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Ministry of Agriculture and Water Resources of the Republic of Uzbekistan



Planning for FURE

What kind of future do we want for Zarafshan river basin from the standpoint of availability of water resources? How to achieve this vision of future? Which initiatives, directions, and approaches should we seek, plan and implement today, combining resources and skills, to adapt to changes in external environment and find ways to overcome obstacles and contradictions? We need an outlook from the desired future into today. Every step and every action today either follows and conforms to the strategy developed, or is driven by external circumstances and represents a reaction or response to these circumstances.

Strategies for various aspects of Zarafshan river basin water resource management are being developed by the best experts of Uzbekistan. International experience is tapped on. For example, development of agricultural productivity improvement strategy is participated by a leading expert of the Center of Agricultural Research under the US Department of Agriculture. IWRM project won

a grant of UNDP-Czech Trust Fund for development of strategy to improve energy efficiency in energy sector. A Czech expert is participating in this effort.

People say that the best way to learn something new is by doing it, i.e. learning by doing. Experts involved in development of the strategies learn new approaches to water resource management in the process of their work. They develop skills of strategic analysis and thinking, intensify existing experience – simply said, they learn. Investing into development of capacity of local staff by building on knowledge and competency of local experts is an issue that the project continuously keeps in focus. Short-term group trainings, individual coaching, discussion activities organized by project specialists and international experts will bring result in the near future.



Abdurakhim Jalalov National Consultant, surface water supply improvement

States changed, their names altered, some nations disappeared, other emerged, one religion replaced another, assimilation of different nationalities led to change in language, rituals, customs and traditions, yet one thing remained unchanged - respectful and sensitive attitude towards water, desire to preserve and protect it.

Throughout millennia, water used to be a strong stimulus for not only economic, but also spiritual development for our nation. Emergence and raise of world civilizations such as those of Khorezm, Fergana, Bukhara, Samarkand, Bactria are associated, first and foremost, with the need to develop culture of irrigation in Transoxania, as our common region was called in the ancient times.

Relations pertaining to water resources formulated and evolved together with emergence of states, their development and raise. In few thousand years, starting from primitive, participated only by few neighbours located close to the water body, these relations expanded, became more complex and evolved into very complex multilateral relations.

Activities to improve WATER USE EFFICIENCY PERFORMED in the Republic of Uzbekistan

Vokhidjon Akhmadjonov, Deputy Head, Water Balance Department, Ministry of Agriculture and Water Resources of the Republic of Uzbekistan

Today, Central Asia and particularly Uzbekistan already faces sharp insufficiency of water resources. With growth of population, intensive development of industries, utility services and other sectors of economy, demand for water grows day by day.

During the years of independence, Uzbekistan saw radical change in water sector. Transition from administrative-territorial to basin principle of water management was performed, allowing more stable, efficient and equitable allocation of water to be ensured at all levels.

In the recent years, huge work to diversify agricultural production was accomplished. To replace waterintensive crops such as cotton, rice and alfalfa, cultivated areas under cereals, melons and other less water-intensive crops were increased. While in early 90-s of the last century, over 50% of irrigated lands was under cotton and the rest was used for food crops, present share of cotton in irrigated agriculture is less than 30% and remaining irrigated land is occupied by cereal, food and forage crops that are vitally important for the population. As a result, total national annual water intake reduced from 64 to 51 billion m³ compared with 80-s of the last century.

RECLAMATION

Country is paying special attention to reclamation of irrigated lands. Irrigated Land Reclamation Fund (ILRF) was created, adopted State Program for Reclamation of Irrigated Lands for 2008-2012.

Over 100 million USD is allocated annually for implementation of these activities, including construction, renovation and rehabilitation of collector drainage systems. Moreover, State Leasing Company Uzmeliomashlizing was established along with 49 State Unitary Enterprises.

In the last four years alone, ILRF provided 550 billion UZS of state budgetary funds for performance of reclamation works.

These funds were used for construction and renovation of 2619 km of collector-drainage network, 40 reclamation pump stations, 1600 vertical drainage units and monitor wells, as well as repair and rehabilitation works on 53,6 thousand km of collectordrainage networks, 4592 vertical drainage units and 183 reclamation pump stations.

