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INVESTMENT MANAGEMENT OF PLANTING CHERRY PLANTATIONS

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Abstract

The branch of cherry production is a sector of perspective for the Republic of Moldova, it is part of the stone fruit sector and a component part of high value agriculture. The article provides a comprehensive analysis of the current state of development of the cherry branch. An important role in the article is assigned to the analysis of investment budgets for the establishment of cherry orchards with the application of different technologies, the analysis of the economic efficiency of cherry cultivation with the application of different cultivation technologies. The authors prepared revenue and expenditure budgets for the fruiting period and compared the economic results and the level of profitability. Based on the research and analyzes carried out, strategic conclusions were formulated for the sustainable development of the cherry branch necessary for the implementation by the actors of the value chains in the sector and especially for the agricultural producers.

Key words**:** *budget profitability, sales income, cost of sales, gross profit*

INTRODUCTION

Modern agriculture must be based on the implementation of scientific innovations in the field and increasing the competitiveness of agri-food products. In the case of horticulture, this is crucial and important for farmers, as it ensures the sustainability of agricultural business and the guaranteed integration of their products into value chains.

The cherry industry is a promising one for the high value sector and in general for agriculture. This conclusion is based on the following considerations: in recent years has seen a constant development and modernization of production technologies; cherries are among the first fruits to enjoy increased demand among end consumers and there is a growing market. In this context, the information presented in this article aims to correctly inform farmers when implementing investments in the cherry production branch, by analyzing the investment needs for planting cherry orchards with the application of different cultivation technologies and arguing economic efficiency in selecting business. Horticulture is the priority directions of agriculture in the Republic of Moldova meant to provide value-added products, with a considerable share in exports and generating job creation for the population of the villages.

MATERIALS AND METHODS

The sources of documentation used in drafting the article were varied and included statistical data collected from the National Bureau of Statistics, Ministry of Agriculture, Regional Development and Environment, sectoral information and studies, and operational information collected from cherry farmers.

The analysis of investment management and economic efficiency in the cherry branch was made possible by drawing up budgets based on two distinctive periods of cherry cultivation, namely: (1) the investment budget (the period from planting to fruiting) and (2) the budget income and expenses (fruiting period). The method of budgeting cherry cultivation technologies and their comparison allowed the creation of an information support for agricultural entrepreneurs interested in

cherry cultivation and ensuring the adoption of qualitative decisions when implementing investment projects.

RESULTS AND DISCUSSIONS

The strategic direction of horticulture consists in the efficient exploitation of plantations with high productivity potential, the deforestation of those plantations that have been exhausted and their consistent replacement with new ones with modern assortment and advanced technologies, which ensure early fruiting, high, constant and quality productivity with competitive assortment on the internal and external market. The evolution of the areas and the volume of production in the horticultural sector of the country, as well as in the cherry branch is presented in Table 1.

According to the data from Table 1, in 2019 compared to 2010, we can observe an increase in all surface and production indicators, both overall on the horticultural sector and in total on the stone fruit subsector.

Table 1. Area and volume of production in the horticultural sector of the Republic of Moldova, years 2010-2019

Indicators	Unit	Years										2019/2010, %
		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
Horticultural sector - total												
Surface - total	mii ha	209.29	209.24	203.80	204.80	258.89	278.66	250.10	243.07	225.40	228.20	109.0
Fruit surface	mii ha	183.89	180.84	175.30	169.80	223.59	250.96	223.59	218.50	198.30	200.08	108.8
Production volume	**thousand t**	**1,072**	**1,230**	**1,006**	**842**	**1,059**	**905**	**1,279**	**1,363**	**1,481**	**1,451**	**135.3**
Average harvest	t / ha	5.83	6.80	5.74	4.96	4.74	3.60	5.72	5.72	7.47	7.25	124.4
Stone fruits												
Surface - total	mii ha	39.30	40.00	40.40	41.10	36.20	42.03	42.16	42.52	43.20	42.81	108.9
Fruit surface	mii ha	30.40	31.00	32.00	27.60	26.20	35.30	35.79	36.20	36.20	35.93	118.2
Production volume	**thousand t**	**91.52**	**84.80**	**79.30**	**91.80**	**102.30**	**153.80**	**153.26**	**143.00**	**143.00**	**167.57**	**183.1**
Average harvest	t / ha	2.90	2.63	2.41	3.33	3.54	4.26	4.18	3.77	3.77	4.66	160.8
Cherries												
Surface - total	mii ha	3.20	3.20	3.20	3.40	3.50	4.07	4.17	4.25	4.70	5.10	159.4
Fruit surface	mii ha	2.20	2.40	2.40	2.30	2.50	3.12	3.20	3.50	3.60	3.90	177.3
Production volume	**thousand t**	**7.13**	**8.50**	**8.60**	**6.50**	**7.60**	**12.36**	**7.60**	**10.60**	**11.90**	**12.00**	**168.3**
Average harvest	t / ha	3.15	3.44	3.54	2.77	3.08	3.87	2.32	2.95	3.31	3.08	97.7

