STUDY ON THE ECONOMIC YIELD OF WHEAT CROPS IN THE SPECIFIC CONDITIONS OF THE GREAT ISLAND OF BRĂILA IN IRRIGATED AND NON-IRRIGATED SYSTEM

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Abstract:
Wheat variety must adapt as well as possible to the climatic conditions and the soil on which it is grown, so that the yield and quality obtained are as high as possible. Some varieties cope well with drought and frost, others adapt even to soils with low fertility. The choice of wheat variety must be made taking into account all these factors. In addition to the climatic factor, Romanian farmers who want to achieve crop performance should consider other aspects when deciding on the variety of wheat they will grow. The aim of the research paper is to identify the best wheat varieties in terms of economic yield under irrigation and non-irrigation conditions. The research was carried out in conditions specific to the plain area, more precisely the Great Island of Brăila, where the wheat crop occupies a significant area. This study intends to make a contribution in order to optimize some elements of wheat cultivation technology, related to the irrigation regime in order to improve economic performance both by increasing production yield and by significantly eliminating losses resulting from the production process.

Key words: irrigation, economic yield, monitoring, wheat

Wheat is known in the world as one of the most important food plants being cultivated in over a hundred countries. The crop extends to 66º north latitude and 45º south latitude, it is estimated that somewhere in the world, wheat is harvested every month.

In terms of cultivated area, Romania ranks fourth in Europe, on the same position as the United Kingdom, after France (5.1 million hectares), Germany (3.2 million ha) and Poland (2.3 million ha). However, the yield per hectare of 2.4 tonnes is less than half the average yield in the European Union. For example, Denmark had an average production of 8.1 tonnes per hectare in 2009, which placed it above Romania as a total production, although the area cultivated with wheat is only 740.000 hectares. In 2009, Romania was ranked 7th in terms of production, due to yield, which accounted for less than half (44.7%) of the EU average yield (https://ro.wikipedia.org/wiki/Agricultura_Rom).

Achieving production that ensures financial comfort for producers must be done by optimizing all the factors that contribute to plant development without forcing high yields through excessive application of fertilizers and other growth stimulants that create imbalances both in the plant and in medium.

For objective and subjective reasons in Romania the production of autumn wheat in recent years is declining. So, there is a need to analyze and assess the economic efficiency of winter wheat production and develop concrete directions, which will help increase the level of profitability of this product. The choice of a wheat variety that ensures the best possible concordance between the pedoclimatic resources of the area and the biological particularities of the variety is an essential condition for obtaining a large and stable production (Ion V., Epure L.I., 2005). In addition to the high production capacity, the varieties must also have a good resistance to the main risk factors and have a qualitative potential corresponding to the requirements.

Obviously, the level of the obtained productions depends on the optimal application of all the technological links starting with the choice of the variety and ending with the harvesting. Choosing the best varieties from those recommended in the area, alone cannot guarantee high yields, if the full range of technological measures is not applied at an optimal level. In wheat cultivation technology, the foundations of high crops are laid with the establishment of the crop, which includes a series of technological sequences designed to lead to the realization of

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well-closed fields at emergence (Petcu Gh., Petcu E., 2008).

The aim of the study is to contribute to the optimization of some elements of wheat cultivation technology, related to the irrigation regime, in order to improve economic performance both by increasing production yield and by significantly eliminating losses from the production process.

MATERIAL AND METHOD

In order to highlight the degree of influence of irrigation on cereal wheat production, complex experiments were organized in 2018-2019 on three varieties of wheat (Glosa, Miranda and Joker), in the plains of the Great Island of Brăila.

Within Romania, the Big Island of Brăila is located in the southeast, being the administrative part of Brăila County.

From a climatic point of view, the area where the Great Island of Brăila is located, is part of a dry steppe climate, with hot and dry summers and cold winters, low rainfall and long periods of drought, sometimes over 30 days, in the interval April-September, with temperatures above 22°C in July, with maximum precipitation at the end of spring and minimum precipitation during winter.

The aridity index is around 22, which indicates a semi-arid, mediterranean climate with high water requirements, especially in the critical periods (June - August) for spring crops.

The soil in the Big Island of Brăila is alluvial, not one of the best.

On the surface of the experiment, the soil texture varies from sandy to contractile clay. The content of soluble salts in the soil varies between 89.16 and 215 mg / 100gr. sol.

From this point of view, they are characterized as normal soils in terms of soluble salt content.