Besides, ILRF purchased 1258 units of modern reclamation equipment, machines and tools.

Accomplished activities allowed improving reclamative condition of nearly 1 164 thousand hectares of irrigated lands, reducing the area of lands highly and intermediately affected by salinity by 81 thousand hectares, as well as to achieve lowering of groundwater table in 365 thousand hectares, which eventually had positive impact on productivity of agricultural crops and unit water requirements per hectare.

In the current year of 2012, assignations for performance of reclamative works under ILRF aegis reached 210,0 billion UZS, or 120 million USD.

INVESTMENTS

Major hydrotechnical facilities are operated during more than 30-40 years, and by now, most of them require renovation and capital repair. This is exactly the reason why the Government is assigning huge amounts from the state budget for reconstruction and rehabilitation of hydrotechnical facilities, complete replacement of worn-out facilities, mechanisms and components.

At the same time, measures are taken to perform modernization and automation of water management system. These works are performed with active involvement of foreign investors and funding of international financial institutions such as the World Bank, Asian Development Bank, OPEC Fund, Kuwait Fund, Islamic Development Bank, Bank of Import and Export of China and funding from other donors: JICA, SDC, USAID, etc.

In particular, in the last 10 years, water sector received over one billiion USD for rehabilitation of irrigation and drainage systems, modernization of water sector facilities and pump stations from funds of international financial institutions provided via 20 large investment projects, increasing irrigation systems efficiency, improving condition of hydrotechnical facilities and increasing capacity for managing and sparing

WATER CONSERVATION

At the national scale, special attention is paid to development of water saving irrigation technologies, especially systems of drip irrigation. Presently, total area under drip irrigation in the country comprises over five thousand hectares, and it is planned to introduce it in additional two thousand hectares during this year. Maily, this system is used for irrigation of gardens and vineyards, as well as for melons and vegetable crops.

Besides, during the last 2 years, special attention is given to development of such systems as irrigation using flexible hoses, mulch film, etc. Such irrigation methods are aleady in use on more than two thousand hectares of irrigated lands, mainly to irrigate cotton.

Presently, work is underway to develop an integrated program for widescale introduction fo water conservation technologies at medium- and long-term.

PRIORITY DEVELOPMENT AREAS

Priority areas for further development of water sector include following:

- 1. Improvement and modernization of hydrotechnical facilities:
 - construction, reconstruction and repair of all hydrotechnical facilities
 - performance of antifiltration measures;
 - measures to improve safety and reliability of major water sector facilities;
 - automation of water facilities operational control.
- 2. Improvement of water resource management and water saving:
 - introduction of water saving technologies;
 - stimulating water conservtion;
 - introduction of new technologies and methods of irrigation;
 - introduction of IWRM principles;
 - improvement of operational control of water resources.
- 3. Capacity building:
 - strengthening physical infrastructure and equipment of water sector organizations;
 - capacity building among water sector experts;
 - wide application of information resources in planning and management of water resources;
 - raising population awareness in sparing use of water;

WHAT IS Project's progress TOWARDS ITS MAIN GOAL?

This year, the project started development of main strategic documents that will constitute foundation of IWRM and Water Conservation Plan for Zarafshan river basin. These strategic plans cover various aspects of water resource management, such as: institutional base improvement, increasig agricultural productivity and water use efficiency, improvement of surface water supply, irrigation and drainage system, increase in the energy sector water use efficiency and energy efficiency of pump stations, industrial water use and economic growth. It must be added that at the moment, the project prepared three strategic documents, including Strategy for provision of environment protection activities, Strategy for improvement of data collection mechanisms, processing and distribution of information for knowledge-based decision making and Strategy on education and public outreach. Pilot projects on these strategies were implemented and their discussion with stakeholder organizations was organized.

Educational programs on IWRM for all levels of education, including schools, colleges, lyceums, universities and advanced training system prepared under the framework of education and public outreach Strategy were highly praised by experts of relevant ministries and departments, who noted relevance and timeliness of these programs and recommended their wide introduction.





