SOCIO-TECHNICAL ASPECTS OF WATER MANAGEMENT IN UZBEKISTAN: EMERGING WATER GOVERNANCE ISSUES AT THE GRASS ROOT LEVEL

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The recent changes in agriculture have created dynamic environment where de-collectivization result formation of individual farm units. The water management system which was meant for collective farming, both hard (irrigation network) and soft (institutional) components became irrelevant for more individualized agricultural production. Recently established water users associations (WUAs) for filling gap on water management at the local level are facing many problems, such as chronic non-payment of membership fees, inability to install clear water management rules, etc. The objective of this paper is to analyze the recent changes in water management governance at the former collective farm level due to the structural changes in agriculture and present options on improving it. In the context of the IWRM discourse, the study will contribute to the development of more realistic plans in the context of transitional economies of Former Soviet Union (FSU).

1 Introdction

Integrated Water Resources Management (IWRM) is defined by Global Water Partnership as follows: coordination of development and management of water, land and other resources for maximizing of economic results and social welfare with no compromise on environment (GWP.2000). The central principals of the IWRM are participation, integration of the resources, institutions and stakeholders for sustainable water resources management. The recent analysis of IWRM worldwide has shown that IWRM plans consist of four components: policy, water management along hydraulic boundaries, participation and management instruments (Saravanan *et al.*,

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2008). There are ambiguity and critique of the IWRM principles at present on how it is understood and implemented globally (Mollinga *et al.* 2006, Saravanan *et al.* 2008). The IWRM national plans are focused to integrate water use sectors along the single coordinating basin-wide organization. However, in the water sector multiple actors at the different levels and arenas are interacting and making water management a socio-political process (Bhat and Mollinga. 2006, cited in Saravanan. 2008). IWRM requires "…. *the enabling environment, which includes an effective water policy, updated legislation, and conducive financing and incentive structures*" (ADB. 2008). The introduction of the IWRM also request institutionalized stakeholder participation and comprehensive water resources planning and monitoring (Shah *et al.* 2006). The enabling environment at the policy level should create space for adapting of cost sharing and recovery, water use rights approaches and making clear roles of national, regional and local governments, service providers and water user organizations, and the private sector on water management (ADB.2008).

The international donors such as UNDP, World Bank and Asian Development Bank, Swiss Development Cooperation have launched few initiatives in different Central Asian countries for the promotion of IWRM principles. For example, UNEP-DHI Centre[1] on Water and Environment, UNDP[2] and ADB[3] are supporting preparation of the national IWRM plans for Uzbekistan, Kyrgyzstan and Tajikistan.

The centerpiece of the IWRM projects is to help national governments to prepare road maps on its implementation. This is very first and crucial step on establishing sustainable water management approach in the countries of Central Asia.

In Uzbekistan, state is funding and controlling all aspects of the water management, the legal system is protecting state ownership of all the essential water resources. Planning and use of the water resources is state's business. There is no platform or space for the water users to participate in water management process. Although this was very well fitting into the socio-political situation during the former soviet period where collective farms were major form of production this does not reflect changing social dynamics of present days. While national IWRM plans are prepared, international donors and implementing agencies should consider ongoing changes at the grass root level which will have also impact on national water management.

The research on adapting of the IWRM plans into the local situation of Central Asian countries recently became available (Dukhovniy *et al.*, 2004, Dukhovniy and Sokolov, 2004, Abdullaev *et al.* 2008). However, recent research reflects mostly IWRM issues at the higher levels, national regional basin and main canals. Therefore, it is important to understand recent changes at the grass root levels and their impact on overall water management. The main focus of this paper is to analyze institutional changes in agriculture and their social consequences for water resources management at the former collective farm level in Uzbekistan.

The first section of the paper is describing methodology of the case study research. The second section presents post- independence changes in agriculture and water resources management in Uzbekistan, with special focus on former collective farm level after the independence and their impact on water management. The third section presents a case study from one of Water Users Association, located in Khorezm region of Uzbekistan and last section presents conclusions and lessons from of the research.

2 Research Methodology

2.1 Research Hypothesis

The main hypothesis of this paper is if socio-technical changes at the former collective farm level (grassroots) are not understood and not integrated into the IWRM plans will have long term negative impact on water management and in will alter sustainable development of the region. The hypothesis based on the explorative literature review and author's extensive work at the former collective work level in Ferghana, Khorezm regions of Uzbekistan.

