УДК 626.810

PROMOTING AGRICULTURAL INNOVATION SYSTEM IN CENTRAL ASIA FOR BETTER WATER PRODUCTIVITY AT PLOT LEVEL

S. Mukhamedjanov[1], J. Kazbekov[2], J. Mohan Reddy[3], H. Manthrithilake[4], L. Averina[5], D. Eshmuradov[6], I. Ruziev[7], R. Sagdullaev[8]

Regional Project Leader from the Scientific Information Center of the Interstate Commission for Water Coordination in Central Asia, SIC-ICWC, Researcher at the International Water Management Institute Central Asia, IWMI-CA, Researcher, Regional Project Leader from IWMI, Head of the IWMI in Central Asia, Researcher, Head of the Sri Lanka Program, IWMI, Regional specialist, SIC-ICWC, Consultant, IWMI-CA, Technician, SIC-ICWC, Supported by the Swiss Agency for Development and Cooperation

The paper presents the short term results of the Water Productivity Improvement at Plot Level project[9] that is implemented in three countries of the Fergana Valley – Kyrgyzstan, Tajikistan and Uzbekistan. The baseline survey and assessment of the farmer's needs and constraints were carried out together with data collection on current levels of water productivity, mainly for cotton and wheat, main crops in Central Asia. To address farmer's requirements, a unique and innovative approach was selected for implementation. This necessitated the establishment of effective partnerships and linkages among research

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[1] Regional Project Leader from the Scientific Information Center of the Interstate Commission for Water Coordination in Central Asia, SIC-ICWC
[2] Researcher at the International Water Management Institute Central Asia, IWMI-CA
[3] Researcher, Regional Project Leader from IWMI, Head of the IWMI in Central Asia,
[4] Researcher, Head of the Sri Lanka Program, IWMI
[5] Regional specialist, SIC-ICWC
[6] Consultant, IWMI-CA
[7] Technician, SIC-ICWC
[8] Technician, SIC-ICWC
[9] Supported by the Swiss Agency for Development and Cooperation

organizations, information processing centers, and existing extension agencies to serve the farmers better. The results of farmer surveys revealed that established partnerships between actors in the innovation cycle confirmed the appropriateness of the chosen strategy.

Introduction

In Central Asia (CA), poor management practices have resulted in unreliable, inadequate and inequitable water distribution, excessive water use, significant water losses and consequently waterlogging and large surface drainage volumes, all of which contribute to potential conflicts between water users. In many cases, irrigation methods applied at farm level are extremely wasteful, resulting in fields being over-irrigated, waterlogged, and the development of secondary salinization. The major reason for excessive water use and low crop yields at the plot level is the lack of knowledge and resources for farmers. This clearly indicates that the issue is not of water scarcity but that of management (WPI, 2008).

Water productivity concept is new to the region. The productivity of land in terms of yield, e.g. "yield per hectare", was the concept used during the Soviet Union. Many contemporary studies suggested new concept of water productivity (Seckler et al., 2003; Molden et al., 2003: Molden et al., 2009). In Central Asia, currently, water saving and water productivity are inadequately addressed at plot level. Major deficiencies that were identified are: insufficiently leveled land, excessive plot size and furrow length with corresponding over-watering and deep percolation at the head-end and under-watering at the tail-end of fields, and insufficient attention to crop water requirements as well as soil water retention capacity.

Furthermore, in CA, the available information associated with crop water requirements has very little relevance with current day challenges of water scarcity and environmentally sound water use. There is a critical need to update this information on the basis of soil, crop and climatic conditions for different agro-ecological zones. Leveling of farmers' fields is generally poor and plot layouts are not adapted to soil conditions and water flow at the farm gate. Changing and adapting plot and furrow layouts and leveling fields are therefore considered to be important elements to minimize water losses and improve water productivity.

Following the reform in the agricultural sector of post-Soviet Central Asia, SDC initiated the IWRM-Fergana valley project to improve institutional and organizational requirements for transparent, reliable and crop demand-based water allocation and delivery to farmers. This project focused predominantly on the institutional, organizational and management aspects related to reliable, timely and adequate water supply to the farm gate. Activities at the plot level, i.e. within the farms, were subsequently initiated to assess the impact of reliable water availability on water use and crop yields. To take full advantage of the water savings potential created by the IWRM project, a specific focus on plot level water use efficiency and productivity was initiated. This paper discusses the first steps, since the beginning of the project in January of 2009, in establishing effective partnerships for linking research, extension and farmers for improving productivity.

