Effectiveness of the Integrated Water Resource Management (IWRM) in Improving of Water and Land Productivity in the Ferghana Valley

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In light of the growth of such destructive factors as climate change, demographic pressure, transition to the market economy and others, the survival of the Central Asian States depends on the ability of these States to achieve sustainable improvements in potential land and water productivity. The basic way to achieve this is to implement IWRM in a broader sense, which will cover all levels of water hierarchy from the bottom (water users) to the top (basin organizations). The Association SIC - ICWC, in collaboration with the Ministries of Water Resources (and Agriculture) of three States: Kyrgyzstan, Tajikistan and Uzbekistan, has developed and tested this approach.

The IWRM in Central Asia is based on some fundamental conditions that are characterized by the specific arid zone, where the irrigated agriculture is the leading sector of economy, which defines

- Hydrographic principle of water management:
- Public participation of all the interested parties (stakeholders) in water planning, financing and management; the well-being, food security and employment of most rural population. These principles are:
- Integration of different sectors at the horizontal level and all levels of water hierarchy from bottom to top;
- Use and registration of all types of water (surface water, groundwater, return water);
- An integrated approach to land and water;
- Compliance with the restrictions related to the environmental situation.

The land productivity in IWRM at the level of Water Users Associations (WUAs) is closely linked with the increase in crop productivity of farmers and dekhkans' households, following technologies adapted to various soil types, precise irrigation water allocation, closer integration between Canal Management Organization and Water Users' Associations, etc.

Irrigation water use efficiency assessment and measures for improvement its productivity

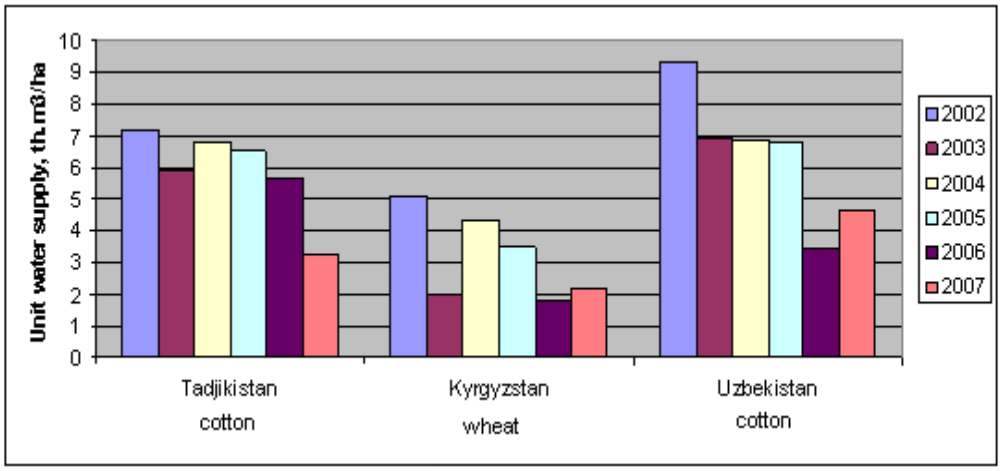
With scarce water resources of the Central Asia Region, the use of irrigation water is far from being efficient. Unproductive water losses can be traced along the whole way from the headwater intake down to the irrigated fields. The percentage of the water distribution unevenness between those consumers who are at the "head" of the irrigation canal and those who are at the "tail" reaches 30-40%. Excessively large amounts of water are used to water the crops. With all this, the main water losses account not only for the irrigation system, which today is in a poor condition, but also for the low level of organization of field irrigation.

With the view of increase in reserves for water productivity improvement, SIC ICWC, first, within IWRM-Fergana project and then within independent WPI-PL project – Water productivity improvement in the Fergana Valley in the territory of three countries: Kyrgyzstan, Tajikistan and Uzbekistan, organized a network of demonstration plots where started to work out both water use analysis and

simultaneously activities for improvement its efficiency. It was identified that for demo plots, before introduction of activities on improvement, average indicators of water use made not more than 63 %.

The materials obtained during monitoring served as a basis for development of recommendations on efficient use of irrigation water and land, and increase in their productivity. Based on the analysis of initial materials, several models were identified for calculation of the efficient irrigation mode adjustable to the conditions of each field. The effective technological solutions for use of irrigation water and farming activities were set for all demonstration sites.

