Agriculture in the Danube Delta

Lup, Aurel and Deniz Alim, Indira and Miron, Liliana

Academy of Romanian Scientists, OVIDIUS" University of Constanta, OVIDIUS" University of Constanta

16 November 2017

AGRICULTURE IN THE DANUBE DELTA

Aurel LUP[1], Indira DENIZ ALIM[2], Liliana MIRON[3]

Abstract: *This paper addresses the evolving nature of agriculture in the Danube Delta, since the 1950s and to the present day. The paper makes the inventory of the studies and programs aimed at increasing the share of the agricultural activities in the Delta, of the attempts to transform the Danube Delta into a significant segment of the Romanian agricultural economy. Over time, there has been a great competition between agriculture and the main Delta resources; in this regard, fishing has always been a key component of the Delta's economy. Between 1955 and 1965, particular importance was given to the industrial exploitation of the reed, as raw material for cellulose and paper. To this end, the Delta was divided and embanked, and a special machine system was implemented in order to harvest the reed. By destroying the reed's biological bases (the rhizomes), the reed yield decreased; thus, by late 1960s, reed cultivation became unprofitable. Then, it was considered that the embanked areas could be drained and turned into agricultural polders. Successive programs assigned to agriculture larger and larger areas, ranging from 100,000 ha to over 200,000 ha; however, these were not materialized. In fact, agriculture was practiced on areas ranging from 60,000 to 70,000 ha, with a tendency to specialize in a biological system according to the requirements for the environmental protection of the reserve.*

Keywords: *delta, agriculture, reservation, program, use*

JEL Classification*: Q19*

INTRODUCTION

The Danube Delta, part of the Danube Delta Biosphere Reserve - RBDD - is the geographical area located between the three Danube branches, i.e. Chilia, Sulina and St. George. The Delta stretches on 430 thousand ha, unlike the reserve, which includes a much larger area, i.e. about 580 thousand ha. Besides the floral and fauna diversity, the Danube Delta has, above all, an economic and social vocation. Fish and agricultural products provide food to the Delta inhabitants; moreover, these represent exchange assets, both locally and nationally.

Taking into account the topic of this paper, we will limit ourselves to the assessment of the agriculture which, along with fishing, has been a basic preoccupation of the Delta inhabitants, since immemorial times. If we are to believe the legend (*The Argonautics of Apollonius of Rhodes*), the first travelers to Pontus Euxinus were the Argonautes who, when returning from Colchis through the Delta, saw sheep flocks and shepherds, whom they scarred.

For centuries, the economy of the Danube Delta has been a natural one; the main traditionally exploited resources were fish and livestock, especially sheep. Since the second half of the 20th century, the Danube Delta had been subject to the planned economy system and, periodically, it represented the focus of various economic programs, where its main resources, i.e. reed, fish and agriculture, alternatively took priority, according to the context of the respective plans within the national economy. For example, since the second half of the 50s, the main economic activity in the Delta was reed cultivation; reed was used as raw material for cellulose and paper. For this purpose, the Delta was divided, embanked and provided with pumping stations for water level regulation. A real system of harvesting and transport machines was also implemented for this purpose. By the late 1960s, reed exploitation was stopped because the reed biological bases had deteriorated, the yield declined, and the reed became a precious raw material. Since the 1950s, the Communist regime started to be interested in the agricultural potential of the Danube Delta. The evolution of programs and their achievement status represent the subject of this paper.

[1] Academy of Romanian Scientists
[2] OVIDIUS" University of Constanta
[3] OVIDIUS" University of Constanta

MATERIAL AND METHOD

The material used is mostly a bibliographic and research retrospection of the agriculture from the Danube Delta, where Professor Lup conducted studies on the results obtained in the Delta, in terms of agriculture. There are also presented the latest agricultural development programs in the Danube Delta and their achievement stages. The research method is specific to economic research, i.e. material collection and selection, processing, synthesis, conclusion and proposals.

RESULTS AND DISCUSSIONS

1. The Danube Delta and agriculture. Agricultural activities have been associated with fish farming since ancient times, because the numerous levees were first of all rich in pastures, which allowed the breeding of a large number of animals, such as sheep, pigs and cattle (some of them in a half-breeding system). On higher lands, the Delta inhabitants grew grain and food plants. It is hard to assess the value ratio between fish and agricultural yield; although fish farming ranked first, agriculture followed it closely. The idea of agriculture in the Delta was not new. As early as the nineteenth century, geographer Ernst von Sylow (1857) predicted the transformation of the Danube Delta into a grain provider through extensive hydro-ameliorative works. In 1895, the first embankment works on St. George's branch, in Mahmudia – called "the Dutch Garden" by engineers Hangeveldt (Netherlands) and Dithmer (Denmark) (1) – were also performed.

