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ESTIMATIVE ANALYSIS OF BREAKEVEN POINT FOR BELL PEPPER CROPS IN CONVENTIONAL AND ORGANIC FARMING SYSTEM - FORECAST 2017/2018

NECULA DIANA MARIA¹

Abstract: Bell pepper, either fresh or preserved, is one of the most common vegetables in the Romanian cuisine, being appreciated for its health benefits, which is why its cultivation is extremely widespread throughout the country. The paper addresses scientifically the methods necessary for analyzing the economic efficiency of the pepper crop in the conventional and organic farming system by providing forecasts for the cultivation year 2017/2018. Using specific indicators, result indicators and profitability indicators were estimated production costs, prices and profitability per product unit, estimates that can be used in making decisions about future production cycle.

Keywords: economic efficiency, breakeven point, pepper crops, conventional system, organic system

JEL Classification: O12, Q14, Q57

INTRODUCTION

Bell pepper is a vegetable of origin in Central and South America, being considered one of the oldest plants used in culture. From here it spread to the north, to the US and to the south, to Colombia, Venezuela, Equator, Brazil, Chile, Argentina and Uruguay. In 1493 the pepper was brought to Europe and spread to southern areas (Italy, France) in the 16th century, and to the Balkan Peninsula in the 17th century.

The most well-known, cultivated and consumed species is *Capsicum annuum* due to its high adaptability to the pedoclimatic conditions of the different cultivars and varieties, allowing it to be marketed throughout the year.

In our country, pepper has an important place, with many uses, being used in the preparation of a very wide range of dishes in the canning industry, while some species and varieties of peppers have a special decorative value and can be grown in pots

Due to the multitude of varieties, pepper is particularly important for increasing the consumption of vegetables and ensuring proper nutrition. The high economic value of pepper is also due to the fact that it ensures high incomes for growers by capitalizing on the domestic and foreign markets.

MATERIAL AND METHODS

Cultivation technology for bell pepper in conventional and organic agriculture system was adapted to the existing conditions and resources at Buzau SCDL.

A. Precursor-cultures

	Conventional system	Ecological system
Very good	- alfalfa and clover in the first year after grubbing; - perennial herbs; - annual legumes (peas, beans).	
Good	- root vegetables (carrot, parsley, celery, red beet, etc.); - bulbous vegetables (onion, garlic, leeks)	
Average	- spicy vegetables (cucumbers, courgettes, melons, etc.); - cabbage vegetables (cabbage, cauliflower, etc.)	
Unsuitable	- solanaceae vegetables (tomatoes, peppers, eggplants, potatoes);	

B. Application of fertilizers

	Conventional system	Ecological system
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Organic fertilizers	<table><tr><td>Soil fertility status</td><td colspan="3">T / ha</td></tr><tr><td>Low</td><td colspan="3">40-50</td></tr><tr><td>Average</td><td colspan="3">30-40</td></tr><tr><td>Good</td><td colspan="3">20-30</td></tr><tr><td>High</td><td colspan="3">0-20</td></tr></table>				Soil fertility status	T / ha			Low	40-50			Average	30-40			Good	20-30			High	0-20			
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Chemical fertilizers	<table><tr><td>Soil fertility status</td><td>Phosphorus P₂O₅ kg / ha</td><td>Potassium K₂O kg / ha</td><td>Nitrogen N kg / ha</td></tr><tr><td>Low</td><td>100-140</td><td>105-145</td><td>125-175</td></tr><tr><td>Average</td><td>80-105</td><td>75-100</td><td>80-120</td></tr><tr><td>Good</td><td>60-85</td><td>60-85</td><td>60-80</td></tr><tr><td>High</td><td>0-45</td><td>0-35</td><td>-</td></tr></table>				Soil fertility status	Phosphorus P ₂ O ₅ kg / ha	Potassium K ₂ O kg / ha	Nitrogen N kg / ha	Low	100-140	105-145	125-175	Average	80-105	75-100	80-120	Good	60-85	60-85	60-80	High	0-45	0-35	-	In green technologies no synthetic fertilizers are applied. Instead, organic fertilizers are used, applied during the periods and doses recommended by the scientific research.
					Soil fertility status	Phosphorus P ₂ O ₅ kg / ha	Potassium K ₂ O kg / ha	Nitrogen N kg / ha																	
					Low	100-140	105-145	125-175																	
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					High	0-45	0-35	-																	
Basic fertilizer fertilization with organic / chemical fertilizers is performed with the 55-75 HP tractor in aggregate with the organic / chemical fertilizer machine.																									