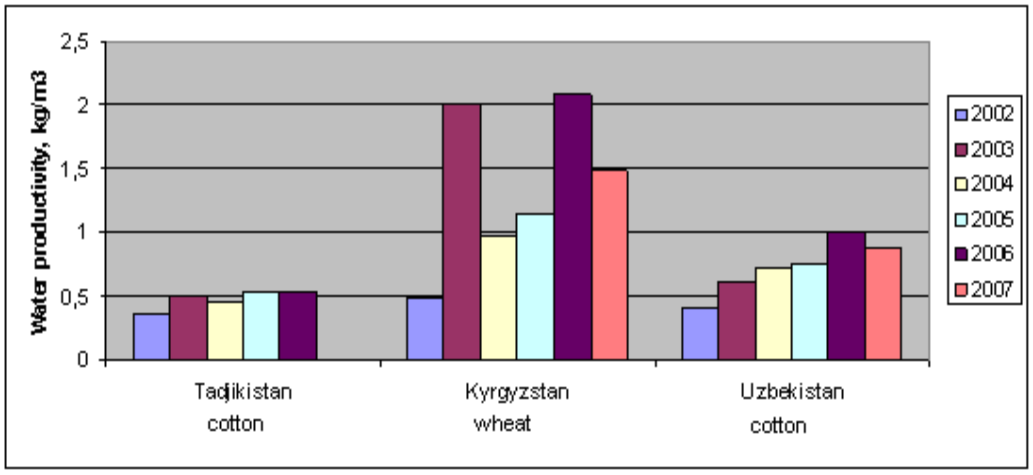
Implementation of the solutions developed by the project has improved the efficiency of water use in subsequent years (2003-2007) throughout all pilot project sites. In Tajik farms, the irrigation rates were reduced according to the quantity of irrigations, though the irrigation rates were similar (in values) to the original rates of 2002. In Kyrgyzstan, reducing irrigation rates has occurred in both aspects: the quantity of irrigations and the volume of irrigation rates. In Uzbekistan, the reduction of use of irrigation water became possible due to the improvement of technological schemes of irrigation and to reduced irrigation rates.



Dynamics of specific water supply of IWRM demonstration sites

The efficiency of water use at the pilot sites ranged from 0.7 to 0.8, that is, on average 75% of the supplied irrigation water was used directly in the field to satisfy water demand of the plants. Discharge from the irrigated fields ranged on farms from 10% to 20% of total water supply, which is significantly lower than previous baseline values.

At all demonstration sites a sustainability of indicators on agricultural productivity, achieved due to the implementation of the activities following the project solutions was noted. According to the evaluation results, the total productivity has increased on average from 20% to 30%. Most of the farms had increased the productivity, both in use of irrigation water and crop yield. In some farms, only due to reduction in use of irrigation water, the efficiency has increased by 30% and yield productivity has increased by 50%.



Dynamics of water productivity at demonstration sites of IWRM

The results of the recommendations realized at the project pilot sites have helped to improve the efficiency of irrigation water. It was found that the efficiency could be achieved through regulation of irrigation rates, by choosing the optimal technological scheme of irrigation.

The experience of demonstration sites, gained under the IWRM-Fergana project, has showed a great potential for rational use of irrigation water and improvement of its productivity. It became apparent that extension of farmers' knowledge and thorough work with them could provide significantly better results in the efficiency of agricultural production.

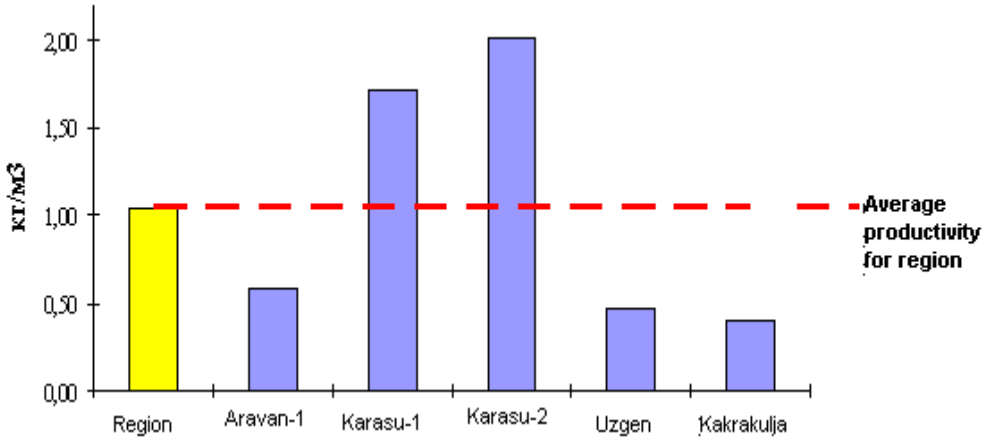
From 2005 to 2010, the efforts of the project were focused on dissemination of the improved technologies aimed at the efficient use of irrigation water and increase in its productivity among farmers. Dissemination of the project experience among farmers was carried out through direct consultations and training, as well as through training of the institutions' specialists, trainers and consultants of advisory services, who interact closely with farmers. In each area of the Ferghana Valley, a communication channel has been established with organizations and advisory services, whose activities were dedicated to work with farmers.

