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DRAINAGE MANAGEMENT ISSUES IN UZBEKISTAN

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ABSTRACT

The article deals with the issues of the impact of melioration on agricultural lands. The melioration conditions of the lands of the regions of Uzbekistan are analyzed. Practical recommendations for increasing farmland with the help of optimal management are given.

KEYWORDS

Basin Irrigation Systems Authority, State Water Special Contract Unitary Enterprises, Hydro-Geological Ameliorative Expedition, Republican Irrigated Land Amelioration Fund, Office of Governor, Ministry of Agriculture and Water Resources, Ministry of Finance, Water Consumers Association

Introduction

Uzbekistan is a landlocked country with an area of 447,400 km^2, larger than most Western European countries, and comprised largely of desert or semi-desert. The population was about30 million in 2013, over 60% of whom live in densely populated rural communities. Administratively, the country is divided into 12 regions and one autonomous Republic of Karakalpakistan. With an educated population and a growing young labor force, it has significant economic potential in the Central Asian republics (United Nations 2008).

Uzbekistan's climate is continental, with hot, dry summers and short, extremely cold winters. According to the regional hydro-meteorological station, the annual evaporation rate, for example, in Bukhara (about 1,600 mm), greatly exceeds the annual rainfall (about 150–200 mm). Thus, large-scale irrigation for cultivated crops is essential for agriculture.

Contributing to 19% of overall gross domestic product (GDP), agriculture still remains an important sector for the Uzbek economy and, most importantly, provides almost 40% of the rural population with employment (World Bank 2013). As a result of the country's arid climate, almost all agriculture depends on irrigation. About 97% of crop production is carried out on irrigated land. There is an estimated 4.2 million ha of land suitable for irrigation, a figure significantly larger than in other four Central Asian republics (0.77 million ha in Kazakhstan; 0.42 million ha in Kyrgyzstan; 0.72 million ha in Tajikistan; and 1.73 million ha in Turkmenistan).

Cotton is the main cultivated crop in the country. Uzbekistan ranked 5th among ninety cotton-growing countries and 2nd largest exporter in the world (Djanibekov et al. 2010). Additionally, wheat is considered to be essential to achieve food security and is the second largest irrigated crop. Other significant irrigated crops include grains (corn, barley, rice and oats), fodder crops, and fruits (grapes, apples) and vegetables (potatoes, tomatoes). As of end-2013, around 43% of cultivated land is devoted

for cotton, about 37% for grains (including wheat), 17% for fruit and vegetables, and the remaining for fodder crops (e.g. alfalfa, barley, maize).

It is important to note that during the Soviet era (1920-1991) large-scale irrigation schemes were constructed to cultivate agricultural crops (mainly, cotton) in order to secure Soviet Union's "cotton independence". Consequently, farming was predominantly linked to cotton production, which required intensive labor work force and application of irrigation water. Production plans of the established *kolkhoz* and *sovkhoz* farms, as well as the product prices were set by the state (Trevisani 2010). Even after its independence from the Soviet Union, Uzbekistan has retained the system of state planning for main agricultural products: cotton and wheat. Local governments regulate the production outputs and in the beginning of each vegetation period (April to September) calculate a minimum amount that farmers need to produce. In the case of cotton, the state is the main buyer of the cotton production. In the case of wheat, farmers must deliver a quota to the state and are free to sell the rest in the market. The main idea behind this strategy is that the cotton serves as "cash crop" and wheat is to achieve "food security".

Methods and Analysis

The main focus of the present analysis is to understand how drainage canal maintenance (nature-related physical transaction or action) is organized in the irrigated agriculture of Uzbekistan. More particularly, "an activity of removing weeds and silt from the canal (i.e. maintaining drainage canals)" will be taken as a transaction, for example, as it may have positive or negative effects on other actors. For example, carrying out drainage canal maintenance may improve the quality and quantity of water for users located downstream of the canal as well as the rivers. By contrast, leaving removed trash alongside of the canals, which is a regular practice in Uzbekistan, may have a negative consequence for local residents. Furthermore, odor and noise caused by maintenance activities may cause environmental problems as well as disturbances for locals residing in the vicinity. Specifically, this particular transaction may directly or indirectly affect actors such as farmers, local households, and the state who is interested in crop yield increase, particularly in cotton and wheat (Table 1).

Table 1: Potential transactions involved in the activities of drainage management

Transactions	Involved actors
Identify possible areas for maintaining drainage ditches	Expedition ↔ BISA ↔ *Khakimiyat*
Determine which ditches need to be maintained	Expedition ↔ MAWR ↔ Fund ↔ MinFin
Establish contracts for maintenance	Fund ↔ DUK
Carry out canal maintenance (remove weeds and silt)	**DUK ↔ Farmers ↔ WCA ↔ BISA**
Transport weeds and silt to landfill areas	DUK ↔ Farmers ↔ WCA

Source: Own illustration.