C. Soil works

	Conventional system	Ecological system
Works performed in the autumn		
Soil Mobilization (Discharge of previous crops)	<ul style="list-style-type: none">- for the discharging of the previous crop, the shredding of the vegetal remains and the loosening of the soil for leveling.- It is done with the 55-75 HP tractor in the aggregate with the disc harrow and the adjustable harrow.- the period: immediately after the harvesting the previous crop.- Working depth: 7-12 cm.	
Maintenance leveling	<ul style="list-style-type: none">- to ensure optimum conditions for crop irrigation.- it is done with the 55-75 HP tractor unit and the grader.	
Basic fertilization	<ul style="list-style-type: none">- with organic/chemical fertilizers- is done with the 55-75 HP tractor in aggregate with the organic/chemical fertilizer machine.	<ul style="list-style-type: none">- with organic fertilizers- It is done with the tractor 55-75 HP in aggregate with the machine for organic fertilizer.
Depth Plowing (28-30 cm)	<ul style="list-style-type: none">- for loosening soil and incorporating fertilizers- It is done with the 55-75 HP tractor unit, the plug and the starter harrow	
Subsoiling (deep loosening)	<ul style="list-style-type: none">- it is recommended to be done once every 3-4 years, especially on heavy soils.- It is done with the 55-75 HP tractor in the aggregate with the ground loosening machine.	
Works performed in the spring		
Preparing the germinative bed	<ul style="list-style-type: none">- to provide land suitable for planting seedlings- It is run with the 55-75 hp tractor unit and combiner- the period: April, the third decade	
Soil herbicidation	<ul style="list-style-type: none">- is made with authorized substances according to the recommendations of the specialists in the field	
Furrow marking	<ul style="list-style-type: none">- for soil modeling- It is run with the 55-75 HP tractor unit and the furrow machine- working depth: 18-20 cm.- the period: April, the third decade	
Soil modeling	<ul style="list-style-type: none">- to ensure the conditions for planting the seedlings.- It is done with the 55-75 HP tractor unit and the soil modeling machine.- the period: April, the third decade	

D. Establishment of culture

	Conventional system	Ecological system
The period of planting	<ul style="list-style-type: none"> - it is established that the plants are not affected by the late spring bruises (soil temperature reaches 14-15 °Celsius) - the calendar date shall be determined by the climatic conditions of that year. - the first decade of May in warmer areas and the second or even third decade of May in colder areas. 	

Density of plants	- is determined depending on the species: 65-88 000 pl/ha bell peppers, red peppers, 54-75 000 pl / ha peppers, 78-95 000 pl / ha long peppers and 88-140 000 pl / ha chili.
Planting technique	- mechanized with 40-45 HP tractor and planting seedlings at 70-75 cm between rows and 15-20 cm between plants in a row. - manually at 60 cm between rows and 15-20 cm between pl / row.
Depth to be planted	- will be up to the level at which the seedlings were produced. - for seedlings grown in pots, the top level of the pot must be at ground level.

E.Crop maintenance

	Conventional system	Ecological system
General works		
Watering	- after planting, to ensure a uniform and rapid emergence of the crop - it can be done manually (approx. 1L water / pl), on furrows (150-200 m / ha), or dripping (water saving).	
Fill in the voids	- is made with seed of the same age and variety. - 4-5 days after planting (runs manually)	
Phaseal fertilization	- may be associated with phytosanitary treatments. - It is carried out with the 40-45 HP tractor in aggregate with the plant-protection machine	
	During the vegetation, complex chemical fertilizers are recommended. Fertilization can be done together with the pesticide treatments or maintenance culture.	Specific products made in ecological mode are used in doses recommended by the technical research.
Slaughter in vegetation (unless the mulch is used)	- it is advisable to carry out as many times as necessary to maintain a clean, weed-free crop - The working depth is small to protect the root system of plants.	
Irrigation of culture	- it is recommended not to wet a short period of time after planting to foster a deep rooting, and then watering is performed regularly, depending on the precipitation. - dripping is recommended, constantly ensuring the water needs of the plant. - is done from the establishment of the crop until the end of the vegetation period, 1 - 2 times a week, depending on the nebulosity and weather conditions / atmospheric humidity. - 1.5-2 liters of water/plant is administered at a pressure of 1-1.2 atmospheres and during the intensive fruit formation and growth, the doses will increase.	
Herbicides	- is carried out prior to the planting of seedlings, with specific herbicides recommended. - is with the 55-75 HP tractor in aggregate with the sprayer.	
Combating diseases and pests	- the most common diseases: Fusarium disease, fruit spot and blushing, Pustular spot, Root rot, stem rot, fruit rot, gray mold, etc. The pepper has no specific pests, the most common being the Colorado beetle, the fen cricket, the green and red lice of the Solanaceae. - is done with 40-45 HP tractor in aggregate with the plant for phytosanitary treatments	
	Chemical control may be achieved with recommended doses of substances authorized specialists and observing the pause time.	Are used products made under specific ecological technology and recommended doses applied by the technical research field.