In order to determine the economic efficiency of agricultural products, the main determining elements will be taken into account: costs, prices, profit and profit rate. In order to reflect as accurately as possible, the necessary efforts, as well as the obtained effects, we will study the practice of conventional agriculture in irrigated and non-irrigated system.

During the experiments, the influence of factors such as wheat variety and the system used, irrigated or non-irrigated, on wheat production was monitored.

This paper presents some of the results on the economic efficiency of the wheat irrigation regime.

For two years (2018-2019) the production of three varieties of wheat (Glosa, Miranda and Joker) was studied, taking into account the irrigation regime factor, two variants were tested - non-irrigated and irrigated, the non-irrigated variant being tested.

For each experimented variant, technological sheets were prepared in each of the two experimental years.

RESULTS AND DISCUSSIONS

On average for the two experimental years (2018-2019), the yields obtained, in irrigated and non-irrigated system, are between: 7211.5 kg/ha and 5475.5 kg/ha for the Glosa variety, 7840.5 kg/ha and 5389 kg/ha for the Miranda variety and for the Joker variety 7616kg/ha and 6121kg/ha.

From the analysis of the data on the productions made for two years for the three varieties *(table 1)* in irrigated system, it is found that the production obtained is higher for the Miranda variety (7840.5 kg/ha), and in non-irrigated system, with the most increases large average yield per hectare was the Joker variety (6121 kg/ha).

Table 1

The average production per hectare achieved for two years for the three varieties

Average production 2018-2019 kg/ha			*Production increase kg/ha*
Wheat variety	*IRRIGATED*	*NON-IRRIGATED*	
GLOSA	7211.5	5475.5	1735.5
MIRANDA	7840.5	5389	2451.5
JOKER	7616	6121	1495

In 2018, the production increase obtained in irrigation regime compared to the non-irrigated regime, determines that the cost price / product unit will be higher. The production increase obtained in irrigation regime compared to non-irrigated *(figure 1)*, was higher for the Miranda variety by 31.04%, for the Glosa variety by 19.48% and for the Joker wheat variety, by 13.28%.

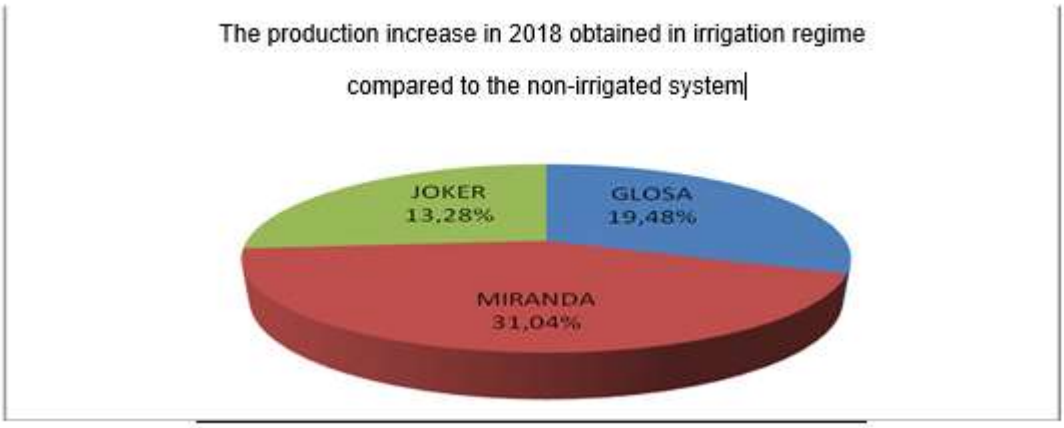

Figure 1 **The increase of production obtained in irrigation regime compared to the non-irrigated system in 2018**

The costs for the establishment and maintenance of irrigated crops, for 2018 *(figure 2)*, were: 4510 lei/ha for the Glosa variety, 4527 lei/ha for the Miranda variety and 4518 lei/ha for the Joker variety instead of the non-irrigation system expenses were lower by 22.48% for the Glosa variety, by 23.01% for the Miranda variety and by 22.59% for the Joker variety.