Source: National Bureau of Statistics [3, 5].

Analyzing the evolution of the cherry sector development in the Republic of Moldova, we can see that the global volume of cherry production increased by 68.3% in 2019 compared to 2010, due to the modernization of technologies, increased intensity and increase in fruit surface by 77.3%, due to the state subsidy policies as well.

Next we propose for analysis the economic information on the investments made in planting one hectare of cherry orchard with the application of three cultivation technologies: regular (with the use of grafted planting material on the generative rootstock - Wild cherry or Frank cherry), intensive (vegetative rootstock - Maxima 14) and super-intensive (vegetative rootstock - Gisela 6 and 5 with planting material of different ages and biological categories, which ensures an earlier fruit bearing, high productivity and fruit quality). An important condition for creating a cherry orchard is the proper selection of land, and namely: it can be set up where there is a minimum of 1,500 hours of sunshine, 36ºC global temperature, 9-11.5ºC average temperature and over 600 mm of rainfall; the soil is permeable to avoid puddles of water; excluded from planting are excessively wet soils which lack drainage, as well as those with the groundwater level below 1.5 m; soils should have a neutral, slightly acidic or slightly alkaline reaction; the soil should be exposed to the sun with southern exposure S-E or S-W, avoiding northern exposures.

Table 2 presents a comparison of the differences between the cherry cultivation technologies, on which analysis were done and which the entrepreneur must know in order to select the most optimal and efficient option for launching his own business.

Table 2. The level of technical indices in cherry plantations cultivated by different technologies

#	Specification of cherry cultivation technology	Operating period, years			Investment recovery term, years	Harvest per hectare, t / ha	Planting scheme, m	Number of trees per hectare, trees
		Total, years	inclusive					
			Vegetation period	Fruitful period				
1	Wild cherry (frank cherry)	26	6	20	**8.05**	**7.10**	5 X 4	500
2	Cherry Maxima 14	20	5	15	**6.52**	**10.56**	5 X 2.5	800
3	Gisela 6 (4x1.9 "Ordinary" biological category)	17	5	12	**8.98**	**17.37**	4 X 1.9	1,316
4	Gisela 6 (4x1.9 biological category "Certificate")	17	4	13	**7.79**	**18.68**	4 X 1.9	1,316
5	Gisela 5 (4x1.6 "Ordinary" biological category)	17	5	12	**7.86**	**21.88**	4 X 1.6	1,563
6	Gisela 5 (4x1.6 biological category "Certificate")	17	4	13	**6.84**	**23.44**	4 X 1.6	1,563

Source: Calculations of the group of authors [1, 2, 4, 6, 7, 8, 9, 10].

The investment budget for planting cherry orchards is a financial instrument that forecasts the expenses and the need for financial resources over a certain period of time. The presented calculations can serve as a basis for farmers, for economic argumentation in selecting the optimal option for planting orchards. Table 3 summarizes the information on the investment budgets for the establishment and care of cherry orchards until fruiting, with the application of three variants of fruit production technologies: regular (wild cherry rootstock, frank cherry), intensive (Maxima 14 rootstock) and super-intensive (rootstock Gisela 5 or 6).