It is important to specify the characteristics of transactions and their influences on drainage performance. Hagedorn (2002, 2008) suggests that properties of nature-related transactions resulting from attributes of an existing production system (asset specificity, frequency, and uncertainty) as well as a particular ecological system (modularity and functional interdependence, excludability, rivalry, separability, complexity, measurability, irreversibility, legitimacy, heterogeneity, and variability) have

to be taken into account in the analysis. Definitions of the individual properties of relevant transactions, based on Hagedorn (2002; 2008) and Thiel et al. (2013), are provided below:

Asset specificity: this is related to an individual transaction. In the context of natural resources, asset specificity requires a specific site, capital and knowledge investments to realize specific transactions.

Frequency: this means to what extent a certain transaction takes place relatively frequently or not. Hagedorn (2002) clarifies that, in socio-ecological systems, most transactions occur with relatively high frequency. For recurrent transactions, transaction costs are distributed over many transactions and can be saved due to learning effects, economies of scale/scope and trust. As a result, with high frequency transactions it "is easier to invest in specialised governance structure[s]" (Hagedorn 2002:6).

Uncertainty: this refers to the degree of certainty about the characteristics of specific transactions (affected actors, costs and benefits) and is related to whether it is difficult for actors to define transaction partners as well as costs and benefits.

Modularity and functional interdependence: these are the key dimensions related to different types of nature-related transactions. The assumption is that physical systems are subject to social construction and that humans decompose these complex and interconnected systems into modules. Yet an inappropriate modularization can result in unnecessary transaction costs. Thus, the questions of how a module can be defined in terms of physical transactions or governance arrangements and how the boundaries of modules are delineated are important.

Excludability: this is the extent to which actors can be prevented from obtaining benefits from a specific resource, based on the mechanisms and costs of exclusion from access to natural resources and environmental goods within given technological boundaries.

Rivalry: the degree of rivalry between actors regarding a particular resource implies the level and scale of social dilemmas they may face. It also influences society's incentives to overcome such social dilemmas in coordinating common pool resource management solutions.

Separability/jointness: this refers to the possibility of distinguishing which individual transactions cause which outcomes and implies whether a transaction can be separated from other transactions in order to analytically establish a transaction–outcome relationship.

Complexity: this refers to the degree to which a transaction is complicated, meaning that it is difficult, impossible, or costly to identify transacting partners and costs and benefits, which are often difficult to clearly identify those factors within natural-resource contexts due to the complexity of the causal relationships of ecological systems. This may result in a high probability of opportunistic behavior requiring coordination.

Measurability: this means whether the costs and benefits from a certain transaction or activity can be identified, assessed and measured with regard to all transacting partners. This often depends on the availability of necessary technology and knowledge to identify such costs and benefits.

Irreversibility: this refers to whether the outcome of a transaction can be reversed or not. Irreversible transactions imply a need for greater attention and coordination.

Legitimacy: this relates to whether a transaction is "compatible with the normative views of actors and groups concerned by or even involved in the decision making and implementation activities" (Hagedorn 2002: 8).

Heterogeneity and variability: this refers to the spatial and temporal dimensions of a transaction ("site and situation specificity"). The effects of transactions and their related costs and benefits depend on specific spatial and temporal dimensions.

The main focus of this analysis is to understand how drainage canal maintenance (a nature-related physical transaction) is organized and what kinds of transactions it involves. The following section operationalizes properties of this transaction that are relevant to this work.

Since the drainage canals pass by farmers' and households' fields, where the exclusion to access it quite difficult but, at the same time, depending on drainage canal capacity there may be a strong rivalry among its users, we may consider it as a typical common pool resource. The empirical studies outlined here corroborates this theoretical assumption, indicating the *difficulty of excluding* non-contributors involved in the maintenance, due to the social and natural structure of the canal. A drainage canal at the on-farm level has been traditionally under the management of farmers, with each farmer able to withdraw resource units (i.e. water) and benefits from its consumption in the case of water scarcity. Although it is possible to sanction free riders, it has not been very feasible, as it involves relatively high transaction costs, such as coordinating and monitoring of individuals who do not comply with local rules. Since the infrastructure's capacity is finite, there is a *strong rivalry* among different resource users to benefit from its use. Naturally, the transaction of cleaning such a drainage canal requires some knowledge, site, and capitally fixed, that is asset-specific, investments (machinery). Generally, cleaning drainage ditches is *moderate in frequency* because of the recurrence and seasonality of the transaction. It is relatively *certain* that carrying out drainage maintenance would result in improved water quality and quantity to local farmers and households. This particular transaction is *non-separable* due to the *jointness of the production* as no other additional activities or actions are involved at the intermediate level, as removing weeds and silt from drainage canals is directly related to the dilemma of cooperation.

