

# THE IRRIGATION SYSTEM IN BRĂILA – A FARMER ECONOMIC FOCUSED APPROACH –

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## **Abstract**

*In the present context marked by ever increasing global climate changes, the use of irrigations in agriculture represents not only an option but more and more a necessity for ensuring a higher yield of agricultural products whose demand increases every year based on population growth. The present paper focuses on the specific elements of the irrigation systems from Brăila County, the way the farmers have access to and the different implications derived by using these systems. The paper turns to quantitative analysis of available statistical data and qualitative analysis of the interviews with local farmers focused on economic efficiency of the water used for irrigations.*

**Keywords:** *agriculture, irrigation, Brăila, economic efficiency, firm behaviour*

**JEL Classification:** Q<sub>14</sub>, Q<sub>24</sub>, Q<sub>25</sub>, D<sub>22</sub>, D<sub>23</sub>, P<sub>25</sub>

## **Introduction**

Brăila County is located in an area with continental climate, with higher temperatures and lower rainfall in recent years, multi-year averages. Under the conditions of climatologically aridity tendency, in which the soil moisture deficit during the growing season reaches approx. 350mm/season, irrigation is absolutely necessary (Symposium 2007).

The soils from Brăila County are predominantly chernozem (class I and II of suitability for agriculture). There are soils with naturally high fertility in which the percentage of humus is 3.0-4.5% (MARD, 2007: 12). According to the MARD data – Department of Agriculture Brăila, the average production in the main field crops (cereals, oilseeds) increased by 40 to 70% for irrigated crops compared to the non-irrigated crops (Table 1).

Table no. 1

**Average annual yields for the main crops in irrigated and non-irrigated systems – North Terrace – Brăila**

Crop / Production system		2008		2009		2010	
		average production		average production		average production	
		t/ha	irrigated/ non-irrigated (%)	t/ha	irrigated/ non-irrigated (%)	t/ha	irrigated/ non-irrigated (%)
Wheat	Irrigated	4.65	152.6	3.31	144.6	3.92	137.0
	Non-irrigated	3.05		2.29		2.86	
Maize	Irrigated	2.72	152.4	5.13	126.1	8.52	178.1
	Non-irrigated	1.79		4.07		4.79	
Sun flower	Irrigated	2.35	159.5	2.64	147.8	2.67	147.3
	Non-irrigated	1.47		1.79		1.81	

*Source:* own calculation based on data from the Department of Agriculture Brăila, for irrigation area North Terrace Brăila (Cazasu, Silișteea, Vădeni, Tudor Vladimirescu and Brăila municipality).

Over 90% of the agricultural and arable lands of Brăila County (92.6% and respectively 93.3%) have, according to NIS data for 2010, available facilities for irrigation. According to MARD, Brăila is the county in which, by far, the irrigations represent an important component of farming, having the largest area covered by Organizations of Irrigation Water Users – OUI (200,028 ha) (MARD 2011:24), the largest irrigated area (65% of the actual irrigated area at national level in 2010 – NIS 2012 data base) and the largest quantity of water pumped (46% of water used for irrigation in 2009 at national level – MARD, 2011). However, in the same year – 2010 –, the use of irrigation system in Brăila was very low. Effectively irrigated areas with at least one watering represented only 15% of the total agricultural area equipped for irrigation at the county level, respectively, 16.4% of arable land provided with such facilities (NIS 2012).

Ministry of Agriculture has developed, after extensive studies on the irrigation system, a national investment strategy in this sector. Through this strategy, the 56 hydro-technical viable arrangements have been ranked in order of the priority for the investment for rehabilitation and modernization of the irrigation systems that they will benefit; in the top three, in priority order, are placed three arrangements from Brăila County that cover 31% of the county area provided with reliable irrigation systems, the rest of the hydro-technical viable areas from Brăila County falling within the category of secondary priorities (MARD, 2011).

Given the records of the irrigation system in the county with the largest area of operation and its use – Brăila: irrigation system is still functional in much of the area with such type of facilities (in 2009 for 62.4% of the county area with hydro-technical facilities, irrigation system was classified as “viable”, capable of use and recipient of the investment in system rehabilitation – MARD, 2011); the acute need for irrigation given by the agro-pedo-climatic conditions; substantial increase of the

yield per unit area due to the use of irrigation water; investment efforts of the public authorities in rehabilitation of the irrigation system in the county – the question that arises is whether and to what extent the strategic, financial and institutional efforts for increasing viability of the irrigation system respond to the triad: *needs - resources - efficiency* at farmers level in Brăila County.