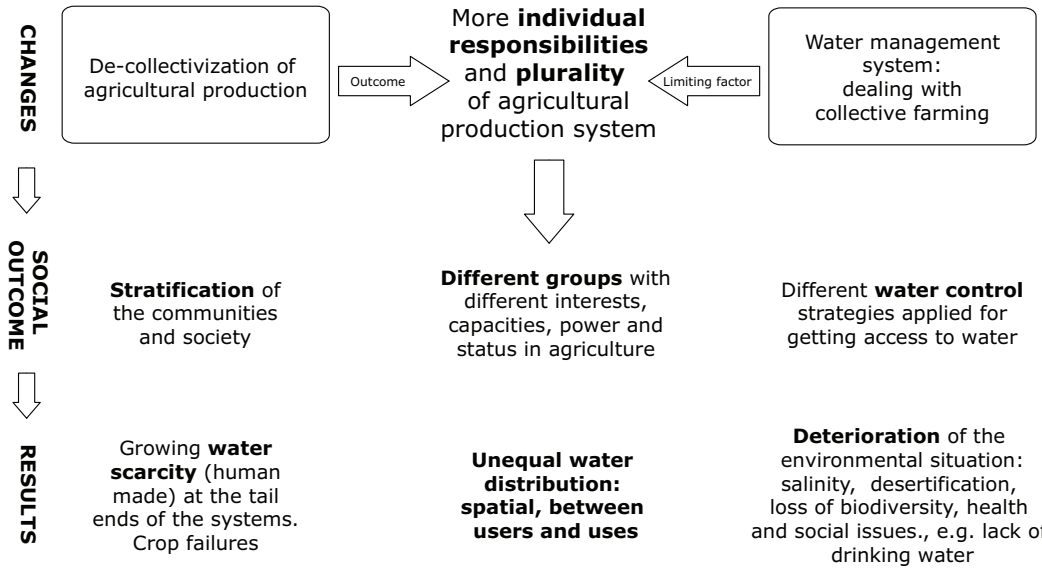

Figure 1. Research Hypothesis – impact of agricultural reforms on water management at the grass root level.

Saravanan (2008) for the rural setting of the India states that the local players in the water arena apply different means for controlling the water therefore without systematic approach it is not possible to understand complicated local setting. Wegerich (2006), in his study of water management at the Khorezm region indicated that there are many players with different interest, applying different means to control water for their purposes. Veldwisch (2008) stated that the water management at the former collective farm level becoming more of competition and contestation between different groups. Trevisani (2007) have indicated in their studies of post soviet changes in agriculture that the land reforms have result stratification of communities in the former collective farm level.
Authors have applied following framework of research in this study (figure 1): de- collectivization of agricultural production system have resulted on more individual responsibilities and plurality of the production (Trevisani.2007, Veldwisch. 2008) which have resulted formation of different groups, stratification of community and society. This has been further exacerbated due to limitation of water management system, which was designed to supply water for collective farming unit with centralized decision making (Veldwisch. 2008).

As result, different groups started to apply different water control (Mollinga. 1998, 2003) strategies for getting access (Ribot and Peluso.2003) to the water at the former collective farm level. The result of this had been seen on water distribution: it became unequal both spatially, between uses and users. Unequal water distribution result on growing water scarcity (human made) at the tail end of the irrigation system leading to frequent crop failures (Abdullaev *et al.*2006, Wegerich. 2006. The social and environmental consequences of this has been growing salinity, desertification, drying of lakes and decline in biodiversity at the tail end of irrigation systems (Molden *et al.*2007).

Authors in this paper applied for the case study of the water management changes above presented framework of analysis.

2.2 Field Research Methodology

The methodology applied in this paper based on socio-technical analysis of water management

framework (Abdullaev *et al*.2008) developed and applied within framework of German – Uzbek Landscape Restructuring Khorezm project (further Khorezm project). The centrepiece of the socio-technical analysis is "water control" (Mollinga.1998, 2003)

The main aim of the field research was to capture and documents those changes in water management at the different levels due to the land reforms. The research was conducted in pilot WUA. The data collection and field research were based on exploratory and documentary methods, which include semi-directive, none /semi structured and group interviews with main actors, studying of project reports, data bases, research publications, archives and mass-media materials on both subject and area of interest.

A field team of 5 trained staff has been interviewing 90 randomly selected water users, located at the head, middle and tail of the irrigation network of the Water Users Association (WUA), more than ten expert interviews, six group discussions and one stakeholder meeting for problem identification were conducted during the April to June of 2008. The field team has been able to participate at least three times in water distribution and irrigation events and have conducted regular drive and walk through surveys of the WUA territory. The intensive research has helped to understand the water management situation in one of typical WUA.