F. Harvesting

Conventional system	Ecological system
- harvesting takes place staggered, depending on the maturity of the fruit and according to the destination of the production (fresh consumption, industrialization or export) - are harvested manually, sorted, packaged and transported as quickly as possible to the disposal units.	
Medium production varies depending on the variety or hybrid grown as follows: - 20 - 60 t/ha pepper, bell pepper and long pepper - 8 - 12 t/ha of chili pepper and red pepper	Estimated yields are 25-30% lower than in the conventional system

RESULTS AND DISCUSSIONS

I. The structure and the analysis of the production costs for bell pepper culture in conventional and organic agriculture system - estimates 2017-2018

For the open field cultivation of bell peppers in the conventional system, a production of 40 t / ha was planned, while for those cultivated in the organic system a production of 32 t / ha. Regarding total agro-technical expenditures in case of field cultivation in the conventional system, investments of 65.554 lei / ha are estimated, while for the conventional system the estimates were 5.7% higher. Raw material and materials costs have the largest share of total expenditure total, 70% conventional system and 76% organic system. The share of mechanized works costs was 28% in the conventional system and 22% in the ecological system, of the total estimated agro-technical expenditures.

Table 1: Structure of production costs for the cultivation of bell pepper in a conventional and organic farming system

Culture	Cultivation system	Production (kg / ha)	Total agro-technical expenditure		Mechanized work		Hand works		Materials and materials	
			lei / ha	%	lei / ha	%	lei / ha	%	lei / ha	%
Bell pepper in the field	conventional	40000	65 554	100	1423	2	18257	28	45 874	70
	ecological	32000	69 515	100	1221	2	15337	22	53115	76

Source: Own calculations

II. Analysis of income and expenditure budgets for the cultivation of bell peppers in conventional and organic farming - forecast 2017-2018

- Bell pepper cultivated in a conventional farming system

At an average production of 40 t / ha of bell peppers, a production value of 89,426.5 lei / ha is obtained, and by adding the subsidy of 585 lei / ha, a gross product of 90,011.5 lei / Ha.

Variable costs represent 70.86% of total expenditure per crop, and value inputs with materials and materials account for 78.03% of variable costs. Of the total fixed expenditures representing 21.13% of the expenditures per crop, the highest proportion of 84.09% is occupied by the permanent labor force value.

By deducting the total expenses from the value of the production, the taxable income amounts to 14,904.4 lei / ha, and finally the net income and the net income rate of 12,519.7 lei / ha and 16.8% respectively. The important synthetic indicator of the economic efficiency with which the cultivation of field bell peppers in the conventional field occurs, the production cost of 1,863.1 lei / t, was calculated by reporting the total expenditures to the estimated average production.

In order to ensure the rentability of the crop, it was determined domestic market price of 2235.7 predictable RON / t, calculated by applying a coefficient of 1.2 in the cost of production.

- Bell pepper cultivated in an organic farming system

The achievement of an average yield of 32 t / ha of bell pepper produced a production value of 95,690.9 lei / ha, and by adding the subsidy of 585 lei / ha, a gross product of 96,275.9 lei / ha was reached.

Variable costs account for 76.03% of total expenditure per crop, and value inputs for materials and materials account for 79.32% of variable costs. Fixed expenditures account for 23.96% of total expenditures, the permanent labor consumption value of 80.26% of fixed expenses.

By deducting the total expenses from the value of the production, the taxable income is 15,948.5 lei / ha, and finally a net income of 13,981.7 lei / ha and a net income rate of 16.8%. The synthetic indicator that express the most concludent the expresses the economic efficiency of the pepper crop in the ecological field, the production cost of 2.492 lei / t was obtained by reporting the total expenditures to the average production expected.

The profitability of the crop was achieved by calculating the foreseeable domestic market price of 2,990.3 lei / t, applying a coefficient of 1.2 to the cost of production.

Table 2: Income and expenditure budget for bell pepper in conventional system field
Calculations per hectare
2017/2018 (prognosis)

