

LAND AND WATER RESOURCES MANAGEMENT IN TURKEY

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New dimensions have been added to the existing development concept. The simple development model which increases the income of people is no longer a satisfactory target. In agriculture, production at the quality and in the quantity demanded by the market should become sustainable, rather than higher only. Sustainable agricultural development concept includes conditions such as improvement of soil and water resources in such a way that they can be continuously productive, utilization and protection of such resources without harming the environment. If we obtain a production increase to the detriment of soil-water-plant and climatic factors, we cannot be aiming at sustainable agricultural development.

In such general concept, before giving more detailed information about irrigated agriculture and water management, I would like to touch a bit on general economy and agriculture, and land-water potential of my country.

National economy and agriculture

Turkey, with a GDP per capita of about US\$ 2000 lies in the middle-income countries (table 1).

This is echoed in the figures for the distribution of employment shown in table 2.

The GDP itself and its agricultural component grow annually in recent years as shown in table 3.

Since in 1992 the total GDP rose by 5.9%, it is possible that the planned target figures will be met by the end of 1994. It is estimated that wise investment in irrigation could raise the annual growth of the agricultural GDP to 3%. Investment in the public agricultural sector has recently averaged 0.95% of GDP.

Since 1975, labour productivity has risen by 62.5% in agriculture and by only 11.7% in non agricultural activities. Turkey's relations with the world economy have changed over the years. Whereas agricultural goods made up 76% of total exports in 1965, this share had fallen to 47% by 1981 and to only 18% by 1989. However, it must be recognized that many manufactured exports depend on the processing of agricultural raw materials (such as cotton-textiles or food products). The position is likely to further change with Turkey aiming at a customs union with the European Community in 1996, by taking advantage of climate and natural resources.

Natural structure of Turkey

Land

The republic of Turkey has a total area of nearly 78 million hectares, of which about 28 million ha are cultivated, 21 million are range-lands and 14 million ha are forest areas. For agricultural purposes, the cultivated area reached its peak in the 1970's. In fact, on land capability grounds, there should be a transfer of land use between cultivation, range and forestry with the effect of reducing the cultivated area by some 3 million ha. It is therefore clear that any increase in agricultural production will have to come from more intensive agriculture, including, of course, irrigation. Out of 28 million ha of arable lands, 92% are classified as irri-

gable, but when economic considerations are brought in, the official estimated Turkey's irrigation potential is 8.5 million ha of which 93% would be from surface water resources and 7% from ground-water.

Climate

The geographical position and topography of Turkey makes it possible to divide it into different large agricultural regions. There are great differences in temperature and rainfall. Rainfall can vary from 220 mm/year in the south-east, to over 3000 mm/year in the North-east Black Sea area.

On 60% of the total land area, the hot dry summers restrict crop growth. Differences between wet years (1990) and dry years (1989) can result in differences in national cereal yields of as much as 30%. Sustained increase in productivity here cannot be ensured unless irrigation water is provided.

Population

The population growth since 1975 is shown in table 4.

The figures shown in table 4 reveal two important facts. Firstly,

Table 1 Sectorial contribution to GDP.

Sector	1960	1990
Agriculture	42%	18%
Industry and Construction	22%	33%
Services	36%	49%

Table 2 Sectorial distribution of employment.

Sector	1960	1990
Agriculture	75%	49%
Industry and Construction	10%	21%
Services	15%	30%

Table 3 Annual growth of GDP and its agricultural component.

