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MANAGEMENT OF LAND RESOURCE, AGRICULTURAL PRODUCTION AND FOOD SECURITY

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Abstract

This article deals with Romania's land policy in the second half of the twentieth century, with an introduction to the global context of the actions undertaken in order to increase the agricultural production, to ensure food in relation to the demographic evolution. For a very long time, i.e. for several millennia, the attention was directed toward the extension of the cultivable area, by deforestation, meadows grubbing, terracing, in parallel with the expansion of the areas equipped for irrigation, which, in 2000, were assessed at about 270-275 million hectares. Lately, and especially in the twentieth century – the 2nd half – the attention was directed towards technological enhancement, in order to double or even triple the production capacity of the land. In Romania, the mid-twentieth century agriculture is characterized by a very low yield, due to an extensive technological system associated with the phenomenon of drought, affecting more than 2/3 of the arable land. In these circumstances, the land policy of the state aimed at expanding the arable area to 10 million hectares and at enhancing technology; in this regard, a priority role was played by land reclamation works, especially by irrigation, which would be imposed on 5.5 thousand ha - about 55% of arable land. By the end of 1989, about 3.1 thousand ha were equipped; this area is questionable if we were to compare it to other countries with similar climatic conditions. With its over three million ha, Romania had 0.14 ha of irrigable land per capita, one of the largest in the world. This performance was achieved through extreme investment efforts, exaggerated in connection to the economic strength of the country. Whereas the land reclamation investments were assessed to over $10 billion, the country resorted to massive foreign loans whose repayment required great sacrifices, while the objectives of land productivity and economic efficiency were not met. The increase in the average yield per ha was well below expectations, particularly in high intensive crops, such as maize, that occupied the largest land area equipped for irrigation. The yield was 3-4 t/ha for wheat and maize, instead of 6-10 t/ha, as it had been planned; 1.0-1.5 t/ha for soybean and sunflower, instead of 3 t/ha; 15-20 t/ha for potatoes or sugar beet instead of 25-30 t/ha or 40-50 t/ha. The authors consider that the main cause of the failures in this field is represented by the disproportion between the financial resources allocated to investments, in arrangement of great surfaces for irrigation, and those allocated for their rational exploitation. Fertilizers and other inputs required for the irrigation technological system and even those required for the integral irrigation of the equipped surfaces were missing. The main attention paid to irrigation was accompanied by the neglect of the other two categories of land reclamation works, i.e. erosion control moisture control, which were affecting Romania's agricultural areas in the same way as drought, and even more, according to the opinion of experimented specialists. In the recent years, under the market economy, the attention of policy makers is still focused on irrigation, i.e. on the rehabilitation of areas as large as possible from the old irrigation systems, erosion control and moisture control being neglected.

Key words**:** *economical efficiency, food area, land reclamation*

INTRODUCTION

In view of the demographic evolution – approximately nine billion inhabitants worldwide for the 2050 horizon, the major concern of the governments, scientists and researchers is food safety. It is known that the land, practically the only resource which can ensure food, is limited in extent, while the population continues to grow. Over time, surpassing the so-called *hunting civilization*, when in order to ensure the food for one individual 5,000 ha were needed, in the *modern civilization of the tractor* this was reduced to 0.25 ha, which is almost equal to the current world mean surface corresponding to one individual [1].

To reach this performance, different techniques, such as, for example, deforestation, following, dewatering, as well

as erosion control works have been performed. An important role in assuring the food for a population of more than a half of the inhabitants of Earth is played by irrigations, which, for a surface assessed to 18% of the cultivated area, lead to obtaining 35-40% of the agricultural production. Similarly, approximately 15% of the agricultural production is obtained from dewatered areas.

On the whole, land reclamations and especially irrigations are among the techniques leading to the significant increase of the yield on the cultivated lands. Although in the world significant surfaces which could be cultivated have been identified, amounting to 40-60% relative to the current cultivated but area, technological enhancement on the currently cultivated areas is preferred, which is less expensive than extension of new cultivable areas.

Land reclamations are an integral part of the technological enhancements which, although costly, is feasible to the enlargement of the cultivated surfaces. Other components of the technological enhancement, such as fertilizers, pesticides, as well as irrigations, aggress the environment, but the need for food is so great that the risk is accepted rather than avoided.

Irrigations, which contribute the most to the enhancement of the productivity of the land, are also aggressive towards the environment. Their irrational exploitation, a frequent case, leads to negative phenomena such as swamp formation, salinization, eluviation and erosion. All these problems are known and solutions are being sought for avoiding, or at least reducing them.