During the command economy, after the bankruptcy of reed exploitation, the agricultural vocation of the Delta was rediscovered; this would become, among other things, the last source of arable land growth, i.e. one of the agricultural obsessions of the totalitarian regime. To this end, the former embankments performed in order to grow reed were well suited to becoming polders, where intensive agriculture could be practiced. Some of these were to be drained (the reed was to be plucked) and then equipped for irrigation. The drained areas were to become large state-owned agricultural enterprises producing grain and industrial plants, but also raising livestock (cattle and sheep). Not less than 218.3 thousand ha were planned to enter the agricultural circuit, of which over 50% were already embanked. The first and ultimately the only drained area was Pardina, with a total area of 28,970 ha.

It is noteworthy that the programs and equipments for agricultural use in the Danube Delta only dealt with the actual Delta area, i.e. 430 thousand ha (fig. 1), and not with the Danube Delta Biosphere Reserve, with an area of 580 thousand ha (fig.2).

Figure 1. The Danube Delta (Source: M. Botzan et al., 1991)

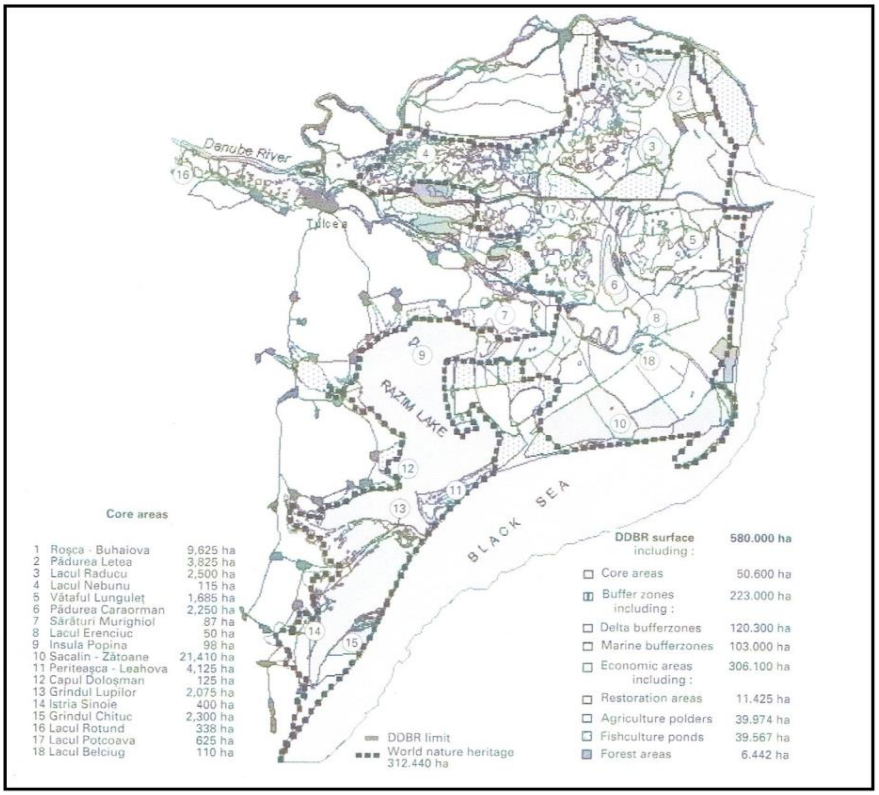

Figure 2. The Danube Delta Biosphere Reserve (Source: ICPDD, 2010)

Along with fishing and reed cultivation, the interest in agriculture bad been manifested since the early 1950s. Thus, in 1953, upon the request of the Council of Ministers, the *General Study for the Integral Equipping of the Danube Delta* was elaborated; it addressed the main activities of the Danube Delta: fish farming, agriculture, reed cultivation and forestry, trying to find a balance between them, since, implicitly, there was a competition among these activities. Logically, over time, each sector had tried to prove its own benefits.

