

CURRENT SITUATION OF THE EXPLOITATION OF IRRIGATION ARRANGEMENTS IN ROMANIA

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REZIME

The paper presents succinctly the history of irrigation arrangements, their current situation and a few considerations regarding their future in Romania. Through the creation of the Water Users for Irrigation Associations and the reorganization of the existing National Company for Land Reclamation, another step is being taken towards a new stage of rehabilitation and modernization of irrigation systems, and thus to their rational exploitation, according to market economy principles, as required by the new social and economic situation in Romania. The paper also presents the equipment in operation in Romania - classic Romanian-made equipment (aluminium lateral sprinklers) as well as newly-introduced Romanian and imported equipment.

1. INTRODUCTION AND GENERAL PROBLEMS. BRIEF HISTORY OF IRRIGATIONS.

The importance of irrigation arrangements is particular, due to their major contribution to ensuring the food of population and the environment protection.

Concerns regarding the development of irrigations in our country started long time ago, being generated by the losses of crops caused during certain years or series of years by droughts, which occurred with a higher or lower frequency during time, starting with the Middle Age.

The analysis of draughts registered in Romania evidences that in Wallachia and Moldavia, from a series of 100 years, 3 have been very draughty, and 58 draughty. Annually, in the plain of Brgan have been registered 8 draught periods, in Oltenia 6, and in Moldavia and Transylvania 3, the duration of a draught being of an average of 15 days in the North of the country and 20 days in the plain regions. During the very draughty years, these figures reach values of 60-100, even more than 100 days.

Irrigation in the carpathic-pontic space could be performed since the prehistory, with a doubtless flourishing during the Roman administration. It has been applied especially for gardening. The very high technical level of the Roman civilization in this field could be restored only after one thousand years.

Taking from the Romans the techniques of transportation and elevation of water (hydraulic wheels), the population from the territory of Romania practised irrigation in small local arrangements, up to modern times.

Thus, these arrangements developed in interconnection with the mill ponds near villages, for the irrigation of the vegetable cultures for the population of towns (Tîrgoviște, Buzău, Focșani).

Most of the history of development of the irrigations in Romania is presented by the founder of the scientific research in the field of land reclaiming, academician Marcu Botzan in his book "Water in the history of Romanian people" (1984).

Starting from the XVII-XVIII-th centuries the works of land reclamation, including irrigation arrangements, developed strongly in all Romanian territories.

In the XIX-th and particularly the XX-th (second half) century have been recorded significant advances in the field of irrigations, to which contributed important scientists like Ion Ionescu de la Brad, Anghel Saligny, Alexandru Davidescu, Gheorghe Ionescu Sisești, Cezar Nicolau, Constantin Haret, etc.

There have been drawn-up courageous projects in the field by A. Davidescu, L. Villoresi (Italia), and W. Wilcoks (Anglia), but which because of different reasons have not been applied.

In the first half of the XX-th century, the irrigation arrangements have been managed by the local communities; for the exploitation of larger systems have been set up associations.

The large irrigation systems commissioned during the communist regime (1965-1989) from budget sources, have been developed almost exclusively in the hot-draughty climate area from the South and South-East of the country, having as main supply source the Danube and using sprinkling as main method.

From the agricultural potential of Romania of 15 million ha, 7 million are potentially irrigable, from which 5.5 million are arable land.

The overall surface with irrigation arrangements of about 3.2 million ha is structured as follows [3]:

- a) according to the end-use (1995) :
 - arable land 2,930,000 ha
 - pasture 79,000 ha
 - hay field 2,600 ha
 - grapevine 53,400 ha
 - fruit orchards 33,800 ha
- b) according to the watering method (1989):
 - sprinkle irrigation 2.8 million ha, of which 2.73 million arable land
 - flooding irrigation 61,800 ha
 - furrow irrigation 331,800 ha

It follows that there are still 2.3 million ha potentially irrigable, to which one must add significant drained surfaces (especially in the plain of Banat) which at present require irrigation in the draughty years.