Setting the Stage for the Project

The inception phase of the water productivity improvement at plot level (WPI-PL) project was initiated in 2008. During this phase, the existing knowledge on water use, crop yields, water productivity and existing extension services in the three target countries, with a special focus on areas where IWRM project activities were being implemented, was reviewed. SIC, IWMI and local partners worked together, collected data from monitoring fields, agricultural departments, and other on-going projects in the region. Current extension services and practices and materials available for dissemination to farmers to improve productivity of water at the plot level were also reviewed during the inception phase (WPI, 2008). This information was reviewed to obtain a broader picture of the issues of water productivity at the plot level. In addition, the project contracted local consultants to review current situation on water productivity and extension services in all the three countries.

Major outputs of the inception phase were:

- Database on water productivity at plot level was strengthened with field data gathered by partners in project regions. This database allows evaluation of basic trends of irrigated agricultural development in the region and provides an estimation of the impact of individual factors on efficiency of water use and crop production. This database is available to all research, water management and farmer organizations.
- Dissemination of information and training was provided through existing advisory services in Kyrgyzstan and Tajikistan and through Basin Authorities of the Irrigation Systems (BISAs) in Uzbekistan. This included trainings for extension workers, and production and distribution of various information bulletins and leaflets.
- Training of free lance consultants available within WUAs as informal extension workers to support farmers with their operational and planning questions to sustain higher yields while applying lesser quantity of water to their fields;
- Situation analysis clearly revealed that farmers use excessive water, do not follow recommended practices, and that water productivity is generally low, the common problem is the lack of knowledge about actual crop water requirements, unstable water supply to farms during the irrigation inadequate access to finances;
- The analysis of the current extension strategies in CA revealed that the agricultural extension systems are fragmented due to changes that these countries are experiencing with regard to different agricultural policies but can be mainstreamed through combination of state and donor efforts on policy and framework development to support extension.

Baseline situation – basis for interventions

The project organized the data collected from the demonstration sites to make assessment of the impact of the extension activities on water productivity. For that reason, each demonstration field was equipped with flow measurement structures to measure incoming and outgoing water at each demonstration site. Thus, in 2009, the project was able to gather baseline data on water productivity. Figure 1 presents information on water productivity of cotton crop in the demonstration sites. This graph consists of three types of information: WP of the delivered water at the plot level, and World's highest and lowest reported WP values (0.12 and 1.70 kg/m^3) for the given crop. As it can be seen, the WP of the delivered water to the demonstration sites ranged between 0.09 to 1.63 kg/m^3. This variation points to the gaps and potentials of WP rates in different plots, which were taken as baseline. The objective of the project was to improve water productivity by introducing a combination of agro-technical interventions. The highest WP observed in Matcha (Sugd, Tajikistan) and Bogdod (Ferghana, Uzbekistan) districts – 1.61 and 1.60 kg/m^3 correspondingly. In Matcha the reason was that bio-cotton project in Tajikistan was testing new variety of cotton with inter-cropping with mung beans, which increased the yield to 4.16 t/ha. In Bogdod, the higher WP is basically due to smaller amount of irrigation water applied (2 irrigations totaling 2100 m^3/ha) owing to high groundwater table (1.0-1.5 m).

Information on WP of wheat is given in Figure 2. The graph shows lowest WP of 0.63 kg/m^3 in Pakhtabad (Andijan, Uzbekistan) due to high volume of applied water (8 irrigations with 7900 m^3/ha of water) due to sandy-gravel soils with high permeability rates and deep groundwater tables. Highest WP values were observed in 4 demonstration sites in Andijan (Uzbekistan) and Osh (Kyrgyzstan) averaging at about 1.5 kg/m^3, but is still less than the highest World's observed WP of 2.60 kg/m^3 indicating the potential for improvement, which is the basis for our project.

