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**Conference Paper**

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**Provided in Cooperation with:**

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

*Suggested Citation:* Petre, Ionut Laurentiu (2018) : Analysis of the rape culture rentability for nonirrigated and unirrigated production systems, In: Agrarian Economy and Rural Development - Realities and Perspectives for Romania. 9th Edition of the International Symposium, November 2018, Bucharest, The Research Institute for Agricultural Economy and Rural Development (ICEADR), Bucharest, pp. 260-264

This Version is available at:

<https://hdl.handle.net/10419/205117>

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# ANALYSIS OF THE RAPE CULTURE RENTABILITY FOR NON-IRRIGATED AND UNIRRIGATED PRODUCTION SYSTEMS

PETRE IONUȚ LAURENȚIU<sup>1</sup>

**Summary:** *This paper proposes the analysis of economic indicators referring to the feasibility and efficiency of rapeseed cultivation in two different irrigated and non-irrigated systems, in order to determine the eventual higher profitability of the increase in production. The question of the research is the following: is it more efficient to ensure that the rapeseed is irrigated in order to obtain higher yields? In order to answer this question, we will use data taken from ADER 13.1.2, coordinated by the Research Institute for the Economy of Agriculture and Rural Development, referring to the technological data and the budget for the income and expenditure of the rapeseed. With the help of these, certain technical and economic indicators will be determined by means of which the final conclusion of this study can be established.*

**Keywords:** *rapeseed culture, profitability, irrigation, non-irrigation*

**JEL Classification:** *Q12, Q15.*

## INTRODUCTION

As is well known, rapeseed occupies an important place in world agriculture and, implicitly, in the global economy, through the processed product and the oil, being used in both human and industrial food.

Like any oilseed rape, rape has a high lipid content, but besides, rape seed contains high protein, sugar and water. The quantitative ratio between the core of rapeseed and their shell varies between 4 and 6 percent.

Rape culture (*Brassica napus*) has a beneficial effect on crop rotation to optimize it, this crop being a good precursor to many crops, also helps to clean the weed soil, optimize it, and demand on the market is ensured, sometimes even before sowing.

These issues have led to a universally valid claim, namely that intensive rape productivity is needed given the importance of this crop.

In order to obtain the highest yields in terms of average yield per hectare, ie intensive growth, an optimal technology should be considered. In order to increase productivity, specialists argue that the following features have to be taken into account in other technologies: the sowing season and the control of pests.

Going beyond these considerations, in this paper we will deal with two different systems of cultivation, namely rape cultivation in a non-irrigated system and irrigated system. By default, the latter records a yield per hectare higher than the first, thanks to the irrigation of the land. However, these additional work to be done for watering the land are additional costs when we make a small record of expenditure.

Although it is necessary to increase the average yield per hectare, and a possible solution would be to irrigate the areas planted with rape, there is a problem that coincides with the question of research, namely, it is cost effective to irrigate the rapeseed culture in order to increase productivity?

## MATERIAL AND METHOD

For this study quantitative and qualitative data will be analysed from the ADER project 13.1.2 „Technical and economic cost-orientation of production costs and estimates of harvest prices for wheat, barley, maize, sunflower, rape, soybean, sugar beet, rice, hemp, hops, tobacco, conventional agriculture and organic farming”, coordinated by Research Institute for Agriculture

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Economy and Rural Development, these data referring to rape crop technology and to its revenue and expenditure budget.

This data, one set for each crop (irrigated and non-irrigated) crop system, will be analyzed comparatively in order to observe income and expenditure differences and calculate the rate of return.