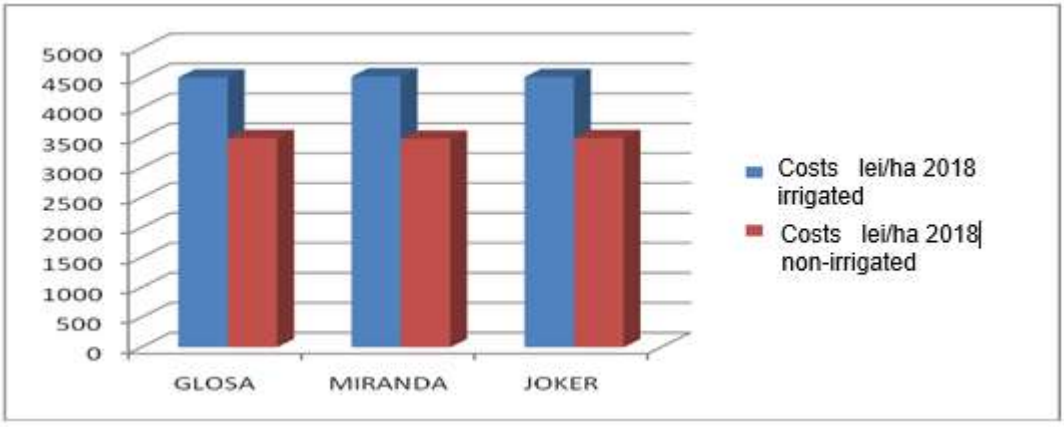

Figure 2 **Total production costs in 2018 in irrigated and non-irrigated regime**

In the case of the Glosa variety in non-irrigated regime, in 2018, the registered unit production cost was 3496 lei/ha, the obtained income was 3729.22 lei/ha resulting in a total profit of 243.22 lei/ha. Comparatively, in the irrigation regime, the production expenses were of 4510 lei/ha and the obtained income was of 4643.8 lei/ha, observing a decrease of the profit, which was of 133.8 lei/ha.

From the analysis of the economic indicators obtained for the Miranda variety, the total production costs show an increase of 23.02% in irrigated system, compared to non-irrigated, and the registered profit was 670.46 lei/ha in irrigation and 99.22 lei/ha at non-irrigated.

For the Joker variety, the amounts spent on obtaining production are 3497 lei/ha for non-irrigated crops and 4518 lei/ha for irrigated crops, expenses induced by the amounts necessary for carrying out mechanized works and the profit obtained was 750 lei/ha for non-irrigated and 380 lei/ha in irrigated system.

Taking into account the results obtained in the conditions of the agricultural year 2018 (*figure 3*) for the three studied varieties, it is found that the maximum profit per hectare in non-irrigation conditions was obtained in the case of Joker variety (750 lei/ha), and in irrigation conditions the maximum total profit is obtained in the case of cultivating the Miranda variety (670.46 lei/ha).

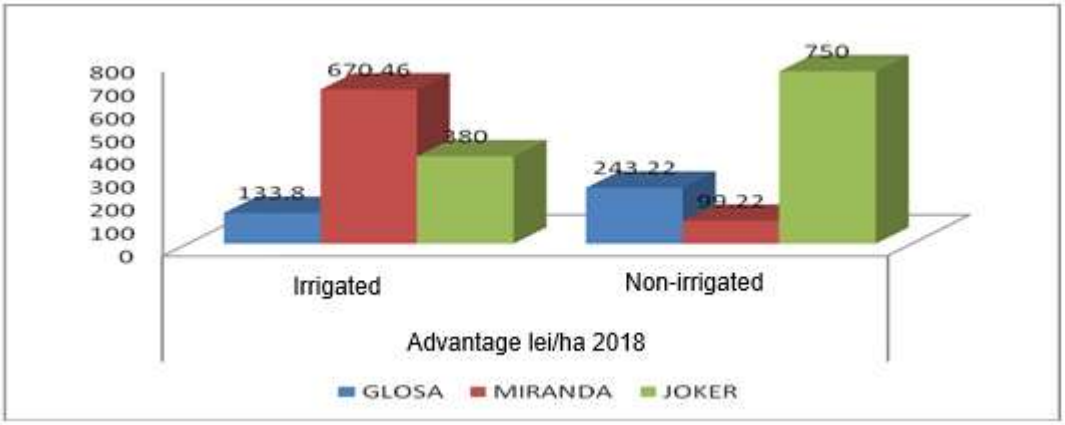

Figure 3 **Irrigated and non-irrigated economic yield, wheat 2018**

In 2019, the costs for the establishment and maintenance of irrigated crops *(figure 4)* were: 5098 lei/ha for the Glosa variety, 4765 lei/ha for the Miranda variety and 4827 lei/ha for the Joker variety instead of the non-irrigated system, the expenses were lower by 28.89% for the Glosa variety, by 24.91% for the Miranda variety and by 23.62% for the Joker variety.