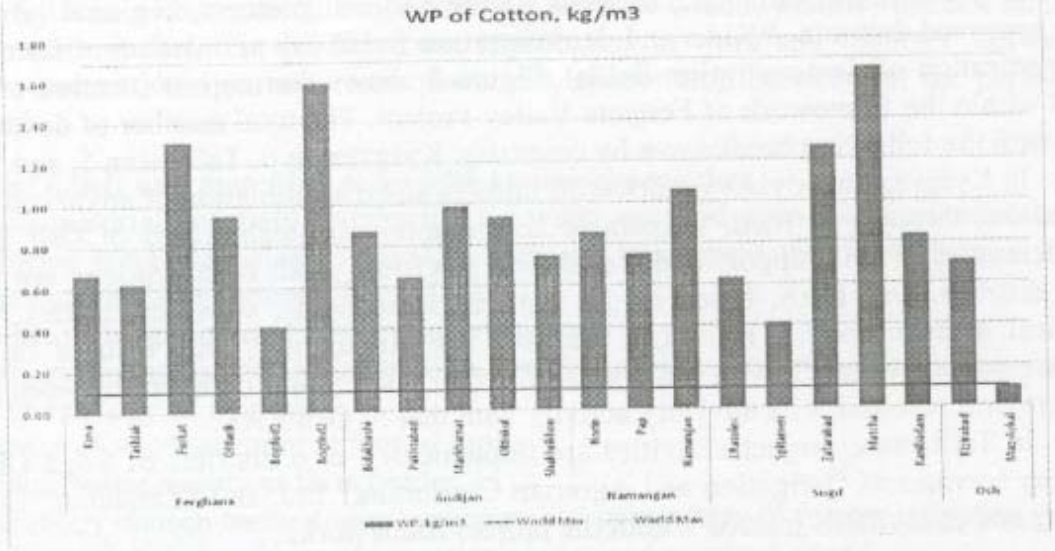

Figure 1 - Water productivity of cotton at demonstration sites in Fergana Valley

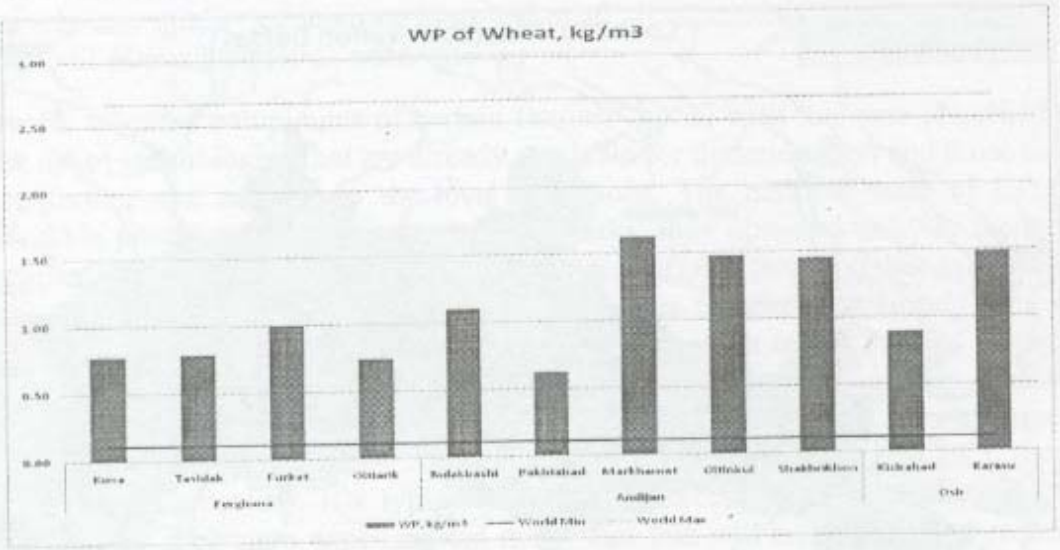

Figure 2 - Water productivity of wheat at demonstration sites in Fergana Valley

Effective partnerships to promote agricultural innovation system

The national partners were selected in compliance with the criteria identified during the project formulation workshop held on 18-20 September 2008 and stakeholders' workshop on planning actions held on 19 November 2008. The selection was based on the criteria for such organizations which were identified by the stakeholders. The selected organizations, whose activities conform to three main directions of the project, are represented by scientific organizations, information centers and advisory services (disseminators) that already have experience in consulting, as well as sufficient technical, organizational and structural capacity to process and share knowledge with farmers. Project activities are implemented in all the three countries of Fergana Valley: Kyrgyzstan, Uzbekistan and Tajikistan. The project implementation started in January of 2009.