To all this is added the water crisis, which, along with energy and food, represents one of the global problems of mankind. Currently, agriculture spends approximately 75% of the freshwater reserves and in the near future this share might reach 80%. All these problems are known and solutions are being sought for solving them, hence the preoccupations in this field represent a pressing current activity.

In Romania, in the second half of the 20th century, land reclamation has represented one of the priority objectives of the agricultural policy in view of increasing agricultural production. The inadequate exploitation of the arranged areas did not lead to the expected results and at present there are ongoing rehabilitation programs in the conditions of the market economy.

MATERIALS AND METHODS

Statistical data at world level regarding the current and prospective problems in the studied field have been used.

For Romania, the following aspects have been analyzed and reviewed:

a)The evolution and size of the arranged surfaces with land reclamation works;

b)Technical and economic results obtained by the exploitation of the works, compared to the period prior to the arrangements;

c)The impact on the national economy in general and on agriculture in particular;

d)The proposals for rehabilitation, conservation and sizing of the main land reclamation, irrigation, dewatering, erosion control works.

The method used is that specific to economic research: the collection and selection of the material, processing, synthesis, conclusions.

RESULTS AND DISCUSSIONS

Land reclamations. Food surface.

Undoubtedly, deforestation and followings have been the first land reclamation works. We do not have statistical data on the evolution of the surfaces claimed for cultivation using these techniques. Some of the first estimations were performed by the Club of Rome, which estimated the world cultivable area to amount to 3.2 billion ha as early as 1650. This is maintained fit 300 years, namely until 1950 [8].

More recent research (2002) have identified a somewhat greater cultivable area of 4,153 million hectares, of which 38.5% (1,603 million ha) is cultivated [1].

Greater reserves of cultivable lands have been identified in Latin America and in the Caribbean, as well as in developed countries, and lower reserves in Asia, where the current cultivated surface per capita is the lowest:

0.15 ha/capita in India, 0.11 ha/capita in China and 0.04 ha/capita in Japan. Only 30 years earlier, FAO specialists identified only 1,454 million ha cultivated of 2,454 million ha cultivable, the share of the cultivated ha being 59.5% (Table 1).

Table 1. The food surface of planet EARTH. Lands cultivated in 1970 and the potential reserves relative to the population in different geographical regions

Specifications	Population million inhabitants	Cultivated lands million ha	Cultivable lands million ha	Cultivated lands ha/person	Cultivable lands ha/person	The degree of use of the cultivable lands %
South Asia	716	197	195	0.27	0.27	101.0
China	760	111	113	0.15	0.15	98.2
Near East	171	85	88	0.49	0.51	96.6
North America	227	236	274	1.03	1.20	86.1
Europe	462	144	180	0.31	0.39	80.0
Central America and the Antilles	93	38	52	0.40	0.55	73.0
USSR (former)	243	233	352	0.95	1.45	66.1
Oceania	15	45	70	3.00	4.66	64.3
Other developed countries	127	18	28	0.14	0.22	64.3
East and South-East Asia	317	72	115	0.22	0.36	62.6
East and West Africa	199	135	228	0.68	1.15	59.2
North Africa	36	19	39	0.53	1.08	48.7
Other Asian countries with planned economy	36	5	11	0.13	0.30	45.4
Central Africa	36	29	169	0.80	4.69	17.1
South America	190	87	540	0.45	2.84	16.1
Total	*3,628*	*1,454*	*2,454*	*0.40*	*0.68*	*59.5*

Source: FAO Yearbooks [1]

In the year 2001, the agricultural area was 5,016.7 million ha, that is 0.82 ha/capita and 1,399.7 million ha arable land, that is 0.23 ha/capita for a world population of 6.086 million inhabitants (year 2000) [1]. Comparing these data with the assessment of the Club of Rome – 1.3 billion ha cultivated in 1970, we observe that the cultivated area did not increase and the chances are slim for it to increase, considering the increasing demand for land for other needs, such as high ways, habitats and even the degradation of some significant land surfaces due to wasteful exploitation. In this case, the sole possibility to increase the agricultural production remains technological enhancement, although its aggression on the environment is well known.

In Romania, after World War II, the land resource per capita was relatively high (0.96 ha/capita land area) and 0.60 ha/capita arable land, but the yield of the land was extremely low, 550-600 kg/ha wheat or maize. The yields did not increase too much even after 10 years. The average yield for the years 1963-1965 was 1,533 kg/ha for wheat and 1,860 kg/ha for maize.

The cause of this situation was an extensive technological system, in which the lacks of fertilizers, of tractors, of irrigation were the primary factors. In these conditions, it was considered that the extension of the agricultural area and especially of the arable area could contribute to the increase of the agricultural yield.