Established within the framework of the project, a system of innovative partnership, which includes various structures, has enabled to systematize the application of the improved technologies with immediate assessment of problems of agricultural production and ensuring the availability of these technologies to the farmers.

Assessment of the effectiveness of use of irrigation water and its productivity in farmers' households

Application of the proposed technologies to the sites covered by the project has showed that the majority of households of all these sites have achieved quite high values. In Uzbek part of the project, values of productivity for cotton increased from 0.43 kg/m3 to 0.82 kg/m3. In some households, the high productivity has been achieved by carrying out minor irrigation portions, given the high groundwater levels and the proper use of timing and duration of irrigation. Moreover, the farmers' households covered by the project were able to navigate while planning the irrigation of cotton plants in difficult climatic conditions of the year, caused by the increased soil moisture, resulted from heavy rainfall.

In Kyrgyz part of the project, the farmers have used irrigation water for the irrigation of wheat nearly to that volume required by the culture, given the abundant rainfall. The irrigation rate was in the range of 2000 to 3500 m3 per hectare of the irrigated corn. The obtained harvest was good enough, mostly around 40 centner/ha, several farms have managed to harvest more than 60 centner/ha. The results of the project have revealed constant work of project experts, provided regular consultations to the farmers of these areas in the aspects of application of the improved methods of irrigation and land treatment.

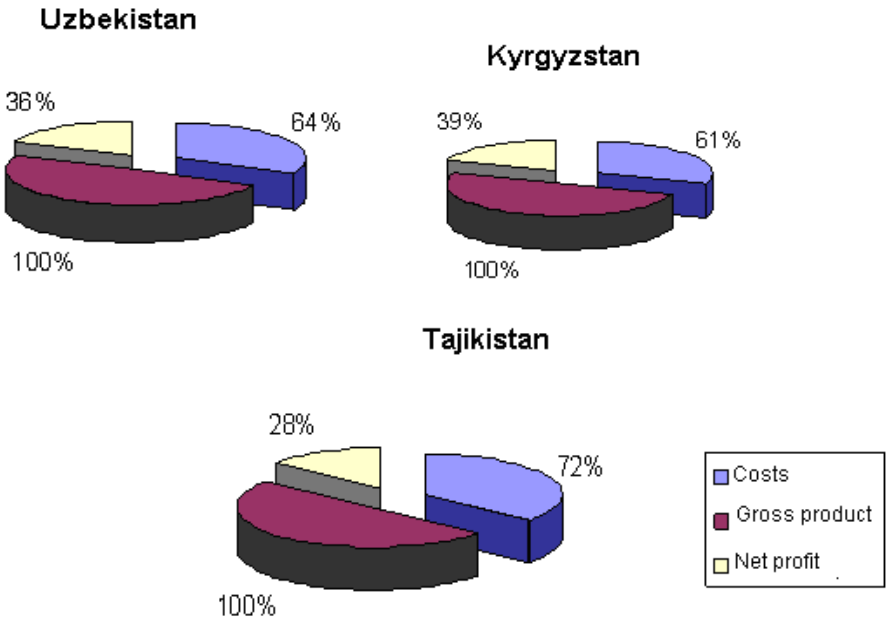


Comparison of water use productivity in districts with the average indicator of water productivity for region (wheat)

Assessment of agro-economic conditions of the Ferghana Valley lands covered by the project

After the USSR collapse, the transition of all Central-Asian States to new economic relations in all spheres of production turned out to be difficult and painful. In agriculture, the crops-growing sector had suffered from lack of equipment, fertilizers and chemicals, as well as from non-compliance of the prices for manufactured goods and means of production.