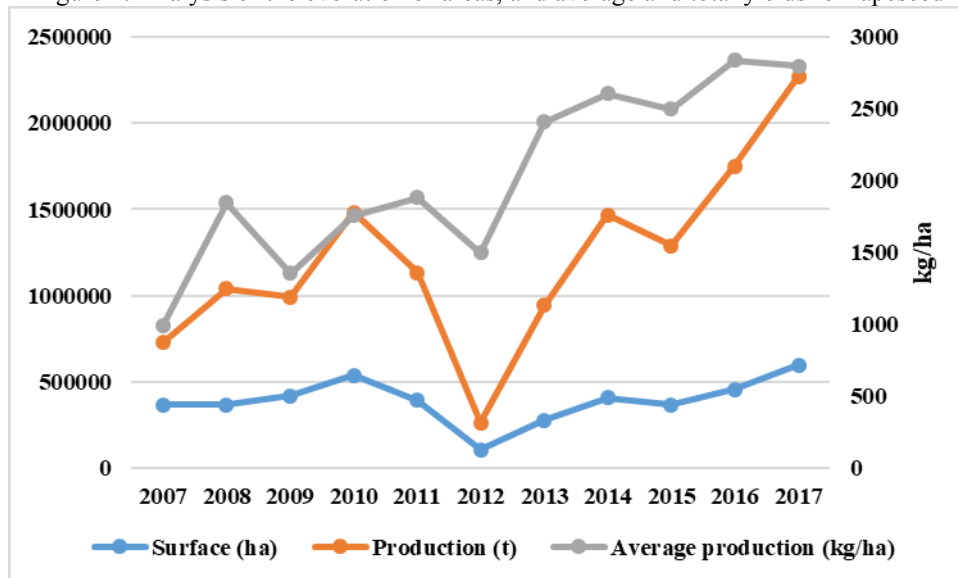
## RESULTS AND DISCUSSIONS

First, it will start from the irrigated agricultural area in Romania, as specified by official national statistics, with at least one watering. On average, over 2007-2017, the irrigated agricultural area was 190,000 hectares, with a maximum in the first part of the analysed periods of more than 320,000 hectares, and in the last year the irrigated agricultural area was over 211 hectares. Out of this area, on average, about 99.3% is the area actually irrigated by at least arid watering. On average, over the whole period, 2007-2017, the irrigated land actually with at least one watering registered a decreasing trend, with an average annual negative rate of 4.06%.

The fact that the irrigated area has decreased in Romania is a direct consequence of the management of irrigation systems and its infrastructure, but the question may arise as to why these areas do not increase if they increase the profitability of crops, ie why large-scale farming companies do not invest in such systems.

Regarding the rapeseed surface, these irrigated crop areas are not allocated in Romania's national statistics, but we can analyse the total area and yields at national level to further analyse the average yield per hectare in order to determine its tendency and the degree of development, if this case exists.

Figure 1. Analysis of the evolution of areas, and average and total yields for rapeseed



Source: own processing based on [www.insse.ro](http://www.insse.ro) data

On average, during the reference period, the area planted with rapeseed recorded an increasing trend, with an average annual growth rate of 5.06%, resulting in an average over the whole period of about 390 thousand hectares. As can be seen in Figure 1, in the first part of the period the area increased year-on-year, and in 2010, it registered a decreasing trend, reaching the lower limit in 2012, when it was cultivated only a little over 100,000 hectares (105.3 thousand hectares), but in the following period the area planted with rape began to grow almost constantly until 2017, when the total cultivated area was about 600 thousand hectares (598 thousand ha).

Also in Figure 1 is the evolution of total rapeseed production in Romania, so it can be seen that it maintains the tendency of the cultivated areas, but it shows a more amplified growth. For this

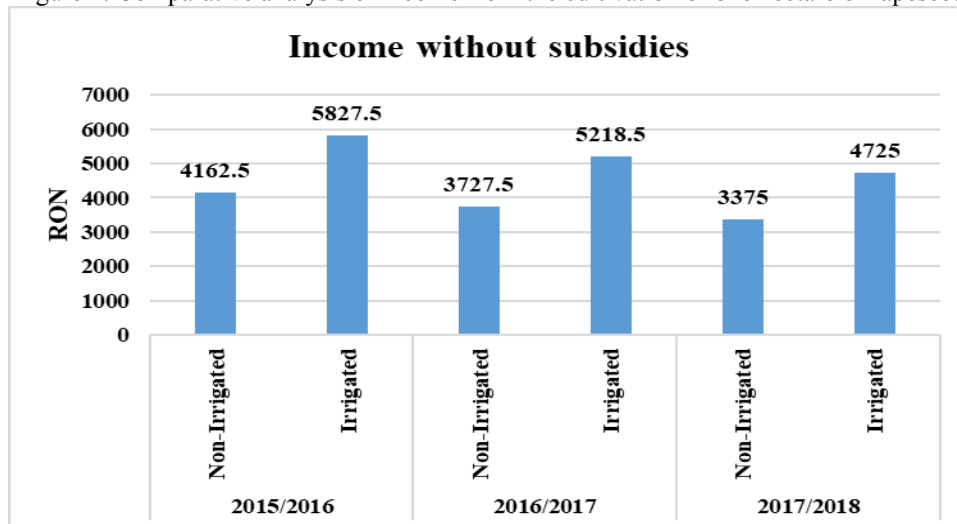
indicator, the average annual growth rate was 16.56% during the analysed period, and in this area of time, the average total production was 823 thousand tons of rapeseed.

