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**Conference Paper**

## Economic efficiency analysis of vegetable production systems during 2011 - 2014

**Provided in Cooperation with:**

The Research Institute for Agriculture Economy and Rural Development (ICEADR), Bucharest

*Suggested Citation:* Ursu, Ana (2014) : Economic efficiency analysis of vegetable production systems during 2011 - 2014, In: Agrarian Economy and Rural Development - Realities and Perspectives for Romania. 5th Edition of the International Symposium, November 2014, Bucharest, The Research Institute for Agricultural Economy and Rural Development (ICEADR), Bucharest, pp. 315-320

This Version is available at:

<https://hdl.handle.net/10419/111653>

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## ECONOMIC EFFICIENCY ANALYSIS OF VEGETABLE PRODUCTION SYSTEMS DURING 2011-2014

ANA URSU<sup>1</sup>

**Summary:** *Economic efficiency plays an important role in the foundation and farm level decisions, constituting a basic criterion in assessing the level of economic activity and development prospects. The study aimed to analyze the economic efficiency of crop production systems, measured through indicators that contribute to an overall picture of the actual conditions of economic efficiency for the analyzed period. For this study were quantified following indicators: income from operations, operating costs, labor productivity and rate of return on different types of farms of different sizes. The analysis concluded that indicators production year 2013-2014 has showed a lower level of economic efficiency compared with 2011-2012 production year; comparison of the two production systems that irrigated production system provides a rate of return of about 9-10% higher than non-irrigated system. Comparing labor productivity in terms of value (lei / Man-hour) the types of farms of different sizes that hourly labor productivity increases with economic size of holding and decreases as the number of man-hours to 1000 lei incomes increase.*

**Keywords:** *economic efficiency, production systems, labor productivity, profitability*

### INTRODUCTION

The concepts of efficiency is treated in economic theory and practice various forms of manifestation of the results of economic agents, such as profitability, productivity of factors of production, capital efficiency, reduced costs, etc. Economic efficiency is closely related to the use of resources in the economy and its essential feature is the causal effort / effect. Doing a conceptual treatment summarizing the opinions of economic efficiency can conclude that economic efficiency is a complex economic category expressed in the most comprehensive results are obtained in an activity. The scale is expressed by farm labor productivity, profitability, unit production cost. A high efficiency is obtained with a modern technology that makes the most of raw materials and energy, providing high quality products at low cost.

### MATERIAL AND METHOD

The methodology chosen for this study was to design plant production systems adapted plains, in different shapes and sizes of farm, level indicators and sub-indicators.

For economic efficiency analysis were performed technical and economic projections for 2011-2014 holding module 20 hectares (irrigated and non-irrigated), 200 hectares (irrigated and non-irrigated), and 1,000 hectares (irrigated and non-irrigated). These projections are based on technological estimates and budgets of income and expenses for each crop, how to farm and year of production.

The average yields set out to achieve, are in accordance with "study to determine potential areas, geographical areas and unitary standard gross margins" for proiectele under Measure 3.1. "Investments in agricultural holdings" of the SAPARD program, developed by the ASAS-ICPA and ICEADR 2004.

Getting set production can be achieved through proper management of inputs, based on scientific rules determinare.

Estimated recovery prices for crops production structures studied:

- For the year 2011-2012: 1.1 lei / kg for wheat, 0.99 euro / kg in corn, 0.875 lei / kg barley 1.95 lei / kg sunflower, 4.0 lei / kg beans, 2.15 lei / kg soybean, 1.8 lei / kg Rape, 0.30 lei / kg of sugar beet
- For the year 2013-2014: 0.77 euro / kg for wheat, 0.98 euro / kg in corn, 0.685 lei / kg barley, 1.9 lei / kg sunflower, 3.5 lei / kg beans, 1.8 lei / kg soybean, 1,750 lei / kg rape, 0.275 lei / kg of sugar beet

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## RESULTS AND DISCUSSION

### Economic efficiency analysis modules designed holding

Module 20 ha (table 1) is specific households and has been developed in two production: irrigated and non-irrigated system. **The irrigation system** four production activities are summarized wheat, corn, sunflowers, beans, sugar beet and **irrigated** also appears barley activity formed in the two ha of the total 20 hectares. Corn is grown on the largest area in this way, and accounts for 30% of the total area. The production value is obtained from corn but only 35.8% of the value obtained at farm level, because lower profitability per hectare recorded in this culture, to an average of 4800 kg / ha. Sugar beet is cultivated although only 10% of farmland has the largest contribution to production value obtained 19.2% of the value obtained in farm irrigated and non-irrigated system by 21%.