In Romania, during the whole period of the planned economy, one of the objectives of the land policy was to increase the agricultural area to 15 million ha and of the arable area to 10 million ha. Obedient to the leadership of the Romanian Communist Party (the initiator of the land policy in the period the study refers to), the statistic of the time confirmed the fulfillment and even the over-fulfillment of the 15, respectively 10 million ha agricultural area, respectively arable land (Table 2).

Table 2. The evolution of the land use in the period 1945-1989

-thousands ha-

Years	Agricultural area	Arable land	Perm. pastures	Perm. crops
1945	15,062.0	9,472.0	5,147.0	443.0
1965	14,791.4	9,816.7	4,316.1	658.6
1987	15,094.1	10,080.4	4,407.2	606.5
1989	14,759.0	9,458.3	4,705.2	595.5

Source: Yearbooks of Romania [10]

Naturally, as usual, *the directive was not fulfilled*, which would be confirmed in the Statistical Yearbook of Romania of 1990, which would confirm an agricultural area of 14.7 million ha and an arable land of only 9.45 million ha.

The need of an arable area of 10 million ha considered as strategic objective of Romanian agriculture and which should have been fulfilled by breaking up of pastures (Fig.1) on slopes was subsequently noted by specialists in the field, such as docent doctor Teaci, who for Romania deemed sufficient 8 million hectares of arable land [13].

Fig. 1. Grasslands transformed in arable land to the top of the slope: Lăpuș area, Maramureș (Photo A. Lup)

Land reclamations. Irrigations. Considering the role of irrigations in the enhancement of agricultural yield, worldwide there has been a permanent preoccupation with the increase of the surfaces arranged for irrigation. The first assessments of the surfaces arranged for irrigations are available from the 8th century, when it is believed were irrigated 800 thousand ha, while in the 13th century the irrigated area is supposed to have reached 1,500 thousand ha.

Until the beginning of the 20th century, the surface arranged for irrigation reached 40 million ha, and in the first two thirds of the 20th century (1965), it reached 140 million ha. Nevertheless, in the last decennia of the 20th century the rhythm of the arrangements decreased and the surface of 300 million ha forecasted for the end of the 20th century was not fulfilled. This is also due to the improper exploitation of the arranged areas, of which at least half are degraded through salinization and swamp formation.

On the other hand, the yield obtained on the irrigated surfaces has been much lower than expected, which was observed by the financers of the big projects.[2].

The evolution of the arranged surfaces worldwide in the period this study refers to (the second half of the 20th century) is presented in Figure 2.

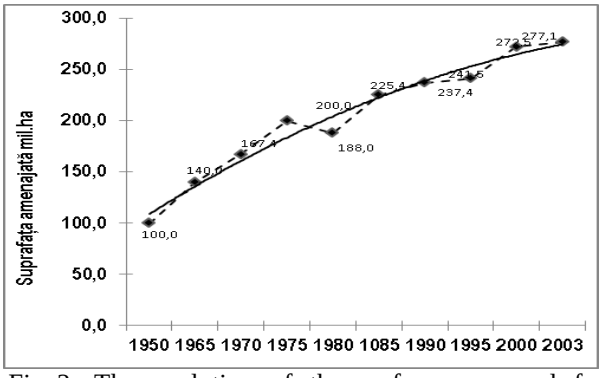

Fig..2. The evolution of the surfaces arranged for irrigation worldwide in the period 1950-2003

The last data from the years 2001-2003 records a surface arranged for irrigations of 2,771 million ha. In Romania, considering the lag compared to other European countries, it was programmed to be arranged for irrigations a surface of 5,500 thousand ha, which would have represented more than 55% of the arable land of the country. By the end of 1989, 3,100 thousand ha were arranged, that is 56.4% compared to the program (Fig. 2).

Regarding the surface of 5,500 thousand ha proposed for irrigation, this was subsequently revised by the teams of foreign specialists [12], who assessed that considering the cases in which water would have to be pumped to very great heights (over 70 m), in Romania should not be arranged for irrigations a surface of more than 1.5 million ha.

The exploitation of the irrigations systems. Due to the constructive characteristics and to the insufficiency of the resources necessary for exploitation, the results obtained were much lower than the designed parameters. First, in the opinion of the most competent specialists, was wrongly appreciated the importance and thus the order of priority of the different works.