Walkthrough survey of water management practices and the state of water infrastructure is the starting technique applied by author. After rapport building meetings with WUAs' staff and water users, researchers have conducted walk/ drive through the main irrigation canals of the WUAs. The researchers should have mapped the area/irrigation system. The goals of the walk/ drive through surveys were many-fold: updating maps, understanding irrigation network, getting known to the community, becoming familiar with technical system and noting down irrigation and water use practices of the location. *Data surveys*: researcher(s) have developed a list and protocol for the secondary data they need and have contacted WUAs for collecting readily available quantitative data. The secondary data helped to understand the main features of the irrigation system, WUAs. However, one should realize that the quality of the secondary data in most cases was low. The secondary data have included information on biophysical characteristics of the locality, data on water inflow, outflow, specificities of the irrigation and drainage system, etc. *Interviews and questionnaire surveys*: series of interviews has been conducted with WUA leadership and irrigators in the location. *Water planning and distribution:* the water use plans of the study WUAs were reviewed together with WUA staff in order to understand how water plans are prepared, what are the major elements, data sets used and processes of water planning. During the peak irrigation season (June-July), one or two times the water inflows (discharges) into study WUA and water distribution quantities canals were measured. The data used to understand spatial differences on water distribution between different parts of the canals. The measurements conducted simultaneously in all above mentioned points of the irrigation system in order to capture actual situation (Abdullaev *et al*.2006). *Participation and observation technique* was frequently applied to understand the socio-institutional aspects. Attending both formal and informal meetings, socializing through friendships and networking were essential methods appropriate for the study area.

2.3 Study area- Khorezm region

The Khorezm region in Uzbekistan is biophysically representative for the irrigated Amu Darya lowlands of Central Asia, which comprise the entire irrigated land (1 060 000 ha) between the Tuyamuyun reservoir and the Aral Sea: the province of Khorezm (275 000 ha), the Republic of Karakalpakstan (500 000 ha), both in Uzbekistan, and the province of Dashoguz (310 000 ha irrigated land) in neighbouring Turkmenistan. The region well represents those of post-independence changes in agriculture. Since 1991, in place of only few hundred collective thousands of private farms were organized. The total irrigated area accounts for about 10% of the entire Aral Sea Basin (ASB). The total population of 3.5 million people corresponds to

about 10% the entire population in ASB. Of the 1.3 million people living in Khorezm, about 70% are rural and about 27.5% live below the poverty line (1 US$ per day); unemployment rates especially in rural areas, are high (Mueller *et al.* 2007).

Khorezm province is located in the lower part of the Amu Darya basin, approximately 225 km south of the remainders of the Aral Sea in Uzbekistan. Due to the arid climate, characterized by an average annual precipitation of around 90 mm contrasting a reference evapotranspiration in the range of 1150 mm, the agricultural systems in Khorezm depend entirely on irrigation to provide adequate soil moisture. The generally acknowledged high losses of irrigation water have contributed to the widespread shallow groundwater tables. Drainage is necessary to ensure an effective leaching, to limit soil salinity accumulation to levels appropriate for crop production, and to avoid water logging.

Topography in Khorezm is flat (with elevation points ranging between 112 and 138 m a.s.l.) complicating the discharge of drainage water. As a consequence, an area of around 275 000 ha has become suitable for irrigated agriculture owing to the irrigation and drainage infrastructure which consists of a complex network of 16 233 km irrigation channels and about 7 679 km of drain (Table 1). With an exception of around 10 % lined canals (Ibrakhimov 2005), the irrigation system consists of earthen canals, whereas especially in the lower hierarchy system levels hydraulic structures are missing or dysfunctional. Drainage is realized by a network of open ditches and collectors. Irrigation water in the field is applied mainly by furrows and basins. Pre-season leaching is performed by basin. Furrow lengths and basin sizes are relatively small to compensate the effects of typically irregular micro-topography of the fields caused by insufficient land-levelling. Annually, about 3.5 to 5 km^3 of water are diverted to Khorezm from the Amu Darya River. About 95 % of supplied water is used by agriculture (Conrad *et al.* 2007). Due to huge recharges caused by losses in the network and at field level as well as the low groundwater slope and a general ill-functional drainage system, groundwater tables in Khorezm are shallow. Even though high groundwater tables at certain periods during the growing season may be advantageous, e.g. contributing to meet crop water requirements, shallow groundwater tables have adverse impacts on the irrigated agriculture in Khorezm due to increasing salt accumulation in the root zone, limiting the effectiveness of leaching, and causing waterlogging.

2.4 WUAs- research domain

At the end of the 1990's, the Uzbek government initiated the formation of Water Users Associations (WUA). Although WUAs in Uzbekistan were organized in a top down, hierarchical manner, using power and resources of the state water management organizations, their formation *per se* was a much needed step for stabilizing irrigation management at on farm level (Zavgordnyaya 2006, Wegerich.2000).

Most of the WUAs in Uzbekistan, which have not been supported by donor interventions, are failing on operation and maintenance of the irrigation and drainage network, have difficulties of managing water within the administrative boundaries and suffering from weak management and governance structures. Although the structure of such WUAs involves managing players mainly (Zavgordnyaya, 2006) practice showed that the water users were hardly consulted, nor informed about the way water management was reorganized. Therefore, the water users considered the WUAs as another water administration imposed on them, and not a way of introducing collective action water management.

