

DETERMINING FEASABILITY INDICATORS FOR CUCUMBERS AND ZUCCHINIS CROPS IN ORGANIC AND CONVENTIONAL SYSTEMS. CASE STUDY

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Abstract

Organic farming conversion is one of the main priority and challenges included in The Green Deal (EC, 2020), in order to achieve its mission, that of transforming Europe into the first climate-neutral region. According to the statistical data, Austria and Germany are fully converted to ecological agriculture and the others European states are in the conversion process. Nowadays, Romania's agricultural organic area measures 1,531,000 ha and 1,331,000 ha still remaining under transition from conventional agriculture to the ecological one. Global and European directives state that to be sustainable, the conventional agriculture sector must be converted to organic and to harm the environment at least at possible. Meanwhile, from the producer's perspective, practicing the agricultural activity is sustainable depending on the generated incomes level. The present paper aims to study several economic parameters (profit, operating risk rate, security index), both in the conventional and organic system, for cucumbers and zucchini. For the studied crops, the income and expenditure budgets were made differentiated according to the applied technologies, production factors, yields per surface unit cultivated in two cropping systems, conventional and ecological. For the economic analysis of the income and expenses budget, technical-economic indicators such as costs, profitability, costs and prices were used. The technologies were developed based on research within the ICDLF Vidra. The conclusions section reinforce the high importance of conversion from conventional to ecological agriculture system, at the farm level, in order to maintain a high production level on long term, indispensable for generating farmers revenues, but also to ensure the sustainability of natural resource and to facilitate the environment conservation.

Key words: organic farming, sustainable food system, economic indicators, cucumbers, zucchini

INTRODUCTION

In general terms, organic production is described by the European Commission as farm management that focuses on balancing the environmental good practice with biodiversity and natural resource protection, in order to increase both organic food supply and demand, using natural substances [3]. Among the latest European Commission's measures applied in encouraging organic food production directions it should be mentioned the organisation of "EU organic awards" competition, since 2022. Thus, by fulfilling the eligibility criteria, interested producers/institutions across the Europe can apply for different award category such as: "Best organic farmer (female/male)"; "Best organic region"; "Best organic "bio-district"; "Best organic food processing SME"; "Best

organic food retailers"; "Best organic restaurant/food service" [5].

The European Commission strategy *From Farm to Fork Strategy* (EC, 2020) is the core of the main directions that a sustainable development of the agriculture sector should follow. Thus, between the main objectives of this strategy we can mention: *ensuring sustainable food production and food security, discouraging food waste, promoting sustainable food consumption for a healthier planet but also for the population health status* [4].

According to the author Willet W. (2019) [12], several category of food describe a food consumption healthy pattern: *vegetables, fruits, whole grains, nuts and pulses*. The present study addresses to the first category, presenting the economic efficiency for cucumbers and zucchini, both in conventional

and organic production system. FAO recent statistical database update shows that comparative to the 2010 values, the a decrease of production level for cucumbers and zucchini, from 172,059 tons at 77,830 tons (cucumbers production), respectively, from 81,625 tons at 14,880 tons (zucchini production) [6].

In the Balkans area, vegetable production (cucumbers included) is practiced especially in Albania, Romania, Bulgaria, Greece and North Macedonia [2].

In this context, this paper aims to present the obtained results during the project “ADER 6.3.15 Integrated management for the control of pest agents in the main vegetable species grown in protected spaces in conventional and organic systems” [9], mirrored by the calculated values of some reference economic indicators for the domestic farmer, in order to determine the profitability of studied crops, both in organic and conventional system.

MATERIALS AND METHODS

In order to achieve this paper, a complex and diverse methodology was applied, both qualitative and quantitative, including but not resuming at literature overview, briefing European legislative framework, statistical data analysis, particularly for the level of production and consumption for cucumbers and zucchini crops, the calculation of relevant synthesis indicators regarding the economic efficiency for the analyzed crops and others.

It is mentioned that the primary data were estimated based on the previous results obtained within the “ADER 6.3.15 Integrated management for the control of pest agents in the main vegetable species grown in protected spaces in conventional and organic system”.

Table 1 presents the following economic indicators which have been calculated and also their formulas: production level (to/ha), production value (lei/ha), variable and fixed production costs, producer price, labor force productivity (in value and non-value expression).