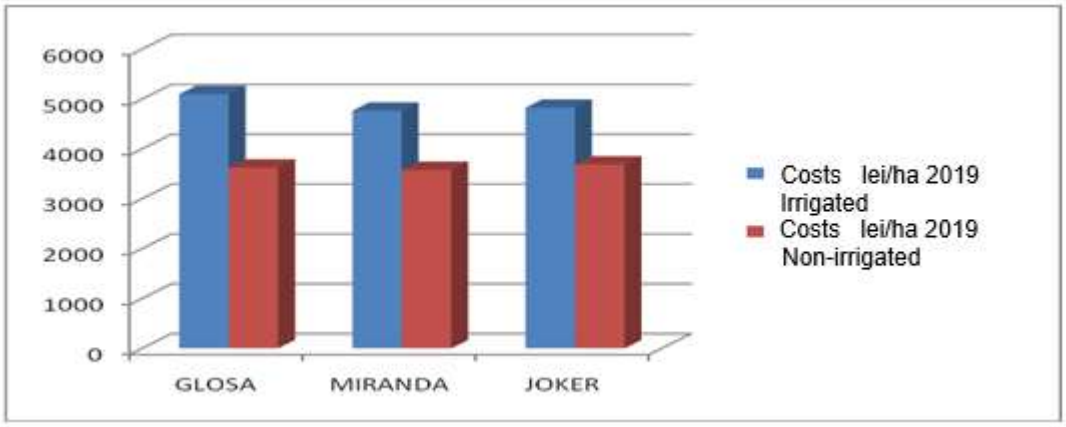

Figure 4 **Total production costs in 2019 for irrigated and non-irrigated**

In the case of the Glosa variety in non-irrigated regime, in 2019, the registered unit cost of production was 3625 lei/ha, the income obtained was 3690 lei/ha resulting in a total profit of 65 lei/ha. Comparatively, in irrigation regime, the production expenses were of 5098 lei/ha and the obtained income was of 5473.5 lei/ha observing a slight increase of the profit, which was of 101.75 lei/ha.

From the analysis of the economic indicators obtained for the Miranda variety, the total production costs show an increase of 24.91% in irrigated system, compared to non-irrigated, and the registered profit was 708.5 lei/ha in irrigation and 169,75 lei/ha for non-irrigated.

For the Joker variety, the amounts spent to obtain production are 3687 lei/ha for non-irrigated crops and 4827 lei/ha for irrigated crops, expenses induced by the amounts needed to carry out mechanized works and the profit obtained was 375 lei/ha for non-irrigated and 672 lei/ha in irrigated system.

Taking into account the results obtained in the conditions of the agricultural year 2019 (*figure 5*) for the three studied varieties, it is found that the maximum profit per hectare in non-irrigation conditions was obtained in the case of Joker variety (375 lei/ha), and in irrigation conditions the maximum total profit is obtained in the case of cultivating the Miranda variety (708.5 lei/ha).

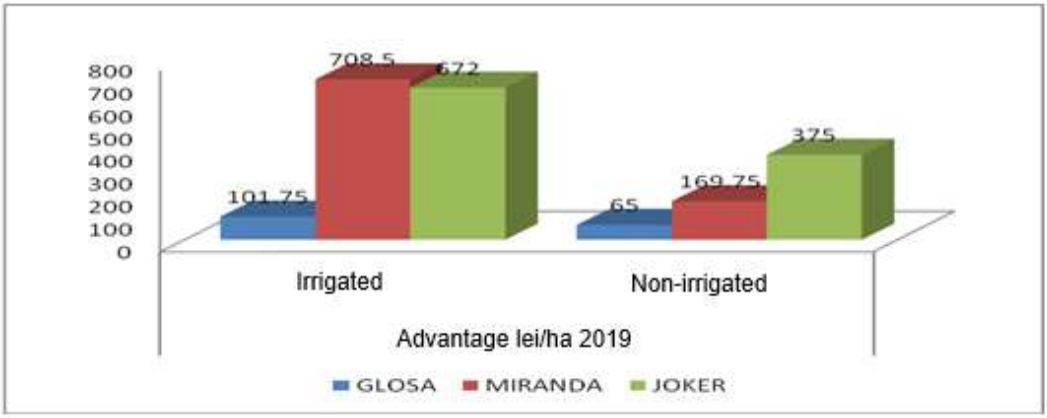

Figure 5 **Irrigated and non-irrigated economic yield, wheat 2019**

Important benefits are obtained for all wheat varieties grown in irrigated system even if production costs were 25.88% higher than in non-irrigated system such as Glosa.