In the following year, i.e. 1954, a group of researchers and specialists from different fields went to the Delta. In 1956, a first synthesis of knowledge emerged, and in 1958, the Academy developed a synthetic study on the delimitation of various Delta uses. Finally, in 1960, the Institute for Agricultural Studies and Design elaborated a *Technical-Economic Memorandum on the Improvement Measures for the Agricultural Land in the Danube Delta*. According to this document, 126 thousand ha were assigned to agriculture. At that time, 11,300 ha were embanked, 400 ha - drained and 803 ha - irrigated (1).

2. The program for the development and full operation of the Danube Delta (1982). The last adjustment regarding the economic use of the Delta's resources during the totalitarian regime was performed in 1983 through a special program that ranked priorities as follows:

- fish farming was to remain the main activity branch, developing both the equipped areas and the fishing in natural lakes, in free flood regime;
- agriculture was to be practiced with complex equipments, ensuring the necessary feed for fish and animal farming, for the consumption needs of the inhabitants, as well as some availability for delivery to the state fund;
- forestry would be mainly represented by the plantations of species growing rapidly in the shore-dike area;
- reed would be grown only in natural regime areas, ensuring raw materials for the production of cellulose;
- tourism would become an important economic branch;

- the systematization of the area and of its villages/towns, provision of facilities in order to improve the lives of the Delta inhabitants and their numerical growth (4).

In terms of agriculture, the program still included very ambitious objectives:

- increasing the agricultural area to 144 thousand ha. Of these 144,000 ha (assigned to agriculture), 93,635 ha were to benefit from land reclamation works (85,000 ha embanked, drained and irrigated; the remaining 50,365 ha would become grass lands by fixing and improving the sands) (1);

- the livestock was planned to reach 20 thousand cattle; 350 thousand sheep; 120 thousand pigs and 350 thousand poultry.

Table 1

Land use in the Danube Delta in 1982

Use	Area ha
Fishing and fish and reed growing, nature reserves	315000
Forestry	20335
Agricultural (equipped and under natural regime)	66185
Constructions and land within build-up areas	4450
Danube branches	7820
Other areas (dunes, islets)	28510
T o t a l	442300

Source: ISPIF

The program was approved by the Decree of the State Council no. 92/1983.

Prior to the elaboration of the last program (where the area assigned to agriculture was 144,000 ha), in the Danube Delta, agriculture was performed on only 66,185 ha (Table 1).

Moreover, in this case also, the media, including the cultural one, watched so that nothing would negatively influence *the party and state leadership's decision* to turn the Danube Delta into a granary.

Tomis Magazine no. 3.

The document entitled "A Paradise Lost" was postponed. The material discusses the problem of defending the fauna and flora in the Delta and makes very serious assessments of some measures taken in order to exploit the Delta's resources. It turns out that until long ago human activity had integrated into the life of the Delta, without disturbing it too much until the moment when the human being has become aware of the value of the Delta's resources; then, evolution acquired a hallucinating, suffocating pace. All sorts of specialists and forecasters, who had studied, assigned and planned everything, emerged. The author then countered the idea that agriculture could be performed in the center of the Delta, because it would damage the nature and balance of the Delta. The author further argues that the sad, sometimes millenary experience of some countries shows us that drainage and intensive irrigation led to secondary salinity, and that is why we need to proceed with attention and caution. Or, the material emerged when the national plan for the development of agriculture based on irrigation was debated upon. The conclusion of the material was quite unconceivable, raising the question: What will we leave to the next generation? Only cultivated fields? It is not enough.

Source: IEA

Figure 3. The facsimile of the project for organizing the yield from Pardina, in the Danube Delta

In 1980-1981, a multidisciplinary collective of researchers from the Institute of Agrarian Economy of the Academy of Agricultural and Forestry Sciences elaborated the project of organizing Pardina area as a state-owned agricultural enterprise. The author of this paper took part in this project. The conclusions of the study included the following (fig. 3):

• In the irrigated phase, 11,0000 tones of grain and soybeans are obtained, with an increase by 82%, compared to the non-irrigated period. The value of the agricultural yield doubles (116% increase). The physical and value yield increase is due to irrigation, but also to the increase in the area cultivated with 2,200 ha (i.e. an increase by 10%).

• Expenditures are growing at a faster pace than the yield growth (an increase by 159%). The yield increases 1.2 times and the expenses increase 1.6 times.