Strategic plans being developed must be flexible enough to allow corrections based on new information and changing circumstances.



or how to improve water productivity and water saving at WUA and farm level?

Well-being of dekhkans and farmers depends on compliance with rules of land and water use. Historical data shows that foundation of life in our region - irrigated farming, could be saved through active participation of dekhkans in impementation of irrigation activities. How rules of land and water use are followed today? What is the situation with clearing and maintaining of canals? What needs to be done to facilitate further sustainable development of irrigated land farming? Strategy for increase of water productivity and water saving at WUA and farm level is designed to give professional answers to these and numerous other questions. Development of this strategy, along with local experts, was

participated by international expert from Center of Agricultural Research under US Department of Agriculture.

The strategy will propose the Government measures to improve efficiency of agricultural water use. These measures will be developed on the basis of analysis of crop structure in Zarafshan river basin, agrotechnical methods of their cultivation, methods of treatment of soil and increase of yield, methods of irrigation involving modern technologies and practices of water conservation, agricultural production incomes and other factors influencing water conservation and increase of water productivity.



James E. Ayars, USDA-ARS

During this mission I traveled with the project team to Samarkand and visited the Pastdargom pilot project and meet with the participating farmers. This is part of an effort to better understand the problems they face with respect obtaining an assured water supply. While we were there I had an opportunity to view a cotton irrigation in progress and compare it methods used in California. Both countries use furrow irrigation and in both countries the field length is reduced to enable better uniformity of irrigation. In California water running off a field is collected in a pond and used to irrigate another field or another area of the same field. In Uzbekistan the farmer was collecting the water running off the field and diverting it immediately to another field. The major difference came between the duration of irrigation. It is significantly shorter in the US than I understood was the practice on this field in Uzbekistan. There was considerable evidence that the irrigation I witnessed was causing a saturated condition in the field that had potential for a significant detrimental effect on yield. A farmer I meet expressed an interest learning more about improving irrigation. He had done some experimentation on his own and is looking forward to participating in the pilot project.

The remainder of the mission was spent at the office reviewing the draft assessment report, participating in a stakeholder workshop, and discussing the next steps in the project. The assessment report will provide a good basis for developing strategies for improving water use efficiency in the Zarafshan River Basin and in Uzbekistan.

The UNDP IWRM Uzbekistan has been cooperating with the Water Management Research Unit, Parlier, CA a part of the U.S. Department of Agriculture, Agricultural Research Service (USDA-ARS). The cooperation has yielded and USDA-ARS provided a senior scientist Dr. James E. Ayars who has an over 30 years experience in water management and agriculture engineering. Dr. James E. Ayars has been participating as the

International Technical Advisor on development Agricultural Productivity and Water Use Efficiency Strategy of the IWRM plan. His main role has been to oversee and technically backstop the development of a strategy for improving agricultural productivity and water use efficiency in the Zarafshan River Basin. The strategy focuses on improving the on-farm water use efficiency and agricultural productivity.

Study trip to Australia

IWRM Project Manager

During 13-23 April, high level officials and key staff of state agencies involved in water resource management participated in a study trip to the basin of Murray Darling, Australia. The delegation included representatives of the Cabinet of Ministers, Ministry of Agriculture and Water Resources, Ministry of Finance, Ministry of Economy, State Inspection under the Cabinet of Ministers, Uzdavsuvnazorat, Zarafshan basin organization, Khokimiyat of Navoi oblast and Tashkent Institute of Irrigation and Melioration. The trip was preceded by a massive effort to study global experience of introduction of IWRM principles into management of water sector. Jointly with experts of the Ministry of Agriculture and Water Resources and with support of international consultant, project experts assessed huge amount of materials, compared conditions in the studied countries with those in Uzbekistan from the standpoint of climatic, water-and-soil, and other features. Taking into account that the project is developing IWRM plan for Zarafshan river basin, one of



enough. Yet, what we saw this year is certainly amazing. There was significant improvement. Of course, harsh drought of the last nine years contributed to speeding up water sector reforms. Nevertheless, achievements in the area of use and protection of water resources certainly impress.

