SECONDARY IRRIGATION INFRASTRUCTURE IN ROMANIA: INFLUENCE OF THE WATER USER`S ASSOCIATIONS MODERNIZATION ON THE PERFORMANCE OF THEIR MEMBER FARMS

Alexandru-Dragoș ROBU[1], Carmen-Luiza COSTULEANU [1], George UNGUREANU[1], Mioara BORZA[2], Stejărel BREZULEANU[1]

e-mail: robu_dragos@yahoo.com

Abstract

In this paper the authors undertook an analysis of the Water User's Associations influence on the performance of their members and on the agricultural sector. The existing crop irrigation infrastructure was built during the communist period, before 1989. It was divided, since it's been built, into primary and secondary infrastructure. After 1989, the secondary infrastructure, usually built and located in key spots, in the proximity of water sources and farms, was assigned to these units for maintenance and modernization. Water User's Associations are non-profit economic units that can be established by a minimum of ten members, agricultural units, and can benefit for receiving such an infrastructure located in their proximity. Since Romania joined the E.U., some financial incentives have been developed with the purpose of modernization of the primary and secondary irrigation infrastructure. Thus, the secondary infrastructure can benefit from up to 1,000,000 Euro, with an intensity of 100% non-reimbursable for the modernization of its entire serving area. In this paper the authors analyze the effectiveness of such an investment, a specific investment amounting to 999,933 Euro. It will be shown how by carrying out the investment and modernizing the infrastructure, an annual saving of 6,621,000 cubic meters of water will be achieved, as well as an annual saving of at least 463,200 lei. As will be shown, the largest impact consists in the sufficient irrigation of the crops that leads to yields up to 4 times higher per ha. The authors determined numerous indicators from the studies that are presented in the paper.

Key words: irrigation, crops, European incentives

Romania is in the top of the European Union countries in terms of the number of farms, about one million farmers developing this activity, unfortunately most of them working in the inefficient system of subsistence agriculture (National Rural Development Programme 2014-2020).

Through the Common Agricultural Policy, Romania benefits from two types of financial support: direct payments granted under the 1st Pillar and non-reimbursable financial aid granted on the basis of investments made by farmers, through the 2nd Pillar (NRDP 2014-2020).

The EAFRD is complementary to direct area payments to farmers, respectively natural and / or legal persons engaged in agricultural production. While the Agency for Payments and Intervention in Agriculture (APIA) manages these direct payments, the Agency for Rural Investment Financing (AFIR) manages European non-reimbursable funds for the modernization of the agricultural sector (Robu A.D. *et al*, 2016).

Each of the two pillars provides support through two different European funds. Thus, direct payments through Pillar have as their source EAGF (European Agricultural Guarantee Fund), while Pillar II payments have as source EAFRD (European Agricultural Fund for Rural Development). The latter, whose tools have benefited the unit analyzed in the present paper, is carried out in Romania through the National Rural Development Program (NRDP 2014 – 2020).

Starting from the initiative of the European Council on support for rural development through the European Agricultural Fund for Rural Development (EAFRD), the National Strategic Plan for Romania, which is the instrument for the implementation of the National Rural Development Program for the period 2007 – 2013, was developed. Finally, NRDP is the instrument for accessing the European Agricultural Fund for Rural Development (EAFRD) and has been developed for the 2007 – 2013 and 2014 – 2020 intervals (AFIR, 2018).

[1] "Ion Ionescu de la Brad" University of Agricultural Sciences an Veterinary Medicine of Iași
[2] "Alexandru Ioan Cuza" University, Iași

One of the main sectors that benefit from EAFRD funds in recent years is the irrigation sector. Specifically, both the primary infrastructure (managed by the National Agency of Land Improvement under the Ministry of Agriculture) and the secondary infrastructure owned by the Water User's Associations are aimed at modernization.

The allocated funds for the secondary infrastructure were not significant in the recent years but it is expected that this allocation will rise given the increasingly dry years that are recorded throughout Romania.

The authors undertook an analysis of the Water User's Associations influence on the performance of their members and on the agricultural sector. The existing crop irrigation infrastructure was built during the communist period, before 1989. It was divided, since it's been built, into primary and secondary infrastructure.

After 1989, the secondary infrastructure, usually built-in key spots, in the proximity of water sources and farms, was assigned to these units for maintenance and modernization.

Water User`s Associations are non-profit economic units that can be established by a minimum of ten members, agricultural units, and can benefit for receiving such an infrastructure located in their proximity.