The irrigation arrangements from Romania commissioned until 1990 where, in more than 80 % extent, very large irrigation systems (with surfaces of 10,000 - 200,000 ha or even more) and the prevailing watering method was sprinkling.

Table 1. Dynamics of irrigation arrangement surfaces

Year	Irrigation arrangement surface, ha	Year	Irrigation arrangement surface, ha	Observations [3]	
				operational, %	irrigated, %
1938	15,400	1990	3,168,700	92	70
1944	18,000	1991	3,125,800	-	-
1950	42,500	1992	3,197,200	83	17
1955	93,100	1993	3,202,300	-	-
1960	199,600	1994	3,202,800	78	27
1965	229,900	1995	3,205,200	-	-
1970	731,300	1996	3,211,100	70	20
1975	1,474,200	1997	3,190,600	-	-
1980	2,301,000	1998	3,184,000	71	8
1985	2,965,300	1999-2003	3,179,800	-	-



Figure 1. Distribution of irrigation arrangements on Romanian territory.

In table 2 is presented the percentage of irrigation arrangements in the private sector, as a result of the application of Law of land nr.18/1991 for the

retrocession of agricultural land to the previous owners.

Table 2. Land Owners

			Irrigation arranged surface	
			%	mil. ha
Owners	Before 1989	State owned land	100	3.18
		Private lands	70	2.23
	After 1989	State owned land	30	0.95

One observes that at present more than 2/3 of the total of irrigation arrangements belong to the private sector, which generally includes small parcels which are a considerable hindrance in applying irrigation. In turn the loss of funds encountered with the private land owners resulted in a very low degree of utilization of irrigations in the last 10 years.

After 1990 the surface with irrigation arrangements suffered no significant modifications. There have

been set up local arrangements, of little significance, the surface of which is not yet included in the statistics, but which are designed obeying the existing legislation.

Starting with the year 1990 the degree of utilization for the irrigation arrangements, respectively the surface irrigated, lowered according to climatic conditions, existing funds, interest of landowners, arrangement system and the costs of irrigation. The

irrigated surface between 1991 and 2002 was, as an average value, 25 %.

Recent research concerning the field of **rehabilitation and modernization (RM)** of the irrigation arrangements in use drawn up a new methodology for the calculation of their opportunity [7].

In this respect Manole E. [7] under the scientific guidance of Nicolaescu N. elaborated an analysis model for the irrigation systems in use with a view to their rehabilitation-modernization, including:

- evaluation of the modification tendencies of the climatic conditions and putting up-to-date the irrigation water requirement;
- calculation model for the determination of water and pumping energy savings by RM including: useful and gross load of the irrigation system, overall and partial yield of water utilization in the system, the utilization degrees and the profitable operation of the system corresponding to the existing state and the after-modernization state (the minimum necessary degree for the profitable operation in the present state and after carrying out the RM works, the climatic necessary utilization degree, the utilization degree of the system achieved with respect to the climatic requirement and respectively with respect to the multi-annual water requirement for 50% assurance.

Further on is presented the method chosen and used presently for the prognosis and warning for the application of watering in Romania.

Prognosis and warning for the application of irrigations in Romania is carried out using the method of water balance in soil, based on the water consumption of plants with free evaporation in the evapometer BAC-class A. The values of the transformation coefficient of free evaporation into water consumption (K) have been established in experimental fields during the last 20-30 years for most of cultures.

2. ASSOCIATION OF WATER USERS FOR IRRIGATION (AUAI) - A new body for the efficient exploitation of irrigation arrangements.

2.1. General considerations (history)

The alert rhythm of arrangement during the period after 1965, under the political pressure of the totalitarian regime, determined some drawbacks of the irrigation systems:

- the large size of the system determines a difficult operation regime, due to the specific inertness at starting up and shutting down the systems, operation of the pumping stations from the hydrotechnical network;
- the real cost of water supplied to the users is increased due to the pumping energy (60 % of the overall cost as an average value for the country);
- great water losses in the hydrotechnical network of delivery-distribution due to poor grouting and to missing automation and dispatching;
- missing of modern equipment and watering plants for the users of irrigation water;
- missing of financial resources allocated by the government for the maintenance, repairing and exploitation of the systems.