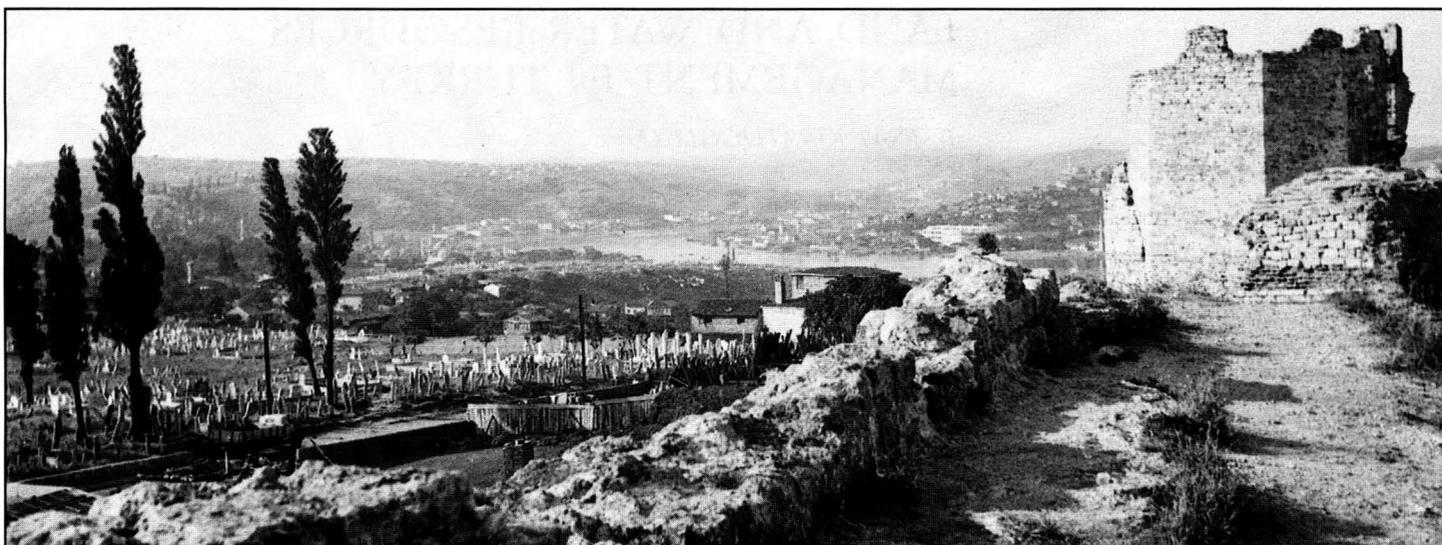
	1978-1990	1985-1990	Expected for 5-year Plan 1990-1994
Total GDP	4.2%	5.8%	6.8%
Agricultural GDP	2.5%	2.8%	4.1%

Table 4 Growth of population.

Year	Population (Million)	Rural Percentage
1975	40.4	58.2
1980	44.7	56.1
1985	50.7	47.0
1990	56.5	41.0
1992	57.7	40.3 (est.)

(*) State Minister, Turkey.

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the recent growth of population is about 2.3% per year, which is high as compared with the European standards. Secondly, they show a drift of population from rural to urban sectors. However, it should be noted that, in absolute numbers, the rural population since 1975 has remained at just over 23 million.

It is estimated for the future a population of about 68 million in the year 2000, 91 million by 2025 eventually stabilized at about 110-120 million. The last figure is what is estimated based on the population supporting capacity of the country with full use of modern inputs to agriculture, including irrigation.

Water resources

Turkey is relatively well-endowed in water resources. Hydrologically, Turkey is divided into 26 drainage basins. The river flow regimes are irregular and cannot be taken directly as usable resources. Average annual precipitation, evaporation and surface runoff vary greatly. The average annual runoff of the country is 186 billion m³. It is estimated that 95 billion m³ of surface runoff could be technically developed for economic use. It is also estimated that the total safe yield of ground water resources is 11.6 billion m³. This gives a total water potential of 106.6 billion m³. At present, the total consumption is 25 billion m³ (23% of potential), with about 3/4 going to irrigation and the rest evenly divided between industry, drinking and utility. It is estimated that the total water demand might be doubled soon.

Providing a safe yield from surface water necessitated valley storage. It is estimated that to regulate all surface water economic considerations should be made. So far 150 large dams have been built and 53 are under construction, an impressive record in itself. It will be inevitable to transfer water resources between basins.