In this research WUAs were the central focus area for socio-technical analysis of water management systems. Five WUAs, located in different biophysical, social and institutional conditions:

i. *Remoteness from the water sources* (Conrad *et al.* 2007): two WUAs with less than 30 km from water source, two WUAs more than 30 km but less than 60 km and one WUA more than 60 km;

ii. *Relative water scarcity*: three WUAs which received 100% of allocated water share (limit) in the previous season, one WUA

received 85% of the limit and one WUA only 70% of the limit;

iii. *Social situation, living standards, diversity of agricultural activities*: two WUAs with relatively high income levels due to their close location to the regions capital city Urgench and high income due to rice growing, diversified agriculture- vegetables, livestock and cotton-wheat, one WUA with medium level of living standards due to good infrastructure and closeness to main road Urgench - Khiva, agriculture is diversified- orchards, vegetables, cotton and wheat, one WUA with relatively low living standards due to the collapse of industry in the main town where most of the settlers were working, the last WUA has very low living standards due to remoteness and water shortage which result in low agricultural productivity, mostly cotton-wheat with only few orchards and livestock farms;

iv. *Institutional strength and type of water management*: all WUAs were organized by state through a top-down administrative approach. Two WUAs have received considerable support from international donor-funded projects. Two WUAs has hydrological borders and three organized in place of the former collective farm.

Although the above indicators do not fully reflect the diversity and differences between WUAs, they help to capture at least most types of WUAs in Khorezm region. In this paper author reports the findings from WUA Koshkopir Ashirmat. The Water Users Association (WUA) Koshkopir Ashirmat has 2116 ha of irrigated land. The irrigated areas are receiving the water from the Zeu Yop canal which is fed by Polvon main canal - one of the largest irrigation networks in Khorezm region.

3 Results and Discussions

3.1 Post soviet changes and emerging water governance issues at the grass root levels

With the collapse of the Soviet Union, Uzbekistan has inherited large-scale irrigation systems which occupied several millions of hectares. The irrigation system and main water sources of Central Asian countries are interconnected with each other but belonging to different countries. With continuing agricultural, land and water reforms, at different stages of development, agriculture became the backbone of the economy of at least Uzbekistan. The agricultural reforms have had impact on water management (table 2).

Later, large farms were fragmented into a large number of smallholdings owned and managed by individuals and each owner growing different crops according to the demand of either government, the market or personal needs. The irrigation water allocation procedures, based on crop type and environmental indicators became irrelevant and inaccurate due to the absence of accurate cropping records.

Water management at the main canal and basin levels did not change until the late 1990's. The basin principles of water management (hydrographic) were introduced in 2003. The territorial water management units at different levels were replaced by hydrographic units, such as basin irrigation system management organizations (BISMO) and canal management organizations (CMO).

Immediately after the independence in 1991, the governments of the Central Asia introduced land reforms, transforming collective farms (locally known as *kolkhozes*) into individual farms. The aim of this transformation was twofold: first to abolish the soviet legacy and the second to revive the productivity of the than bankrupt collective farms (Spoor, 2004). During the reforms, the social and organizational structures of collective farming, including one regulating the water management has been abolished alongside with collective farms. On- farm irrigation and drainage infrastructure, formerly managed and maintained by collective farms were left abandoned. The water distribution became an issue of social interaction, a place of contestation and competition (Wegerich 2000, Abdullaev *et al.* 2006).

The impact of land distribution on water management on farm level was initially ignored.

Table 1. Main information on study WUAs

#	WUAS	REMOTENESS FROM WATER SOURCES	RELATIVE WATER SCARCITY- HOW MUCH FROM WATER SHARE WAS DELIVERED	SOCIAL SITUATION, LIVING STANDARDS	INSTITUTIONAL STRENGTH AND TYPE OF WATER MANAGEMENT
1	A. Timur	Middle located from water sources More than 30 km but less than 60 km	85% water share	Relatively high living standards due to closeness to the main market in Urgench, growing mainly vegetables for sale. Diversified agriculture- vegetables, livestock and cotton-wheat	Has received considerable support from international projects. Territorially organized water management, middle of the irrigation system
2	Ashirmat	Tail located from water sources >60km	Less than 70% of water share	Very low living standards due to remoteness and water shortage as results low agricultural productivity. Mostly cotton-wheat with only few orchards and livestock farms	Water management is organized by hydrographic- canal borders- tail end of the irrigation system
3	Shomahlum	Middle located from water sources More than 30 km but less than 60 km	100% of water share	Medium living standards, access to good infrastructure and closeness to main road Urgench- Khiva Agriculture is diversified- orchards, vegetables, cotton and wheat	Has received considerable support from donor funds and Uzbek Ministry of Agriculture as pilot site for testing irrigation service fee introduction water management is territorially organized,
4	Amudarya	Located on the right bank of Amu Darya river, north of Khorezm less than 30 km from water sources	100% of water share (limit)	Relatively high living standards, large areas are rice growing. Agriculture is relatively diversified, mainly rice and cotton-wheat system	Water management is organized by hydrographic- canal borders- head of the irrigation system
5	Akalan	Located 30 km from Tuyamuyun water reservoir	100% of water share (limit)	Relatively low living standards due to the collapse of industry in the main town where most of the settlers were working. Only cotton-wheat system	Water management is organized by territorial principles-head of the irrigation system