• The net income in the irrigated phase does not increase in the same way as the yield pace. While the latter increases 1.2 times, the net income increases only 0.3 times, i.e. four times slower, due to expenditures. The net income mass increases by 30% compared to the non-irrigated phase.

• The incremental investments made between the non-irrigated phase and the irrigated phase, amounting to 528,820 thousand lei (i.e. 68%), lead to a corresponding physical and value yield increase; however, this does not lead to the increase in the net income in the same proportion. The investment efficiency index decreases from 5.3% to 4.2%, and the recovery period increases from 18.7 to 24.2 years.

Subsequently, the author carried out some studies on the agricultural exploitation of the drained area from Pardina. However, the results obtained through the agricultural operation of Pardina were very modest and inefficient. Even in the areas with some agricultural traditions (Chilia Veche), the yields per unit area did not exceed 2,500 kg/ha in wheat and maize, 1,200 kg/ha in sunflower, below 800 kg/ha in soybeans. In terms of economic efficiency, profit was recorded only in wheat and barley, the other crops being more or less unprofitable (4). It was only after 1990 that the irrigation systems manufacturers on drained lands started studying the effects of the agricultural operation of the drained areas from the Danube Delta, as well as from the Danube Floodplain. A particular reference to Pardina is made: *Subsequent to a hydro-ameliorative operation conducted for a few years, the secondary salinity and other phenomena (such as changes in the levels and chemistry of surface and ground waters, ground compaction), which contributed to the sharp reduction of agricultural yields, started to emerge more obviously (...). After draining, all soil types from the area present a relic gleization. The lowering of the groundwater level and, thus, the removal of the underground water resulted in the phenomenon of compaction, salinization, physical maturation and rapid mineralization of the organic matter* (2).

UNESCO reacted to the 1982 Danube Delta Integrated Planning and Operation Program, approved by the Decree of the State Council in 1983. Thus, in 1990 the entire Delta, including the southern coastal lake complex, was declared a biosphere reserve.

3. Resuming the old agricultural land use programs of the Danube Delta. Taking advantage of an earlier study (from 1973), at the National Debate entitled *The Danube, the Floodplain and the Danube Delta. Agriculture and Environment. Present and Future,* (8^{th}-9^{th} May 2008), which took place under the auspices of the ASAS, the ISPIF representatives resumed and even amplified the role of the agriculture in the Danube Delta:

Regarding the agricultural equipping of some areas from the Danube Delta, these were based on the following studies and documents:

• Preliminary study on the proposals made in order to enhance the use of natural resources from the Danube Delta, elaborated by ISPIFGA, in December 1973, in collaboration with specialists from the Department of State Agriculture, Danube Delta Plant and People's Council of Tulcea County. This study predicted the following evolution of the agricultural land from the Danube Delta:

Area -ha-		*The status of works (1975)*	*Final stage provisions 1995*
Agricultural	*Equipped*	*6440*	*100540*
	Natural regime	*52720*	*24260*
	T o t a l	*59160*	*124800*

Thus, it was proposed to increase the agricultural land area from 6,440 ha to 100,540 ha, i.e. an increase by 94,1000 ha.

• Study on the complex capitalization of the important resources from the Danube Delta. The study addresses the development of all economic activities that can make the most of the Danube Delta's resources: agriculture, fish farming, reed growing, extractive industries, transport and telecommunication, manufacturing, tourism, etc. The study was conducted in collaboration with experts from countries that had performed such works. Until the approval of the study, the measures proposed in the preliminary study presented by the MAAA at that time were considered to be minimal.

In determining the development of economic activities, agriculture was considered to be one of the main economic activities, by maximizing the agricultural area (200,000-250,000 ha, so that the Delta would have became an important area proving corn, vegetables and sunflower; all agricultural work would be mechanized).

The agricultural lands had to be protected against floods; the proposed land reclamation systems had to be used for both drainage and irrigation. In terms of natural reserves, approx. 10,000 ha were maintained under this status, the rest of the areas being transferred to other uses.

