.86
7	4,832.00	2,010.52	-1,284.80	1,773.60	362.86
8	4,832.00	2,010.52	4,832.00	4,832.00	3,421.26
9	4,832.00	2,010.52	4,832.00	4,832.00	3,421.26
10	4,832.00	2,010.52	4,832.00	4,832.00	3,421.26
11	3,923.00	1,101.52	3,923.00	3,923.00	2,512.26
12	8,828.09	6,006.61	8,828.09	8,828.09	7,417.35
Σ	50,498.09	22,283.29	19,914.09	35,206.09	21,090.09

Source: authors' calculations

For all assumed variants of financing and for both models in table 3 and 4 are determined differences between net cash flows and loan payments (principal and interest payments).

Table 4: Difference between the annual net cash flow and loan payments for Model II (EUR)

Year	Variant of financing				
	A	B	C	D	E
0	0	0	0	0	0
1	0	0	0	0	0
2	0	0	0	0	0
3	-1,515.39	550.77	-1,096.90	432.31	-273.07
4	4,377.50	1,556.02	-1,739.30	1,319.10	-97.65
5	4,832.00	2,010.52	-1,284.80	1,773.60	362.85
6	4,832.00	2,010.52	-1,284.80	1,773.60	362.85
7	4,832.00	2,010.52	-1,284.80	1,773.60	362.85
8	4,832.00	2,010.52	1,773.60	3,302.80	1,892.06
9	4,832.00	2,010.52	4,832.00	4,832.00	3,421.26
10	4,832.00	2,010.52	4,832.00	4,832.00	3,421.26
11	4,377.50	1,556.02	4,377.50	4,377.50	2,966.76
12	9,971.83	7,150.35	9,971.83	9,971.83	8,561.09
Σ	46,203.44	22,876.28	19,096.33	34,388.34	20,986.26

Source: authors' calculations

Financing of investments according to variant C is not financially feasible for both models because cash deficit will occur. In this case the investments for a number of years will not generate sufficient net cash flow to make the loan payments.

For both models the biggest positive difference between net cash flow and loan payments (cash surplus) is occurred if investment is financed only with equity funds (variant A), because for this variant principal and interest payments are not calculated.

The sum of all cash surpluses (and deficits) is in almost all variants of financing higher for Model I, which means that Model I is more financially feasible. Only for financing variant B sum of cash surpluses is higher for Model II.

Within financial feasibility analysis special attention is paid to variants D and E. This is because variant D is usually used in practice, while variant E is important from theoretical point of view. According to variant of financing D both investment models are financially feasible but more favorable is Model I because it has higher cumulative cash surplus (35.206.09 EUR > 34.388.34 EUR).

In financing variant E both models have problems with liquidity. Model I has cash deficit in third year of the project, while Model II has cash deficit in third and fourth year of the project. Therefore, Model I is considered to be more financially acceptable. Financial feasibility of both models in this variant of financing is possible in all years only if interest rate for equity is not higher than 4.07%. In this case difference between net cash flows and required principal and interest payments (for equity and loan) would be positive during entire period.

On the other hand, if interest rate for equity funds cannot be lower than 4.5% than (in order to provide financial feasibility of investments during entire observed period) financial structure should be changed - the higher acceptable participation of loan for both models is 41.07% (participation of equity would be 58,93%).

4. Conclusion

It is necessary to increase level of raspberry production in the Republic of Serbia, or at least to keep it at the current level. Therefore, it is needed to invest in re-planting of existing raspberry plantations or establishment of new plantations, which requires significant investments. For that reason there is a need to perform economic and financial evaluation of investments in establishment of raspberry plantations. This has been done on models which have represented different dynamics of investments. Using net present value, modified internal rate of return and payback period it was determined that for investors would be the best to raise raspberry plantations at the same time on entire area (not in the two phases), provided that it is possible to acquire necessary financial funds (equity or borrowed funds).

If principal payment and interest are calculated for equity assets the highest possible participation of borrowed funds in structure of financial sources for both models is 41.07%. If participation of loan in financial structure is 50% (and loan payments are calculated for equity funds), investments will be financially feasible only if interest rate for equity assets is not higher than 4.07%.

References

1. Denić, M., Milivojević, J., Bošnjaković, G., Nedić, M., Fotirić, M. and Radosavljević, D. (2002). *Profitabilnost gajenja maline u uslovima fertirigacije*. Jugoslovensko voćarstvo, 36(137-138), 45-57.
2. Mišić, P., Tešović, Ž., Stanisavljević, M., Milutinović, M., Nikolić, M. and Milenković, S. (2004). *Malina u Srbiji i Crnoj Gori - prošlost, sadašnjost i budućnost*. Jugoslovensko voćarstvo, 38(145-146), 5-22.

3. Nikolić, M., Ivanović, M., Milenković, S., Milivojević, J. and Milutinović, M. (2008). *The State and Prospects of Raspberry Production in Serbia*. Acta Horticulturae, 777, 243-249.
4. Petrović, S. (2004). *Ekonomski aspekti proizvodnje maline u Republici Srbiji*. Jugoslovensko voćarstvo, Vol. 38, br. 145-146 (1/2), 49-58.
5. Veljković, B., Glišić, I. and Leposavić, A. (2008). *Analiza uslova proizvodnje u kojima uspeva malina u Srbiji*. Acta agriculturae Serbica, 13(25), 9-16.
6. Veljković, B., Petrović, S., Leposavić, A. and Glišić, I. (2006). *Profitabilnost proizvodnje maline na području Srbije*. Ekonomika poljoprivrede, 53(4), 1013-1022.