Existing practice of natural resource management in Murray Darling river

important criteria in selection of the country to visit was experience in development and introduction of basin-level plans of water resource management.

As a result of study, the choice was made in favor of Australia, namely basin of river of Murray-Darling. Justification of the choice of place to visit was prepared in order to get government approval and obtain permission for the trip. Approval was obtained and preparation for the trip started. A solid Terms of Reference (TOR) was prepared, including program specifying concrete goals, places to visit and dates. After approving TOR with the Ministry and UNDP, project team started negotiations with administration of Murray Darling basin authority.

Australia is a beautiful country with remarkably affable and kind people. Country's achievements in the area of socio-economic development are impressive, and the progress in agriculture, especially in water resource management, is particularly large. I visited Australia in 1998 to study technology of growing cotton. Already at that time I noted that all farmers' fields were laserleveled. Water management was effective basin has a fifty years history with changing technical capabilities and varying public attitude towards water resource management.

The delegation could visit and participate in discussion virtually on all levels of management of water resources of Murray Darling basin, starting from the national and basin level, irrigation systems, environmental organizations, and down to local water users. Valuable knowledge and experience was obtained with regard to key elements of water sector policy in the basin. Moreover, meetings with producers of water accounting and control equipment were organized at delegation's request.

Without a question, the trip was very useful for all the participants. Its outputs would help the project develop a modern Water Code, agree sectorial strategies, formulate recommendations on institutional development and improve water productivity in agriculture.

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UNDP & Occologia

an example of social responsibility of business

In 2011, IWRM project won USD 74,970 to supply clear drinking water to the village of Canal Yoka, Pastdargom district, Samarkand oblast, as a part of UNDP-Coca Cola joint program "Every Drop Matters-II". Residents of the village participate in construction of the local drinking water supply system and creation of Water Users Association, which will manage and maintain the system in operational condition, helping ensure its prolonged life. Approaches used by the project to involve people in its implementation help ensuring their responsibility for water supply system being built, as well as its continued operation.

After successful implementation of Phase I of the project, the program released additional USD 74 998 in 2012 to support its second phase. This next phase includes implementation of activities on capacity building of the newly created associations of rural water users. Other activities planned include review of existing legal regulation system managing relations in the area of drinking water supply. It was developed as early as in 1980-s and was not updated yet,

despite changing conditions.

Participation of Coca Cola clearly stands as a brilliant example of business social responsibility for addressing the issues of rural drinking water supply. This example must be taken into account in development of strategy aimed at guaranteeing stable provision of the basin population with drinking water. The strategy will review the options to attract investments towards development of drinking water supply.

every drop matters



IWRM Plan FOR NAVOI OBLAST – PREPARING TO PLAN AT THE BASIN LEVEL

This year, for the first time in Navoi oblast, a plan of integrated management of water resources is being developed for one single oblast. It will cover all sectors of economy of the oblast, as well as issues of environment protection and utility services (drinking water and sewerage), as well as ensure public and stakeholders participation in various components of the plan. IWRM planning activities will include addressing organizational issues, performing econometric analysis of water in the oblast to elaborate options for water distribution, training activities for experts in multiobjective water resource planning, consultations with government agencies and public organizations and, finally, development of the IWRM plan. Results of Navoi pilot IWRM plan would allow providing recommendations on further steps in implementation of the plan and their effect on the basin-level IWRM planning process.

Process of development of IWRM plan for Navoi oblast involves local consultant for development of IWRM plan, water resources management expert, expert in water sector economy and a GIS and database expert.



The BEST way to understand IWRM concept is to APPLY IWRM in live practice

Alisher Rashidov,

IWRM project consultant in Navoi

Pilot project on development of integrated water resource management plan for Navoi

oblast is "first robin" of a kind. This is the first time plan of multi-purpose use of oblast's water resources is developed. Located down the stream of Zarafshan river, Navoi oblast has the most developed industrial sector in the country. Here, environmental issues manifest most intensively. The oblast already faces difficulties related to lack if water and growing competition for water between different sectors of economy. Taking these factors into account, project's initiative to develop a pilot project to demonstrate new approaches to water resource management specifically in our oblast is highly relevant. This is why this initiative was fully supported by the Project Board, which decided to approve implementation of the pilot project.