There are 18 key partners working within the project framework: 2 major partners in the regional group represented by SIC -IWMI association, and 16 national partners and organizations selected for implementation of project tasks (Figures 3 and 4). In Osh City, in the premises of Osh BWMD, the country office of the project of Kyrgyzstan is located. Training room and the country office of the project in the Republic of Tajikistan are located in Khodjent City in the space provided by the Sogd PDMWR. The country office of the project in the Republic of Uzbekistan is located in the premises of Naryn-Karadarya BISA in Andijan City.

In compliance with the proposals of the national partners, regional group jointly with them approved districts, WUAs and demonstration fields (by permission of farmers who agreed to organization of demonstration fields). Figure 3 shows the map of location of demonstration fields within the framework of Fergana Valley Project. The total number of demonstration fields is 26 with the following breakdown by countries: Kyrgyzstan 6, Tajikistan 5, and Uzbekistan 15.

In Kyrgyzstan, advisory work with farmers and dissemination of advanced technologies is carried out through 13 main trainers or consultants: agro-technicians of Osh RAS and hydro technicians of WUA Support and Regulation Division. Both organizations are working in the same districts. Osh RAS, based on its demonstration fields, consults farmers regarding agro-technical arrangements. The WUA Support and Regulation Unit focuses on implementing measurement of water flow in outlets and internal distribution of water between farmers. WUA Support Unit reconciles its advisory activity with that of Osh RAS.

In Tajikistan, project activities are implemented in 6 districts of Sogd Oblast, based on advisory services of "Irrigation and Agrarian Consulting" Ltd, and "Zarzamin" Ltd, with 8 main trainers and consultants trained within the project framework.