Professor Botzan (the greatest Romanian specialist in the field of irrigations) for instance considered that the primary problem of Romanian agriculture was erosion and that it should have started with works for erosion

[2] *Responsible factors from the Inter-American Development Bank have shared their concerns regarding the arrangement of 40 major catchments in the world: in their view, 39 of them represent failures The major irrigation projects have had mediocre financial and agricultural results. Where a production of 4-5 tons of cereals per hectare was expected, only 1.7 were obtained. In most of the countries, irrigation programs do not cover the costs. This means that the severe criticism set forth against the great works are most of the times legitimate and that failure is obvious if we compare the objectives to reality. This waste requires huge budgets and makes us wonder every time: wouldn't these sums have found a wider and more profitable use for the Third World peoples, had the investment been made in more modest, but mire general forms, of development? If these are the terms in which was expressed a kind of a general agreement to condemn a development policy which has shown, throughout two decennia, that it is not suitable for the resolution of the problems, a new concept of development has not yet imposed itself.* [6].

control.
Secondly, it should have continued with the moisture control and after that would have come irrigations [9]. Professor Vlad Șișești was of the same opinion[3].[5]
One of the main structural characteristics was the choice of the river Danube as the main source of water for irrigations (in over 75% of the irrigation systems).
The consequence: the pumping of water from below upward, sometimes at very great heights, while everywhere in the world it is irrigated from water accumulations situated upstream of the land to be irrigated (Fig. 3).

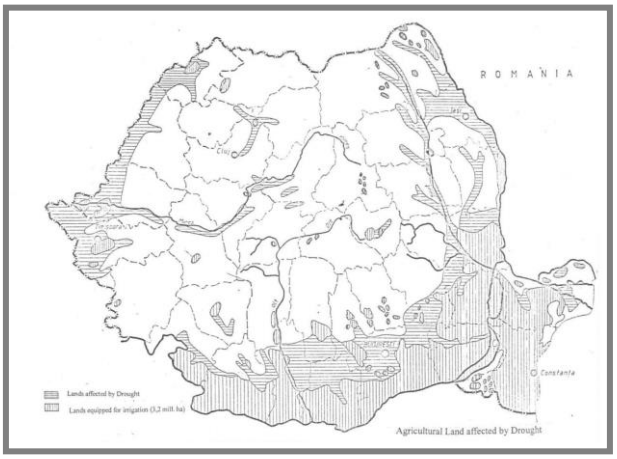

Fig. 3. Lands affected by draught in Romania and the degree of arrangement at the end of 1989 [9]

In Romania, the use of water accumulations from dams for irrigations is very low (for less than 20% of the surfaces arranged for irrigations). In 1950, when the hydroelectric power plant of Bicaz was designed, were programmed for irrigation from the water reservoir 300 thousand ha.
Nothing was irrigated from this reservoir, just as nothing was irrigated later from the reservoirs of the hydroelectric power plants Portile de Fier I and Portile de Fier II [Iron gates I and Iron gates II].

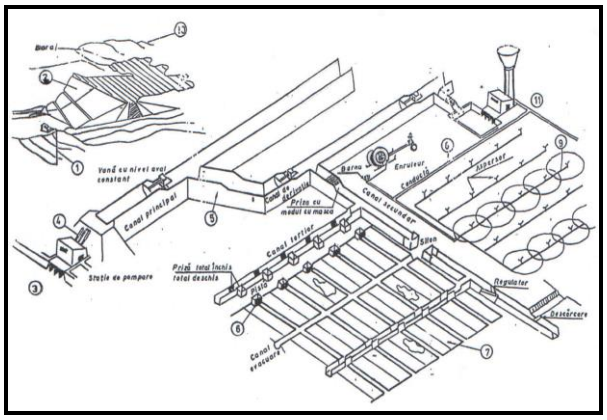

Fig.4. The position of the dam on the Rhone river (France) upstream of the irrigated lands [3]

For pumping the water from the Danube 54 floating base stations were built (Fig. 5).

Fig.5. The floating pumping station of the irrigation system of GALATUI, Calarasi County

The exploitation of irrigation systems.
During the exploitation, the designed technical and economic parameters failed to be fulfilled in all of the irrigation systems in Romania.
Some of the causes are due to the structural characteristics and another cause is the failure to assure the water inputs necessary to be administered to plants.
From the intent to arrange surfaces as large as possible, irrigation systems lacked some essential components such as: the impermeability of transport canals (Fig. 6), the lack of drainage systems, the lack of water measurement equipment and others.

[3] *In 1975, an important meeting at the Ministry of Agriculture took place, with all the decision factors, for the discussion and approval of the program of land reclamation works for the next quinquennial. The minister presented the order of priorities: irrigations, dewatering, salinization control and erosion control. I asked to speak and I said approximately as follows: "Although I am a professor of irrigations and especially since I am acting in this capacity, I propose to invert the order of priorities. First erosion control works, then the control of the excess moisture, salinization control and, at the end, irrigations, which will be installed on the already improved lands, only if it is necessary." The Minister, obviously disconcerted, answered: "Maybe you are right, but "the comrade" want it this way, so let's not discuss the issue of priorities anymore."* (Vlad Ionescu-Șișești, 1990) [5].