**Table 1: Economic efficiency indicators**

Nr. Item	Indicators	UM	Module 20 ha irrigated		Module 20 ha non-irrigated	
			2011	2014	2011	2014
One	Total revenue	lei	109858	97932	72372	64409
February	Income from primary production	lei	103794	91868	68148	60185
Three	Crude product	lei	121454	113362	84926,2	79839
4	Total expenditure	lei	96161	86146	68795,4	61926,5
5	Expenditure on primary production	lei	90097	80172	64571,4	57702,5
6	Raw materials	lei	37340	33485	30521,0	27400,6
7	Permanent labor expenses	lei	10545	10545	6582,7	6931,5
8	Total time spent working	man-hours	2287		1556,8	
9	Working time consumed on average per 1 ha	man-hours	114,4		77,8	
10	Labour productivity (Wm)	lei / man-hour	45,4	40,2	43,8	38,7
11	Labour productivity (Wm)	man-hour /1000lei	22,0	24,9	22,8	25,9
12	Labor costs 1000 lei prod. value	lei	101,6	118,6	96,6	115,2
13	Expenditure on valuable products 1,000 lei	lei	360	364	448	455
14	Production expenses 1,000 lei Home	lei	868	873	948	959
15	Gross profit	lei	13697	11696	3577	2482
16	- Tax 16%	lei	2192	1871	572	397
17	Net profit	lei	11506	9825	3004	2085
18	Gross profit rate	%	15,2	14,6	5,5	4,3
19	Net profit rate	%	12,8	12,3	4,7	3,6
20	Gross profit + grants	lei	25293	27216	16131	17912
21	- Tax 16%	lei	4047	4355	2581	2866
22	Net profit + grants	lei	21246	22862	13550	15046
23	Gross profit rate + grants	%	26,3	31,6	23,4	28,9
24	Net profit + rate subsidies	%	22,1	26,5	19,7	24,3

Source: *Own calculations*

**Analysis of revenue:** the total activity, revenue recorded a decrease of 1.13 times in 2013-2014 compared to 2011-2012. The decrease in revenues was driven by lower selling prices of production. Revenues are irrigated with 1.52 times higher than in non-irrigated system, the decisive contribution in this regard starring increase yields per hectare. The correlation coefficient between the index of income and expenditure index is greater than one, the pace of decline of revenues ranging from 1.05 (irrigated) and 1.15 (irrigated) in 2013-2014 to 1.04 (neirgat) and 1, 14 (irrigated) in 2011-2012. Reducing income reflects directly on the indicator expenses 1,000 lei income.

**Expenditure Review:** the total activity costs have been reduced by 1.11 times (irrigated system) and 1.12 (irrigated) in 2013-2014 compared to 2011-2012 this reduction, attesting first

reduction index inflation of 3.2% (2011-2012) to 2.8% (2013-2014) according to the National Weather Institute.

**1000 lei revenue expenditure** a slight increase from 868 lei (2011) 873 lei (2014) - irrigated and 948 lei (2011) to 959 lei (2014) - sitem neirgat, which means that the farmer in this module covers all costs Operation and get a small benefit, as evidenced and **Rate taxable income** which is between 14.6% and 15.2%, irrigated, compared to only 4.3% and 5.5% in irrigated system.