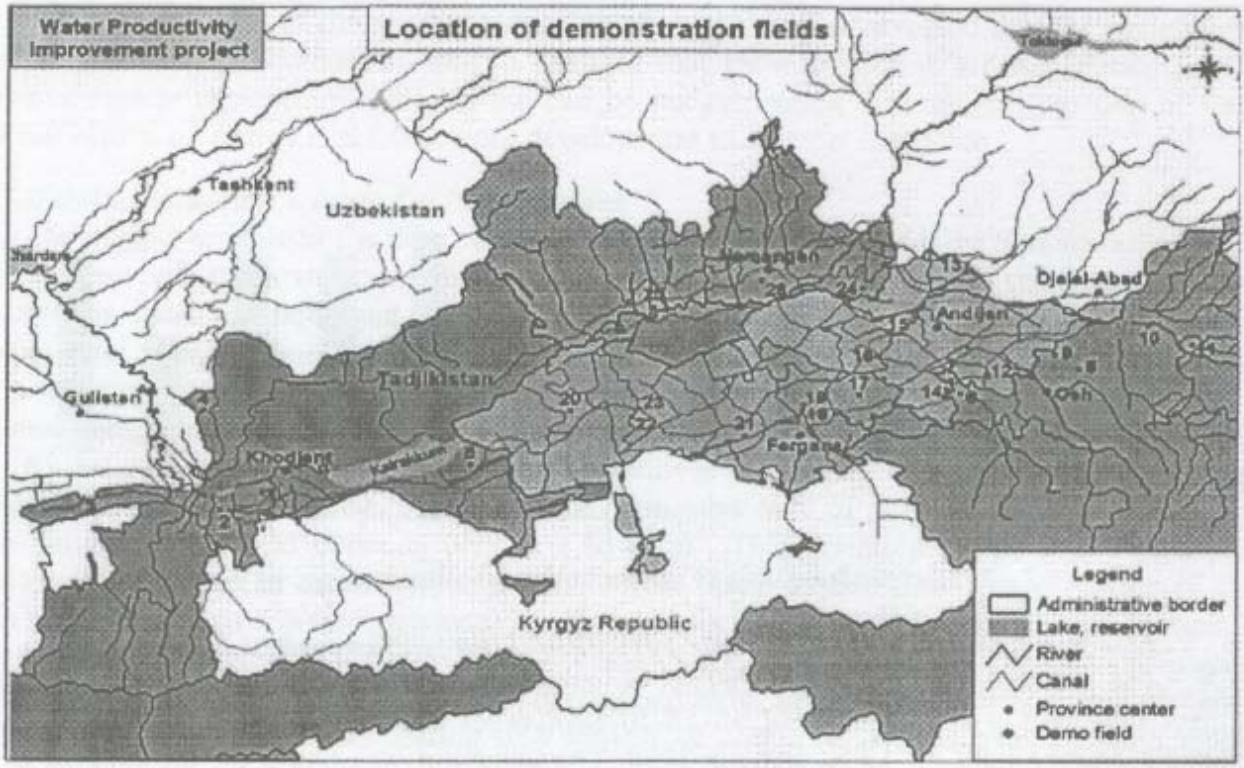

Figure 3. Map of location of demonstration fields within Fergana Valley:
Tajikistan: 1-Buri Kurmas, 2-Shark, 3-Navbahor, 4-Amakjon, 5-Khimoyatbonu;
Kyrgyzstan: 6-Tukhtarov, 7–Tolobekov, 8-Abbsatorov, 9-Kyrgyzbaeva, 10-Mamafaliev, 11- Jusubaliev;
Uzbekistan: 12–Akiev, 13-Abdurahmon ota, 14–Mirzakhmad sahovati, 15–Baht imkon rivozh, 16 Dilshoda, 17-Kahramon davlat, 18–Ergash ota, 19–Sobir ota, 20-Botirjon, 21–Artikov, 22–Kosimov, 23–Nilu, 24–Durdona Gayrat, 25-Omonov, 26–Nabijon ota

In Uzbekistan, the following BISAs are selected as dissemination organizations: Syrdarya-Sokh, Naryn-Karadarya and Naryn-Syrdarya, which cover 13 districts of Fergana, Namangan and Andijan Oblasts.

Till present partners were identified; conditions were created for their work and established effective interaction between them. Key coordinators and project executors were identified and approved, jointly with the ministries. A system for interaction between partners is created in each country and strategies were developed for national groups' actions. This short period of implementation, showed the strengths and weaknesses of each partner, including their

successes and failures with regard to organizational matters which, mainly, are not connected with project contextual part. For the first time, approbation of work and "contact" between the regional groups and national partners took place and, cooperation between all the partners has been established.

Farmers' needs and matching them with known approaches

Based on materials of field monitoring on water use and agro-technical measures, the following problems were identified to develop, plan and implement the dissemination strategy which was based on needs of farmers (WPI 2009):

- top-heavy irrigation rates are used everywhere;
- grate losses on runoff and filtration because of low level of knowledge and non-observance of technology of irrigation;
- absence of water account at taps of farms
- instable water supply at farm border
- incorrectly chosen technological schemes and parameters of furrow irrigation
- discrepancy between planned irrigation modes and required ones
- low quality of lands leveling
- relatively low quality of separate agro-technical arrangements
- absence of plan-schedule of water use

The partners assessed compliance of certain farmers' needs with the ones identified earlier and prepared the list of technologies that are already available for dissemination and those that need to be developed further and adapted to the local conditions. The national team of Kyrgyzstan achieved considerable progress in execution of all the works; they obtained unity in thoughts and certain synchronism among all players. In particular, out of the technologies selected at the preparatory stage, they clearly identified the list of technologies for dissemination (17 out of 19); 2 technologies need to be developed further through adaptive research in ER 5. They carried out a written survey among farmers. More than 100 farmers have been surveyed, and they discovered a new technology of reinforcing heads of furrows and proposed to disseminate it among farmers.The Tajikistan team, by efforts of OO IAC and provincial coordinator and partially by CECI, succeeded in achieving all planned indicators. It's typical that disseminators try to persuade farmers into installing water meters at their own expenses and prove that this will enable them to reduce their payments, sometimes 2 times, compared to hectare-based payment. By the efforts of provincial coordinator in Tajikistan they developed a legal mechanism and package of documents for farms and irrigation water suppliers for their effective interaction.