Estimated production = 40 tons

Nr.crt	indicators		Conventional system	Ecological system
		UM	40t / ha	32t / ha
1	A. VALUE OF PRODUCTION, of which:	lei	89426.5	95690.9
2	A.1. The value of the main production	lei	89426.5	95690.9
3	B (+). SUBSIDIES	lei	585.0	585.0
4	C (=) GROSS PRODUCT	lei	90011.5	96275.9
5	D (-) TOTAL EXPENSES	lei	74522.1	79742.5
6	D.1. Of which for the main production	lei	74522.1	79742.5
7	I. VARIABLE EXPENSES	lei	52811.7	60635.9
8	1. Expenditure on raw materials and materials	lei	41213.1	48099.8
9	- seed and planting material	lei	27320.0	28600.0
10	- organic fertilizers	lei	3000.0	2000.0
11	- chemical fertilizers	lei	1670.0	501.0
12	- substances for combating diseases and pests, foliar fertilizers	lei	4528.1	12253.8
13	- other materials	lei	4695.0	4745.0
14	2. Expenditure on mechanized works	lei	1423.3	1221.1
15	3. Irrigation costs	lei	4660.5	5015.4
16	4. Supply costs	lei	4121.3	4810.0
17	5. Insurance	lei	1393.5	1489.7
18	II. FIXED EXPENSES	lei	21710.4	19106.6
19	- Expenditure on permanent labor	lei	18256.7	15336.6
20	- General and management expenses	lei	1741.9	1862.1
21	- Loan interest	lei	655.5	695.1
22	- Amortization for buildings and utilities	lei	1056.2	1212.7
23	E (=) IMPOSABLE INCOME	lei	14904.4	15948.5
24	E.1 (-) Taxes and charges	lei	2384.7	2551.8
25	F (=) NET INCOME + Subsidies	lei	13104.7	13981.7
26	F.1 (=) INCOME NET	lei	12519.7	13396.7
27	G. RATED INCURRED TAX	%	20.0	20.0
28	H. NET INCOME RATE + Subsidies	%	17.6	17.5
29	H.1 RATA VENIT NET	%	16.8	16.8
30	COST OF PRODUCTION	lei / tone	1863.1	2492.0
31	PREVIOUS INTEREST PRICE MARKET	lei / tone	2235.7	2990.3

Source: Own calculations

CONCLUSIONS

In order to achieve estimated breakeven point of bell pepper crop in conventional and organic agriculture system – forecast 2017-2018, were used indicators of production and economic indicators.

Table 3: Synthesis of economic indicators for the cultivation of pepper in the field - forecast 2017/2018

Nr. crt.	Economic indicators of synthesis	UM	Conventional system	Ecological system
1	Average production at ha	t / ha	40.0	32.0
2	Production value at ha	lei / ha	89426.5	95690.9
3	Production costs per hectare	lei / ha	74522.1	79742.5
4	Variable costs	lei	52811.7	60635.9
5	Raw materials and materials	lei	41213.1	48099.8
6	Expenditure on permanent labor	lei	18256.7	15336.6
7	Fixed costs	lei	21710.4	19106.6
8	Unit production cost	lei / tone	1.9	2.5
9	Cost of capitalization	lei / tone	2235.7	2990.3
10	Productivity of work in physical expression	man-hours / tone	54.3	57.1
11	Profit or loss per unit of production	lei / ha	14904.4	15948.5
12	Profit or loss per unit of product	lei / ton	372.6	498.4
13	Rate of return	%	20.0	20.0
14	The threshold of return in units of value	lei	53024.6	52155.8
15	Revenue threshold in physical units	to	23.7	17.4
16	Risk of exploitation risk	%	59.3	54.5
17	Security Index (Is)		0.4	0.5

Source: Own calculations

From the table presented it is noted that the value of the produced output exceeds that of the expenditures made by 16.67% both in the conventional and in the ecological system.

Variable expenses accounted for 70.86% holding 76.03% of the total expenditure and the difference was made up of fixed costs. Materials and materials represent a proportion of 78.03% and 79.32% of total consumption.

Reference indices for expressing the economic efficiency of product costs, the production cost is 1863.1 RON / t in the conventional system, and the system is environmentally 25.24% higher, in particular owing to a lower approx. 20%. The average price per unit of product recovery is 2235.7 RON / t in the conventional system, when the ecological system is 25% higher.

Concerning the productivity of labor, it is noted that for one tone of product in a conventional system, 54.3 hours are consumed, of which 0.8 hours / t in mechanical works and 53.5 hours / t in manual works, while one tone of product required a total of 57.1 hours in the organic system, of which 0.9 hours / t for mechanical works and 56.2 hours / t for manual works.

The rate of return was 20% in the conventional system and in organic systems, the production of bell pepper in the field proving economically efficient. The profitability threshold means the physical or value level of production where the expenses incurred are totally covered by the value of money from the capitalization of production, that is, the level at which the profitability of the crop manifests itself.

As such, the cultivation of bell peppers is considered cost-effective in a conventional system of average production of 23.7 t / ha corresponding to the value of 53.024,6 lei / ha, because in an ecological system this threshold begins from an average production expressed in physical units of

less than 26.6% and more than 1.6%. The operating fluctuation rate consists of a synthetic indicator that evolves the risk in the case of non-realized output.

For bell pepper, this indicator is 59.3% for conventional and 54.5% organic system. The security index refers to the existing security margin of the crop, increasing in the same way as the value of the security index. For the bell pepper crop, this index is 0.4 and 0.5, respectively

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