Traditionally, elderly and respected people would call for community labor mobilization (*khashar*) to collectively remove weeds and silt, using gardening tools, such as hoes, shovels, spades, rakes and trowels. However, the recent change in reforms and implementation of the Republican Irrigated Land Amelioration Fund to invest in local drainage indicate that most drainage canals require physical capital (such as an excavator or bulldozer) to remove weeds and silt, an aspect of the *complexity of the system*. The State Water Special Contract Unitary Enterprises (DUKs in Uzbek) organize these activities under state financing (Picture 1). The timing of maintenance is determined by the Fund and usually does not depend much on great mobilization of human labor, as the rented machines sufficed to do the job. Generally, *variability* in terms of the timing of the transaction is quite low. It can be said that this particular transaction is *non-heterogeneous* in terms of spatial variation, meaning that drainage canal maintenance has no major implications for wider ecosystems. Additionally, the costs and benefits emerging from maintenance are *measurable*, meaning that they can be identified and evaluated. During times of water scarcity, water is lifted using electrical pumps for irrigation using drainage water. As a result, this particular transaction is also *reversible* but bears certain costs, as the users can benefit from alternative sources, such as irrigation canals. Since resource system is complex and very difficult to divide into different modules, it can be classified as having a relatively high degree of *modularity and decomposability*. Finally, due to the state intervention in drainage management, the state has more *legitimacy* to sanction various actors in accessing the drainage canals, when necessary.

Picture 1: Excavators belonging to the State Water Special Contract Unitary Enterprise (DUK) in Bukhara undertaking drainage maintenance activities

Drainage benefited from massive investment during the Soviet era (Bucknall et al. 2003). Since declaring its independence from the Soviet Union in 1991, the situation in the country has worsened considerably, meaning that investment in drainage declined (Dukhovny 2007). Maintenance has been repeatedly postponed, and many drainage systems have reached the stage of advanced decay. As a result, most areas suffer from salinization and waterlogging.

During the Soviet era, due to the overarching political objective of boosting the Soviet Union's economy, the Ministry of Land Reclamation and Water Resources of the Union of Soviet Socialist Republics (USSR) became involved in the expansion of irrigated areas. As a result of this expansive policy, an additional 3 million ha of land came under irrigation. As such, by 1990, the total irrigated lands of Uzbekistan accounted at 4.2 million ha (Khamraev et al. 2011). Dukhovny (2007) reported that the expansion of irrigated areas and the intensive irrigation water use for crop production during USSR led to the emergence of salinization issue. Thus, large-scale irrigation projects were concentrated on drainage-irrigation-reclamation development. By the beginning of the 1990s, almost 2.9 million ha of irrigated lands in Uzbekistan were connected to drainage systems (*ibid*).

Due to the decline in investment in irrigation projects after the break-up of the Soviet Union, national governments as well as local farmers were unable to sufficiently invest in drainage management. Unlike in the irrigation systems where the state water agencies continued to invest in inter-farm irrigation canal management but less investment in on-farm irrigation canal management by farmers, in the drainage system both inter-farm and on-farm drainage ditches received almost no attention. As a result, the conditions of drainage canals were in poor situation. UNDP (2007) study assessed the maintenance level of the drainage infrastructure throughout Uzbekistan and concluded that more than 50% of ditches require reconstruction or repair.

Deterioration of drainage infrastructure resulted in widespread soil salinization and waterlogging. For example, Bucknall et al. (2003) have reported that the problem of soil salinity is particularly acute in the areas closest to the Aral Sea, meaning that about 90-94% of the land in the Karakalpakistan, Khorezm and Bukhara regions of Uzbekistan is salinized to varying degrees. Moreover, salt content in drainage water in those areas may reach up to 6 g/l (UNDP 2007).

Since independence, a lack of maintenance of the irrigation and drainage network, application of excessive water by farmers and water shortages caused both by drought and the redirection of water

resources to hydroelectric power generation have caused a decline in land productivity and increased in the salinity problem.

Despite scale of works growing with years, a meliorative condition of the irrigated land is a big concern. From all volume of the irrigated land about 50 percent are salted in various degrees, and about 19 percent is oversalted, over 23 percent concerns a category of the land with low bonitet (low soil saline). A big part of the land with an unsatisfactory meliorative condition is in the Republic of Karakalpakstan, Khorezm, Bukhara, Dzhizak, Sirdarya, Ferghana and other areas of Uzbekistan.

Prior to the reform, about 338 thousand in hectares (8 %) of irrigated land in Uzbekistan were in unsatisfactory condition due to poor management of irrigation and drainage networks, including about 258 thousand hectares (6 %) due to high levels of subsoil waters (bogging), soil salinity and high mineralization of subsoil waters, 271 thousand hectares (6,3 %) because of a lack of irrigation water and deterioration of an irrigation network.

The basic part of the meliorative-unsuccessful land is located in the Republic of Karakalpakstan (110,400 ha), Bukhara area (46,800 ha), Kashkadarya (30,600 ha), Syr-Darya (43,600 ha), Ferghana (20,200 ha) and Khorezm (28,600 ha).On the balance of Operational Water Economic Organisations under MWAR, there was in total 40,5 thousand in km of meliorative system, including 31,6 thousand in km of open collectors and 8,9 thousand in km of the closed horizontal drainage, from which unsatisfactory conditions were 11,2 thousand in km (35 %) and 1,8 thousand in km (20 %), respectively.