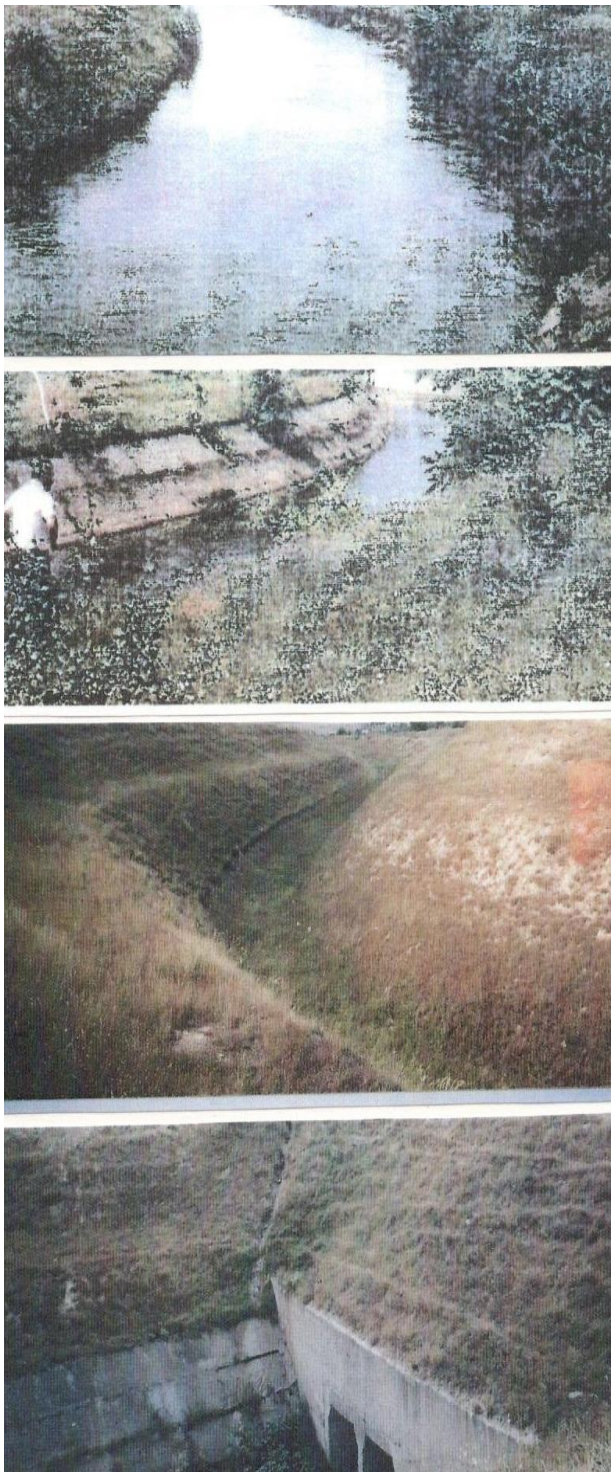

Fig.6. No-waterproof and partial waterproof irrigation canals in irrigation systems of Constanta County (author's archive)

In these conditions, the leakage of water reached over 40% of the water pumped for the source, which with time has led to swamp formation. The quantity of water was approximated and paid by the farmers as such. Deficiencies have also come from the side of the farmers, who lacked most of the equipment for the administration of water to plants.

Water losses also occurred in the field, due to the improper quality of the equipment for the administration of water to plants, as well as due to faulty handling.

We also add that due to the many deficiencies including of organization, the arranged surface was only irrigated at a rate of 80-85% and on the irrigated surface the number of applications and quantities of water required by the different species of plant failed to be applied.

The main reason why the whole arranged surface was not irrigated and why the water application rules were not applied was the lack of the electric energy required for pumping, for transport and for ensuring the water pressure in the pipes (over 80% of the systems were irrigated through aspersion at different pressures) (Table 3).

Table 3. Actually irrigated area during 1971-1989 and electricity provision rate

Period	Irrigated area thousand ha	Electricity consumption mil. kWh		Provision degree %
		Necessary	Provided	
1971-1975	4,335.3	8,191	4,686	57.2
1976-1980	7,097.8	15,726	7,207	45.8
1981-1985	9,388.6	17,387	9,544	54.9
1986-1989	9,424.3	17,812	8,956	50.3
1971-1989	30,246.0	59,116	30,393	51.4

Source: DGEIFCA operative data [4]

The surfaces equipped for irrigation in the southern province of Moldova and Dobrogea, totaling more than 700 thousand ha (one fourth of the national total), due to high water pumping heights (over 100 m) had a significant impact on the irrigation operating costs.