Table 1. Main economic indicators in order to determine the economic efficiency

Indicator	Formula
Sales revenue (CA)	$CA = Q \cdot P$, Q - quantity sold P - sale price [8]
Profit (P_r)	$P_r = CA - CT$, CA = sales revenue CT = total costs [7]
Rate of return (RoR)	$RoR = (P_r/CA) \cdot 100$ [10]
Margin on variable expenses (MCV)	$MCV = CA - CV$, CV=variable costs [11]
Break even	The level of sales revenues when $P_r = 0$ [1]

Source: Authors' processing based on the specialized literature.

Also, starting from the initial situation regarding the feasibility of cucumbers and zucchini production both in organic and conventional system, 3 scenarios will be developed in order to simulate possible further evolutions of the economic parameters of interest:

- Scenario 1 (S1)*: the cucumbers/zucchini production value will increase by 20% compared to the initial situation;
- Scenario 2 (S2)*: the cucumbers/zucchini production value will decrease by 20% compared to the initial situation;
- Scenario 3 (S3)*: maintaining the initial result when the level of fixed costs is reduced by 10% of initial level.

RESULTS AND DISCUSSIONS

In this section it is presented the main results obtained regarding the cucumbers and zucchini cultivation feasibility, both in conventional and organic system.

Regarding the results presented in Table 2, we used several input variables, in order to calculate the economic efficiency indicators described in the methods section, like: average production, production costs, unit production cost and selling price. The fixed costs represents those expenses incurred by producer regardless of the level of production. For variable costs estimation, raw materials and materials costs (37,083 lei in organic system and 38,917 in conventional farming) and labor costs (estimated at 21,575 lei in

conventional agriculture respectively 27,897 lei in organic farming) where included. Starting from a lower crop yield in organic farming, it can be observed a lower cucumbers production value and a higher production cost, mirrored in a highest delivery price. However, the organic farming brings also economic advantages for farmer, through a lower level of variables costs, including those with labor force and raw materials. Practicing organic farming shows in this case a higher labor productivity value and also a higher profit for each product unit (with 2.17% higher in organic farming case). Finally, the same level of RoR is obtained, both in conventional and organic farming, of 20%, for cucumber crops cultivation.

Table 2. Main economic indicators in order to determine the economic efficiency for cucumbers crop

Indicator/ Unit measure	Organic farming	Conventional farming
Average production (to/ha)	30	35
Production value (lei/ha)	120,681.3	137,797.2
Production costs (lei/ha)	100,567.8	114,831.0
Variable production costs (lei)	74,389.3	81,612.8
Fixed production costs (lei)	26,178.5	33,218.2
Unit production cost (lei/to)	3,400	3,300
Selling Price (lei/to)	4,022.7	3,937.1
Labor productivity in physical expression (to/man-hour)	60.4	62.9
Labor productivity in value expression (lei/man-hour)	66.6	62.6
CA (lei)	120,681	137,797
P_r / unit of production (lei/ha)	20,113.6	22,966.2
P_r / product unit (lei/to)	670.5	656.2
RoR (%)	20	20
MCV (lei)	46,292.1	56,184.4
MCV (%)	38.4	40.8
Break even (lei)	68,246.2	81,470.6
Break even (to)	17	20.7
Operating risk rate (%)	56.6	59.1
Is	0.4	0.4

Source: preliminary calculation obtained through ADER 6.3.15 project [9].

However, a slight difference regarding the profit express in production unit (lei/ha) can be observed (20,113 lei/ha in organic farming compared to 22,966 lei/ha in conventional system).

Initial economic situation for cucumbers crop in conventional and organic farming system

In Figure 1 it is illustrated the initial results of certain economic parameters, such as sales revenue, total production costs (fixed and variable), the profit and the optimal level for achieving the feasibility characteristics at the farm level activity. The data were calculated based on the input variables defined in Table 2.

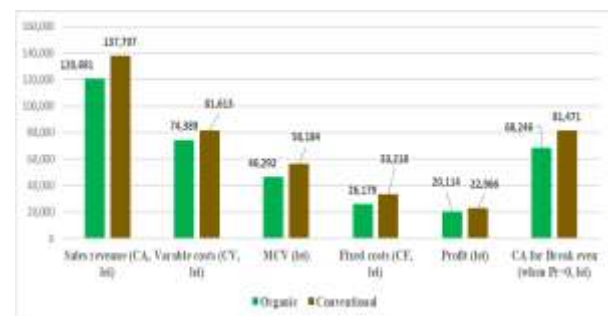


Fig. 1. Economic indicators for cucumber production in organic and conventional agriculture
Source: [9].