In the former collective set up, the number of secondary water users ranged between 10 to 15 units (*brigades*) and water management was linked to the agronomic operations and readiness of the land to be irrigated. Trained and experienced staff, agronomists and hydro-technicians had been employed in every collective farm and were mandated to overlook the irrigation water management. Former members of the collective farms as well as citizens with no agricultural experience became individual farmers. The land reforms have led to a big increase in the number of individual farm units along secondary and tertiary canals. Given the new setting, the former methods for water distribution, as applied under the former large-scale collective farming system, have become irrelevant, leading to much chaos, inequity and unreliability in water supply to farmers. The formerly, during the collective farming times the tillers or members of the collective farm had no interest on influencing the water distribution. The state has been insuring the supply of all inputs into the collective farm because the state was receiving larger share of the outputs. However, after the de-collectivization situation has been changing, now individual farmers, land owners have much more share on outputs and they have an interest on influencing water management that they get water on time and enough amounts. Thus, many farmers and water managers have had to resort, with variable success, to some alternative water distribution methods to meet these new challenges. Nevertheless, transparency and equity in local water use still remains an issue. The competition and contestation on water distribution further exacerbated due to the increasing plurality of agricultural operation and production systems. The poor state of the irrigation and drainage (I&D) networks have further exacerbated the water management situation at the former collective farm level (further called as grass roots level)

In Uzbekistan, changes the irrigation water management were mainly concentrated on transferring management responsibility to water users associations at secondary canal levels. Planning, distribution and management at the former collective farm level became the business of Water Users Associations (WUAs). Although WUAs in were organized in a top down, hierarchical manner, using power and resources of the state water management organizations, their formation was a much needed step for stabilizing irrigation management at on farm level (Zavgordnyaya 2006, Wegerich.2000).

Most of the WUAs, which have not been supported by donor interventions, are failing on operation and maintenance of the irrigation and drainage network, have difficulties of managing water within the administrative boundaries and suffering from weak management and governance structures, because the structure of such WUAs involves managing players only (Zavgordnyaya, 2006) as the water users are neither consulted, nor informed about the way water management was reorganized.

Therefore, the water users consider the WUAs as another water administration imposed on them, and not a collective action organization of their own. Although the roles and responsibilities of state water management agencies and WUAs are attributed clearly, in daily water management their interests and operations clashes regularly due to external administrative interference and growing interest by makes effective water management almost impossible.

The growing individual responsibility for agricultural production pushes the farmers to get access to all inputs of production, including water. Other inputs (e.g., fertilizers, seeds, etc.) are available either by state run or commercial shops or in this chain of inputs only water is becoming an uncertain and contested input. Therefore, individual farmers apply different means (power, money, technology and resistance) for getting access to water for irrigation of their crops. The contestation of the water distribution at the grass root level (former collective farm territory) became a regular practice. In the context of increased dynamics over water and emerging social and production differences in the grass root levels in Uzbekistan have long-lasting impact on water management. At present the functions and structure of WUAs do not reflect those changes.

Table 2: Changes in Agriculture and Irrigation Water management

TIME	CHANGES IN AGRICULTURE	OUTCOMES/ RESULTS	TIME	CHANGES IN WATER MANAGEMENT
Starting from 1999-2006	De-collectivization and individualization of agricultural production	Formation of individual farms	Mid 1990's until now	Numbers of secondary water users-farmers have been increased which lead to the increased competition at the former collective farm level on water Testing and organization of pilot WUAs to fill gap at the grass root levels Formation of hydrographic water management organizations from national level until main system canal level Interstate water management agreements and formation of institutions Preparation of road maps on national IWRM plans in Kazakhstan, Kyrgyzstan and drafting it for Uzbekistan and Tajikistan

3.2 Emerging Water Control Strategies in Irrigated Agriculture: case Study from Water Users Association in Khorezm Region of Uzbekistan

3.2.1 Analysis of existing situation at the grass root levels

According to widely accepted principles of IWRM, the WUAs should become as grass root institution for representing the interests of wide range of water users (GWP.2000, Khanal. 2003). However, WUAs in Uzbekistan although repeat in their by-laws the same structure as elsewhere in the world (IWMI.2002, MAWR.1999) in practice act very differently. They are act as branches of water management organization or busy with implementation of top down, daily instruction of local government officials (Zavgorodnya.2006, Weigrech.2006). The case study, presented in this section from WUA Koshkopir Ashirmat from Khorezm region illustrates the problems on water management and emerging trends at the grass root levels.