Also on the maintenance of Operational Water Management Organisations under MAWR there were 3345 units of meliorative wells, from which efficiency of 1325 wells was lowered twice, including 416 wells. In separate zones, 96 meliorative pump stations with 278 units, from which 24 units were maintained over the service life and require replacement.

On the balances of water consumers associations, there were about 71,5 thousand in km opened and 28,1 thousand in km of the closed horizontal meliorative network, from which about 23,5 thousand in km (32 %) and 6,7 thousand in km (23 %) were in unsatisfactory conditions.

Improvement of meliorative condition of the land, increase of their fertility was the major reserve and the defining factor of intensive development of agriculture.

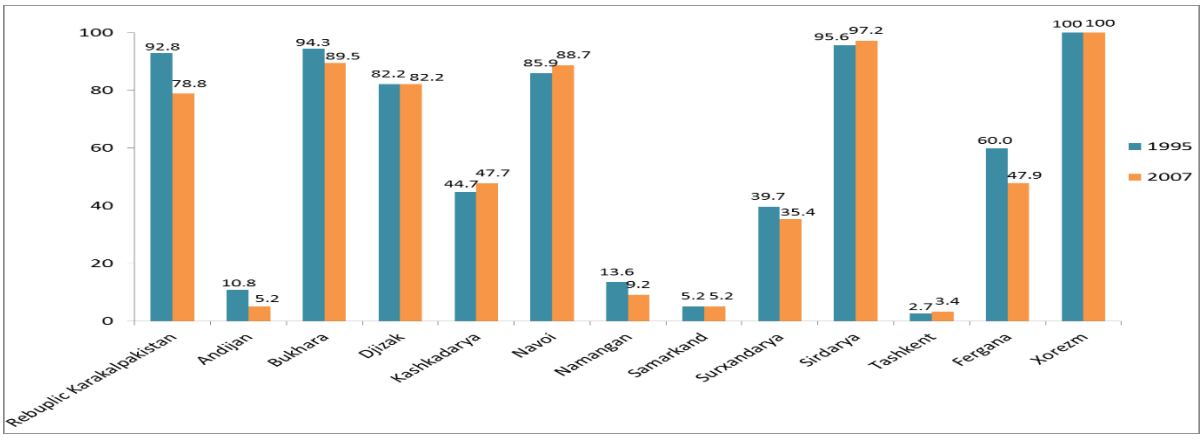

Figure 1: **Percent of soil salinity prior to the implementation of Melioration Fund in Uzbekistan, by region**

Source: MAWR.

Ecological and public health in rural areas of Uzbekistan was worsening, with 50% of fields suffering from soil salinity (Qadir et al. 2009) as well as high rates of asthma, cancers and the increase in infant

mortality particularly in the Aral Sea zone (Groll et al. 2013). The Uzbek government recognized that the main reason for these problems were the deterioration of irrigation and drainage systems. Bucknall highlighted that drainage systems were in worse shape than irrigation canals (Bucknall et al. 2003). Properly functioning drainage systems were required to improve agricultural fields that experienced high soil salinity and waterlogging issues.

The government took the first step of improving the drainage systems with the Cabinet of Ministers' Decree No. 3932 dated on October 29, 2007 through the establishment of the Republican Irrigated Land Amelioration Fund, which is allocated to the Ministry of Finance (MinFin) for maintaining and rebuilding large scale inter-farm drainage systems (big canals, big drainage systems and big pumps) as well as pilot-testing in some regions to clean, maintain and rehabilitate drainage canals managed by local water consumers associations (WCAs). In accordance with the Decree, the main source of channeling money should come from: i) the single land tax paid by the rural individuals producing agricultural products; ii) state funds; iii) privileged credits from international financial organizations and international banks; and, iv) various national and international grants. The total amount of the fund exceeded UZS 750 billion (or more than US$400 million) for the period of 2008-2012 (data received from the Ministry of Agriculture and Water Resources of Uzbekistan in 2013).

During this timeframe: 1) about 1.2 million ha of irrigated land's ameliorative conditions were improved; 2) severely and moderately salinized irrigated lands were reduced by 81,000 ha; and 3) contaminated groundwater tables were reduced to an acceptable level in 0.8 million ha of irrigated land throughout the country (*ibid*).

The follow-up program on the improvement of irrigated agricultural fields with reference to drainage systems was approved on the 19th of April 2013 with the President's Decree No. 1958 for the period of 2013-2017. Moreover, the Cabinet of Ministers' Decree No. 39, approved on 24th of February 2014, provides specific tasks to be undertaken during the program implementation. Using its centralized budget, the state is active in investing fund in the maintenance and rebuilding of drainage systems, including at the on-farm level.