**Labour productivity** was calculată wide activities, total farm modules. Total work time spent (effort) with production values obtained (effect) reveals the degree of economic efficiency of labor exploitation modules designed. It can be appreciated that in the period 2011-2014, labor productivity based on value of production at farm level and fund time varies as follows: the irrigated labor productivity ranges from 22.8 man-hours to 1000 lei production value (2011) to 25.9 man-hours to 1000 lei production value (2014), and the irrigated labor productivity ranges from 22.0 man-hours to 1000 lei production value (2011) to 24.9 man-hours to 1,000 lei production value. It follows that labor productivity declined as working time consumed to 1000 lei production value in 2014 increased compared to 2011 with 3.1 man-hours to 2.9 hours non-irrigated and irrigated-man which means a reduction in economic efficiency of the labor front of 2011-2012. The results were in line with available created by holding the level of competitiveness in labor productivity related to the corresponding production.

### Module 200 ha

Module 200 ha (table 2) has an economic dimension top and were designed farmers organized into family associations being developed in two productions: irrigated and non-irrigated system. **The irrigation system** production seven activities are summarized wheat, corn, barley, sunflower, soybean, sugar beet, oilseed rape. Corn is grown on the largest area in this way, and accounts for 33% of the total area of 200 ha. Revenues highest level of activity but how are obtained from sugar beet, which although only 5% of cultivated area, has a 10.3% contribution to total value of production from the farm. Activity barley also provides a good return, 22.7% of taxable income rate, while significant subsidies granted to the sunflower crop this activity lies third place (12%) in terms of income per hectare made the farm. **In irrigated system** are contained the same activities as irrigated system, but different cultures share in the structure of production. Soy Lowers surface half (5% to 10% as they were in irrigation system) and increase in rapeseed area to 13% (compared to 4% in irrigation system). A lower yield obtained in this production system achieves an output value 33.3% lower than the irrigation system. Activity wheat has the highest share both in size (32% of the total 1000 ha) but the production value obtained (26.5% of total production) is lower than that obtained from corn (30%) in the system.

Activity sugar beet is the most effective in the module, **rate taxable income** (Gross profit) was 21.5% in this culture.

**Table 2: Economic efficiency indicators**

Nr. Item	Indicators	UM	Module 200 ha irrigated		Module 200 ha non- irrigated	
			2011	2014	2011	2014
1	Total revenue	lei	1205320	1072020	831160	735110
2	Income from primary production	lei	1126960	993660	780680	684630
3	Crude product	lei	1321280	1226320	947120	889410
4	Total expenditure	lei	1050359	908062	759949	672210
5	Expenditure on primary production	lei	971999	857693	709469	621730
6	Raw materials	lei	358297	317722	314357	277210
7	Permanent labor expenses	lei	94929	94929	55282	55282
8	Total time spent working	man-hours	20851		13163	
9	Working time consumed on average per 1 ha	man-hours	104,3		65,8	
10	Labour productivity (Wm)	lei / Man-hour	54	48	59	52

11	Labour productivity (Wm)	Man-hour / 1000 lei	18.5	21.0	16.9	19.2
12	Labor costs 1000 lei prod. value	lei	84.2	95.5	70.8	80.7
13	Expenditure on valuable products 1,000 lei	lei	318	320	403	405
14	Expenses 1,000 lei main prod	lei	862	863	909	908
15	Gross profit	lei	154961	135967	71211	62900
16	- Tax 16%	lei	24794	21755	11394	10064
17	Net profit	lei	130167	114212	59817	52836
18	Gross profit rate	%	15,9	15,9	10,0	10,1
19	Net profit rate	%	13,4	13,3	8,4	8,5
20	Gross profit + grants	lei	270921	318258	187171	217200
21	- Tax 16%	lei	43347	50921	29947	34752
22	Net profit + grants	lei	227574	267337	157223	182448
23	Gross profit rate + grants	%	25,8	35,0	24,6	32,3
24	Net profit + rate subsidies	%	21,7	29,4	20,7	27,1

Source: *Own calculations*

**Analysis of revenue:** the total activity, revenue recorded a decrease of 1.14 times in 2013-2014 compared to 2011-2012. The decrease in revenues was driven by lower selling prices of production. Revenues are irrigated with 1.45 times higher than in non-irrigated system, the decisive contribution in this regard starring increase yields per hectare. The correlation coefficient between the index of income and expenditure index is greater than one, the rate of decrease of income over expenditure ranging from 1.10 (irrigated) to 1.16 (irrigated) in 2011-2014.