The Water Users Association (WUA) Koshkopir Ashirmat has 2116 ha of irrigated land. The irrigated areas are receiving the water from the Zeu Yop canal which is fed by Polvon main canal- one of the largest irrigation networks in Khorezm region. The human made water scarcity due to the competition on water resources at the head of the Zeu Yop canal result that a considerable part of the irrigated agricultural fields in the area are 'abandoned' –150 to 200 hectares were not cultivated in the last years. These fields have been left by fermers and are regarded unsuitable for cultivation at the moment due to water scarcity. The WUA is located at the tail of the system and has problems with water provision.

The water to the WUA Koshkopir- Ashirmat is delivered through territory of other three WUAs, located above study area. This situation creates an unsustainable and non-reliable water supply. Although the irrigated area within the command system of Zeu Yop canal has not been increased, the water supply to WUA has become very much contested by both WUAs and individual water users along the canal. This is due to the two interrelated issues on WUAs formation and operation. The first issue, WUAs in Uzbekistan were organized in place of territorial collective farms not by hydrographic borders. Therefore, it is usual that water should flow through one WUA to other WUA, this

situation have result continuous conflict on water distribution between WUAs.

The second issue is that WUAs are not allowed to form federations along the main canals. The state Water Management Organizations (WMOs) and local governments are strictly guiding WUA Chairmans on daily operations. The daily water distribution decisions are made at the office of district governor (hakim in Uzbek). There is no viable role for WUAs to cooperate and come up with arrangements with each other. As results WUAs along the same canal not cooperate with each other rather compete for water. Therefore, the message to the IWRM plan developers is that the new legal system under IWRM should have reflect the need for hydrographic borders for WUAs and provide scope for WUAs federate along the main canals.

The de-collectivization has resulted in different socio- political situations and led to the formation of different interest groups in the area. There are at least three different groups of farms in rural Uzbekistan (Trevisani. 2007). The first group of farms are under state quote, growing cotton and wheat for the state with 10 to 20 ha of irrigated land, the second group is growing more commercial crops, such as rice, vegetables and fruits with land sizes around 1 ha and less. The third group is smallholder landowners which grow mainly crops for the subsistence of their livelihoods. However, some time state quota farming also may grow rice and he may have a smallholder land in their backyard (Veldwisch. 2008). The social differences in grass root level in study WUA have not yet been realised as strong as it has in societies with strict social stratification. However, the different groups started to apply for getting access to the different resources, including for water. For example, the farmers with larger irrigated land and higher incomes are buying diesel or electric pumps for organizing irrigation of their fields. Although they do allow neighbouring fermers and smallholders but only if they pay for the cost of operation of the pump. The smaller land owners and weaker groups are not represented in WUA structures at present. The standard bylaws of WUAs establish membership on the base of land ownership, only heads of the registered farm units can become a member. However, most of medium (up to 1 ha) and smallholder (less than 0.5 ha) are not registered as farm units. This already created inequality and WUA is not representing all water user of the area. Therefore, it is very important to have mechanism for inclusion of the small farming units and water uses for other purposes, lakes- fishing, construction (brick making) and the households who depend from the irrigation network for their water for daily uses (drinking purposes, etc.). In study WUA there are three lakes where people cutches the fish, many families are using the irrigation network for household use. However, they were not members of WUA.

The positive changes at the grass root level was that the collective actions of water users are emerging - they do joint pump management, take care of maintenance of the irrigation and drainage network of their location, and act as a group for acquisition of water for their area through social activities. They use irrigation and drainage infrastructure, technologies such as use of pumps, re-fixing of the water regulation gates, etc. This could be a potential option for strengthening of WUAs, the water users at the different channels of WUA forming collective action groups for short periods, until they get water intro their areas. Carefully planned social mobilization activities by WUA management may help to turn this temporary collective action into more systematised water users groups (Abdullaev *et al.* Forthcoming).

The WUA also trying to get out from the situation they are at present, one of such attempts is to assign the pumps to the individual farmers. The operation and maintenance of the pumps, especially payments for electricity use was heavy burden on WUAs. 10 pumps, formerly owned by WUA were assigned to the cotton-wheat farmers who have access to the state credits and subsidized inputs. When pump was belonging to the WUA, the cost of pumps was evenly distributed among the members- large farmers, the smallholders have not paying for the cost of pumping. The large farmers were charging their costs on pumping against state credits paid for the cotton or wheat. However, in

most cases the payments were delayed and WUA was fined for non-payment.

