

## DEVELOPMENT OF IRRIGATION AND DRAINAGE IN BULGARIA

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### ABSTRACT

In Bulgaria, rainfalls are insufficient and unevenly distributed from July to September. Most frequently draughts occur from August to September, which determines the need of irrigation. Irrigation on large scale began to be practiced in the 15<sup>th</sup> century when rice growing was introduced in the Maritsa River Valley. In 1920 water Syndicates (joint state and co-operative associations) were established by special law and a State Water Development Programme was initiated. Intense development of irrigation and drainage took place after the Second World War. Till 1989, irrigation was well developed and structured all over the country. Co-operations and agro-industrial complexes, existing at that time, controlled, maintained and operated the periphery of the irrigation systems, including small dam lakes, sprinkler- and drip-irrigation fields. A governmental agency with branches in all country regions controlled, maintained and operated the main parts of irrigation systems including the bigger dam lakes specialized in irrigation, pumping stations, distributive canal and pipe networks, outfits etc. The same agency was in charge for water distribution and for implementation of the governmental policy in irrigation. Since 1989 Bulgaria has undergone profound political, social and economical changes, which have affected irrigation in an extremely negative way. By now, the irrigated land is only 5-10% of the area equipped for irrigation. Water is supplied only to vegetables, orchards, tobacco and some other profitable crops, which cannot be grown without irrigation. Due to the decreased water consumption, the Governmental agency "Irrigation Systems" Inc. cannot provide all financial resources for maintaining of the irrigation and drainage

infrastructure. On the other hand, Bulgarian Government tends to maintain low prices of irrigation water in favour of the agricultural producers, including subsidizing of part of the water primary cost. During the period of political and economic reforms that started in 1990, a number of legislative initiatives were implemented in order to re-establish the normal irrigation and drainage activities in Bulgaria, including (1) The Ownership and Use of Farmland Act 1992; (2) The Water Act - 2000; and (3) The Water User Associations Act. Recently, a group of scientists, irrigation specialists and managers (Petkov et al., 2000) offered a programme on the development of irrigation in free market environment, which was approved by the Collegium of the Bulgarian Department of Agriculture and Forestry. According to the authors, the property of irrigation and drainage systems should gradually change from governmental to private and this process should be stimulated and supported by the Governmental policy. Water users should pay to water suppliers the real price for water supply. Irrigation and drainage infrastructure in the agricultural lands will be transferred to the Water User Associations free of charge. The role of state in irrigation and drainage management will gradually decrease. Only objects of national importance as big dam lakes, protection dams, river corrections, bank drainages and drainage outfits remain public state property and will be managed by a Governmental agency.

### GEOGRAPHIC, CLIMATIC AND HYDROLOGIC CHARACTERISTICS

Bulgaria is situated in the eastern part of the Balkan Peninsula. The surface area of Bulgaria is 110630.9

km<sup>2</sup> of which about 4700000 ha or 42% are cultivated. The forest resources are about 3450000 ha or 31% of the total land. The remaining 2913000 ha or 27% are uncultivated including wastelands, rivers and lakes, meadows and pastures, forest shelter belts, inhabited areas, roads, etc. The soil covering is characterized by significant diversity. Most important for agriculture are the deep soils in the lowlands and the plains - Fluvisol, Luvisol, Vertisol and Chernozem. The climate in Bulgaria is temperate-continental. In the Southernmost part of the country, however, sub-tropical climatic manifestations are also observed. The evaporation from free water table ranges from 900 mm for the Danubian Plain and the Thracian Lowland to 250 mm for the mountain regions. The average annual precipitation in Bulgaria is 673 mm (Marinov, 1976). In the plains, constituting the greater part of the cultivated land, the average precipitation ranges from 400 to 600 mm. The prevailing part of precipitation falls from October to June. In the summer months, July to September, the rainfalls are insufficient and unevenly distributed. Most frequently draughts occur from August to September.

#### **HISTORY OF IRRIGATION AND DRAINAGE IN BULGARIA**

Since ancient time people in Bulgaria have built hydraulic structures for the irrigation of vegetables, orchards, meadows, etc. situated along the rivers. Irrigation on large scale began to be practiced in the 15<sup>th</sup> century when rice growing was introduced in the Maritsa River Valley. In 1878 there were about 560 km of irrigation canals for irrigation of about 30000 ha including 5000-6000 ha of rice. The first attempt for organized water utilization was made in 1904 with the establishment of the Office for Crop Improvement, reorganized in 1906 in the Water development and Crop Improvement Department at the Ministry of Trade and Agriculture. In 1920 water Syndicates (joint state and co-operative associations) were established by special law and a State Water Development Programme was initiated. Flood control and drainage works began in 1897 for preventing the flooding of the Danubian Plain. Important drainage and river correction works were completed after 1925 when about 25000 ha of

marshland were drained and protected against floods along Danube and the Black Sea coast. Intense development of irrigation and drainage took place after the Second World War. After 1966-1968 the emphasis was shifted from surface irrigation to sprinkling and after 1975 the subsurface drainage networks were introduced along with the surface open drains. In the seventies micro-irrigation was also introduced in Bulgaria (Framji et al., 1981)