Irrigation development in Turkish agriculture

As every related body knows, because of the anxiety caused by the different estimates of the rapid population growth and food production following World War II, many countries have considered that the expansion of irrigation facilities on a large scale is the only way to increase food production. Therefore, large State irrigation organizations have been established and the responsibility for planning, design and construction of irrigation schemes is given to such organizations to develop water and land resources thus increasing the agricultural production. In 1954, DSI General Directorate was established within this framework and Topraksu General Directorate 6 years later. Investment activities began rapidly with a view to develop water and land resources. Almost half of the 8.5 million ha economically irrigable land have equipped during the past 40-year period. Irrigated areas have expanded eve-

ry year and over the period 1985-90, the annual rate of increase of areas equipped for irrigation was 45,000 ha for the main projects implemented by DSI and 32,000 ha for minor GDRS projects. This represents an annual rate of increase of 4.1% which is 1.3% above the world average for that period. The average cost was US\$ 4430/ha for the DSI projects and \$1656 for GDRS small-scale projects. These figures are not excessive compared to world standards.

In Turkey, 65% of the funds recently allocated for agricultural investments, is spent for irrigated agricultural investments. By irrigation the yield increased 7 times, the added value could increase 2.6 times. The reasons for the low increase in added value expected from the delay in the development of schemes and the other reasons are mentioned below.

- Regarding investment policies, following unexpected procedures without paying due attention to the mental and economic contributions of the beneficiaries of these investments from the beginning.
- Problems related to water management and operation-maintenance services,
- Investments in projects having a low internal rate of return.
- Starting extra number of projects considering the available budget allocations, thus, causing a delay in commissioning.
- Realization of on-farm Development Services slower than the desired rate of progress.
- Problems related to market conditions and farmers' training.

The **figure 1** shows the area equipped for irrigation and management by reorganization till 1992.

GAP (South-eastern Anatolia) project

A package of integrated projects like energy, transportation, industry, urbanization and agriculture in the South-eastern Anatolia Region of Turkey. Irrigation investments take a large part of the package. Some 1.7 million ha of land will be equipped for irrigation by this project.

By the end of 1993, nearly 40% of the investment on the 13 major irrigation projects of the GAP has been made, mainly at the headworks and conveyance. Developing of irrigation systems is speeding up recently. Project costs are estimated at around US\$ 8,690/ha or nearly twice the average cost of other DSI projects. Although the DSI budget allocation for 1992 for the GAP accounted for nearly 30% of the total for major irrigation investment, this is still only 5.75% of the remaining total required to complete the first phase of 259,000 ha indicating that it will be well into the next decade before this is effected. GDRS has started to invest for on-farm development services.

I believe that you will be hearing more from this project in the future.

Policies on financing and management of irrigation

Some investigations done in recent years for increasing the added value obtained from irrigated agriculture showed that we could not develop the «participatory investment and management policies in irrigated agriculture» efficiently. The time has come that the subsidy policies should be radically reviewed which was to improve the income of the poor farmers in the past. If we take into consideration that the reason of low added value from irrigated agriculture is «the lack of efficient participation of users» we realize that this situation has negative effect on our economy. For that reason our aim is to have a successful O+M and management, supply water timely, ad to increase the power of buying and paying of farmers by making farming more profitable. If we cannot achieve this target, it is not possible to avoid the vicious circle.

Another reason of deficiencies in participatory irrigation management is that the «anxiety felt about increasing the irrigated areas rapidly, has Overshadowel very important aspects, such as how the areas equipped for irrigation for the first time were to be man-

aged successfully, how the development periods of investments made could be completed in a short time, how to organise operation and maintenance of some on-farm services and whether or not the investment could achieve a sustainable agricultural development».

The practices of the two State organizations (DSI and GDRS) which are responsible for the development of irrigation areas, as shown in the above figure, on O & M and management and participation in investment cost are summarized below:

Considering the irrigated area of approximately 4 million ha, 1.5 million ha is operated by the State (DSI). 1.2 million ha are private schemes operated by individuals. Finally, 1.3 million ha is left to be operated by irrigation Cooperatives, Muhtars (heads of the villages), Municipalities and some State organizations partly being transferred and partly left by GDRS. In the large irrigation schemes run by the state (DSI), almost 1,000 irrigation groups help the DSI for the operation and maintenance of 600,000 ha. Accordingly, the General Directorate of DSI operates the area of 700,000 ha just by their own means and the area of further 600,000 ha by the contribution of Irrigation Groups.