Simulations of possible scenarios.

Cultivating cucumbers in solariums ecological and conventional system

Figure 2 shows the evolution of calculated economic parameters through the 3 scenarios presented in the “Materials and methods section”.

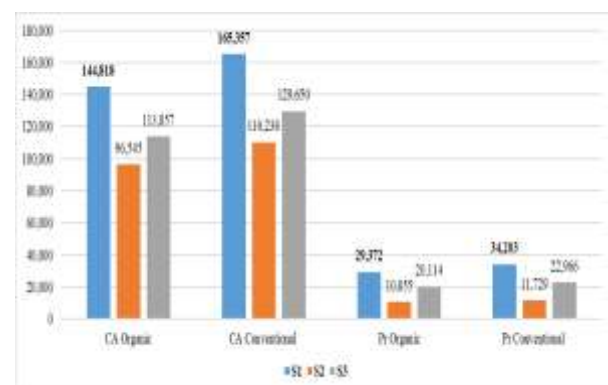


Fig. 2. Economic indicators for cucumber production in organic and conventional agriculture through S1, S2, S3
Source: [9].

Thus, it can be observed from Fig. 2 that Scenario 1, according to which increasing the level of production value is the optimal one, taking into consideration the profit level, in organic agriculture and also in conventional farming. Applying this type of strategy, the organic producers could increase their business profitability with 46% (from the initial value 20,114 lei to 29,372 lei). In conventional agriculture case, the profitability is also increasing, with a higher level compared to the organic agriculture case (49%), from 22,966 lei to 34,203 lei. Regarding the results presented in Table 3, we used the same input variables like in previous presented crop.

Table 3. Main economic indicators in order to determine the economic efficiency for zucchini crop

Indicator/ Unit measure	Organic farming	Conventional farming
Average production (to/ha)	18.3	23.2
Production value (lei/ha)	130,111.6	85,118.1
Production costs (lei/ha)	108,426.3	70,931.8
Variable production costs (lei)	90,334.5	55,126.5
Fixed production costs (lei)	18,091.8	15,805.3
Unit production cost (lei/to)	5,900	3,100
Selling Price (lei/to)	7,125.9	3,661.2
Labor productivity in physical expression (to/man-hour)	50	38.9
Labor productivity in value expression (lei/man-hour)	142.4	113
CA (lei)	130,111.6	85,118.1
P _r / unit of production (lei/ha)	21,685.3	14,186.4
P _r / product unit (lei/to)	1,187.6	610.2
RoR (%)	20	20
MCV (lei)	39,777.1	29,991.7
MCV (%)	30.6	35.2
Break even (lei)	59,178.7	44,856.4
Break even (to)	8.3	12.3
Operating risk rate (%)	45.5	52.7
Is	0.5	0.5

Source: preliminary calculation obtained through ADER 6.3.15 project [9].

For variable costs estimation, raw materials and materials costs (63,757 lei in organic

system and 39,691 in conventional farming) and labor costs (estimated at 12,454 lei in conventional agriculture respectively 13,004 lei in organic farming) were included.

As in cucumbers case, although the calculations starts from a lower crop yield in organic farming (18.3 to/ha in organic farming compared to 23.2 ton/ha in conventional agriculture), it can be observed a higher zucchini production value produced in organic system (130,112 lei compared to 85,118 lei). The higher level of organic zucchini production is explained by a significant difference regarding the selling price (7,126 lei/ton in organic case compared to 3,661 lei/ton case of conventional production). However, the organic farming brings also economic disadvantages for farmer, through a higher level of variables costs, including those with labor force and raw materials. Practicing organic farming shows in this case a higher labor productivity value and also a higher profit for each product unit (with 53% higher in organic farming case). Finally, the same level of RoR is obtained, both in conventional and organic farming, of 20%, for zucchini crop cultivation.

Initial economic situation for zucchini crop in conventional and organic farming system

Figure 3 illustrates the initial results of certain economic parameters, such as sales revenue, total production costs (fixed and variable), the profit and the optimal level for achieving the feasibility characteristics at the farm level activity. The data were calculated based on the input variables defined in Table 3.

