

## **SOME SPECIALITIES OF AGRICULTURAL WATER MANAGEMENT AND IRRIGATION IN HUNGARY**

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### **INTRODUCTION**

Large parts of Hungary belong to the sub-humid and semi-arid climatic belt. The climate is normally described in terms of the total annual precipitation and the seasonal and spatial distribution thereof. The normal annual precipitation ranges about 500-600 mm, in the South-West parts of Transdanubia between 600 and 800 mm. Years with abundant rainfall are on record together with more frequent dry, arid years, like those of the severe droughts in 1990, 1992, 1994 and 2000. Of greater interest to agriculture is the annual mean precipitation and the distribution of rainfall during the growing season. The ratio of annual precipitation and potential evaporation was lower than 0.65 over the past 20 years (Ijjas and Szlavik, 2000).

Around 90 per cent of the territory of Hungary is exposed to droughts. The likelihood of drought events is very low only in the parts along the South-West border, the forefield of the Alps. In the principal cereals growing area in the Plains the average precipitation during the March to September period is less than 350 mm, with July and August being the driest. The crop yields fluctuate between very wide limits depending on the temporal and areal distribution of rainfall.

### **TASKS OF AGRICULTURAL WATER MANAGEMENT**

The state functions related to agricultural water management are shared by the Ministry for Environment and Water Management (KvVM) and by the Ministry of Agriculture and Rural

Development (FVM). Water management is required to ensure

- the water resources,
- the transport and distribution of water, and
- the legal background of water uses as well as of the establishment and operation of water distribution networks.

The functions associated with the use of water in agriculture belong to the sphere of competence of the Ministry of Agriculture and Rural development. Supplying water to agriculture is one of the important functions of general water management as well, in that irrigation presents a major part of the demand for surface water.

Water to the areas developed for irrigation can be supplied

- from surface water by
  - a) water provision via state principal facilities, and
  - b) diversion directly from surface water body by the user,
- from groundwater, without provision, the water being abstracted directly by the user.

Water provision is understood here to mean the conveyance of water up to the intake of an irrigation section through the state-owned principal facilities, that are the transfer and regional projects, the double-use canals (for drainage and irrigation) and the control structures on them.

Demands for irrigation water arise in their vast majority in the Tisza Valley, especially in the South-east part of the country, in the area of the Körös

stream network. The flow available for use in the Körös rivers is too small in summer to meet the irrigation demands, therefore most of the water must be transferred from the Tisza river. This is accomplished by the Tisza-Körös Valley cooperating water management system, the main components of which are the Tiszalök and Kisköre dams on the Tisza river and the Békésszentandrás Barrage on the Hármas-Körös.

The water backed up by these structures is conveyed to the irrigation sections via the large irrigation principal canals, like the Eastern Main Canal, the Western Main Canal, the Nagykúnság Main Canal, etc, and the laterals thereof. In the critical periods during the extremely dry years water for irrigation is diverted from the reservoir impounded by the Kisköre Dam (Tisza Lake).

The flow in the Danube is large enough to meet all demands of the irrigation developments along the river even in extremely dry years. The only problem here is the low river stage, as a consequence of dams - the water must be diverted - in the absence of dams - by pumping to supply the irrigation sections.

#### **AREAS DEVELOPED FOR IRRIGATION**

The total area developed for irrigation in Hungary was 311 thousand hectares in 1998, the greater part of which - 218 thousand hectares - water was conveyed via the state-owned principal facilities. The part not relying on these for irrigation water is 93 thousand hectares large (Ijjas and Szlavik, 2000).

The areas developed for irrigation grew considerably in size from 1985-86 to 1991 and became stable thereafter. Development has meant not only a larger area, but also higher technical level, in that advanced, high capacity coiled-hose and linear types of sprinkler equipments found spreading application. The changes occurring in the ownership of the land in development areas for irrigation have, however, presented problems in the ownership, the operation and the use of these high-capacity equipment fleet.

Water provision was ensured in 1998 by the 1,125 km long irrigation canals and by the 3,546 km long

double-use canals owned by the state and managed by the district water authorities.