Besides the mentioned drawbacks, the law of land retrocession after 1990 amplified the current difficulties of maintaining and operating the irrigation systems, making almost impossible the control of the relation between the water supplier and the irrigation water user.

Because the large irrigation arrangements from Romania were set up for large agricultural exploitations (1000-10000 ha), after their suppression, the operation of the irrigation systems became difficult and non-efficient because in a single irrigation system occurred hundreds or thousands of users, owning each very small land parcels (0.5-3 ha).

Also, due to some objective reasons (missing of financial funds, lack of selling market for the agricultural products), but also to some subjective reasons, the farmers became not interested in using irrigation (as chain loop in the agricultural process).

This resulted in a very low degree of utilization for the arrangements (an average of 10-20%) in the last years, which in turn decreased the economic performances, and in deterioration of the infrastructure.

Romanian government made a re-evaluation of the necessities of the irrigation and drainage sectors, with a loan from The World Bank and with the support of the companies Binnie & Partners, Hunting Technical Services Ltd. from England and ISPIF SA from Romania. The overall objective of the study (carried out in the years 1992-1994) was that of producing for the Ministry of Agriculture and Food of investments plans for the rehabilitation and modernization.

From the experience of the economic analyses concerning the viability of the irrigation arrangements resulted that, generally, their utilization degree should be minimum 60 % in order to reach a minimum degree of profitability.

2.2. Initiation of the constitutive program for the Association of Irrigation Water Users (SNIF).

As consequence, in order to obtain the above mentioned profitability degree, based on the experience of other countries with irrigation arrangements resembling those of Romania, it has been promoted the concept of Participative Irrigation Management (MPI), with the setting-up of the **Associations of Irrigation Water Users (AUAI)** and of Transfer Management for Irrigations (TMI) towards the users grouped in AUAI.

Supported by the World Bank, the promotion of the concept MPI included the Project "Technical Assistance for setting-up AUAI" in Romania between February 1999 - March 2000. The results of the project appeared in two planes: setting-up of the legal frame necessary for the setting-up and operation of AUAI and the setting up of AUAI itself, in the same time being implemented a training program for farmers.

Thus the Romanian Government issued the Ordinance nr. 147/7.10.1999 which is at present the legal basis for the setting-up of AUAI.

In the Ordinance there are provisions concerning the setting-up of AUAI, their functioning, the legal relations between the association and the members, records an control of the association, property of the irrigation structures, dissolution, liquidation or fusion of associations.

Under the provisions of Law nr.213/1998 concerning the public property and its legal regime, every AUAI may obtain the right of property of the irrigation substructure consisting of underground transport and distribution pipes, pumping and water pressuring stations, together with the corresponding endowments and land which are located on the territory of the association, as well as other similar goods, as a result of their movement from the public to the private domain of state.

By assuming the responsibility of exploitation and maintenance of the irrigation works, respectively taking over their management, AUAI will have an activity of both own and public interest. After the transferring of the management responsibilities, the association become gradually more capable to collect funds for both maintenance, improvement and even rehabilitation of the taken works. Thus the degree of utilization will increase, the state subsidies for maintenance, repairing, exploitation, as well as the investments for non-viable irrigation arrangements will gradually diminish. This means that the associations will participate in the program of rehabilitation and modernization of the irrigation arrangements.

The methodological survey of the activity of AUAI will be the responsibility of an Office of Regulation for AUAI within the Ministry of Agriculture and Food.