The assignment of the pumps to the individual farms helped WUA to reduce debt from Electricity Company and led to the formation of water users groups around the "privatized" pumps. Although this was positive for short run in long run may result inequality to the access. For example, pump owners started disconnect non-payers from the pump. If we consider that 75% of irrigated lands need pumping of water (BUIS.2008) then most of smallholders also depend from the pumping. Most of the smallholders have not enough economical means to buy pumps and pay full cost of the pumping from farmers pump. Therefore, "privatization" of the pumps and other assets of the WUA to the individual users although economically sound should consider potential social consequences.

3.2.2 Responses of water users on water situation at the grass root levels

During the field research authors have conducted series of surveys with different water users (farmers, smallholders and non-irrigation water users). In total 50 fermers, 10 smallholders and 10 non-irrigation water users were interviewed in each of study WUAs. In this report authors present the responses from farmer group (both cotton-wheat and commercial). The respondents were selected from head, middle and tail of the secondary canal which feeds WUA. Therefore, responses of water users are also analyzed according their location. The responses are presented in % from the total number of water users interviewed in the each reach of the canal.

The first question, which will help shed a light on water situation with WUA is "did you get enough water this year (2008)?" Survey results indicated that 20% of the respondents at the head of the canal responded positively top this question, at the middle of the canal 18% and at the tail end only 3% of the respondents got enough water for the irrigation (table 3). This was mainly related to the overall water scarcity of the season[4] and the fact that the WUA located at the tail end of the irrigation system. However, the survey results quite clearly indicate the difference on getting enough water between different reaches of the canal. There are clear head-tail differences on water distribution.

The next question respondents were asked was about the reasons of not receiving enough irrigation water – "Why do you think you could not receive enough water?" The respondents have given 7 choices to tick. The choices were identified during the joint problem identification workshop, organized for the WUA area, 67 farmers and other water users, staff of WUA have participated in group works to identify major water problems and reasons for water shortage in the area.

Most of the respondents located at the head of the canal have indicated that they do not know reasons for not receiving enough water, 9.8% of them indicated that water distribution inequity, timeliness and time of water release as main reasons for the problem (table 4). In the middle reach, the respondents have indicated as major reason for not receiving enough water timeliness and scarcity of the water in the river.

Only 7.8% of the respondents at the head and 5.9% at the middle have indicated as reason for not receiving enough water the problem of water delivery to the WUA. Strikingly, 56.9% of the tail end water users have indicated this as main reason of the problem. This response indicates that the tail enders are more concerned with water inflow into WUA and they expect that more water would give more chances to them get enough water for their irrigation needs.
The concern over water distribution equity in the WUA canal was reflected in the 9.8% of head, 17.6% of middle and 11.8% in the tail end respondents. This again confirms message that the tail enders perceive that even more equal water distribution will not increase water for them. The head located water users are not too much concerned with water distribution equity.

The survey had questions on assessing the WUA performance, respondents were asked to grade performance on WUA. They were given 5 choices to assess the WUA performance: bad, not good, satisfactory, and good and not to give any response

Table 3. Did you get enough water this year?

LOCATION OF WATER USER ALONG THE SECONDARY CANAL	RESPONSE FROM WATER USERS	PERCENT	VALID PERCENT
Head	yes	20	20
	no	80	80
	Total	100	100
Middle	yes	18	18
	no	82	82
	Total	100	100
Tail	no answer	3	3
	yes	3	3
	no	94	94
	Total	100	100

(I don't know). The respondents located at the head of the canal have given 40% good and 60% satisfactory rate for WUA performance (table 5). At the middle good rate was 45.5%, satisfactory 36.4% and not good 9.1%, the same % of have responded as they do not know.

At the tail end, the good rate reduced to 32.4%, satisfactory was 50%, not good rate was 14.7% and bad rate was 2.9%. In all reaches more than 80% of interviewed water users have rated WUA performance in average satisfactory or good. This may be linked to the fact that WUA management has been trying very hard to bring some water during the whole season. Therefore, the water users when they were asked to rate WUA performance they have assessed the efforts of the WUA but not results.

3.2.3 Socio- technical nature of water management at the grass root level

Participation in the daily water management practices and close observation of the water management have helped to understand those of strategies water users, WUA managers apply during the irrigation season. Following were few of those strategies observed in study WUA:

- WUA Chairman, through his relations in the local government was able to get the appointment of someone from high ranks of the WMO as a *vakil* (representative of province or district governor) for his area. Consequently, the *vakil* who is responsible for all agricultural operations in the area, starting from sowing until harvesting, was pushing all WMO staff hard to guard and deliver water to the WUA where he is vakil.