### **Literature review**

The growing water scarcity and the misuse of available water resources are nowadays major threats to sustainable development for most countries. The important role that agriculture could play not only in feeding and clothing burgeoning population is well recognized, but also in increasing the limited available water supply by reducing water losses and by increasing the water use efficiency in the irrigation sector. In agriculture, water use efficiency may be defined quite differently by a farmer, a manager of an irrigation project, or a river basin authority (Hamdy, A. et. al., 1999).

From the economic perspective, a series of static and dynamic methods for evaluating irrigation efficiency was developed in literature. In the present moment these methods recognize the importance of managers' goals such as profit maximization and risk minimization as well as the impact of limited information on the attainment of these goals (Bosch D.J. et al., 1987). The present state-of-the-art related to irrigation systems analysis identifies factors affecting organization of water users' associations, and collective action by farmers in major canal irrigation systems and move beyond isolated case studies to comparative analysis of the conditions for collective action based on quantitative and qualitative analysis of a stratified sample of irrigation systems (Rosegrant et. al., 1995; Rasmussen et. al., 1995; Meinzen-Dick et. al., 2002).

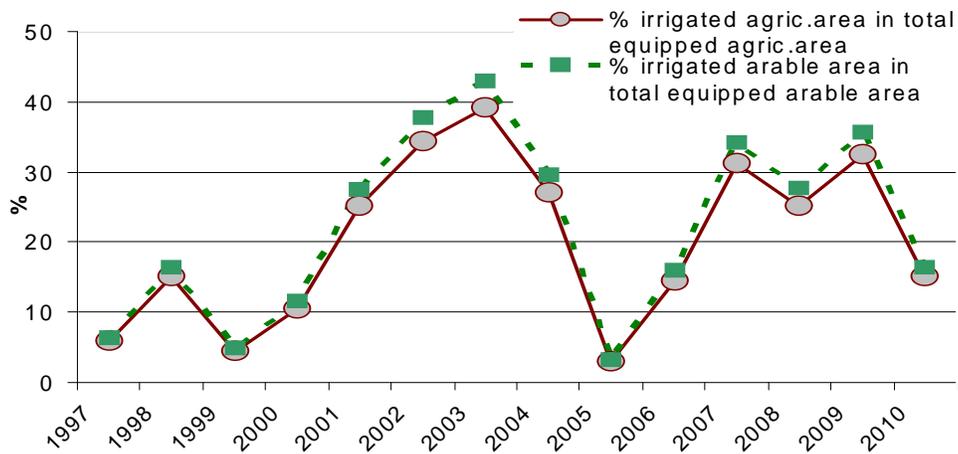
### **Theoretical background**

The finding of this analytical approach was based on the research undertaken within the project: *Sustainable Irrigation water management and River-basin governance: Implementing User-driven Services – SIRIUS* – (2010-2013) funded through 7 Framework Programme of the EU. Quantitative analysis of available secondary statistical data sources from NIS and territorial agricultural departments was used to elaborate a picture of the current situation and of the recent developments in access and use of the water for irrigation in Brăila County. This overview is supplemented with quantitative analysis and, especially, qualitative analysis of the interviews that were conducted with farmers from the North Terrace – Brăila (the interviews were designed by a team of researchers from the Institute of Agricultural Economics, Bucharest in the June 2011 - March 2012 period). By this method we tried to query the opinions of the farmers with access to irrigation system on: awareness of the *need* to access and use water for irrigation; economic and technical capacity to access the irrigation system, in other words, the *resources* available at the farm level that enhance/restrict the access to the water for

irrigation; the perception of economic *efficiency* of water use for irrigation in the investigated area.

### Brăila Irrigation System – farmer’s economic point of view

The secondary statistical information available at the level of National Institute of Statistics for the 1997-2010 period shows that in Brăila County there are significant variations of irrigated farmland from one year to another. These fluctuations are partly explained due to environmental conditions but, at the same time, these are motivated, as confirmed to us by the farmers themselves, by providing subsidies and access to the irrigation system. Thus, setting up of the Irrigation Water Users Associations – IWUA (since 1999) that associations of farmers with access to irrigation facilities, has enabled: i) the transfer of ownership of the tertiary irrigation infrastructure to the IWUA associations; farmers become responsible in maintaining and repairing the irrigation infrastructure that belongs to the IWUA; ii) access to subsidized electricity needed to run the irrigation system (which is mostly in the price paid for access to irrigation system in Brăila). This new institutional construction with private foundation, slowing down the degradation of irrigation system infrastructure and the subsidies allocated from the state budget for irrigation increased the access to water for irrigation (the irrigated area increased exponentially after 1999 so that, in 2003, they are nine times extended compared to the onset of reorganization of irrigation) (Figure 1).