Since Romania joined the E.U., some financial incentives have been developed with the purpose of modernization of the primary and secondary irrigation infrastructure (Brezuleanu S., 2009).

Thus, the secondary infrastructure can benefit from up to 1,000,000 Euro, with an intensity of 100% non-reimbursable for the modernization of its entire serving area. The studied unit invested 999,933 Euro by which covered three sectors: modernization of the irrigation of waterpipes for 6.4 km, modernization of the main pumping station and the acquisition of six irrigation equipment.

By this investment, after its commissioning, It will be shown how by carrying out the investment and modernizing the infrastructure, an annual saving of 6,621,000 cubic meters of water will be achieved, as well as an annual saving of at least 729,951 lei. The largest impact consists in the sufficient irrigation of the crops that leads to yields up to 4 times higher per ha. The authors determined numerous indicators from the studies that are presented in the paper.

MATERIAL AND METHOD

The necessary studies and approaches for development of this paper have been carried out during 2020. The primary data was the main source of information. The authors have gained access to the Water User's Organization financing project, financial statements and accounting statements. For studying these documents, a series of visits were carried out at the unit's headquarters. Since the Organization has 13 members, these member's financial and accounting documents were studied. The documents of the 13 units regarding the evolution of the areas used for crops in the agricultural year 2019 – 2020, the financial accounting documents regarding the evolution of the economic indicators, the evolution of the technical capacity through the irrigation investments made and other aspects were analyzed.

On the other hand, data from secondary sources, respectively the specific literature in Romania and abroad was used, including the official reports of the Agency of Financing of Rural Investments.

Both the data obtained in the analysis of the documents of the agricultural units as well as those of the specialized literature were processed and interpreted in order to highlight the advantages of the 1,000,000 Euro investment that this Water User's Organization made during the last two years.

RESULTS AND DISCUSSIONS

Two main factors are currently involved in sector irrigation in Romania: the Ministry of Agriculture and Rural Development - including through subordinate agencies - and farmers, who have formed Irrigation Water User's Associations. The general lines of activity of these two factors were drawn by Law 138/2004 - the Law on Land Improvements.

Since Romania's accession to the EU, on 1st January, 2007, it benefits from grants for the modernization of the existing secondary irrigation infrastructure. This infrastructure comes from the regime prior to 1989 and is located in the proximity of large and constant water sources: Prut, Siret, Olt rivers, Danube stream etc.

In order to take possession of this infrastructure located in their vicinity, farmers have to establish Water User's Associations, according to the requirements designed and published by the Ministry of Agriculture and Rural Development.

Owning such an organization, they become eligible to benefit from 1,000,000 Euros from the E.U., 100% non-refundable, to modernize their irrigation system.

These systems generally consist of irrigation pumping stations, canals, pipes and antennas. All these together contribute to the water pumping from the primary infrastructure (main pumping

stations which sucke water from the source) to the crop irrigation final equipment (pivots, drums etc).

The specific investments of the project consist in modernizing the secondary irrigation infrastructure by modernizing and rehabilitating the SPP pressure station and the network of buried pipes which the Association owns. The investment is of public utility and serves all its member and landowners. The modernization and rehabilitation works, with the acquisition of irrigation equipment were the object of the investment.

The total area of the Association taken for study has 2,761 ha. This area is cultivated by the 13 member farmers, on the territory of three communes from Iași County. The modernization will generate, after its commissioning, a water saving of 20.17%. This investment was proposed taking into account the required quantity of water for each crop. *Table 1* centralizes the quantity of water required by each crop of the farms in the Association.

The investment was required especially due to the appreciable age (about 36 years old), the existing facilities and equipment are physically and morally worn, damaged, so they operate with very low energy yields, high electricity consumption for water pumping and particularly high maintenance and repair costs.

As it can be seen, the expenses for all the irrigation systems used for the 2,761 ha is double in the scenario of maintaining the current structure without the grant modernization (*table 2*)

Besides the important financial economies that the Water User's Organization benefits, another significant benefit for the farmers is the much better production of their crops. In 2020, the most significant differences were recorded on maize and sunflower crops. Given that all the above costs of the infrastructure usage and staff salaries are supported by all the 13 members, the expenses for each member is extremely low compared with the benefits of optimally and sufficiently irrigating the crops. Moreover, given the state-of-the-art technologies used when building these systems by European financing, the needed staff for operating the whole system is minimum. One of the main assets of the system is the SCADA technology which allows the system to be controlled by any mobile phone or computer.