The volume of water consumed in the areas developed for irrigation ranged from 118 to 325 million cubic meter per year between 1992 and 1996, corresponding to 1,170-2,080 cubic meter per year and hectare, depending primarily on the rainfall during the growing season.

The direct state functions comprise the construction, maintenance and operation of the transfer and regional projects, which create the infrastructure in particular areas for farm irrigation developments by ensuring water for, and conveying it to the irrigation sectors.

Farm irrigation development is beyond the sphere of the state functions. Such projects are implemented by associations, the collective efforts of interested farming operations, or with financing by an economic corporation. State support to such projects may be granted on an application basis. The birth of small farms is likely to entail spreading irrigation from groundwater sources abstracted from shallow, dug wells. The small groundwater volumes abstracted by the individual farmers may in combination affect adversely the subsurface supplies within a brief period of time.

#### **WATER PROVISION RATE AND THE COSTS OF IRRIGATION**

Irrigation water via the state principal facilities was provided up to 1990 for an officially fixed, uniform rate in the entire country. In 1990 the water provision rate was transferred in the category of deregulated prices and the revenue is expected to cover all costs of the service - except those of maintenance for the time being. The water provision rate varies between wide limits by irrigation sections, depending on the particularities of the section. The rates are high in the small sections served by pumped diversions or abstractions, and are lower in large sections supplied by gravity. The rates range from 0.5-2.0 Ft per cubic meter in case of gravity supply, to 12.0-25.0 Ft per cubic meter in case of water supply by hydrants.

Controlling droughts and aridity pose substantial burdens on the population, the farming operations and the state budget alike.

The exaggerated functions assumed formerly by the state keep shrinking also in the field of water management, as the regulatory role of the market becomes increasingly stronger also in irrigation farming and water supply. The farmers interested in irrigation are presently required to pay for the full costs of water, the state having discontinued supporting the operation of irrigation sections. The Ministry of Agriculture and Rural Development grants support to farm irrigation projects (building canals, reservoirs, wells, buying irrigation equipments), the magnitude of which may be up to 40 per cent of the total construction costs.

In view of the fact that the water norm of field and horticulture crops is 1500-2000 and 2000-2500 Ft per hectare, respectively, irrigation is a very expensive agrotechnical operation. However, in growing water-demanding crops, reliable yields and the required high produce quality are impossible to guarantee without irrigation. Wet farming is an essential prerequisite of intensive farming in the drought-prone regions of Hungary.

#### IRRIGATION FARMING ASPECTS

As it is well known water has a deterministic role in all processes of food production as well as in agricultural production. According to the saying water causes tremendous problems either it is scarce or it is too much. Therefore a rational management and use of water sources is basic task of the successful economy in the whole agrarian sphere. In this respect irrigation is one of the most important element of the agricultural water management in Hungary, because it is an indispensable mean

- in the satisfaction of the increasing quality demands of the market,
- in the creation of the production assurance,
- in the foundation of the reachable safety income, and
- in the accomplishment of the quantity and quality expectations in the production of specific agricultural produces.

The irrigation area with the permission of water rules in the year 2001 was 227.200 hectares, that is 3.5 percent of the total cultivated land (6.47 million hectares) of the country. While the largest irrigation area was 470 thousand hectares in the middle of the years of the 1970-ies, and stagnated between 300-360 thousand hectares up to the 1990-ies, the area decreased to 228 thousand hectares in the year 1999, and the effectively used water for irrigation decreased to the half of the volume consumed in the previous years. It can be generally stated that only 45-60 percent of the permitted area is used by the farmers effectively for irrigation. This area is irrigated by sprinkler and micro irrigation, the development of the latter is increasing considerably due to its water and energy saving characteristics.

There are several reasons of this relatively low utilization rate, but it is by no means an acceptable and justifiable state, especially taking into account, that in the last decades there were many dry, droughty years. It is true that drought damages can be omitted by irrigation only in the fields equipped for irrigation, and these are amounting only few percent of the total cultivated land, however the minimum 70 percent average use of the irrigation capacity should be required in those areas (Vermes, 2002).