**Expenditure Review:** the total activity costs have been reduced by 1.14 times (irrigated system) and 1.13 times (irrigated) in 2013-2014 compared to 2011-2012 this reduction, attesting first reduction index inflation of 3.2% (2011-2012) to 2.8% (2013-2014) according to the National Weather Institute.

**1000 lei revenue expenditure** no differences between the two production systems, lower costs 1.05 times irrigated (863 lei to 1000 lei income) from non-irrigated (908 lei lei 1000 revenue). Comparing the two modules holding non-irrigated and irrigated system operated at 200 ha irrigated module, work on the farm is less profitable, as evidenced rate and taxable income (10%) to 200 ha irrigated module that has a income rate of 15.9%, but allow the resumption of production and allocation of funds for development profit (recommended 50%) to achiziției of new agricultural machinery and equipment required for the farm. Comparând two study periods 2013-2014 to 2011-2012, the modules do not show significant diferenței to mark the two periods of production.

**Labour productivity** was calculată wide activities, total farm modules. It can be appreciated that in the period 2011-2014, labor productivity based on value of production at farm level and fund time varies as follows: **the irrigated.** Labor productivity ranges from 18.5 man-hours to 1,000 lei production value (2011) to 21.0 man-hours to 1000 lei production value (2014), and **for irrigation,** labor productivity ranges from 16.9 man-hours to 1000 lei production value (2011) to 19.2 man-hours to 1,000 lei production value. It follows that labor productivity declined as working time consumed to 1000 lei production value in 2014 increased compared to 2011 with 3.5 man-hours to 2.3 hours non-irrigated and irrigated-man which means a reduction in economic efficiency of the labor front of 2011-2012. The results were in line with available created by holding the level of competitiveness in labor productivity related to the corresponding production.

#### **Module 1 000 ha**

Module 1000 ha (table 3) has a large economic size and was designed for agricultural companies with legal personality, being developed in two productions: irrigated and non-irrigated system. **The irrigation system** production seven activities are summarized wheat, corn, barley, sunflower, soybean, sugar beet, oilseed rape. Corn and wheat have together accounted for 53% of the total at the module level. These cultures also provide 55.4% of the recorded production at farm level. Activity crop barley and sugar beet culture presents the highest return per ha.

**Table 3: Economic efficiency indicators**

Nr. Item	Indicators	UM	Module 1000 ha irrigated		Module 1000 ha non - irrigated	
			2011	2014	2011	2014
1	Total revenue	lei	7099340	<b>6374760</b>	4847560	975691
2	Income from primary production	lei	6681940	5957360	4579700	3982780
3	Crude product	lei	7679140	7146260	5427360	5022140
4	Total expenditure	lei	5853145	5099756	4196684	3674960
5	Expenditure on primary production	lei	5435745	4830046	3928824	3407100
6	Raw materials	lei	997574	997574	1409044	1550737
7	Permanent labor expenses	lei	468289	468289	266341	267991
8	Total time spent working	man-hours	104257		62070	
9	Working time consumed on average per 1 ha	man-hours	104,3		62,1	
10	Labour productivity (Wm)	lei / man-hour	64	57	74	64
11	Labour productivity (Wm)	man-hour / 1000 lei	15,6	17,5	13,6	15,6
12	Labor costs 1000 lei prod. value	lei	70,1	78,6	58,2	67,3
13	Expenditure on valuable products 1,000 lei	lei	149	167	308	389
14	Expenses 1,000 lei main prod	lei	813	811	858	855
15	Gross profit	lei	1246195	1127314	650876	575680
16	- Tax 16%	lei	199391	180,370	104140	92109
17	Net profit	lei	1046804	946944	546736	483572
18	Gross profit rate	%	22,9	23,3	16,6	16,9
19	Net profit rate	%	19,3	19,6	13,9	14,2
20	Gross profit + grants	lei	1825995	2046504	1230676	1347180
21	- Tax 16%	lei	292159	327441	196908	215549
22	Net profit + grants	lei	1533836	1719063	1033768	1131632
23	Gross profit rate + grants	%	31,2	40,1	29,3	36,7
24	Net profit + rate subsidies	%	26,2	33,7	24,6	30,8