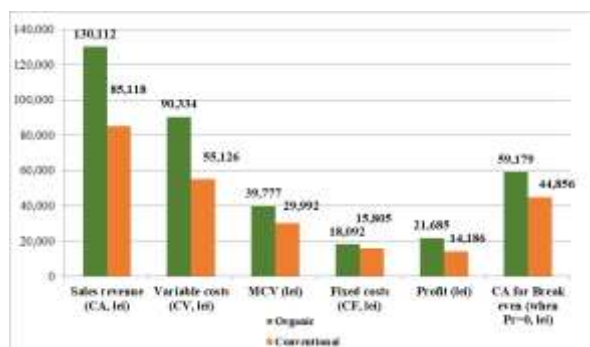


Fig. 3. Economic indicators for zucchini production in organic and conventional agriculture
Source: [9].

Simulations of possible scenarios

Cultivating zucchini in solariums ecological and conventional system

Figure 4 shows the evolution of calculated economic parameters through the 3 scenarios presented in the “Materials and methods section”, as in the previous studied crop, cucumbers.

Thus, it can be observed from Fig. 4 that Scenario 1, according to which increasing the level of production value is the optimal one, same situation with the previous analyze, at cucumbers crop, taking into consideration the profit level, in organic agriculture and also in conventional farming.

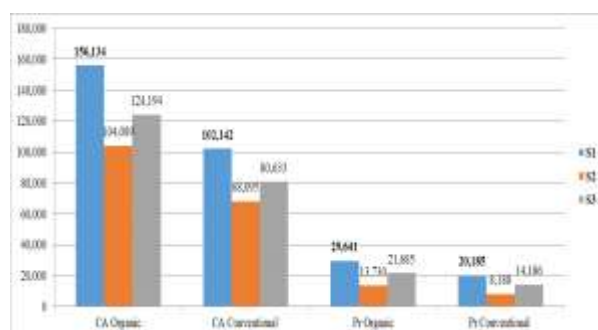


Fig. 4. Economic indicators for cucumber production in organic and conventional agriculture through S1, S2, S3

Source: [9].

The lowest level is presented through S2, according to which the production value will decrease with 20% compared to the initial level presented in Table 3.

CONCLUSIONS

This paper offers a synthetic presentation of the main results obtained within the ADER 6.3.15 project, entitled “Integrated management for the control of pest agents in the main vegetable species grown in protected spaces in conventional and organic systems” (First stage). The objectives of the current research are related with the European Green Pact main ambition, to facilitate the transfer from the current production and consumption models to the organic one, thus ensuring the sustainability of environmental resources and encouraging a healthy lifestyle of population. Starting from European specific legislation and policies, the zucchini and cucumbers

crops were selected for the foundation of the specific economic indicators calculation, in order to establish the economic feasibility characteristic of the agriculture activity, both in organic and conventional system. Although related in terms of identified crops characteristics, the presented simulations demonstrate different results. Thus, from the farmer perspective, a highest level of income is obtained practicing organic farming, in cucumber crop study case. Meanwhile, in zucchini case, a highest level of income is registered within the organic farming, due to the possibility of setting a higher recovery price compared to the conventional agriculture products. This explanation can also be accompanied by the changes in consumer preferences and the type of demand registered for the reference products, the fluctuations in consumer behavior. This research also tests 3 types of scenarios, regarding cucumber and zucchini production in organic and conventional systems, in order to determine the optimal case for farmer’s wellbeing: the cucumbers/zucchini production value will increase with 20% compared to the initial situation (S1); the cucumbers/zucchini production value will decrease with 20% compared to the initial situation (S2); and maintaining the initial result when the level of fixed costs is reduced by 10% of initial level (S3).

The results of this research confirm the results of previous field research: the best way to increase the farmer revenues is to increase the level of production value. In order to ensure the sustainability of the agricultural business, farmers need to produce more, or to maintain the initial production level but capitalize on it at competitive prices, specific to a superior quality production.

Regardless of the producer’s decision in the agricultural sector, the conversion from the conventional farming to organic farming is the main challenge for each entrepreneur.

By producing in organic system, the farmers will bring their contribution to a better natural resource conservation management, a mandatory condition for ensuring the sustainability of the agriculture sector but also

for the food safety and security, a primary need for the entire population.

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