We observe different levels of water availability in oblast across the years. In dry years, water supply is reduced proportionally, which is clearly justifiable today. However, we need to look into future, considering reduction of water availability due to growth of population, development of economy and climate change. Having understanding of IWRM principles, I believe that time to apply new approaches in planning and allocation of water to sectors of economy, while also respecting environmental needs, has come. In dry years, criteria of economic efficiency of water use should play decisive role. At that, it is necessary to take into account the cost of water supply and value of water for production of outputs.

Of course, I cannot claim that the process of development of IWRM plan for our oblast is easy. There are certain difficulties that we foresaw in the beginning of our cooperation. First of all, it is related to the fact the very concept of IWRM is a novelty for water sector experts of the oblast, who participate in development of IWRM plan for the first time. Speaking about myself, despite 13 years of experience in water resources management sector, I have to learn many new things in the process of implementation of pilot project. Discussions with experts, international consultants of the project, as well as training activities on development of new approaches help our advance. They force us to rethink approaches towards water resource management in accordance with new requirements, as well as develops ecological and economic thinking, which is necessary for water experts.



The IWRM Project received a funding from Czech-UNDP Trust Fund The IWRM Project received a funding in the amount of USD 20 962 from Czech-UNDP Trust Fund to develop a Strategy on improving water use efficiency in the energy sector and energy efficiency in water pumping. Based on Tender Procedure of UNDP a Czech Consultancy Company AECOM CZ is engaged in the strategy development process.



Oleríny Milan, the company's main expert says:

"During my first visit to Uzbekistan I mainly focused on assessment of the existing 90 pumping stations with an installed power of more than 250 MW. They are in operation in five regions of Zarafshan river basin. Efficiency of operation, management and maintenance of pumping stations is a key point for agricultural production because other sources of irrigation suitable for large agricultural areas are not available in the region. In Zarafshan, some devices and sometimes entire pumping station worked for decades in demanding conditions and thus decreased their efficiency. Energy costs, which account for about 75% of the budget allocated to water sector, are still rising.

Our other activities include methodology and training program for water professionals in Tashkent and Samarkand being prepared with focus on the principles of effective design and implementation of equipment

maintenance and operation of repair stations. It will be based on Czech experience with efficiency of electricity use reflected in the National Action Plan of the Czech Republic in the area of energy".

Czech-UNDP Trust Fund supports development activities that involve sharing experiences, best practices and lessons learned from Czech transitional period – both to democracy and market economy as well as to European Union membership. The Fund is a joint initiative of Czech Ministry of Foreign Affairs and UNDP, and contributes to bilateral cooperation for development with Czech Republic. Czech-UNDP Trust Fund was established in 2000 and was the first example of such successful co-operation in Central Europe

(http://europeandcis.undp.org/ourwork/partne rships/show/2215F0BC-F203-1EE9-B36F4C7AFDB61198).

There are 90 state-owned pump stations with 380 pump units operational in Zarafshan river basin. Total capacity of these pump stations is 220 m3/sec, serving a command area of 65 thousand hectares of irrigated lands.

Integration of surface WATER and GROUNDWATER management

Zarafshan river basin groundwater is the sole source of drinking water supply for three oblasts - Navoi, Samarkand and Bukhara. Overview of existing situation in the river basin shows that in the last 30 years, 20% of fresh groundwater resources in the basin was lost, not in terms of quantity, but rather quality. Deterioration of surface water quality leads to reduction of quality of groundwater. Experts came to a conclusion that groundwater resources of the Upper Zarafshan groundwater basin located within Samarkand oblast are under threat of depletion, being affected by intensive technogenic influence. Only strict observation of all sanitary-hygienic norms in influencing subsurface hydrosphere and sustainable use of water resources may ensure preservation of this unique groundwater source as a guaranteed drinking water source for future generations of the region. There is a need of immediate efforts to develop integrated environment protection activities to manage water resources of Zarafshan river basin not only as a source of irrigation, but more importantly, as a source to warrant biological life for growing population of the region.