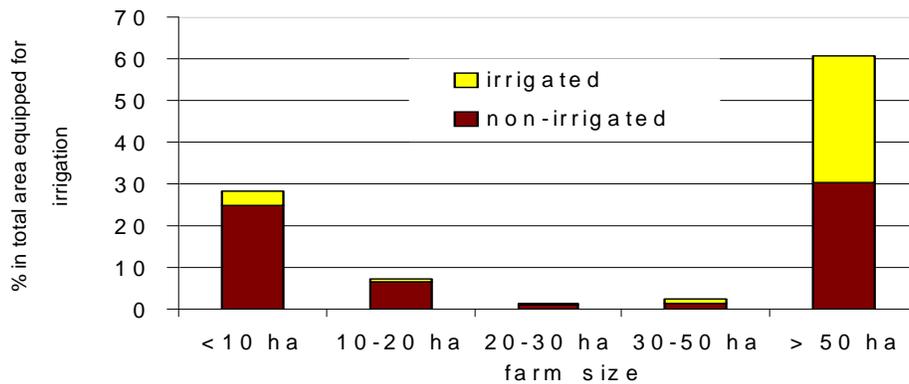
Source: NIS (2012)

Figure no. 1. *The use of irrigation system, Brăila County*

The 2004-2005 period, excessively rainy year, according to the information of National Administration of Meteorology (Sandu, 2009), reduced the demand of water for irrigation, but as soon as the climate regime reversed, the need for irrigation in the agricultural sector increased appetite of farmers to use alternative

water sources. 2010 is the year that shows the existing reverse relationship between the use of irrigation water system and subsidies received from the state for this. Basically, in a dry year (2010), the area of irrigated agricultural and arable land almost halved compared to the previous year, the interviewed farmers accusing the high cost of access to the water through irrigation system once the subsidies were eliminated.

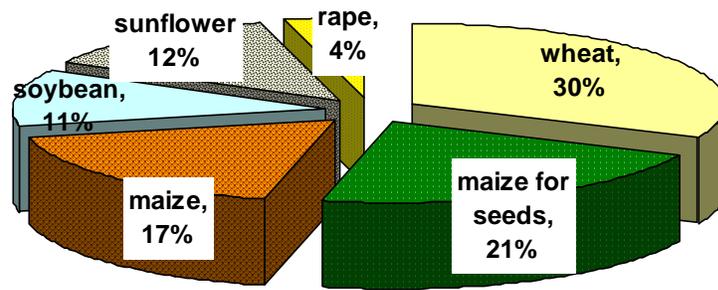
The NIS statistics also show a direct correlation between the agricultural farm land size and the utilization of irrigation facilities (Figure 2). Small farms with access to irrigation systems water a small part of agricultural land on which they operate, compared with the large and commercial farms. Although 28.4% of irrigation facilities in Brăila County are located in the area of the small farms (less than 10 ha), in 2007 these farmers applied watering only for 1/10 of these areas. In the same year, at the level of commercial farms (over 50 ha), at least one watering have been applied for a half of the area equipped for irrigation.



Source: NIS (2008)

Figure no. 2. Utilization of irrigation facilities by size of farms, 2007, Brăila County

It seems that even in the period when the irrigation system was subsidized (2007), the inclination of the small farms to use water for irrigation was relatively low, mainly because of their poor technical capacity to access the farm irrigation system. Their low economic power and the focus on the semi-subsistence agriculture of these small farms have limited their chances to increase their agricultural areas and to acquire advanced agricultural equipment necessary to facilitate access to irrigation now when subsidies were removed. Therefore, their technical and economic capacity to using water from the irrigation system has been further reduced, after 2010.



Source: MARD (2010)

Figure no. 3. The structure of irrigated crops Viziru Terrace, Brăila (2009)

The fact that the large farmers are those who used mostly the water from the irrigation system in Brăila County has influence over the structure of irrigated crops. Thus, the production structure of this type of farm is more directed to field crops and agricultural seeds production (Figure 3), suitable to be grown on large areas and less for vegetables that involve a lot of work force and a greater consumption of water. More than that, for vegetables, a better coordination between the members of the same IWUA structure is needed in order to correlate their structures of production for a better correlation of water demand for irrigation of all farms and, through this, to optimize the cost for the access to the irrigation system.

The big size commercial farms seem to be favoured in this organizational-institutional framework and, in the context of eliminating the subsidies for irrigations, they are in the best position for optimization of the effect/effort economic ratio, relying on the following arguments:

- *The high productive capacity of the soil in the area*

Soils in classes I and II of suitability for agriculture cover 48% of the agricultural area of the county, a fact that permits high potential yields per area unit and substantial profits even from the big culture.

*„...this land is good. At wheat I make 2000 kg/ha without doing it anything. If I give it an herbicide it grows by 1000 more. If I water, it grows by 1000 kg”. (farmer Brăila, 52 years old, agronomist engineer)*

- *Technical-financial capacity for the access to the irrigation system*

40% of the interviewed representatives of the commercial farms evaluate as ‘good’ or ‘very good’ the technical capacity of the own farms in order to access the irrigation system.