Table 3. Total investment in planting and care of cherry plantations until fruiting

#	Specification of cherry cultivation technology	Necessary investment, lei / ha	The cost of investments on items from planting to fruiting, lei / ha											Possible subsidies to be obtained, lei / ha	Return on investment to total subsidy,%
			total	drip irrigation system	Support - trellis + project	combined net	Grassing between rows	Land acquisition	the cost of the investment according to the technology						
									means of production	mechanized services	manual operations	other costs and fees	unexpected expenses		
1	Wild cherry (frank cherry)	**137,324**	137,324		2,500			42,000	44,001	17,850	21,875	660	8,439	**15,000**	**10.9%**
2	Cherry Maxima 14	**232,478**	232,478	55,000	2,500			42,000	74,952	19,654	25,733	550	12,089	**42,500**	**18.3%**
3	Gisela 6 (4x1.9 "Ordinary" biological category)	**1,543,135**	1,543,135	65,000	254,500	840,000	85,000	42,000	172,292	26,108	34,355	550	23,330	**390,000**	**25.3%**
4	Gisela 6 (4x1.9 biological category "Certificate")	**1,647,522**	1,647,522	65,000	254,500	840,000	85,000	42,000	278,304	22,054	27,404	440	32,820	**390,000**	**23.7%**
5	Gisela 5 (4x1.6 "Ordinary" biological category)	**1,587,626**	1,587,626	72,000	254,500	840,000	85,000	42,000	200,398	27,705	38,734	550	26,739	**393,500**	**24.8%**
6	Gisela 5 (4x1.6 biological category "Certificate")	**1,713,618**	1,713,618	72,000	254,500	840,000	85,000	42,000	327,120	23,651	30,714	440	38,193	**393,500**	**23.0%**

Source: Calculations of the group of authors [1, 2, 4, 6, 7, 8, 9, 10].

Thus, we can mention that when planting a hectare of ordinary orchard, the farmer needs approx. 137.3 thousand lei (MDL). For the establishment of 1 ha of intensive orchard, investments will increase by 69.3% (investments are provided for the drip irrigation system) compared to the ordinary orchard, and for 1 ha of super-intensive orchard – by 12.5 times (investments are taken into account for the cost of planting material, higher tree density, drip irrigation system, rain and hail nets) (Table 3).

The intensive and super-intensive technology is the most expensive for the entrepreneur, it requires the largest investments per hectare (but the natural risks are practically diminished). As a result, it allows to obtain the best economic results, quality fruits (fruits are greater than 28 mm in size – they are in demand on export markets), it is recommended for the entrepreneurs who offer competitive advantages to producers. Table 4 summarizes the information on the revenues and expenditures budgets for the care of

cherry orchards which bear fruits with the application of three variants of cultivation technologies.

Table 4. Revenue and expenditure budgets for the care of fructifying cherry plantations

#	Specification of cherry cultivation technology	Sales income, lei / ha	Cost of sales, lei / ha						Profit, lei/ha	Economic profitability,%
			total	inclusive						
				means of production	mechanized services	manual operations	other costs and taxes (including depreciation)	unexpected expenses		
1	Wild cherry (frank cherry)	**113,600**	54,052	6,161	2,191	36,963	**3,823**	4,914	**59,548**	**110.2%**
2	Cherry Maxima 14	**211,200**	85,931	11,030	3,136	46,195	**17,759**	7,812	**125,269**	**145.8%**
3	Gisela 6 (4x1.9 "Ordinary" biological category)	**521,053**	231,438	20,692	5,037	59,465	**125,205**	21,040	**289,615**	**125.1%**
4	Gisela 6 (4x1.9 biological category "Certificate")	**560,526**	228,846	20,692	5,099	58,640	**123,612**	20,804	**331,680**	**144.9%**
5	Gisela 5 (4x1.6 "Ordinary" biological category)	**656,250**	233,035	21,742	5,774	60,241	**123,612**	21,667	**423,215**	**181.6%**
6	Gisela 5 (4x1.6 biological category "Certificate")	**703,125**	238,115	21,742	5,848	60,183	**128,696**	21,647	**465,010**	**195.3%**

Source: Calculations of the group of authors [1, 2, 4, 6, 7, 8, 9, 10].

If we compare the data from table 4 we find out:
(i)The regular technology allows to obtain a gross profit of 59,548 lei/ha;
(ii)The intensive technology allows to obtain a gross profit of 125,269 lei/ha;
(iii)The super-intensive technology allows to obtain a gross profit from 289,615 to 465,010 lei/ha, which is the most advantageous for a modern and sustainable agriculture.
Table 5 presents the economic indices for the cultivation of cherry orchards with the application of three variants of fruit production technologies for the three analyzed technologies.