The main research and design institutes wherewith the ISPIF collaborated in the elaboration of the study on the complex capitalization of the important resources from the Danube Delta were:

- ICPA (Institute of Pedological Research on Agriculture; in Romanian: Institutul de Cercetări Pedologice pentru Agricultură);

- IEA (Institute of Agrarian Economy; in Romanian: Institutul de Economie Agrară);

- IPTANA (Naval and Air Carrier Design Institute; in Romanian: Institutul de Proiectări Transporturi Auto Navale şi Aeriene);

- SLGC;

- IGFCOT;

- ISPCAIA;

- IRE Constanta;

- ICPDD;

- Ministry of Tourism;

- Institute for Social Issues within the Academy;

- I.C.A.S. (forestry) (3)

4. Agriculture in the Danube Delta. Programs and facts. In the paper entitled *Monograph of Reed in the Danube Delta*, published in 1965, the structure of the Delta uses was the following: fish farming - 323.6 thousand ha; reed growing and fish farming - 213.9 thousand ha; agriculture - 62.3 thousand ha; forestry - 18,800 ha; land within build-up areas, embankment-seashore areas, coastline - 17,8 thousand ha (4). Towards the end of the reed-growing period, which had begun 10 years earlier, the Delta was subdivided into 11 embanked areas equipped with pumping stations and locks for the introduction and removal of water inside the enclosures during reed harvesting. Until 1979, the whole activity was abandoned due to the yield decrease, which in turn, was due to the destruction of reed rhizomes. The enclosures with dikes, dams, works of art remained; thus, the state government of that time thought that the respective drained land could become agricultural polders.

In fact, as we have already mentioned, in 1960, there was a program showing that agriculture could benefit from a much larger area, i.e. about 126 thousand ha (1). The next project would be drafted in 1975, confirming the 1960 proposals, namely 124,800 ha assigned to agriculture, out of which 100,540 ha would be equipped. However, in 1982, when the last program on the structure of uses in the Danube Delta was developed, assigning 144,000 ha to agriculture, the project authors found that agriculture was performed only on 66,185 ha, i.e. with 3,885 ha more than the area mentioned in *Monograph of the reed* (1965), i.e. 62,300 ha. Neither this program approved by state decree in 1983 was implemented; this fact is revealed by the Report on the Management Project of the Danube Delta Biosphere Reserve (1993), which mentions that *agriculture was performed on about 62,000 ha* (6).

In 2010, the Danube Delta Research Institute (Tulcea) recorded agricultural use on approx. 40,000 ha, except the strictly protected areas. We can say that over a half-century there was practically no increase in agricultural use, this area being around 60,000 ha, i.e. 2.4 times smaller than the most ambitious totalitarian plan whose appetite for increasing the agricultural area to 15 million ha is well known.

Why did not the authorities act forcefully in the Danube Delta, as happened in the Danube Floodplain? The answer to this question remains an enigma. Despite the warnings that the land taken out from under the water would degrade (swamp formation, secondary salinity, aridization), hundreds of thousands of hectares *were assigned to agriculture*. This could be explained by the tacit acknowledgment that in the Delta the negative phenomena would have been much more difficult and more expensive to control. Moreover, we should not forget the failed attempts to embank, drain and use as permanent dry land some land areas from Mahmudia (undertaken by the Dutchman Hangeveldt) and from St. George branch (undertaken by the Danish Ditgmer) (1895).