*“Very good! We have irrigation equipments taken on credit!  
(farmer Brăila, 42 years old, economic education)*

*“Weak! They do not have enough devices and equipments (n.b. for applying watering at farm level)” (farmer Silișteea – Brăila, 52 years old president of IWUA)*

- *Bigger chances to minimize production costs per area unit and to maximize profitability*

Because of the physical depreciation of the irrigation system on terrace of Brăila, the present output of the flowing in and distribution network is estimated at around 60% (MARD, 2007). The losses are then transferred upon the costs of access and utilization of the water for irrigations.

*“The present price (of the water) is high enough ... it is not real with what is consumed..... ....The engines are very big, the consumption (n.b. electric power) is big. We pay more on water and because of this the engine used for water re-pumping must be replaced)” (farmer, 42 years old, economic education, head of IWUA)*

A great part of the areas irrigated in 2010 at the level of the farms surveyed was destined to the seeding lots contracted before with the seed producers – Pioneer, Monsanto etc. who support a great part of the production costs, including a significant part of the expenses with irrigations.

*“It cannot be without irrigations! We work with maize for seed!” (Farmer Brăila, 42 years old, economic education)*

*„ ...it’s the crop (n.b. maize for seeds) which brings the best profit. 6 million/ha (n.b. in lei, old currency). .... If the seed producer did not give the 200 euro/ha (n.b. for irrigations), I would not have irrigated” (farmer Brăila, 52 years old, agronomist engineer, vice-president of an IWUA).*

The supply channels have a huge ‘reserve’ of weeds seeds brought in by the water or coming from the vegetation not taken off the canals, which is leading to the infestation of the irrigated areas; with big expenses for herbicides used in diseases and pests control from the vegetation in the canals.

*“...open canals where the grass grows... In spring they come (through the water for irrigation in the canals) weeds seeds – bottle grass, cane – 30-40% of the irrigated lands are infested” (farmer Brăila, 52 years old engineer agronomist, vice-president IWUA).*

Farmers are reducing the future risk to increase expenses with crop herbicides application by limiting the water consumption for irrigation.

- *The securing of chances to sell the production and avoiding losses by perish character*

Farmers in Brăila area relate the negative experiences in selling the vegetables, which, in most cases, are connected to non-respect of the clauses in

contracts by the firms for overtake and processing of vegetables: not overtaking the products at terms established, delayed payments, invoking of some clauses for products refuse not foreseen in the initial contract.

- *Avoiding the risks of not having access to irrigation water in due time*

The answer of a farmer who farmed in 2011 over 200 ha of which more than 1/2 was irrigated at the question: How do you make the decision to irrigate a crop area?

*“It is difficult! You are conditioned by the others who are on the same canal (n.b. of irrigations). The decision is commonly agreement taken!”*

### **Conclusions**

Although the farmers in Brăila County are aware of the need for water through the irrigations systems, their capacity to access this system is strongly conditioned by: the land size of the farm, the financial capacity to support the costs of access to the irrigation system, the technical capacity of the farmers themselves to use water from the irrigation system, affiliation and active involvement in an IWUA, membership to a IWUA with a good technical and financial capacity and which brings together viable and solvable users of water for irrigations.

The agricultural size structure of the farms that use water for irrigation and the irrigated crop structure are largely the result of the organization and operating mechanism of the irrigation system in general and are dependent of the IWUA functionality, in particular. Thus, IWUA are associations of farmers, owners of tertiary irrigation infrastructure on their territory which have yearly contracts with the irrigation water suppliers, contracts stipulating the projected periods and quantities of water required for irrigation. Under this contract, the water supply to IWUA is made at its request, demand that represents the cumulative water needs of all farmers, IWUA members. If the price of water to IWUA is established by the annual contract, the water pumping costs, requested for the distribution of water between farmers, depend on the amount of water delivered. According to the principle of decreasing marginal costs, the greater the simultaneously irrigated areas are the smaller the costs of water pumping per irrigated unit area are. This fact: i) favours the large farms that simultaneously irrigate large areas and/or have the capacity to optimize the irrigation costs through a good management of the production structure and of water consumption, ii) determines the farmers to correlate the periods when they ask for the water to irrigate obliging them to uniform their structure of crops.

The big size commercial farms seem to be favoured in this organizational-institutional framework and, in the context of eliminating the subsidies for irrigations, they are in the best position for optimization of the effect/effort economic ratio, relying on the following arguments: the high productive capacity of the soil in the area; technical-financial capacity for the access to the irrigation

system; bigger chances to minimize production costs per area unit and to maximize profitability; the securing of chances to sell the production and avoiding losses by perish character; avoiding the risks of not having access to irrigation water in due time.

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