In the future, competition for use of groundwater will increase. While developing IWRM plan for Zarafshan river basin, we need to think of what approaches to use at the basin level to integrate management of surface water and groundwater. This would require analyzing legal-regulative base to check if there are available tools for effective management of groundwater. Clarification will also be needed to find out whether prerequisites for sustainable management are in place, and which approach to use: more general, at regional level, or local, at site level. Analysis of institutional framework for joint management of surface water and groundwater resource will need to be analyzed. The issue is how effective is existing management system, should it be changed, and to which extent.

ccording to opinion of E. Ongley, project international advisor: "There is a need to develop rules aimed at preservation of groundwater resources. By creating new rules we limit people in using them, which bears risk of problems in social sector. However, these potential problems are incomparably smaller than problems that may emerge, shall source of groundwater simply disappear. This is why it is important to look at the management system and see how decisions made influence groundwater condition. The project gives an opportunity to look at the situation from another prospective, not like it is done usually. Working in other countries, I saw similar situation and I can tell that, unless measures are taken, consequences will be disastrous. It must be remembered that groundwater is a key element of the system and it is good that this issue was included into the project scope».



On 19 July 2012, Tashkent Institute of Irrigation and Melioration (TIIM) hosted a workshop dedicated to issues of increasing water productivity and water conservation at WUA and farm level organized

through a joint effort by IWRM project and the Institute. This was not the first joint activity held within the walls of this educational institution. As U.M. Umurzakov, TIIA Rector, mentioned in his welcome address to workshop participants, "Institute and the project established business



tics and monitoring of technical condition of hydrotechnical facilities and pump stations. This strengthens capabilities of the Center, increasing number of areas of capacity building and retraining of water sector experts on elements of integrated management and distribution of water resources,

relations benefiting both parties". The project supported Center for Capacity Building and Retraining for Water Sector under the Institute, including organizing and equipping multimedia training rooms on agricultural hydrotechnical reclamation, operation of hydrotechnical facilities and pump stations, geodesy and hygrometry.

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operation of hydrotechnical facilities and pump stations. It will also be possible to build on capacity of hydro-geological reclamation expeditions experts, land planners, cadastre experts, hydrometers and land surveyors.

for the total amount of nearly 15 thousand USD.

Training rooms of the Center are partially equipped

with modern appliances and equipment for diagnos-



Online database developed by experts of SANIIRI is a practical tool and allows local organizations transition to unified information language, improving data reliability and helping achieve maximum efficiency in management of water resources.

Database consisting of four sections covers such sectors as hydro power, environment and measures taken to achieve sustainable water resource management. Decision makers, stakeholders and general public will have access to relevant and regularly updated information. At the same time, management of available water resources is expected to become more responsive, allowing to jointly address emerging water supply problems, thus reducing the risks of critical situations. IWRM project bought IT equipment to be used by organizations involved into data exchange system.

HOW TO IMPROVE information management in Zarafshan river basin

Quality management of water resources is impossible to imagine without access to reliable, up-to-date information to make justified decisions. Within the project framework, group of experts from SANNIRI developed strategy for improved information management for Zarafshan river basin. It is based on the results of analysis of water sector organizations needs in the area of information support and modern information technologies, takes into account global experience and existing practice of its application in organization's operations, as well as current level of development of information technology infrastructure in organizations.

The strategy describes key issues and priorities of using information technologies in operation of water sector organizations of Zarafshan basin and defines areas for improvement of existing information support and management system in organizations.

Developers of the strategy recommend creating unified information environment within Zarafshan river basin boundaries. Unified Zarafshan Basin Information System (UZBIS) will include organizations involved in management or consumption of water resources, as well as provide access to information resources at the basin level. M.R. Ikramova, Component Manager I. A. Akhmedkhodjaeva, Project consultant





Local knowledge of water use efficiency in agriculture: **On-farm water management in the Zarafshan River Basin**

James E. Ayars, USDA-ARS Bakhodir Mirzaev, Specialist on Water Resources Management Tatyana Khamzina, Project consultant



My father used to say "Water gives yield or kills yield..." it depends how and when it is applied (a farmer, 2012).