Alongside the lack of equipment for water application, for about half of the equipped area, the failure to provide the electricity for water pumping, transportation and irrigation itself was one of the main causes, if not the first, wherefore the planned yields were not achieved.

The frequent interruptions of the electricity supplier required as many times the re-pumping on the main channels, triggering

additional electricity consumption, which was already insufficient.

Table 3 and figure 7 and 8 present the electricity provision rate for the effectively irrigated areas during 1971-1989. It is noteworthy that actually irrigated area is, in fact, lower by 15-25%, compared to equipped area that should have been irrigated.

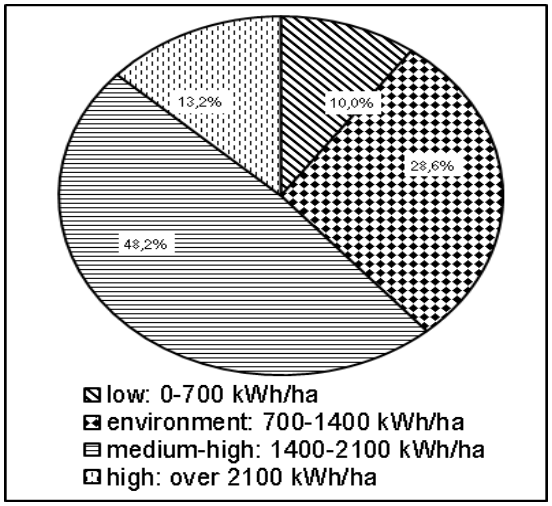

Fig. 7. Grouping the surfaces equipped for irrigation according to the electricity consumption, necessary for the irrigation of a ha, with an average crop structure
Source: Study of Irrigation and Drainage in Romania (1991-1994) [12]

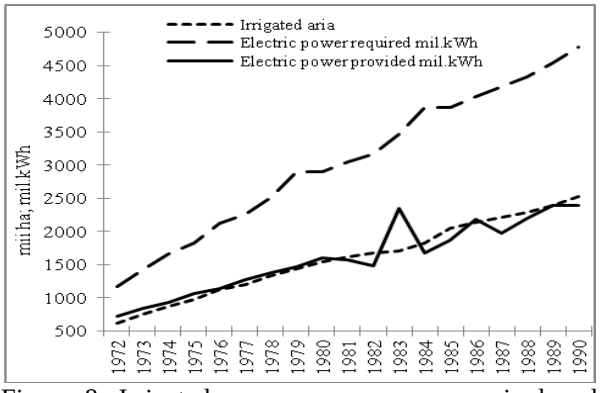

Figure 8. Irrigated area, energy power required and electric energy provided during 1972-1990
Source: DGEIFCA [4]

The influence of irrigation on the average yields per ha. The fight against the drought that affecting more than 70% of the agricultural land area was the main purpose of building an impressive irrigation system, on about one third of the arable land. However, at the same time, the irrigation was considered the main factor that was intensifying the Romanian agriculture and that was increasing the agricultural yield, taking into account it's in increasing the production per ha.

In table 4 we can trace the influence of irrigation on the yields per ha during 1971-1989, on the whole agriculture. In 1966, the area equipped for irrigation occupied 220 thousand hectares (2.2% of the arable land), and, in 1970, less than 700 thousand hectares.

Table 4. The evolution of the average yield in some crops (1966-1990)

kg / ha

Crop	1966-1970	1971-1975	1976-1980	1981-1985	1986-1990
Wheat	1,955	2,441	2,974	3,015	3,162
Maize	2,230	2,684	3,260	3,407	2,919
Sunflower	1,396	1,445	1,585	1,583	1,582
Soybean	1,003	1,386	1,200	1,033	830
Sugar beat	19,239	22,139	24,165	21,571	21,371
Potatoes	9,407	11,644	14,795	17,592	12,744

Source: DGEIFCA [4]

This period (1966-1970), when the irrigation played an insignificant role in crop development, was taken as a reference period for the crop evolution until 1989, when the area equipped for irrigation represented 1/3 of the arable land.

It is noteworthy that, overall, in agriculture, the influence of irrigation on crops was low considering that, in the projects of the irrigation systems, high yields had been planned: 6,000 kg/ha wheat; 10,000 kg/ha maize; 3,000 kg/ha soybean or sunflower; 40 t/ha sugar beet or 25 t/ha potatoes (the latter two crops being grown throughout the period only on areas equipped for irrigation).

The irrigation facilities were concentrated on the most fertile land areas in the Romanian Plain and Dobrogea, nine counties concentrating about 80% of the entire area equipped for irrigation in the country[4].