- WUA chairman and other local authorities use their links in Electricity Company to switch off the electricity during the peak time for the water demand. Due to the absence of electricity, pumps above the Ashirmat WUA did not work and water reaches Ashirmat WUA for irrigation.

- When water at the tail-end of the canal became so scarce that it threatened the yield of the farmers, they collectively appeal to the governor to help and a pump was installed at the biggest collector to deliver drainage water to the tail-end farms.

- People of villages irrigating their *tomarkas* (smallholder) blocked the water flowing to other areas and women guarded these blocks. The women aggressively defended the water from others. Men cannot force women to

Table 4. Why do you think you couldn't receive enough water?

LOCATION OF WATER USERS ALONG THE SECONDARY CANAL	ENOUGH WATER WAS NOT DELIVERED TO THE AREA OF WUA	WATER WAS NOT DISTRIBUTED EQUALLY WITHIN CANAL?	WATER WAS NOT DELIVERED IN TIME?	WATER WAS DELIVERED BUT IRRIGATION TIME WAS NOT ENOUGH	WHEN THERE WAS WATER PUMPS WERE NOT WORKING	NO WATER IN RIVER	I DON'T KNOW
Head	7.8	9.8	9.8	9.8	7.8	7.8	47.1
Middle	5.9	17.6	21.6	19.6	13.7	21.6	0.0
Tail	56.9	11.8	3.9	2.0	2.0	2.0	21.6

Table 5. What do you think how WUA performs?

LOCATION OF WATER USER ALONG THE TERTIARY CANAL	INDICATOR	PERCENT	VALID PERCENT
	satisfactory	60.0	60.0
	good	40.0	40.0
Head	Total	100.0	100.0
	I don't know	9.1	9.1
	not good	9.1	9.1
	satisfactory	36.4	36.4
	good	45.5	45.5
Middle	Total	100.0	100.0
	bad	2.9	2.9
	not good	14.7	14.7
	satisfactory	50.0	50.0
	good	32.4	32.4
Tail	Total	100.0	100.0

open/close offtakes (ethnically in Khorezm and elsewhere in Uzbekistan a man cannot use force against women who are not his relatives).

Above examples are showing that a variety of strategies, such as relationship with local governor, use of electricity blackouts and non-violent social pressure were applied to get access to water by individuals and groups of people. There are frequent interferences by local governments at the grass root levels due to the fact that water users involve them through different means. Although the administrative interference at the study WUA was effective on short run it may become a negative incentive towards developing viable WUAs. The water users during the interviews and problem identification workshop have been grading local governor as an institution which deals with water management.

4 Conclusion

The IWRM diverse and a political process, and a concept in search of constituency (Mollinga, 2007). The forms of integration are not always

tangible, but at any given time, are only realised through linkages between pre-existing activities across decision-making arenas. This requires replacing ideological approaches with 'strategic action' approaches that acknowledges the inherent political character and plurality of actors, institutions and objectives of water management (Mollinga, *et al.*, 2004). Therefore, authors in this paper tried to shed a light on on-going developments in water management at the former collective farm level.

The post soviet changes in agriculture sector result on increasing of numbers of individual farms, although state has still strong control over the water management, this case study shows that there are new set up emerging at the grass root level. The different groups of the water users and other players apply different means to get access to the irrigation water. In long run this tendency may result social differentiation and most powerless groups may be affected.

The research has helped to understand major issue or problems WUAs face in Uzbekistan. One of the problems WUA are facing is the absence of the platform for coordinating of water efforts at the main canal level which would help to produce more. There is convincing success in water management, in the Ferghana region of Uzbekistan, where such federations were allowed (Abdullaev *et al.* 2008). It is obvious from the case study that the WUA are malfunctioning at present. The institutional analysis of study WUA has helped to highlight problems which WUA currently facing. The solution of the problems highlighted in this research requires more strategic steps to be taken, e.g., update on water law, introduction of WUA law, which describes role and status of WUAs in water management system. Therefore, required action plan can become part of the IWRM plan for the country. Unfortunately, in elsewhere in the world the complex social and political processes on water management at the grass root levels, where interaction of many different players are taken place (Saravanan. 2008) have largely been ignored. As result, poor farmers and smallholders has been also limited on their access to water which is the crucial resource for their livelihoods. There is great chance to avoid this at least in Uzbekistan and elsewhere in Central Asia through better understanding socio-technical aspects of water management at the grass root level and integrating required policy decisions into the IWRM plans.

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Endnotes

1. For details see http://www.ucc-water.org/
2. For details see http://europeandcis.undp.org/environment/show/3D2B761C-F203-1EE9-B438534DF68252D7
3. For details see http://www.adb.org/Water/WFP/basin.asp
4. Information on water situation is available at http://www.cawater-info.net/amudarya/index_e.htm

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