According to the Ministry of Agriculture and Water Resources (MAWR) of Uzbekistan representative, "drainage canals should have been cleaned and maintained by farmers at the on-farm level. However, since farmers failed to do so, the quality of most agricultural lands had started to deteriorate. Some lands had been abandoned. Presently, through the Republican Irrigated Land Amelioration Fund the state is financially supporting drainage canal maintenance". Box 1 provides a detailed description of the process with drainage management.

Box 1: A process of drainage maintenance in Uzbekistan

Each region (*Oblast* in Russian) has Regional Hydro-Geological Ameliorative Expedition with district-level representatives on the ground. The district-level expedition carries out field visits twice a year (e.g. April and October) to identify possible areas for cleaning drainage systems and submits application with the signature of local district governor to the regional office. The regional expedition defends its application at the Republican Irrigated Land Amelioration Fund. Then, with the decision by the Fund's Council, the Fund will allocate money starting from the new Calendar Year.

Once the decision on cleaning particular drainage ditch is done, the Fund initiates the maintenance of the selected ditch through regional/district-level State Water Special Contract Unitary Enterprises (DUKs). Local interviews with farmers' groups revealed that WCAs do not pay for cleaning drainage ditches to the DUKs but informally, provide food (lunch or dinner) for the driver of the machinery.

It is important to note that not all drainage canals are included into the Fund's program. It is decided in the Ministry of Finance depending on number of applications received and the available budget. WCAs and local households are formally still in charge of maintaining drainage systems at the on-farm level. If the association is successful for including its territory to the Fund's program, then, it might have potential benefits of improving crop productivity and rural income.

In terms of the organizational structure of the Expedition, at the regional level, they are monitored by the Basin Irrigation Systems Authority (BISA). However, they directly report to the division of Land Amelioration, which is functioned under the Department of Water Resources at MAWR. Apart rom drainage aspect, the Expedition is in charge of conducting field-level soil analysis to determine the amount of water for leaching

According to Decree No.3932 for 2008-2012, more than 3,144 km of main, inter-district and inter-farm collectors were planned to construct and reconstruct whereas 62,784 km of drainage networks were planned for maintenance.

The size of the state investments into activity of Fund of meliorative improvement of the irrigated lands annually grows. Figure X below shows the increase of state investments in drainage managements.

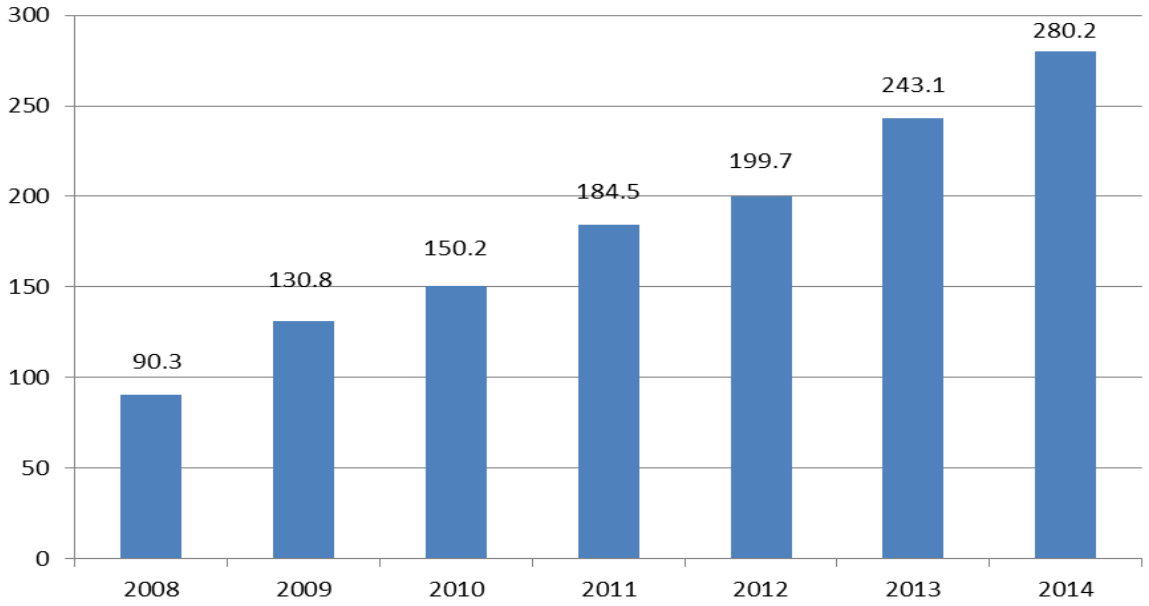

Fig. 2. Dynamics of the Fund budget for 2008-2014.