Table 1

Irrigation norms used within the studied farm

Nr. crt	Crop	Area ha	Percent	Irrigantion norm (mc / ha)	Norm distribution by month – ha					
					April	May	June	July	August	September
1	Wheat	359	13	1,840	359	359	0	0	0	-
2	Maize	1,105	40	2,470	0	1,105	1,105	1,105	1,105	-
3	Sunflower	138	5	2,000	0	138	138	138	-	-
4	Sugar beet	221	8	3,060	0	221	221	221	221	221
5	Soy	138	5	2,530	0	138	138	138	138	-
6	Lucern	414	15	3,470	0	414	414	414	414	-
7	Forage plants	248	9	3,670	0	248	248	248	248	248
8	Vegetables	138	5	3,030	138	138	138	138	138	-
TOTAL		2,761	100	-	497	2,761	2,402	2,402	2,264	469

For the cost – effectiveness analysis of the project the following data was used; it revealed a cost / effectiveness ratio of 0.46 lei / 1 cubic meter of saved water. This is due to the many positive features of the system after its commissioning, automatizations, higher efficiency etc.

Table 2

Figures on the system modernization benefits – lei

Description	By modernizing	Without modernizing	Odds
Pumped water volume from the water source, cubic meters	6,621	8,372	1,751
Repairs and maintenance costs, lei	65,000	300,000	235,000
Staff salary	110,000	360,000	250,000
Supplies	30,000	30,000	0
Cost of pumping electricity	572,130	815,330	243,200
TOTAL	**783,751**	**1,513,702**	**729,951**

It can be seen that there is a difference of 729,951 lei in terms of financial savings because of the modernization by the financing project. This means that the whole investment will pay off in as short as six and a half years.

Table 3

Calculation of irrigation water cost

Nr. crt	Specification	Unit	By modernizing	Without modernizing
1	Necessary water volume	Thousand cubic meters	1,730	1,730
2	Total water costs	Lei / year	969	969
2.1	Delivered water quantity	Thousand cubic meters	2,167	3,308
2.2	National Land Improvement Agency fee	Lei / year	969	969
3	Total exploitation costs, of which	Lei / year	600,460	286,492
3.1	Electricity	Lei / year	205,460	149,492
3.2	Wage	Lei / year	180,000	72,000
3.3	Consumables	Lei / year	15,000	15,000
3.4	Repair and maintenance costs, machine spare parts	Lei / year	200,000	50,000
4	Unit price of water required for irrigation	Lei / 1,000 mc	347,65	165,60
5	Water price reduction / increase [(2+3)/1]	%		-52,37

The main differences in costs consist, as can be seen in Table 3, in the amount of water delivered, electricity consumed, wages and maintenance costs.

The significant difference in the quantity of water delivered is explained by the significant losses recorded through the defective pipes before the investment.

As we can see from the same Table 3, the reduction if the water cost for irrigation in the investment scenario is 52.37% lower compared to the scenario where no investment is established.

A very important aspect is that the difference of 52.37% will be felt in the accounting and profitability of all farms served by this investment.

CONCLUSIONS

1. The authors of this paper took into study a Water User's Association which applied and won an European Grant of 995,100 Euros, finishing the project implementation in 2020;

2. The whole irrigation infrastructure of the Association taken into study is one of the largest in Romania, serving a total netto area of 2,761 ha and a number of 13 different vegetable farms;

3. The authors made an analysis on both the Association financial statements and individual statements on some of the members;

4. The expenditure of each member was minimum for implementing the project and for the usage of the infrastructure the whole yearly expenditure is 783,751 lei for year 2020; the cost – effectiveness analysis revealed a ratio of 0,46 lei for each one cubic meter of saved water;

5. The most important contribution of the system is that it provides enough water for all the crops of the members raising all the crop productions

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REFERENCES

BREZULEANU S., 2009 - *Management în agricultură*, Tehnopress Publishing House, Iași;

Robu A.D., Brezuleanu S., Borza M., Boldureanu G., Toma M.C., Costuleanu C.L., 2016 - *An analysis of S.C. AGROMIXT SPINENI S.R.L. agricultural company's evolution as an european funds beneficiary*. Scientifical Paper. Agronomy Series, 59(1):273 – 276;

******* - **Agency for Rural Investment Financing - AFIR, 2018,** Applicant's Guide for sub-measure 4.3i available online at www.afir.info

******* - **Ministry of Public Finance, 2019,** Public reports concerning the financial indicators of traders;

******* - **National Institute of Statistics, 2019,** Romanian Statistical Yearbook for 2018;

*** - **National Rural Development Programme 2014-2020**, NRDP 2014-2020 working procedures available at http://portal.afir.info.