After agrarian reforms of 1991-2008, kolkhozes and sovkhozes were replaced by farmers who were responsible for their own fields and farms. Responsibility to manage water distribution and

infrastructure maintenance at farm level was given to newly formed Water User Associations (WUAs). Both main and secondary canals continue to be managed by the Ministry of Agriculture and Water Resources and its branch agencies. As part of the reform and restructuring, provincial water management organizations were replaced by Basin Irrigation System Authorities (BISA), and Irrigation System Authorities (ISA). The BISA were established along hydrological boundaries, i.e. along river basins and canals. As a result of these reforms, field sizes decreased as land was divided and given to farmers based on long term contracts. Most of farms were taken by dehkans or workers at kolkhozes or sovkhozes and other professionals who lost jobs during transformation period. Recent land consolidation increased average farm size from 1-50 to 50-100 hectares. However, the state law requires cotton and wheat to be grown on 70-80% of arable farm land. The other form of land use is dehkan farms that are privately owned. Dehkan farms are not large (less than one hectare in size) and specialize mainly in production of cash crops e.g. fruits, vegetables, melons and potatoes that are sold at local markets, as well as exported to neighboring countries like Kazakhstan and Russia. Household plots occupy 15-20% of irrigated lands and represent another important source of fruits and vegetables to open markets.

'Despite these reforms, leases to farmers in long term contracts remain subject to state will as illustrated by the event of land consolidation in 2008. At the end of 2008, farmers land was recollected and redistributed in bigger plots to roughly one fourth of the former farmers' Many farmers are lacking technical knowledge of modern agronomic and irrigation practices as a result of outdated or missing technology and lack of technology transfer infrastructure. Lack of technology and information are further exacerbated by institutional setting in which irrigators operate. WUAs do not have technical capacity to support farmers within the association. One example of water management problem is basis for determining irrigation water requirement for crops. Current method of water allocation and irrigation schedul-



ing is based on norms developed in 1960's based on irrigation practices and crop varieties of that era. Both Irrigation systems and crop varieties have changed considerably since that time. However, no corrections were introduced since that time, even though farm field sizes decreased, groundwater level and mineralization increased, cropping patterns diversified (particularly, centralized planning was abolished in dehkan farmland) and awareness on limitation of water withdrawals increased.

Furrow irrigation is the major type of irrigation used throughout Zarafshan Basin. It was introduced about sixty years ago to meet requirements of mechanized agricultural production. However, even an ideally managed furrow irrigation system cannot provide high levels of irrigation uniformity and acceptable values of deep drainage and surface runoff. Under ideal operational conditions, irrigation uniformity coefficient can possibly be from 0.7 to 0.8. Today, in Zarafshan basin, as in the other parts of Uzbekistan, using advanced irrigation systems is very difficult, except at experimental scale, , due to high cost of equipment and operational constraints that require constant supply of water and power.

It is the view of many researchers that even very sophisticated water management at all levels will not solve water supply problem without increasing water use efficiency in the field. Better water use efficiency is described as increasing the yield while maintaining existing water application. Every cubic meter of water saved in the field (when efficiency of irrigation network is 50-60%) reduces the need for water delivery by 50% without any reconstruction of the canal network.

However, efficiency of furrow irrigation is also affected by several external factors as follows:

- poorly leveled field surface;
- fluctuations of water supply flow during irrigation;
- use of non-optimal irrigation technique elements that do not correspond to specific natural conditions;
- land users are not interested in using improved methods of irrigation;
- subsidized water price that is not stimulating water users to save.

In addition to these reasons, quality of irrigation still depends on availability of water in the right quantity and at the right time. Areas with water supplied via canals are better supplied, while areas with pumped water often suffer from delayed water supply due to pump breakdowns or problems with electric power. Leaching is not effective due to poor drainage system operation.