#### **IRRIGATION AND DRAINAGE INFRASTRUCTURE**

Till 1989, irrigation was well developed and structured all over the country. Co-operations and agro-industrial complexes, existing at that time, controlled, maintained and operated the periphery of the irrigation systems, including small dam lakes, sprinkler- and drip-irrigation fields. A governmental agency with branches in all country regions controlled, maintained and operated the main parts of irrigation systems including the bigger dam lakes specialized in irrigation, pumping stations, distributive canal and pipe networks, outfits etc. The same agency was in charge for water distribution and for implementation of the governmental policy in irrigation. According to the Annual Report of the national company "Irrigation Systems" Inc. for year 2000, there are 235 irrigation systems and a great number of irrigation fields in Bulgaria, designed to collect, store and supply irrigation water to 740600 ha agricultural lands. The infrastructure includes also 168 irrigation dam lakes, 681 irrigation pumping stations, 1497 pressurized pipe lines, 530 derivations, 6435 km open canal network, and 9269 km subsurface pipe network. The capacity of dam lakes managed by governmental agencies is 4.162 km<sup>3</sup> including 3.106 km<sup>3</sup> in those specialized for irrigation and 1.491 km<sup>3</sup> in five complex reservoirs used also for electric power production and water supply. The equipped irrigation area is 537500 ha of which 247300 ha are supplied with water gravitationally and the remaining 290200 ha - by pumping stations. Agricultural lands and other objects of national importance are protected from flooding and drained by 653 km dikes, including 268 km along the Danube River, 3164 km river corrections, 14 retention dam lakes, 157539 ha drainage systems 32% of which are

equipped with 94 drainage pumping stations, 2334 km main canals and 11192 km drains.

### PRESENT STATE OF IRRIGATION AND DRAINAGE SYSTEMS

Since 1989 Bulgaria has undergone profound political, social and economical changes, which have affected irrigation in an extremely negative way. The change of property on the land and the prolonged procedure of land restitution leaved part of irrigation systems, which was controlled by the former agricultural organizations, without owners for a long period. Moreover, land was given back to owners in small pieces - as it was nationalized fifty years ago, which made the large-scale irrigation systems inapplicable and useless. Small canals were buried,

machinery stolen, pumping stations and outfits destroyed. Because of the missing owners and for reasons of safety, the Government appointed municipalities to control and maintain the small dam lakes. Lacking financial and material resources, however, municipalities prefer to lend this property for fishery or recreation and the water is not more used for irrigation. By now, the irrigated land is only 5-10 % of the area equipped for irrigation. Water is supplied only to vegetables, orchards, tobacco and some other profitable crops, which cannot be grown without irrigation. Recently, there is a tendency of increased interest in highly effective technologies as drip irrigation and micro-sprinkling, but no reliable information is available. Present state of the irrigation in Bulgaria is illustrated in table 1.

Table 1. State of irrigation and drainage infrastructure in Bulgaria

Description	Unit	Quantity
<b>Irrigation potential</b>	ha	740600
<b>Irrigation:</b>		
Full or partial control irrigation: equipped area	ha	537500
- Surface irrigation	ha	443839
- Sprinkler irrigation	ha	296539
- Micro-irrigation	ha	3332
% of equipped area actually irrigated	%	9.2
As % of cultivated area	%	12.2
Increase over last 13 years	%	0
Power irrigated area as % of water managed area	%	54
<b>Harvested crops under irrigation (full or partial control)</b>	ha	49351
- Vegetables	ha	5455
- Maize	ha	17887
- Rice	ha	2884
- Other annual crops	ha	16490
<b>Drainage:</b>		
Drained area	ha	157599
As % of cultivated area	%	3.4
- Drained areas in full or partial control irrigated areas	ha	157599
- Total drained area with subsurface drains	ha	35568
- Total drained area with surface drains	ha	122031
<b>Flood-protected area</b>	ha	81728

\*Annual Report 2000. National company "Irrigation Systems" Inc.

\*Republic of Bulgaria Statistical Yearbook 2000.