Only the half of the existing irrigation capacity of Hungary can be qualified to acceptable technical status, therefore the present grants support both the building of irrigation water supply structures and facilities, new irrigation projects, establishment of new irrigation equipments, and the technological modernization and reconstruction of old or existing irrigation plots and/or equipments. For the promotion of irrigation development and land reclamation investments altogether 2.952 million Ft was available in 2001 from the budget, which could be applied by the farmers according to the 40 percent of the total investment costs.

The production structure of the irrigated land shows in several years average that about

- 60 thousand hectares are covered by corn and hybrid-maize seed production,
- 30 thousand hectares by vegetables,
- 10-15 thousand hectares by sugar beet,

25-30 thousand hectares by other seed- and propagation material production,  
6-10 thousand hectares are covered by different plantations (mainly orchards and vine-yards)

The surplus yield reachable on arable land with irrigation in case of corn is 4-5 ton per hectare. In case of high value seed production, vegetable growing as well as fruit and grape production without irrigation the yield and income is doubtful and uncertain (Kocsondi, 2001).

The ever increasing investments of irrigation (0.5-1.2 million Ft per hectare) could be repaid only with continuous irrigation and very well managed production. For the intensive plant growing and quality yield production a well organized, conscious and systematic farm management is necessary on the irrigation fields, which is basically different from the dry farming, or better to say from the rain-fed agriculture.

The development of irrigation is based mainly on surface water resources. This creates rather serious strained relations in areas with minimal or strongly limited water sources, like in the Eastern and Southern counties, and on the sandy table-land between the Danube and Tisza rivers. Nevertheless among the aims of our irrigation development plans - in order to have a safe and good quality yield in case of crops which have a stabile and permanent export market - the followings could be mentioned:

- irrigation of minimum 50 percent of the vegetable growing area, that means 50-61 thousand hectares,
- yearly irrigation investment on 3-4 thousand hectares of intensive plantations, up to 2006 irrigation of 25-30 thousand hectares fruit- and grape plantations,
- irrigation of minimum 50 percent of the seed and propagation material production fields, that means 50-70 thousand hectares.

According to the irrigation development plans between 2001 and 2004 we are counting with about 60-80 thousand hectares of newly established

irrigation fields, which needs a yearly development of 20-25 thousand hectares, and parallel the continuous reconstruction of the presently existing irrigation plots are foreseen. Up to 2004 the planes estimate at 280-300 thousand hectares total irrigation with authority permission, including the necessary development in the water supply facilities, too (Somlyódy, 2002).

A general strategic goals are the formation of the conditions of the high quality production in agriculture, the increasing of the production level of the traditional plant growing regions, the improvement of the living conditions in the landscape regions, and laying the financial foundation of the rural development, based first of all on horticultural production. These goals can be reached only if the necessary branch developments - including irrigation development - could get stable and countable state protection.

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## NEKE SPECIFIČNOSTI POLJOPRIVREDNOG VODNOG MENADŽMENTA I NAVODNJAVANJA U MAĐARSKOJ

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### Rezime

Veliki delovi Mađarske pripadaju polu-suvom klimatskom pojasu niske vlažnosti. Ova klima se obično opisuje u terminima totalne godišnje količine padavina i sezonskom i prostornom raspodelom istih. Normalna godišnja količina padavina je oko 500-600 mm, u jugo-zapadnim delovima Transdanubije je između 600 i 800 mm. Godine sa obiljem padavina su zabeležene zajedno sa češćim suvim godinama sa malo padavina, kao što su one sa jakim sušama, 1990, 1992, 1994, 2000. Od najvećeg značaja za poljoprivredu su prosečne godišnje padavine i raspodela padavina tokom sezone uzgajanja. Racio godišnje količine padavina i

potencijalnog isparavanja bio je niži od 0,65 u poslednjih 20 godina.

Okolo 90% teritorije Mađarske je izloženo sušama. Verovatnoća sušnih perioda je veoma niska samo u delovima duž jugo-zapadne granice, u prednjem delu Alpa. U glavnim oblastima uzgajanja žitarica u Niziji prosek padavina tokom perioda od marta do septembra manji je od 350 mm, gde su juli i avgust najsušniji. Prinos useva fluktuiraju između vrlo širokih granica u zavisnosti od vremenskih i oblasnih raspodela padavina.