It is possible for GDRS to execute the operation-maintenance and management of thousands of small scale irrigation schemes scat-

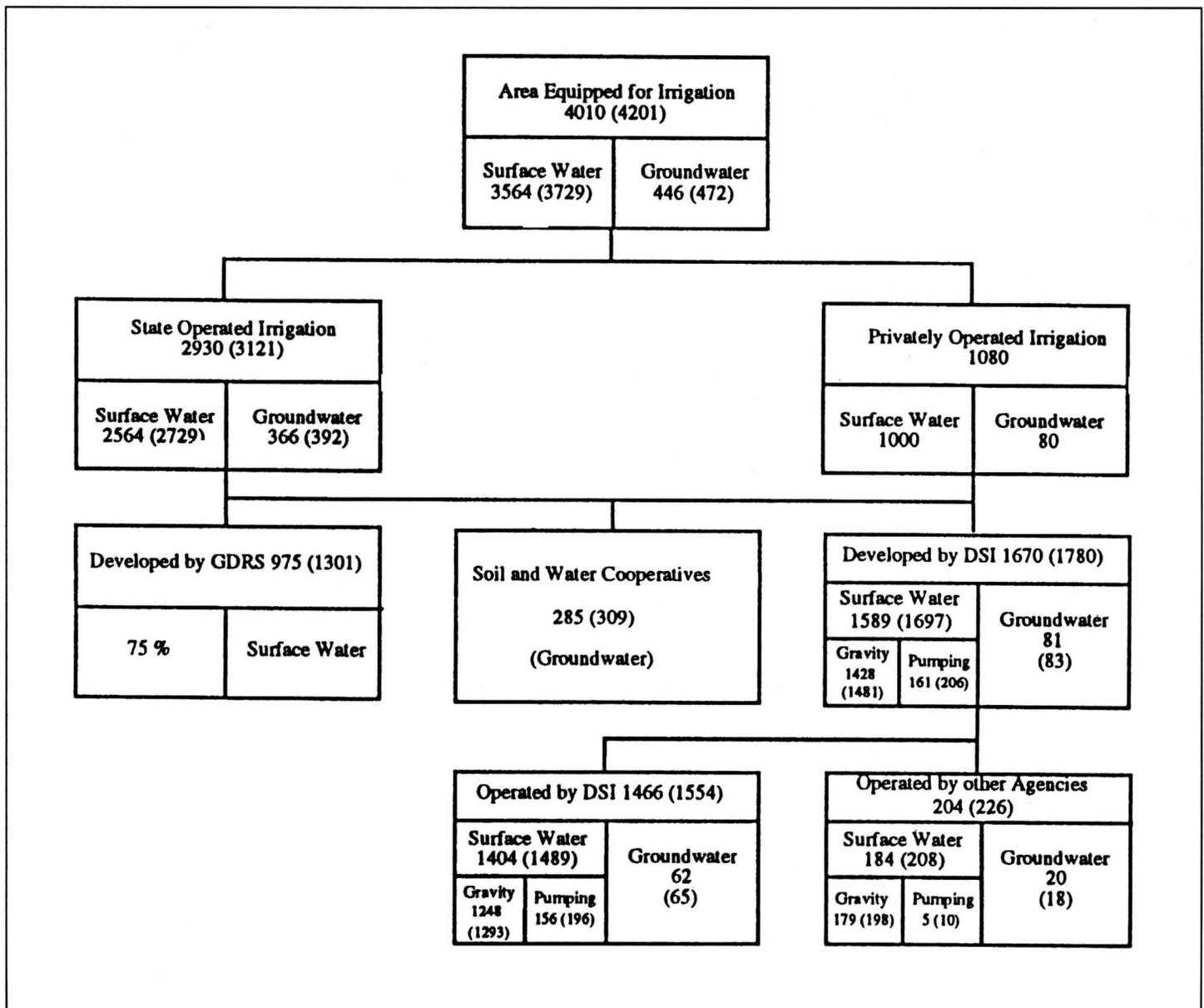


Figure 1 - Area equipped for irrigation 1991 (...1993 mostly realized figures). Thousand hectares.

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tered in various locations of the country; thus, GDRS undertook no responsibility for operations. However, transfer practise should be improved and widespread. Groundwater irrigation schemes are transferred to irrigation cooperatives and most of these operate effectively. For this reason, it is required that irrigation cooperatives are to be established also for the schemes irrigated by electropumping and from small dams; related implementations have already started.