Source: *Own calculations*

**Analysis of revenue:** the total activity, revenue recorded a decrease of 1.15 times and 1.12 times irrigated during the 2013-2014 to 2011-2012 production. The decrease in revenues was driven by lower selling prices of agricultural products. Revenues are irrigated with 1.46 to 1.50 times higher than in non-irrigated system, the decisive contribution in this regard starting increase yields per hectare. The correlation coefficient between the index of income and expenditure index is greater than one, the rate of decrease of income over expenditure ranging from 1.17 (irrigated) to 1.23 (irrigated) in 2011-2014.

**Expenditure Review:** the total activity costs have been reduced by 1.15 times (irrigated system) and 1.13 times (irrigated) in 2013-2014 compared to 2011-2012 this reduction, attesting first reduction index inflation of 3.2% (2011-2012) to 2.8% (2013-2014) according to the National Weather Institute.

**1000 lei revenue expenditure** no differences between the two production systems, lower costs 1.05 times irrigated (813-811 lei lei 1000 revenues) compared to non-irrigated (858-855 lei lei 1000 revenue). Comparing the two modules holding non-irrigated and irrigated system operated at 1000 ha irrigated module, work on the farm is less profitable, as evidenced rate and taxable income (16.6% - 16.9%) compared to module 1000 ha irrigated which has a 22.9% rate of income - 23%, but allows resumption of production and profit allocation of funds for development (50% recommended) to achiziției of new agricultural machinery and equipment required for the farm. Comparând two study periods 2013-2014 to 2011-2012, the modules do not show significant diferenței to mark the two periods of production.

**Labour productivity** was calculated for wide activities, total farm modules. It can be appreciated that in the period 2011-2014, labor productivity based on value of production at farm level and fund time varies as follows: **the irrigated**. Labor productivity ranges from 13.6 man-hours to 1,000 lei production value (2011) to 15.6 man-hours to 1000 lei production value (2014), and **for irrigation**, labor productivity ranges from 15.6 man-hours to 1000 lei production value (2011) to 17.5 man-hours to 1,000 lei production value. It follows that labor productivity declined as working time consumed to 1000 lei production value in 2014 increased compared to 2011 with two man-hours in non-irrigated and irrigated 1.9 man-hours in which which means a reduction in economic efficiency of the labor front of 2011-2012.

## CONCLUSIONS

Considering the above, the analysis of economic efficiency of crop production systems in the period 2011-2014, and the following conclusions:

- Comparing the two periods of production, total activity, revenues in 2013-2014 showed a reduction of 1.13 times compared to 2011-2012 due to the volatility of agricultural prices;
- Comparing the two production systems, irrigated and non-irrigated, irrigation system proceeds are greater than those obtained in irrigated systems;
- Determination of variation of income that enables us according to all natural and economic factors affecting production structure to choose crops with the highest stability (lowest coefficient of variation). Income stability is a necessary condition for self-management of farmers who have to cover from own revenues and profits.
- Production flexibility program seeks permanent adaptation of production to local natural and economic conditions to achieve maximum profitability. It removes the risk of losses caused farmer as a result of cyclical changes or perspective that it operates in the production structure based on the advantages that it offers a culture or another.
- Comparing labor productivity in terms of value (lei / Man-hour) the types of farms of different sizes, that labor productivity increases with economic size of holding and decreases as the number of man-hours to 1000 lei incomes increase.
- The economic results of small farms can improve the diversification of agricultural activities (vegetable, livestock) and for large farms, the results can be improved by investing in tractors and related equipment.
- Analyses of economic efficiency achieved by designing modules have a high economic viability in terms of obtaining yields scheduled.
- Variety and factors leading causes of deviations on the size indicators requires equally diverse solutions. Other examples as comprehensive as can not provide general solutions, but suggest methods of interpretation of situations.
- Background economic decisions primarily on efficiency criteria in this context, primarily through cost management are a basic requirement.

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