Improving water use efficiency will require accurate measurement of water supplied to farmer's field. However, irrigation water application is not measured due to lack of simple measuring devices. Also, farmers are not interested in saving irrigation water and have insufficient knowledge about negative impacts of over irrigation. These problems have been accumulating for more than half a century. They were insufficiently studied at initial stages, and effects of many technical solutions were not as obvious at the outset as today. Now it is necessary to find feasible ways out from this difficult situation.

Surface and subsurface drainage are required in arid irrigated agriculture to ensure crop development and to manage soil salinity. Surface drainage from furrow irrigation is often discharged into drainage ditches and lost for future use on the farm. Subsurface drainage is discharged into large open drains to be later disposed into surface water bodies. Improving irrigation management will reduce total volume of drainage water being discharged and provide additional water supply for irrigation. Drainage water contains sediment and pollutants from agricultural chemicals, therefore, controlling drainage water will reduce negative impacts of irrigated agriculture on the environment. Drainage and irrigation should be considered as a package for Integrated Water Management.



Nazir Mirzaev,

Project consultant on Institutional Development

It is known that there is a traditional belief being most popular between decision makers and experts of water sector that development of water sector requires increasing investments into water sector and first of all, restoration of water infrastructure (structural approach).

One cannot claim that institutional aspects were ignored altogether – water sector was under continuous structural reform, however it was limited to only trivial rearrangement of functions, merging and splitting organizations without introducing principal changes.

Frequent and not always justified reorganization of water sector institutions in Central Asian countries is a consequence of: a) underestimation of significance of institutional aspects and, b) lack of justified concept of organizational setup of water sector. This is explained by the fact that creating water sector institutional system is a fundamental issue of social policy rather than purely engineering problem.

A many-year practice, however, shows that without addressing institutional issues (hydrographisation, decentralization, community participation) aimed at shifting accent from water resource management to water demand management, the impact of investment may be minimal. Unfortunately, level of comprehension of expedience of creating institutional prerequisites to attain the most impact from investing into rehabilitation of water infrastructure still remains low.

At the present moment, only a narrow circle of experts realize that lack of community participation in management of water sector is one of the main limiting factors constraining growth of agricultural production efficiency and quality of water management in the region.

During introduction of IWRM principles, both local and global experience was accumulated allowing following conclusions to be made:

- important steps were taken during the reform, but there is still space for organizational structure improvement;
- not all practices that existed in water sector should be discontinued. If something appears to be outdated from the first glance but just keeps "clinging on", this is a reason to think again, whether we are being too hasty with the innovations;
- IWRM is not a dogma. It should be introduced taking into account existing realities. A great idea used at a wrong time and place may compromise the very idea and even cause damage;
- reorganization is a continuous process and should be performed based on a wellconceived, theoretically justified and stakeholder approved long-sighted strategy residing on the principle of evolutionary improvement.

Draft Strategy to strengthen basin level institutional framework was developed on the basis of lessons learned from national and global experience. The strategy proposes measures for institutional improvement of water sector structures under pragmatic and radical options. These options, depending on success achieved in institutional development of specific water sector systems, can be regarded as stages of institutional capacity strengthening. Levels of water sector covered include basin, irrigation system and WUA, and water sector agencies are: administrations and water management agencies.

The strategy provides recommendations for human capacity strengthening through both training in education facilities and advanced training for experts, as well as training program for management to facilitate institutional strengthening.



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Contact Address:

IWRM Project Office 1, Shayhontohur street 100011-Tashkent, Uzbekistan Ph.: (998-71) 241-91-82 E-mail: iwrm.undp@gmail.com

UNDP Uzbekistan

41/3, Mirabadskaya Street, Tashkent 100015 Ph.: (998-71) 120-34-50 Fax: (998-71) 120-34-85 Tashkent, Uzbekistan E-mail: registry.uz@undp.org www.undp.uz

Ministry of Agriculture and Water Resources of the Republic of Uzbekistan

№4, Navoiy Street 100004 -Tashkent, Uzbekistan Ph.: (998-71) 241-00-42 E-mail: info@agro.uz www.agro.uz

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