FDRS Groundwater Cooperatives (Co-Ops)

Groundwater projects are executed jointly by GDRS and DSI, but their O & M is arranged by GDRS, who have adopted a policy of establishing user group Co-Ops before project construction begins. The Co-Ops are responsible for all O & M costs and pay back the capital cost of the DSI wells and pumps on very advantageous terms. In 1993 about 309,000 ha were under the management of about 1,600 Co-Ops, with an average Co-Op size of 190 ha.

GDRS Surface Water Co-Ops

Originally on completion of the project, GDRS performed the O & M. function, eventually transferring it to the local village head. This worked when only one village was involved: this was not always the case with surface water schemes. As a result, GDRS began to experiment adopting the Groundwater Co-Op model on an unofficial basis. These proved to work well, so in 1992 the formation of Co-Ops before the beginning of construction became a prerequisite. By 1990, GDRS had developed 723,000 ha for 12,554 surface water projects based on simple diversion or pumping, with an average size of 58 ha and 107,000 ha of gravity-fed small dam projects.

In relation with the irrigation schemes and on-farm development

services realized by Topraksu and also later by GDRS according to the act n. 3202, no cost recovery is paid by beneficiaries. This investment policy, started in the 50s, is still going on.

A review has been done by a consultancy company (Dapta/Su-Yapi/Temelsu/Nedeco) to investigate the on-going investment policy to apply new approaches. The result of this review is that «the new policy should be a programme of the farmers done by the help of government but not a programme of government done by the help of farmers». It is a rule by the DSI act n. 6200 that the users are to pay the cost of investments. But the money collected from users is becoming meaningless because of bureaucracy and inflation in years. The fines given for delayed payments are very low.

Over an area of 1.5 million ha, the operation-maintenance and management of which was undertaken by DSI, problems of the same nature are experienced. The rate of cost decreases annually. The collection rate was 53.9% in 1984, whereas, it was 33.6% in 1992. The collected amount covers a very small part (17%) of the requirement. The irrigation areas commissioned every year and also the shortage of allocation led to the increasing number of inadequately maintained and repaired facilities. To overcome such difficulties, the most favourable solution seems to transfer these schemes to farmers according to a certain plan based on consistent policies, and to undertake responsibility of collection as well as operation-maintenance by the organizations to be constituted.

As a result

In relation with sustainable agricultural development, the main purpose is to operate, maintain, repair and manage irrigation schemes and on-farm works so as to serve for long years. Thus, the most effective implementation is to carry out these tasks by the beneficiaries themselves.

I can summarize the future policies especially on certain subjects as follows:

- A. farmers' requests should be given priority in investments;
- B. investments in undesired locations should not be made although it seems profitable before starting investments, long discussions should be made with the beneficiaries and sociologists considering the general development policies of the country, thus the most sound solution is found out and designed;
- C. farmers should be organized beforehand;
- D. legal transfer of the completed facilities to these farmers' organizations and these policies will be valid not only for irrigated agricultural investments but for all development efforts.

As a start of those policies:

- GDRS has already started such participatory project applications by organizing farmers in pilot areas.
- GDRS will also start to practice the new approaches for on-farm development (subsurface drainage, field roads, irrigation canal, etc.) projects by supplying farmers with expertise and credit facilities. We will not invest without the demand of organized farmers. We will sue the World Bank credits if necessary.
- GDRS will concentrate its efforts onto Land Consolidation Projects. Those projects take the intensive participation of farmers and cover several aspects of on-farm development activities as well. We are planning to expand very developed types of projects through the country rapidly. I believe that land consolidation projects will contribute to the future of Turkish Agriculture.
- DSI has started new attempts to transfer the irrigation schemes constructed and operated itself. DSI is planning to transfer all the schemes to the users till the year 2000 by the financial and technical support of the World Bank.
- DSI and GDRS are realizing a change to modernize the present classical irrigation systems rapidly. They are changing from classical trapezoidal cross-sectional canals and upstream-controlled systems to pressurized or downstream-controlled systems for water delivery and distribution. ●