Regarding the unit cost of production (lei/ha), on average for the two years of production (*table 2*), the Miranda variety had the lowest expenditure per hectare in both irrigated and non-irrigated systems.

Table 2

The main economic indicators for wheat varieties cultivated in irrigated and non-irrigated system Great Island of Brăila 2018-2019

Average 2018-2019				
System	Economic indicator	Variety		
		Glosa	Miranda	Joker
Non-irrigated	Cost of prod. (lei/ha)	3560.5	3531.5	3592
	Selling price (lei/kg)	0.685	0.685	0.685
	Revenue (lei/ha)	3714.61	3665.98	4145.5
	Profit (lei/ha)	154.11	134.485	562.5
Irrigated	Cost of prod. (lei/ha)	4804	4646	4672.5
	Selling price (lei/kg)	0.685	0.685	0.685
	Revenue (lei/ha)	4921.77	5326.48	5198.5
	Profit (lei/ha)	117.775	689.48	526

Analyzing the results obtained on average over the two years of study, it is found that the highest profit per hectare of wheat (*figure 6*) is obtained by cultivating the Joker variety in non-irrigated regime and the maximum total profit per hectare cultivated with wheat was determined in the case cultivation of the Miranda variety, in irrigation regime, this being of 689.48 lei/ha.

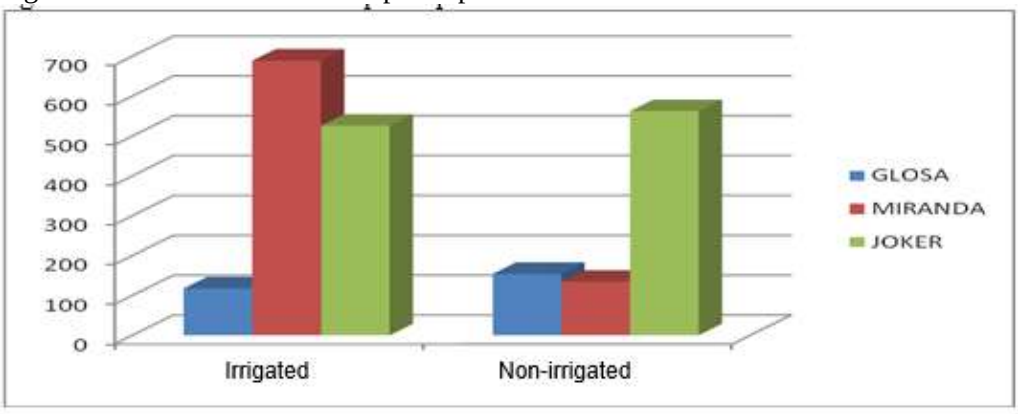

Figure 6 **Economic efficiency of wheat crop irrigation regarding the profit obtained in 2018/2019**

CONCLUSIONS

Analyzing the results of the production averages, for the two years, from table 1, it results that the variant in irrigation regime obtains the highest production, 7840.5 kg/ha for the Miranda variety, followed by the Joker variety with 7616 kg/ha and respectively 7211.5 kg/ha for the Glosa variety.

In the non-irrigated regime, the highest average production was obtained for the Joker 6121 kg/ha variety, followed by the Glosa variety 5475.5 kg/ha and 5389 kg/ha, respectively, for the Merinda variety.

From the results obtained on average over the two years of study, it is found that the highest profit per hectare of wheat is obtained by cultivating the Miranda variety under irrigation.

The maximum total profit per hectare cultivated with wheat, Miranda variety, in irrigation regime was 689.48 lei/ha.

Regarding the unit cost of production (lei/ha), on average for two years of production, it was lower for the Miranda variety, both in non-irrigation conditions and in irrigation conditions, compared to the other varieties analyzed.

Comparing the results obtained over the two years of study with the irrigated and non-irrigated cultivation variants, it results that the wheat, Meranda variety responds better to irrigated cultivation and Joker variety adapts better cultivated in non-irrigated system compared to the other studied varieties.

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