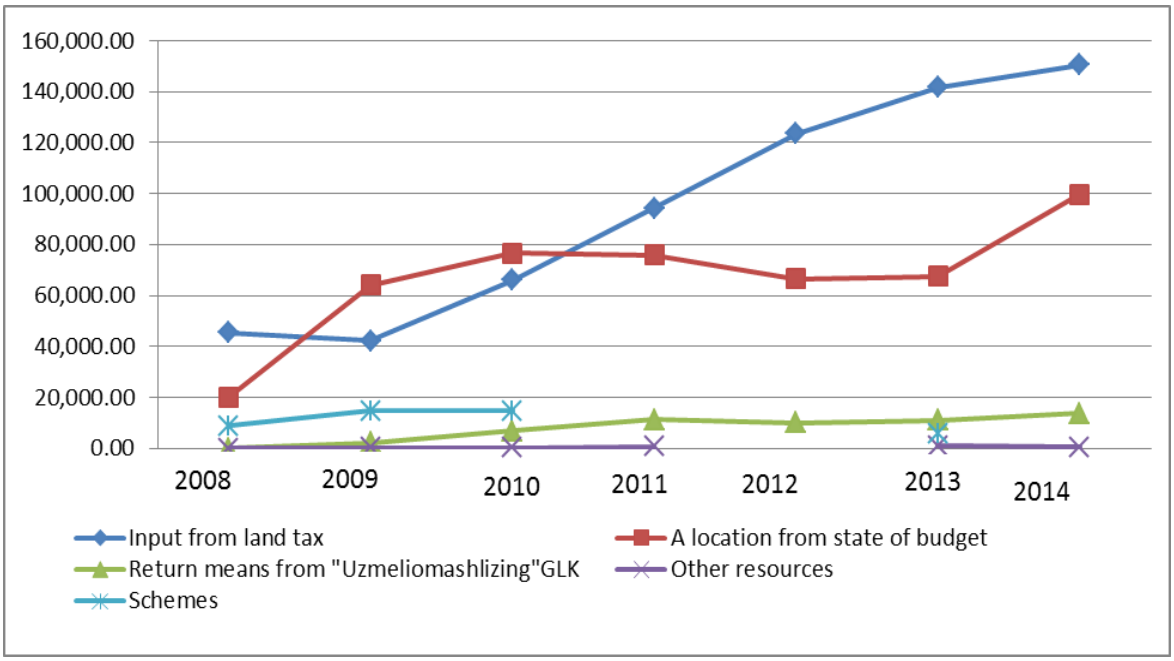

Fig. 3. Different sources of financing the Fund activities (2008-2014)

Considering the fact that the country loses US$ 1.7 billion annually (or about 8% of GDP) due to inefficient water resources management, and the annual decrease in agricultural production is esti¬mated to be in the order of US$ 2.0 billion according to various estimates it is hoped that the efforts spent under this program will be a base and a starting point for the creation of this strategy (UNDP).

As part of this study, the on-site researcher conducted interviews with experts working in the area of irrigation and drainage management in Uzbekistan. In particular, the head of Dispatcher Fergana Main Canal, representatives of MAWR as well as MinFin, and an expert from the Irrigation and Water Problems Research Institute under the Tashkent Institute of Irrigation and Melioration (former SANIIRI) during May-November 2014. In total, five experts were interviewed. This section is mainly based on their perspectives and the data they provided regarding the drainage management reforms.

According to the head of Dispatcher Ferghana Main Canal, for instance, the Fund was established under the MinFin to improve drainage systems including at the on-farm level. It does not maintain some parts but, systematically the whole part of a drainage canal. The interview with a representative of the MinFin corroborated this statement highlighting that the Fund is targeting towards systemic approach, meaning that if annually 240-250 projects are carried out in the country, the Fund is trying to cover the whole system of on-farm and inter-farm drainage canal maintenance.

During the interviews, it was mentioned that farmers do not pay for maintenance but if some farmers offer food for drivers of agricultural machinery, that is generally appreciated. At the moment, however, there is no mechanism regarding who shall continue with maintenance once DUKs maintain and clean those canals. There is a general understanding that WCAs should take over maintenance responsibility after it has been maintained by state funding.

Meanwhile, there were few criticisms regarding the performances of drainage maintenance. For instance, SANIIRI expert reported that generally, by May 15 of each year, districts and regions should prepare a plan for maintenance. These plans were mostly done by expert views and not the real measurements or scientific proof. According to the expert, “the Fund officials think that if a certain place is cleaned, it will have definite impact. But that is not the case always”. Moreover, the expert highlighted that “MAWR has Hydro-Geological Ameliorative Expedition in each region and district. They should establish a monitoring system to observe how the situation is changing during the implementation of drainage canal maintenance, meaning that how it was before and how it has changed overtime. They take some small parts of the channel, clean it, and after harvest in the nearby, they measure the effectiveness with slight higher yields. However, there is not scientific prove or effectiveness of this work yet. There should be a clear mechanism to prove that this initiative works perfectly and the investment improves socio-ecological and economic status in the vicinity. The Fund conducts systematic cleaning without measuring its effectiveness”.