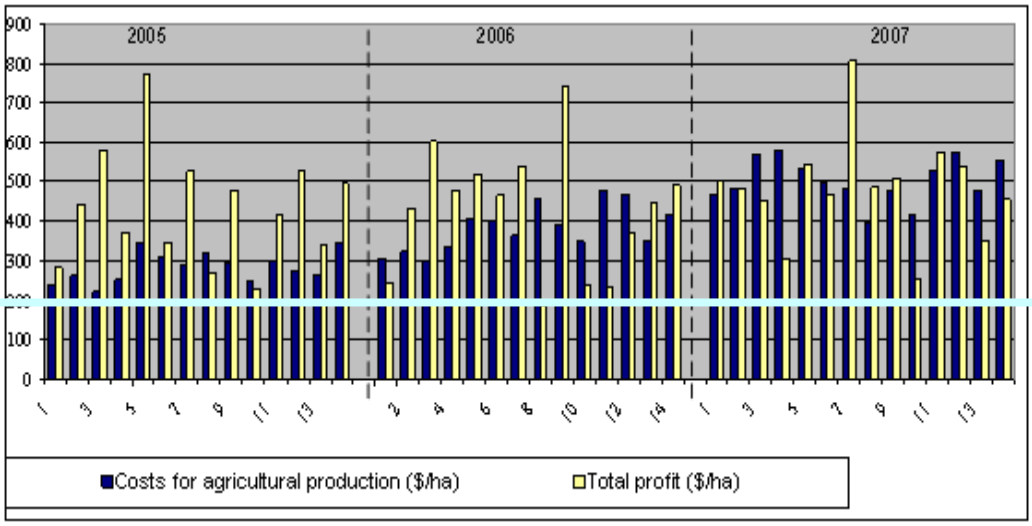
Kyrgyzstan and Kazakhstan since the early years of the USSR collapse have completely abandoned the public orders on agricultural products and transferred the lands from public to the private sector. As a result, the agricultural producers became free in their choice of crops and sale prices. However, they turned to be not secured with the means of production, which immediately affected the quality of production and farmers' income. The other Central Asian States have transferred not all their lands from public to the private sector, keeping the public order on the main products (cotton) and its purchase according to the state established prices.



The relation between cost, gross product value and net income of the farmer

Differences in the agrarian structure of the States, one way or another have the certain impact on the productivity and efficiency of agricultural production. At the same time, analyzing the data received from the farmers' households, we can say that according to the main indicators forming the profitability of the farms, the situation by the countries does not show big differences.

The costs of agricultural production amount within the range of 30 to 40%. Moreover, as the analysis of the received for the last five years materials shows, there is an upward trend of this indicator with respect to total income.



Assessment of costs and profits by sites of Andijan Region

Based on the agro-economic evaluation of farmers' households, all expenses made by farmers from plowing to harvesting and sale of the harvest were identified and analyzed. The total production cost of each farm was calculated, depending on the scope of works and rates on each type of works. The

largest costs in crop production account for manual labor, machinery and fertilizers. Farms owing their own machinery have lower operation costs than farms leasing the machinery.

An important factor in calculation of the overall costs is the cost of water, particularly in Tajikistan and Kyrgyzstan. Although this figure is only about 5% of total variable costs, its value, for some farms, is higher than the cost of seeds, transportation and agricultural chemicals. The other key factor is the efficient use of water, it is important both in terms of improving the socio-economic conditions of Central Asia, and in terms of the existing water shortage in CAR.

Conclusion

Assessment and analysis of the actual water use indicates that in the irrigated agriculture of the Central Asian region the efficiency could be achieved without major capital investment at the field level and planning for water distribution at the farm level.

For the efficient use of water and land resources at the farm level, it is necessary to extend the experience of the existing projects and the improved technologies to the farmers through training of local trainers, consultants and existing advisory services.

Based on the experience of this work one should make the following conclusions:
- Excessively large amounts of water are used currently for crops irrigation;
- Main water losses account not only for the irrigation system, which today is in a poor condition, but also for the low level of organization of field irrigation;
- Assessment and analysis of the actual water use indicates that most farmers' households have reserves and real opportunities to improve the efficiency of use of irrigation water and its productivity;
-In this regard, the development of simple and affordable methods of rationing and use of water at field level as well as dissemination of the gained experience on water and land productivity improvement among farmers is very important.