Due to the decreased water consumption, the Governmental agency "Irrigation Systems" Inc. cannot provide all financial resources for

maintaining of the irrigation and drainage infrastructure. On the other hand, Bulgarian Government tends to maintain low prices of

irrigation water in favour of the agricultural producers, including subsidizing of part of the water primary cost. The average primary cost of irrigation water for the country is 0.028 US\$/m<sup>3</sup> and, depending on the specific region, ranges from 0.010 US\$/m<sup>3</sup> to 0.193 US\$/m<sup>3</sup>. Nevertheless, the Government sets one single price of the irrigation water for all country regions which, for individual farmers, is 0.018 US\$/m<sup>3</sup> and 0.046 US\$/m<sup>3</sup> for gravitationally and power supplied water respectively. For rice growing the water price is about 0.005 US\$/m<sup>3</sup>. For the associations of water users, which are 119 in Bulgaria, the price is 0.009 US\$/m<sup>3</sup> and 0.037 US\$/m<sup>3</sup> for gravitationally and power supplied water respectively. These prices are applied only if the water expenditure does not exceed an annual application rate, determined by the Government for each crop. For water amounts exceeding those application rates the price is doubled (Annual Report of the national company "Irrigation Systems" Inc. for year 2000).

#### **LEGAL SYSTEM PERTAINING TO WATER USE AND WATER SUPPLY.**

During the period of political and economic reforms that started in 1990, a number of legislative initiatives were implemented in order to re-establish the normal irrigation and drainage activities in Bulgaria. The following legal acts were passed from the Bulgarian Parliament: (1) The Ownership and Use of Farmland Act 1992; (2) The Water Act - 2000; and (3) The Water User Associations Act - was accepted from the Parliament in 2001.

*The Water Act* governs the water resources. According to this act, the water as a natural resource is a public property and the water rights are vested in the State. The Water Act also mandates the rules concerning the property of the available mostly State-constructed hydro-meliorative systems (dams, main water channels, pumping stations, reservoirs, water intakes, distributary channels, field pipe networks, etc.).

*The Water User Association Act* defines the WUA as a voluntary organization of individual citizens with variable capital that is engaged in economic activities (irrigation and drainage) based on the mutually

based economic interest. Every member participates with shares according to the farmland he/she possesses. The general meeting of the WUA members elects the executive bodies of the WUA for a given period. One very important part of the Statute is that the WUA members are permitted to vote with maximum 20% of the total number of shares they owned.

#### **PROGRAMME FOR FUTURE DEVELOPMENT OF IRRIGATION IN BULGARIA**

Recently, a group of scientists, irrigation specialists and managers (Petkov et al., 2000) offered a programme on the development of irrigation in free market environment, which was approved by the Collegium of the Bulgarian Department of Agriculture and Forestry. According to the authors, the property of irrigation and drainage systems should gradually change from governmental to private and this process should be stimulated and supported by the Governmental policy. Water users should pay to water suppliers the real price for water supply. Irrigation and drainage infrastructure in the agricultural lands will be transferred to the Water User Associations free of charge. The role of state in irrigation and drainage management will gradually decrease. Only objects of national importance as big dam lakes, protection dams, river corrections, bank drainages and drainage outfits remain public state property and will be managed by a Governmental agency.

Effective irrigation technologies and the profitable agricultural crops are determined comparing the price of irrigation water to the additional incomes from irrigation. For some regions surface irrigation appear profitable, while power supplied water is ineffective. Profitable crops under irrigation are vegetables and tobacco. Maize, vineyards and orchards will be profitable if water price is about 0.02 US\$/m<sup>3</sup> in year 2006 and 0.04-0.06 US\$/m<sup>3</sup> in 2020. Alfalfa, sugar beet and cotton will be irrigated if water price is 0.02 US\$/m<sup>3</sup>. Under the present water prices, irrigation will be effective only on 218 000 ha in 2006 and on 298 000 ha in 2020. If the prices are lower by 30% (e.g. by increasing irrigation efficiency), the irrigated lands will be 364 000 ha in 2006 and 430 000 ha in 2020. The increase in the

area of irrigated lands will be provided by investments of about 153 million US\$ till year 2020. Besides this amount, for the same period Water User Associations will have to invest about 85 million US\$ for maintaining and repair of the existing infrastructure as well as for construction of new one. Additional 298 million US\$ should be paid for maintaining, repair and protection of the main units of the existing effective infrastructure.

According to the authors, the program will be implemented in three stages. Administrative, institutional and legal prerequisites for development of irrigation will be established till 2006. Irrigation systems efficiency will be increased in the period 2007-2012. In the same period Water User Associations will be stabilized and enlarged for management of larger technological units of irrigation and drainage infrastructure, and an Irrigation Management Information System will be developed. In the third period, 2013-2020, maximum area of the effective irrigated lands will be achieved, the transformation of property on irrigation and

drainage infrastructure will be completed and investments for increasing efficiency of water distribution, systems maintenance and repair will be provided.

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