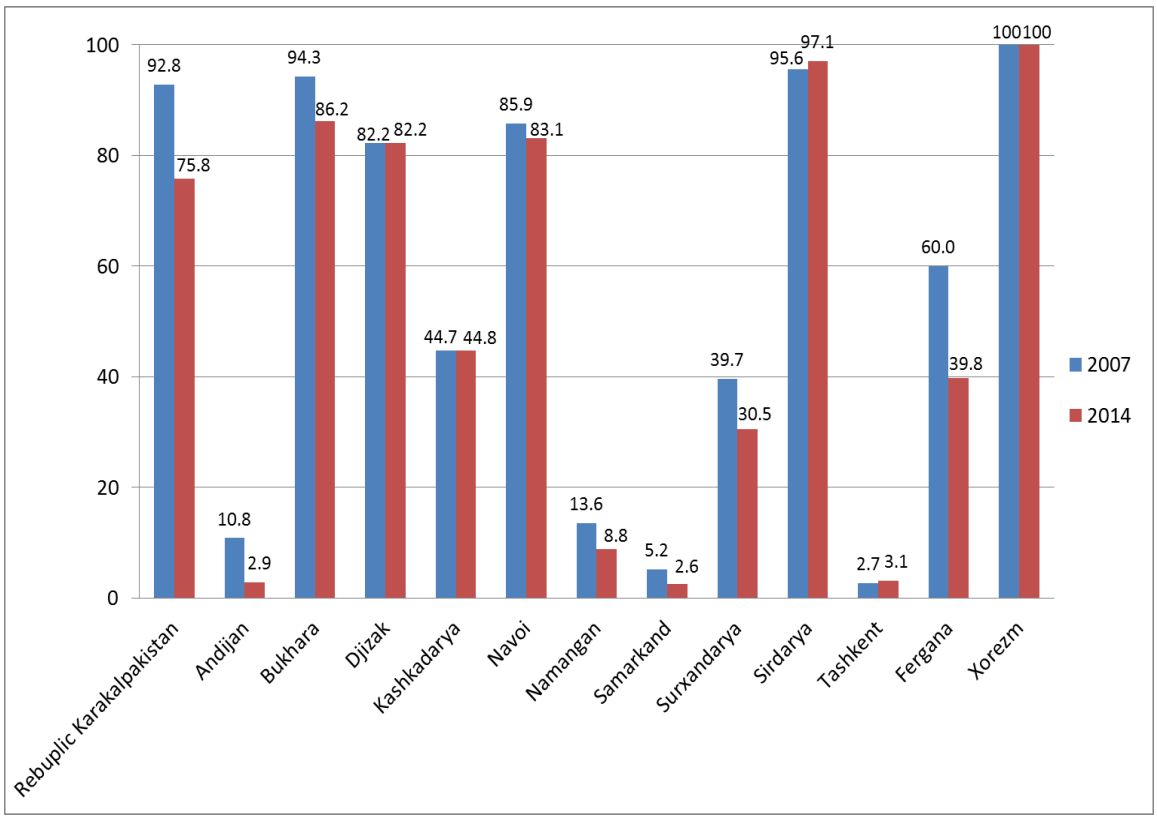

Fig. 4. Percent of soil salinity after the Fund implementation, by region

According to the UNDP (2010) analysis, the Fund has paid little attention to "softcore components" that are listed in its mandate. This is because it has little or no capacity to address these activities despite having a mandate to do so. Predesign survey has been carried out by experts of Hydro Ameliorative Expedition who reiterated that the absence of qualified educated personnel and lack of sufficient experience in state melioration organizations do exist. The same problems exist in project design organisations.

Another factor affecting the quality of the design process, hence the financial aspects is the unbalanced distribution of the workload during the year. This is exacerbated by short deadlines.

SANIIRI identified 20-30 years ago optimum periods for constructing I&D networks during vegetation and non-vegetation seasons. However, irrigation and drainage network's mode of operation has been altered due to changes in the structure of crops. Therefore, now it is required to develop relevant regulations, which would enable to determine optimum time limits. The construction period established by the State Committee on Architecture and Construction is not applicable for land reclamation facilities either. The length of execution phase is to be defined following a tender procedure. In the former Soviet Union reclamation works were done within the period starting from August till December. Now a contractor is forced to start its activities straight after the tender, whereas climatic and environmental conditions may adversely affect the expected results.

Despite a big number of WCAs currently registered, the question of their sustainability is still of paramount concern. The majority of WCA's exist only on paper and are not able to provide any services to their members. The problems of WUA's are largely non-payment of membership fees, lack of required technical water management equipment, shortage of knowledge and skills of both management and members, and the persistent control/interference of local authorities into the water

distribution process. Farmers quickly form the opinion that the WCA is yet another quasi-government structure designed to extract money from them. The breakup of Shirkats into private farms has greatly increased the complexity of the WCA's tasks and they are struggling to carry out their role as intended. It is in the interest of the Fund to support and promote effective management of the WCA's in order to achieve its objectives. It is difficult to see how the Fund could achieve it's mandate without the active co-operation of well organized and effective WCA's. However, at present the Fund has no mechanism to provide support to WCAs.