In Uzbekistan, the project implementation although it is not visible the clear inter-linkages between research, information centers and disseminators and insufficient information work on determining the needs of farmers, it is necessary to mention the great efforts of information center, which was able to integrate all the problems and inconsistencies which were experienced in all three provinces and were able to train the specialists from Fergana and Namangan in the field. Owing to the appropriate actions taken by the information center, the disseminators were able to cover larger groups of farmers with advisory and improve farmers' knowledge. In contrast to Tajikistan and Kyrgyzstan, Uzbekistan partners were able to present full and reliable information which was needed for the analysis.

Transfer of technologies into a farmer-friendly language and dissemination

Trainers have been selected, strategy and approaches for farmer and disseminator training have been identified in all the republics. On three tertiary level canals and on 15 outlets (in total), they have introduced water measuring systems to each farmer and introduced volumetric pricing. Selected leaders of outlets register water volumes, distribute irrigation water among farmers and maintain documentation. Training materials were prepared on the basis of the documents compiled. Strategy of setting up farmer schools under WUA is being developed in Uzbekistan. Monthly agro-ameliorative bulletins and recommendations in the national languages are extended among farmers. Demonstration fields have been selected and equipped. The

regional group has expressed its opinion and made the preliminary proposals on organizing farmer schools.

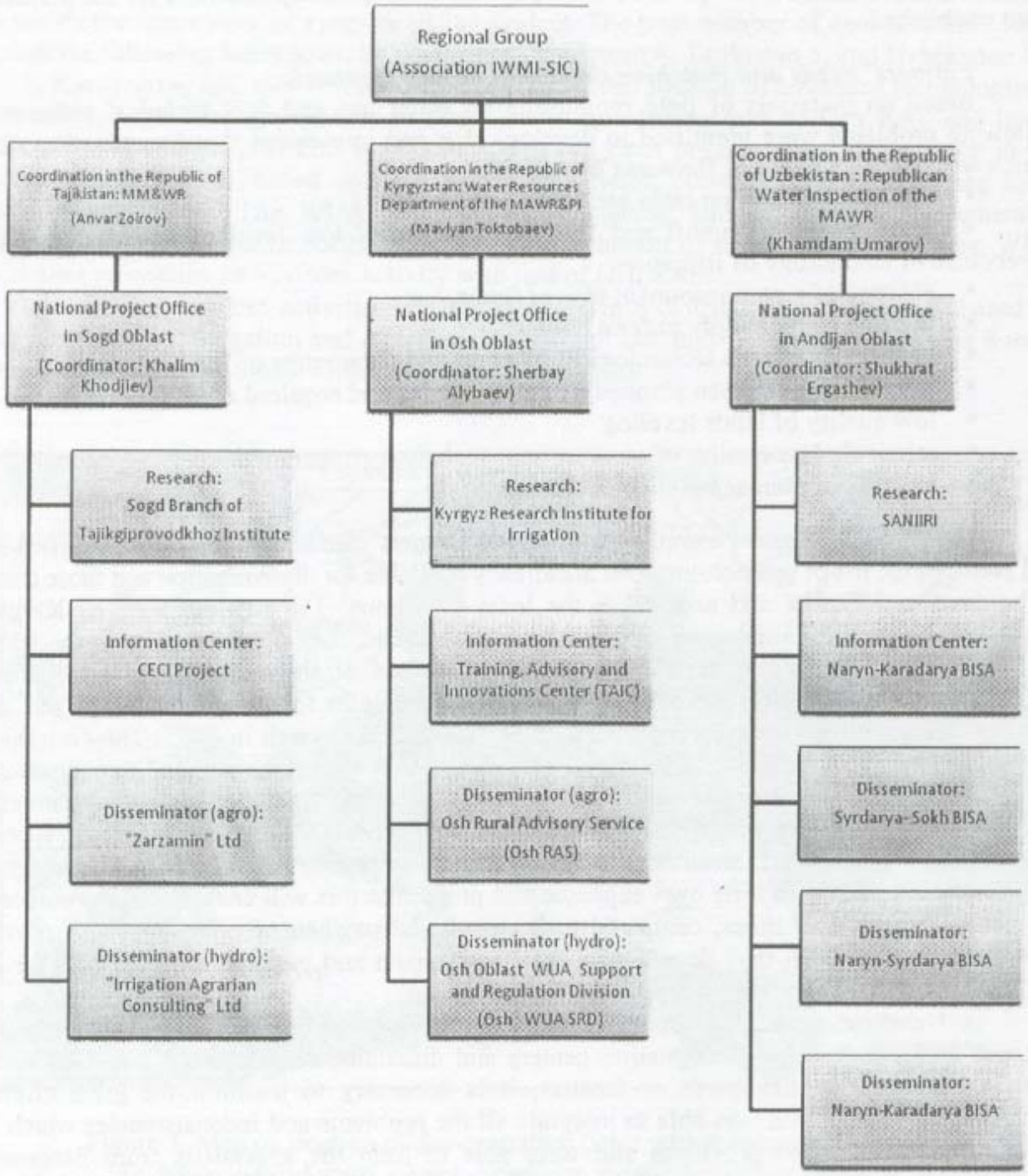

Figure 4 - Structure of project organization and partners in the three countries

In Uzbekistan, trainers and BISA implementing officers have a vague idea on principles of working with farmers, advisory activities are at an inappropriate level, and field trainers are unable to implement approaches and activities proposed during the IWRM-Fergana Project. The same can be said about Tajikistan, especially Zarzamin Ltd., the performance of its specialists is quite poor. In CECI Information Center professionalism of its specialists, as key players in the overall project chain, is not evident. The only exception is RAS. It's worth mentioning that Kyrgyzstan, based on good interaction between partners, managed to organize a successful advisory work with farmers. Table 1 gives information on the trainings and the dissemination activities that were undertakenwithin the project.

It's important to mention that some training courses were conducted without considering farmers' actual needs. Such trainings, as a rule, did not produce much effect. Project implementers, e.g. we should pay attention to this.

Table 1 - Total number of trainings held within the framework of WPI-PL Project

Training organizer	Number of trainings	Number of participants	Whom the training is meant for
TAIC	5	35	Trainers
Osh WUA SRD	3	93	Farmers
Osh RAS	6	162	Farmers