Regarding the average yield per hectare, it oscillated according to the two indicators presented above. Starting from a very low yield in the first period, ie 990 kilograms of rapeseed per hectare, this indicator has been quite significant, with an average annual growth rate of 10.94%, reaching 2017, at a crop yield per hectare of 2798 kilograms of rapeseed. This is due to the fact that this cultivation has intensified, ie the total production has increased considerably more than the growth of cultivated areas. On average, for 2007-2017, the average yield per hectare for rapeseed was 2110 kilograms per hectare.

Therefore, it can be established that the importance given to this culture is significant given its intensive growth and the fact that the production obtained is demanded by the market. Next, the economic indicators of rape crop for the two non-irrigated and irrigated production systems will be analysed in order to determine the irrigation efficiency of the crop to increase the average yield per hectare.

According to the data and technical reports submitted to the Ministry of Agriculture and Rural Development by the Research Institute for Agriculture Economy and Rural Development concerning ADER 13.1.2, these data were calculated and estimated between 2015-2018, cultivating one hectare of rapeseed.

Figure 2. Comparative analysis of income from the cultivation of one hectare of rapeseed



Source: Data processed according to the ADER project 13.1.2

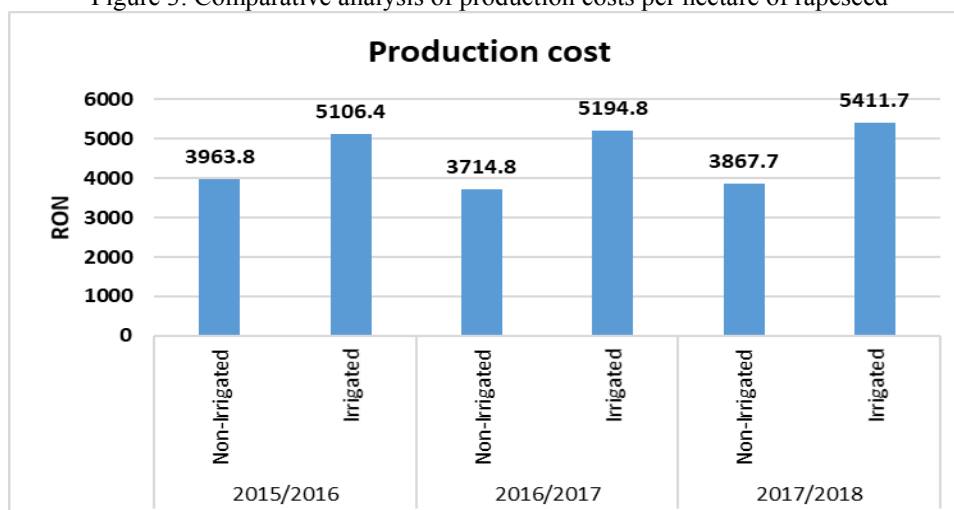
Figure 2 compares the income obtained without subsidies after the cultivation of one hectare of rapeseed for three agricultural years, depending on the crop, irrigated and irrigated system respectively.

Analysing comparatively, it can be noticed that for the crop year 2015-2016, the income obtained in the irrigated system is higher than that obtained in the non-irrigated system by 1665 lei / ha and 40% respectively.

In the agricultural year 2016-2017, in the irrigated system a higher income is earned, compared to the non-irrigated system, by 1491 lei per hectare, respectively by 40%, but the income is lower than the previous agricultural year due to the price of capitalization rape that directly influences the income per hectare.

In the current agricultural year, the yield per hectare of irrigated rapeseed, higher by 1350 lei, was estimated by the project, compared to the non-irrigated one, the relative growth remaining at the same level, being strictly linked to the increase in production; an average yield of 2500 kilograms per hectare for non-irrigated crops and 3500 kilograms of rapeseed per hectare was taken into account for what irrigation, hence the level of revenue by 40%, given the constant sales price between systems.