In these counties, the share of the arable area equipped for irrigation has reached, at the end of the period, over 60% of the whole group (40% in Olt County, more than 80% in Calarasi and in Constanta counties and 100% in Braila County). In this group of counties, the influence on the average yields can be traced in Table 5. In this group of counties with larger areas equipped for irrigation, the yields did not reach the expected levels.

[4] Counties: Braila, Calarasi, Constanta, Dolj, Giurgiu, Ialomita, Olt, Teleorman, Tulcea.

Table 5. The average yield of state farms and agricultural cooperatives during 1986-1988, compared to 1967-1969 (no irrigated), on an area equipped for irrigation at a rate of 60%

- kg/ha -

Crop	1967-1969	1986-1988		1986-1988 / 1967-1969 %	
		State farms	Cooperative agricultural	State farms	Cooperative agricultural
Wheat	2,083	3,392	3,395	162.8	163.0
Maize	2,740	3,355	4,043	122.4	147.6
Sunflower	1,559	1,536	1,785	98.5	114.5
Soybean	719	1,000	815	139.1	113.4
Sugar beat	22,061	21,846	18,462	99.0	83.7
Potatoes	6,729	14,886	7,992	221.2	118.8

Source: DGEIFCA [4]

Irrigation costs. In Romania, the major irrigation systems were built by the state that, during the operation period, provided water to farmers based on fees and charges established by it.

Table 6. Evolution of the irrigation expenditures per ha, at the agricultural units, the water provider, per total, and the water subsidy rate during 1971-989

- lei / ha -

Period	Expenditures at agricultural units	Expenditures at the water provider	Total irrigation expenditures	Revenues from provider tariffs	The difference uncovered at the provider (the state)	Subsidy rate %
1971-1975	798	731	1,529	178	553	75.7
1976-1980	1,040	798	1,838	323	475	59.5
1981-1985	1,383	1,133	2,516	308	825	72.8
1986-1989	1,532	1,017	2,549	335	682	67.1

Source: DGEIFCA [4]

On the other hand, the farmers also invested both in the equipping process of their land and in the water provision equipment. Other expenditures added to the investment costs, such as those incurred by the irrigation itself.
The operating costs of the irrigation systems for the two partners (the state and the agricultural units) are shown in Table 6. These data reveal that the units spent more on irrigation than the state did. In its turn, during this entire period, the state spent more than it collected from the agricultural units for water delivery and for the maintenance of the irrigation systems, the water supply being subsidized by 68.6% during 1971-1989[5].

Irrigation investment efficiency. According to some authors [9], over 10 billion dollars had been invested in land reclamation, of which almost 2/3 for irrigation. Two partners were involved both in investment and in operation: the state, with the largest investment share, and the agricultural units with the infrastructure incumbent on each unit and with the water application equipment. Since the pressurization stations had been built and operated by the state, their value was included in the investments belonging to the state; for agricultural cooperatives, the internal combustion engines that provided the water pressure in the irrigation pipes constituted an important and expensive investment, purchased by loans and never repaid.
According to the investment projects in irrigation systems, they appear very profitable. Yield increases range between 83.3 and 150% and profit increases range between 154 and 216%, depending on the validity period of the projects. These extremely optimistic efficiency parameters were obtained by planning average yields per ha of 6 t/ha in wheat, 10 t/ha in maize or over 3 t/ha in soybeans and sunflower. The differences in income also included the low average yields per hectare taken into account during the period before the equipping process (Table 7). In order to obtain high profits, the expenditure per ha were sparingly planned.
Although the income somewhat approached the design parameters during the operation period (by 10% less in the case of Carasu complex, in Constanta county) the operating expenses have nearly doubled – from those projected to 196.2%; therefore, instead of profits, there were registered losses assessed at 2803 lei/ha. This also happened for the projects developed after 1981.

[5] By non-equivalent trade - expensive industrial product sales and purchases of cheap agricultural products, the state has recovered its subsidy.

Table 7. The evolution of the planned economic efficiency parameters of the irrigation equipment, depending on the period for the design and execution of works (averages)

Specification	U/M	Design period		1981-1989 < 1981 %
		Before 1981	After 1981 (1981-1989	
Income before the equipping process	lei/ha	3,714	7,605	204.7
Income after the equipping process	,,	9,077	17,724	193.1
Income increase	,,	5,363	10,119	185.2
Expenditures before the equipping process	,,	2,344	5,643	240.7
Expenditures after the equipping process	,,	5,600	11,527	209.6
Additional expenditures	,,	3,256	5,884	186.4
Net income before the equipping process	,,	1,370	1,962	143.2
Net income after the equipping process	,,	3,477	6,197	168.5
Additional net income	,,	2,107	4,255	183.6
Specific investment	,,	17,330	45,800	264.3
Recovery period	years	8.2	10.8	131.7

Source: Data processed according to ISPIF [13]

When there was registered a relatively significant increase in the prices of agricultural products, the income per ha was even higher than the projected one, by 6.3%. Nevertheless, the costs per ha were higher than double and, therefore, instead of profit, there were registered losses assessed at 3.864 lei/ha.