2.3 The present situation and the perspective of AUAI.

The first 4 pilot-AUAI have been set-up in 2000 (Sadova-Corabia, Mostiștea, Nicorești-Tecuci, Kogălniceanu). Presently, including those in formation, the number of AUAI reached the value of 172 and they will have an overall surface of more than 500,00 ha, within the perimeter of about 1.8 million ha of irrigation arrangements. From this 172

AUAI, more than 100 are legally established, over 40 have initiative committee and convoked the general assembly, and the other have initiative committee and will convoke the general assembly. After the general assembly the associations have to obtain the notification from the Land Reclaiming Service from the Ministry of Agriculture and then go to the court for the legal establishment.

Also there has been created the legal frame for the reorganization of the exploitation activity by issuing the Emergency Ordinance nr. 23/2000, later on adopted through the Law nr. 440/18.07.2001 concerning the setting-up of The National Society for Land Reclamation by the reorganization of the Autonomous Administration for Land Reclamation. The main provisions of this law are presented further on:

- the National Society for Land Reclamation operates under the authority of the Ministry of Agriculture and Food and is organized territorially in branches, the activity of which is mainly concerned with the repairing, maintenance and exploitation of the land reclamation works.
- the works carried on in the public domain of state, consisting of the basic substructure, irrigation (from the water intakes to the pressuring stations) and drainage, the works for erosion control, barrages and dikes against floods, will be taken over by the National Society for Land Reclamation, by granting for a period of 49 years.
- the other works, which do not belong to the public domain of state, will be administered by the National Society for Land Reclamation until they will be transferred, at request, without payment, according to the law, to the associations of water users, as these form, within up to 5 years.
- the Ministry of Agriculture and Food, as unique share-owner, on behalf of the state, will reorganize by division the National Society for Land Reclamation in order to achieve the privatization of certain activities concerning the initial social capital (consisting of production and administration buildings, with the corresponding lands, endowments and equipments and means of transportation).

- the subsidies from the state budget for the expenses for the electrical energy for the pumping of water and the expenses for maintenance and repairing of the works that will be taken over from the new set up associations of water users will gradually diminish within a period of up to 5 years, paralleling the financial consolidation of the associations.

In the frame of the Project concerning Rehabilitation and Reformation of the Irrigation System of Romania, in 2001, the Mission of the World Bank, together with the Romanian Government (Ministry of Food and Forestry and the National Society for Land Reclamation) named a team of experts that had as objective the reorganization of the activity of the National Society for Land Reclamation of Romania. In 2002 it was concluded that the problem will be solved by legislative reform embracing a larger number of problems than only the transformation of the Society into a National Agency for Land Reclamation, that is, by issuing a special law, "The law of Land Reclamation", intended to solve both the irrigation and drainage works according to the new Romanian legislation.

2.4 Irrigations mobile equipments

As far as the watering equipments are concerned, besides the classical aluminium sprinkling units type IIA, IIAM, still representing the majority, one tries to introduce new equipments, like the Valley-Valmont (USA) ones or those produced in Romania by IRIDEX GROUP, Figure 2.

From the company Valley-Valmont are sold installation with central pivot, with lengths of 300-400 m, an installations with linear movement of 300 m length, to be used in existing irrigation arrangements where the distance between antennas is of 612 m.

The main Romanian companies producing irrigation plants are: SC INSTIRIG Balș, SC TEPRO SA Iași, SC IRIDEX GRUP Bucharest, SC CEFRITEK Brașov, SC NOVUS Constanța, SC RELIAN SA Bucharest, IMA Iași, SC UPSROM SA Petroșani,

SC TEHNOLOGII SERVOPRINT Otopeni, SC REVAHO AGRO-ROMANIA Bucharest, SC GINI TRANSCON SRL Craiova, SC PALPLAST SA Sibiu.