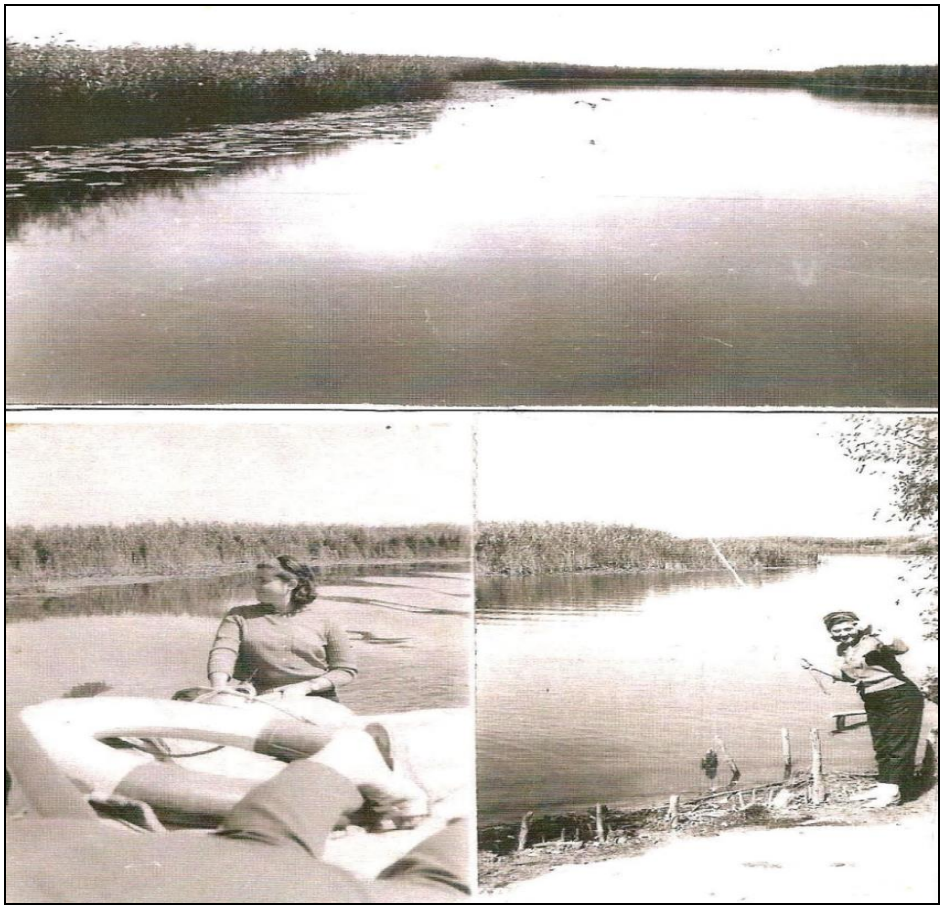

Figure 4. Civilized tourism could become one of the important economic resources in the Danube Delta (Photo A. Lup)

Even more surprising is the recent proposal (2008) of the Institute for Studies and Design for Land Reclamation, i.e. that agriculture should be practiced in the Danube Delta not on 144 thousand ha, as the totalitarian regime wanted, but on 200,000-250,000 ha, so that the Delta would become an important area for the yield of corn, vegetables and sunflower. Considering that the Danube branches and forests amount to about 75,000 ha (out of 430 thousand ha), 70% of the remaining area, i.e. 355 thousand ha, would be drained and transformed into agricultural land. Let us hope, however, that these proposals will not materialize and that agriculture will continue to be performed on 60,000-70,000 ha, subject to the restrictions imposed by the Delta's reservation status.

CONCLUSIONS

The Danube Delta is primarily a biosphere reserve, whose main resources (flora and fauna) can be economically assessed only by admiring it. Attempts to turn the Delta into a barn have failed at least until now. With a declining population of 14,000-15,000 inhabitants, the Delta provides the main products needed for the subsistence of this population and, at the same time, it produces, or could produce, commodities such as fish, reed, and wood.

The agricultural vocation of the Delta has been limited until recently to a system of self-supply with most agricultural products, except for bread.

Upon the presentation of the Reservation Management Project (1993), 19,000 cattle, 60,000 sheep and 45,000 pigs were declared as livestock. In fact, nobody will ever know the real size of the livestock grown in the Delta; moreover, it is not known how much fish it has and how much it is fished. The shift to aquaculture has not been successful, at least until now.

At present, there is a tendency to capitalize the Danube Delta's touristic potential; however, we are also faced with the leaders' tendency to capitalize it for purposes other than the touristic ones.

REFERENCES

1. Botzan M., şi colab.,1991: *Valorificarea hidroameliorativă a Luncii Dunării româneştişi a Deltei.* Redacția de propagandă agricolă Bucureşti.
2. Cristea Maria şi colab.,1992: *Studiul tehnic privind adaptarea şi echiparea unor incinte din Lunca Dunării în vederea exploatării acestora în condiţii ecologice.Impactul lucrărilor de îmbunătăţiri funciare asupra mediului înconjurător.* ISPIF-SA Bucureşti.
3. Hâncu S., Jelev I., Codreanu M.M. (coord.), 2009: *Dunărea, Lunca şi Delta Dunării. Agricultură şi mediu. Prezent şi perspectivă.* Editura BREN, Bucureşti.
4. Lup A., 2012: *40 de ani de agricltură socialistă în Dobrogea.* Eitura Ex Ponto. Constanța.
5. Rădulescu I., Niculescu C.,Chiru S.C., 1965: *Monografia stufului în Delta Dunării*. Editura Academiei Republicii Populare Române, Bucureşti.
6. x x x 1993:*Programul de management al mediului privind Rezervația Biosferei Delta Dunării Tulcea.*