Total for Kyrgyzstan	14	290	
CECI	9	90	Trainers and farmers
RAS	8	555	Farmers
Zarzamin	9	244	Farmers
Total for Tajikistan	26	889	
Andijan IC	12	226	Trainers and farmers
Fergana BISA	1	28	Farmers
Namangan BISA	3	70	Farmers
Andijan BISA	5	98	Farmers
Total for Uzbekistan	21	422	
Total for the project	61	1601	

Conclusions

The project's short period was the period for gaining experience from this newly established structure of the project, and there are some instances that require proper analysis, removing of shortcomings, and enhancement of progress already made. The established partnerships between innovation cycle participants, which formed the basis of the project, has already confirmed the appropriateness of the chosen strategy. Notwithstanding the relatively short time period, the project managed to launch the first innovation cycle, taking into consideration those farmers needs that we had at the beginning of the innovation cycle and based on the technologies proposed by the project and selected by the partners (WPI, 2009).

It's worth mentioning that farmers do not completely understand the importance of proper use of water, receiving consultations and advices from the trainers of disseminating organizations, they hardly familiarized themselves with all the aspects of the set of necessary and important instruments, they do not use in full the advices received. In most cases irrigation norms are exceeded, production indicators are low, but the main objective is achieved – people understand the importance of the proposed technologies, there's a desire to use them and they are supported in implementation. Today we can state with certainty that the farmers changed their attitude to water, they understood that water has other dimensions like electrical energy, water can be and must be regularly measured, they must know the norms of water use. And this is one of the major achievements of the project so far.

The work on discovering farmers' innovations, their assessment and processing for the purpose of their implementation is implemented partially. Currently innovations have been identified in Kyrgyzstan and Uzbekistan, they need to be studied and approved. For example, in Kyrgyzstan farmers are using improvised or available means ("baklashka"), deliver needed amount to furrows. In Uzbekistan a farmer from Altynkul District uses magnetized water for irrigating wheat fields. Assessment and monitoring shows that farmers have a substantial capacity in terms of innovations, but during the period untill now the project and national partners could not tackle this matter in real earnest. This is so because for the partners the organizational part of the project proved to be labor-intensive, and advisory work and adjustment of dissemination strategy took a lot of time and required a lot of effort.

Such experiment with the involvement of numerous partners and of substantial scale is being implemented for the first time and it is a kind of innovation in project works. Results from our approach will be reported in the near future!

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