Table 5. Economic indices in cherry plantations cultivated by different technologies

#	Specification of cherry cultivation technology	Economic calculations per 1 kg of production, lei / kg			Cash flow available annually, lei / ha	Basic indices for the fruiting period of orchard, thousands lei			Cumulative gross profit on average at one year of operation, lei
		Average selling price, lei / kg	Unit cost, lei / kg	Gross margin (commercial addition), lei / kg		Cumulative total costs	Cumulative total sales revenue	Cumulative gross profit (gross margin)	
1	Wild cherry (frank cherry)	16.00	7.61	8.39	63,632	1,173.1	2,412.0	1,238.8	**47,647**
2	Cherry Maxima 14	20.00	8.14	11.86	144,682	1,291.3	3,421.7	2,015.3	**100,764**
3	Gisela 6 (4x1.9 "Ordinary" biological category)	30.00	13.33	**16.67**	**427,219**	2,852.6	7,069.1	4,216.4	**248,026**
4	Gisela 6 (4x1.9 biological category "Certificate")	30.00	12.25	**17.75**	**467,532**	3,049.7	8,138.8	5,089.1	**299,360**
5	Gisela 5 (4x1.6 "Ordinary" biological category)	30.00	10.90	**19.10**	**559,597**	2,934.8	8,816.6	5,881.8	**345,991**
6	Gisela 5 (4x1.6 biological category "Certificate")	30.00	10.16	**19.84**	**606,455**	3,170.3	10,124.4	6,954.2	**409,069**

Source: Calculations of the group of authors [1, 2, 4, 6, 7, 8, 9, 10].

Based on the data from Table 5, we graphically present the size of the main economic indicators for the cultivation of cherry orchards with the application of the three variants of production technologies (Fig.1).
According to the economic calculations presented in Table 5 and Fig. 1, when planting a cherry orchard, specialists recommend entrepreneurs to apply super-intensive cherry cultivation technologies (seedlings grafted on rootstock Gizela 5 or 6), because it allows to obtain the best economic results and guaranteed access to strategic cherry markets. Despite the high profitability of cherry orchards and the high demand for the products obtained from them, the expansion of cherry plantations is conditioned by increased natural risks.

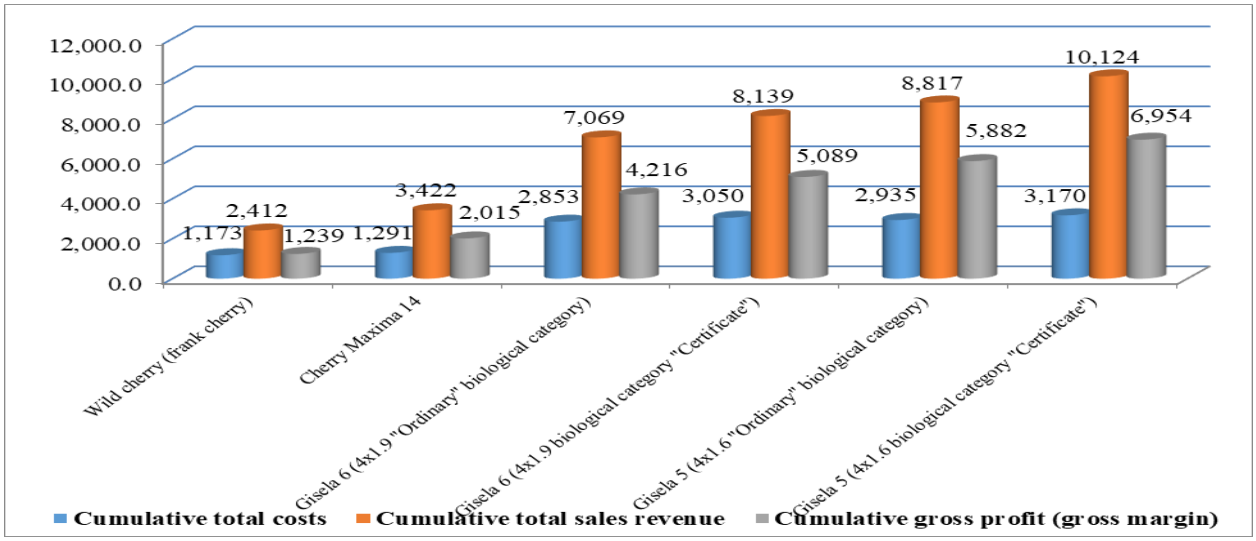

Fig. 1. Economic indicators for cherry cultivation by applying different technologies
Source: Calculations of the group of authors [1, 2, 4, 6, 7, 8, 9, 10].