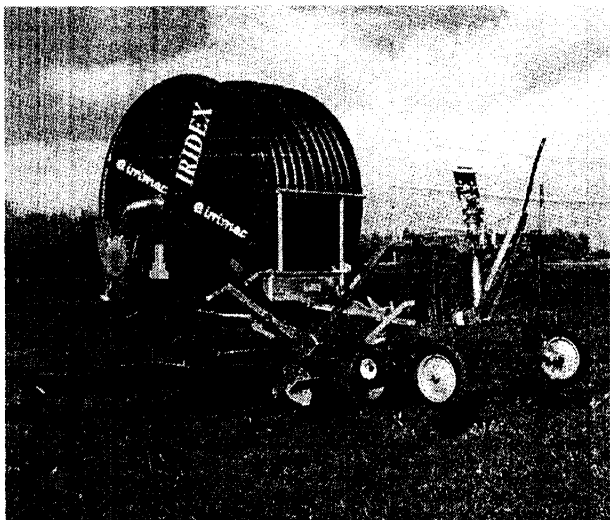


Figure 2. Self-moving irrigation installation with drum and hose (IATF) type ST4, ST5, ST6 (IRIDEX GROUP)

At present, IRIDEX Bucharest produces and sells Self-moving irrigation installation with drum and hose (IATF) plants (Type ST4, ST5, ST6) and with linear movement type Mustang-1 (length 300, 360, 400 m), in cooperation with different foreign companies.

The company CERITEX SA Braov manufactures Bauer-type equipments: IUA of 300 m; IUR of 320 m with sprinkling ramp of 45 m, and at S.C. INSTIRIG Bal are produced sprinkling installations with classic aluminium pipes IIA12, IIA17, IIA22, respectively polyethylene pipes, IIP50/30, transversal self-moving, and EUBA, furrow watering equipment of aluminium.

Romanian irrigation installations by dropping are made by the companies RELIAN SA Bucharest and GINI TRANSCOM SRL Craiova.

Table 3. Technical characteristics of the installations type IATF produced by IRIDEX GROUP.

Type	Nozzle, Φ , mm	Sprinkling pressure, bar	Output m^3/h	Inlet pressure, bar	Distance between positions, m	Wetting quota*, mm	Constr. types
ST 4	14-28	1.5-5	9-69	2.5	38-89	4-78	73/350 82/330 90/300
ST 5	24-28	2-6	32-76	3.8-10	46-104	7-107	82/360 82/400 90/340 90/370 100/340 110/300
	16-34	14-112	3-10.6				
ST 6	24-32	3-6	53-90	5.4-10.4	82-97	17-94	

*for a working speed of 10-40 m/h

3. CONCLUSIONS

1. In order to increase efficiently and surely the surfaces annually irrigated within the irrigation perimeters, there have been set-up AUAI which will include starting with this year over 500,000

ha from the total of the 3.2 million ha of irrigation arrangements of Romania.

2. At present, unless the annually irrigated surface is only 25 % of the overall irrigation arrangements, new and higher-performance

installations are introduced besides the classic installations (for example drum and hose self-moving installations, central pivot, linear installations), either produced in Romania or imported.

3. A team of experts designated by World Bank and the Romanian Government is elaborating a project for the reorganization of SNIF in order to render it more efficient and complying with the market economy. It is also intended to diminish the number of the subsidized state-owned companies through a new law of land reclamation.
4. Considering the setting-up of AUAI, the future reorganization of SNIF and the setting-up of a National Agency for Land Reclamation, it is expected that the irrigation in Romania will recover the role played before 1990.

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TRENUTNA SITUACIJA EKSPLOATACIJE NAVODNJAVANJA U RUMUNIJI

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Summary

Rad predstavlja sažetu istoriju primene navodnjavanja, trenutnu situaciju i nekoliko razmatranja u vezi budućnosti. Kroz osnivanje Udruženja korisnika vode za navodnjavanje i reorganizaciju postojeće Nacionalne kompanije za melioraciju zemlje, još jedan korak je preduzet prema novoj fazi rehabilitacije i modernizacije sistema za navodnjavanje, a samim tim i ka njegovoj

racionalnoj eksploataciji, prema tržišno ekonomskim principima, nametnutim novom socijalnom i ekonomskom situacijom u Rumuniji. Rad talode predstavlja opremu koja se koristi u Rumuniji - klasična oprema Rumunske proizvodnje (aluminijumske lateralne prskalice) kao i novo-vedena rumunska i uvezena oprema.