Figure 3. Comparative analysis of production costs per hectare of rapeseed



Source: Data processed according to the ADER project 13.1.2

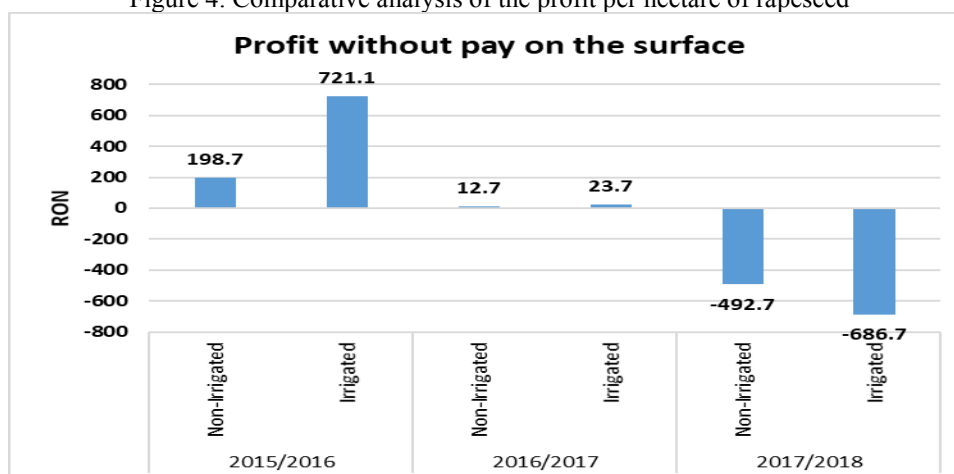
In Figure 3, the level of expenditure for one hectare of rapeseed is similarly high, so in the first agricultural year, 2015-2015, the difference between the irrigated and non-irrigated system in terms of the production cost is 1196.6 lei per hectare, being 28.83% higher. Thus, it can be seen that the absolute difference between systems of expenditure is less than the income gap previously analysed for the same year.

In the following year, the irrigated culture cost, on the surface unit, more than the non-irrigated with 1480 lei, being higher by 39.84%. There is an increase compared to the previous year of the difference between the two crop systems, by 11 percentage points, respectively by 283.4 lei per hectare.

In the current agricultural year, there is an even greater discrepancy between the two systems in terms of the cost of rape cultivation, so it is estimated that the irrigated system recorded a higher cost of 1544 lei per hectare, respectively 39.92 %, an increase of only 64 lei (0.08 percentage points) compared to the previous year, but this increase is sufficient to exceed the level of the expenditures in the previous figure by 194 lei, given the downward trend in revenue and rising costs.

In order to better observe the profitability level, the level of profit obtained from a hectare of rapeseed will similarly be compared.

Figure 4. Comparative analysis of the profit per hectare of rapeseed



Source: Data processed according to the ADER project 13.1.2

Regarding the profit per unit area, in Figure 4 it can be noticed that for the first agricultural year, the difference between the two irrigated and non-irrigated crop systems was 522.4 lei per hectare, respectively in the irrigated system the profit was higher than 3.63 times.

In the second year there is a significant decrease in the profitability of the crop, thus registering a gross profit of 12.7 lei for the non-irrigated system and of 23.7 lei for the irrigated one, even if the relative difference is almost double, it is obtained profit margin of only 11 lei per hectare.

This year, a loss for rape crop is expected for both crop systems, respectively 492.7 lei for non-irrigated and 686.7 lei for irrigation. Therefore, the increase in production by irrigation works this year is economically ineffective, with a higher loss of 194 lei and 39.37% respectively.

By analysing gross profits, it can be seen that it is more influenced by the level of spending that "pulls down" the level of profit per hectare of rapeseed, and the increase in production level in the last year is economically unjustified, the expenses that come with the increase in production are higher than the level of income generated by this increase.

## CONCLUSIONS

The paper sought to analyse economically the efficiency of productivity growth on the surface unit by using the irrigation system for rapeseed crops.

It is appreciated that, in the last period, the level of incomes obtained for the irrigated system compared to the irrigated system is higher, given the average yield per hectare, but it shows a decreasing trend. Besides this, the level of spending is higher for this system, and the difference between the two systems has a diametrically opposed trend towards revenue and an increase. Therefore, analysing the evolution of these two economic indicators will intersect and will change the profitability of the culture as it can be seen in the last analysed year, when the profit level for the irrigated system was lower than the irrigated system.

It can be appreciated that the intensive development of the crop by increasing the yield per hectare by irrigation can be economically inefficient, in certain situations, when the price of capitalizing on the crop is reduced and the increase of the costs directly proportional to the level of the increase of the production is too high.

This situation can also be explained by the fact that the share of irrigation expenditure actually decreased over the analysed period, influencing more the other variable expenses that increase with the increase of the production. In the first agricultural year, irrigation expenditures accounted for 41.15% of the difference in expenditure between the two systems, and with the increase of this difference and the decrease of the irrigation expenditures it reached 20.3% and 19, respectively, 43%.

It should be noted that in the last year legislative measures have been made with regard to the cost of irrigation and settlement or their de-commitment for farmers in the country. This would reduce the loss recorded in the last year, but due to the low share of irrigation costs in the cost gap, the situation will not improve significantly.

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