Table 6 proposes for analysis the economic efficiency of cherry cultivation with the application of different technologies where the advantages and disadvantages of technologies in economic terms can be easily elucidated.

Table 6. The possible economic efficiency to be obtained in cultivation of cherries with the application of different technologies

The main economic indicators	Unit	Analysis of economic efficiency in cherry cultivation					
		Wild cherry (frank cherry)	Cherry Maxima 14	Cherries Gisela 6 (4x1.9; 1316 trees/ha)		Cherries Gisela 5 (4x1.6; 1563 trees/ha)	
				local planting material	import planting material	local planting material	import planting material
Investment budget for the creation of the cherry plantation	**lei**	**137,324**	**232,478**	**1,543,135**	**1,647,522**	**1,587,626**	**1,713,618**
Possible subsidies to be obtained	lei	15,000	42,500	390,000	390,000	393,500	393,500
Sales revenue (turnover)	lei	113,600	211,200	521,053	560,526	656,250	703,125
Sales costs	lei	54,052	85,931	231,438	228,846	233,035	238,115
Annual gross profit	**lei**	**59,548**	**125,269**	**289,615**	**331,680**	**423,215**	**465,010**
Economic profitability (profits obtained at 1 lei of costs)	**%**	**110.2%**	**145.8%**	**125.1%**	**144.9%**	**181.6%**	**195.3%**
Cash flow at the end of the year - availability of money	**lei**	**63,632**	**144,682**	**427,219**	**467,532**	**559,597**	**606,455**
Unit cost	**lei / kg**	**7.61**	**8.14**	**13.33**	**12.25**	**10.90**	**10.16**
Average marketing price	lei / kg	16.00	20.00	30.00	30.00	30.00	30.00
Gross profit (gross margin) of production	**lei / kg**	**8.39**	**11.86**	**16.67**	**17.75**	**19.10**	**19.84**
Investment return term (fruiting years)	ani	2.05	1.52	3.98	3.79	2.86	2.84
Investment return term (years from planting)	**ani**	**8.05**	**6.52**	**8.98**	**7.79**	**7.86**	**6.84**

Source: Calculations of the group of authors [1, 2, 4, 6, 7, 8, 9, 10].

Analyzing the data from the table, we can conclude that super-intensive technologies are clearly superior and are recommended to be implemented by farmers, because they offer the highest results of economic efficiency and a significantly higher profitability compared to the regular and intensive ones.

CONCLUSIONS

Cherries marketing is advantageous for the entrepreneur, as it allows to obtain income from early sales which is very necessary for cash inflows in the flow of the enterprise and for more efficient management of agricultural holdings. Cherry fruits are in great demand with consumers, being among the first fruits and having an advantageous and stable marketing price for the season (in the case of quality fruits and the required assortment range).

The group of authors recommends to farmers the implementation of super-intensive cherry cultivation technologies, and the following aspects are the arguments:

-The super-intensive orchards allow to obtain qualitative cherries (homogeneous by size and quality with a stable harvest every year);

-The management of super-intensive orchards is more efficient due to the small shape of the tree crown (easier dry cutting, tree spraying, cherry harvesting, short harvest time, etc.);
-The high productivity of cherries in super-intensive orchards allows us to have unit production costs ensuring competitiveness, which is extremely important in the competitive fight on regional markets;
-Production factors in super-intensive orchards are used at a high level and can be more easily controlled by humans;
-Super-intensively planted orchards benefit from substantial subsidies;
-The purchase prices of cherries from the open field will be high, because they are among the first fruits, and the super-intensive orchards allow to have a high level of profitability in these conditions.

Practical recommendations for increasing the economic efficiency of cherries cultivation:
-Integrated cherry business demonstrates that the performance of producers can take place through professional and commercial association/cooperation, where the legal framework should facilitate and develop these initiatives through clear and sustainable mechanisms;
-Professional associations should provide an appropriate information circuit for producers and offer operational information on the real situation in the industry and on regional markets;
-Cherry growers recognize the importance of standards. Quality standards are becoming a critical necessity in the context of general traceability requirements, which relate not only to the exigent EU markets but also to other strategic markets.

The final conclusion is the following: the cherry growing sector has increased profitability, but only if the producer implements a super-intensive fruit production technology, which will allow him to produce competitive cherries that will be easily accessible on strategic markets, by cooperating with producers in the formation of industrial batches for export and ensuring stable deliveries for a longer period.

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