The efficiency of the agricultural crops on the lands equipped for irrigation. Tables 2-3 present the influence of irrigation on crops, across agriculture and the group of the nine counties where the percentage of the area equipped for irrigation represented 60% of their arable land.

Both in the first and in the second case, due to several causes belonging to the water supplier – i.e. the state – and to the user – i.e. the agricultural unit – the yields per hectare and, consequently, the projected profit were not achieved.

In an attempt to determine with greater vigor the influence of irrigation on the technical and economic results of the agricultural units from the group of the nine counties, there were selected all the state and cooperative units whose land was equipped for irrigation at a rate of more than 90%, during the analyzed period. The results are shown in Table 8.

Table 8. Average yield, income, technological expenditures and profit per ha in some cultures, in the area equipped for irrigation at a rate of 60% (Romanian Plain) and on the farms whose areas were equipped for irrigation at a rate of more than 90%

		Share of the irrigated area %	Average yield kg/ha	Income lei/ha	Technological expenditure lei/ha	Profit lei/ha
State farms	*Wheat*					
	Irrigated 60%		3,509	6,364	4,723	1,641
	Irrigated <90%		3,375	5,323	4,783	540
	Maize					
	Irrigated 60%		3,492	5,147	7,230	-2,083
	Irrigated <90%		4,078	5,638	6,580	-942
	Soybeans					
	Irrigated 60%		1,010	3,774	5,350	-1,576
	Irrigated <90%		1,100	3,641	5,783	-2,142
	Sunflower					
	Irrigated 60%		1,750	5,538	5,178	360
	Irrigated <90%		1,646	4,852	4,623	229
	Potatoes					
	Irrigated 60%		15,024	16,815	26,587	-9,772
	Irrigated <90%		-	-	-	-
	Sugar beet					
	Irrigated 60%		-	-	-	-
	Irrigated <90%		-	-	-	-
Agricultural cooperatives	*Wheat*					
	Irrigated 60%		3,073	5,592	5,237	355
	Irrigated <90%		-	-	-	-
	Maize					
	Irrigated 60%		3,816	5,827	7,005	-1,178
	Irrigated <90%		-	-	-	-
	Soybeans					
	Irrigated 60%		765	2,493	3,982	-1,489
	Irrigated <90%		-	-	-	-
	Sunflower					
	Irrigated 60%		1,603	4,955	4,584	371
	Irrigated <90%		-	-	-	-
	Potatoes					
	Irrigated 60%		10,167	9,884	17,130	-7,246
	Irrigated <90%		-	-	-	-
	Sugar beet					
	Irrigated 60%		23,909	9,097	10,852	-1,755
	Irrigated <90%		-	-	-	-

Source: A. Lup, Irrigation in Romanian Agriculture [7]

We first notice small differences in the average yields per ha between the area equipped for irrigation at a rate of 60% and the agricultural units whose areas were equipped for irrigation at a rate of more than 90%.

The explanation lies in the fact that, in reality, neither of the two categories of agricultural units had irrigated their entire surface, and the application of water to the plants was faulty, as already mentioned.

The low yields per ha obtained in these conditions entailed the economic inefficiency. Of the six crops analyzed, only those of wheat and sunflower were profitable.

Because of the low crops per ha, the greatest losses were registered especially in the crops specific to the irrigation technological system, such as sugar beet or potatoes.

Since 1990, the land has been watered less

and less reaching, in recent years, 10% of the existing 3 million ha in 1989. Parts of the major irrigation systems, particularly in the Danube Valley, are being rehabilitated.

The fight against soil erosion and water logging. The last land reclamation program approved by the Grand National Assembly of Romania in 1983 (the parliament of that time) provided for soil erosion control works for 5.3 million ha and for water logging control works on 5.53 million ha.

CONCLUSIONS

The provision of food to a steadily increasing population represented, across time, a major concern for both state leaders and international bodies, researchers, scientists. After a long time – thousands of years – the attention was directed towards increasing the cultivable areas by deforestation, grubbing, terracing, and drainage.

The land resource in our time is limited and, thus, the attention has been directed towards technological intensification, in order to significantly increase the agricultural yield, but not enough as to ensure a decent food supply for the entire population of the Earth.

Romania followed the same line strategically, focusing, in the second half of the twentieth century, toward expanding and improving the productive capacity of arable area, on land reclamation works, represented especially by irrigations.

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