It has the mandate to attract donor funding, but currently the Fund needs to organize this function and develop it in the future. The scope of work in rehabilitation is simply too large to be funded solely from the State budget. Donor funding is essential if the Fund is to carry out its mandate properly.

The biggest problem for donors is the absence of a standardized method of project appraisal where costs/benefits and social and environmental impacts of projects can be assessed and ranked on a comparative basis.

The main lack of existing system of financing of carrying out meliorative actions and maintenances of meliorative and water economic systems have been:

- Absence of direct dependence between system of financing and efficiency of actions conducted;
- Gap between the centralised financing of actions for radical improvement of the land and possibilities of economy on their rational agricultural development and use corresponding to increase of level of manufacture conducting;
- Distortion of self-economic indicators of the cost price, profitability of manufacture on the reclaimed land at the expense of granting means to economy, low rates of a loan payment, free use of natural resources.

As a result the selection of the most important and efficient objects of melioration was difficult. The situation created obstacles for the most efficient allocation of investment. The objective assessment of alternative options of the resources utilisation was absent, responsibility of the agricultural enterprises for efficient targeted use of assignments decreased.

Conclusion

According to the data from MinFin (2014), in 2006 highly salinized irrigated lands were accounted at 163,000 ha, whereas by 2009 the area with highly salinized lands has been reduced to 141,000 ha. In 2012, only 124,000 ha of irrigated land are under highly salinized land category. It can be seen that the reform has brought some improvements in land quality compared to prior to the reform implementation.

According to the interviewed experts, the regions that benefit the most from the drainage reform are Syrdarya, Djizzakh, Bukhara, Khorezm and Karakalpakistan. Moreover, since cotton and wheat are strategic crops, the government of Uzbekistan provides a subsidy to local farmers in the form of a tranche for growing these important crops, providing privileged credits at the start of each vegetation period to farmers who plant them. Thus, experts believe that the state is a main beneficiary from this reform. This is due to the fact that once drainage canals are maintained and the water quality as well as the quantity is improved, crop production will also improve. Since the state is a main buyer for cotton, it is obvious that the increase in yield results in win-win situation for the state. Of course, farmers' well-beings will also be improved with the increase in crop yields.

According to the statistics received from MinFin (2014), in the areas where land quality has been improved due to the drainage-cleaning activities, the yield was improved by 200,000–250,000 kg from 1 ha of cotton field and by 250,000–300,000 kg from 1 ha of wheat field.

In total for 2008-2014 on meliorative activities, it was allocated more than 1266,3 billion Uzbek soums. About 4914,7 km open and 640,0 km closed collector-drainage network, 164 units of meliorative pump stations, 1065 units of vertical wells have been reconstructed and constructed for 550,5 billion Uzbek soums. Besides, repair and restoration of 86365,0 km open and 5510,0 km of closed collector-drainage network with constructions, 6352 units of vertical wells, 233 units of meliorative pump stations for a total soums 534,9 billion Uzbek soums have been carried out.

In 2008-2014 the irrigated land reclamation fund allocated 180,9 billion Uzbek soums for improvement of material base of the water economic organisations, 1835 units of meliorative technics and mechanisms, including 721 units of high-efficiency dredges and 227 units - bulldozers have been acquired.

As a result of the executed activity, the meliorative condition of 740 thousand ha of the irrigated land have been improved and stabilised.

The share of the land with strong and average salinity in designed zones has decreased against 2007 by 129,6 thousand hectares and the share of "not salted irrigated land increased" by 19,6 thousand hectare.

Positive dynamics of decreasing in a mineralization of subsoil waters is observed. 860,7 thousand hectares of the land deduction of level of subsoil waters on optimum for agriculture production marks is provided and the area of the land with a mineralization of subsoil waters to 2-3 g/l has increased by 530 thousand hectares.

From the beginning of realisation of the Program the share of the irrigated areas with critical level of subsoil waters to 2 m is lowered by 397,4 thousand hectares. For example, in the Republic of Karakalpakstan (199,4 thousand hectares of the land), in Khorezm and (17,4 thousand hectares), Bukhara (44,2 thousand hectares) areas decreased in comparison to 2007.

The analysis shows that by 2014, on average cotton productivity increased by 1,2 % or 2 tons/hectares in the entire country. The same positive changes are observed in grain. So, in 2014 productivity against 2008 on wheat has increased by 3,4 tons/hectares and amounted at 55,0 centners.

The analysis of productivity of 8411 farms in which territory meliorative activity at the expense of Fund financing have been carried out illustrates that 56,2 % from them have achieved productivity growth of the cotton on average 2,0-3,0 tons/hectares. As, 5181 farms which are growing grain crops, have achieved productivity growth on average 5-17 tons/hectares.

Growth of productivity of grain in the farms of Andizhan, Dzhizak, Kashkadariya and Fergana regions, where meliorative activity has been carried out, amounted at 4,5 - 15,3 tons/hectares.

References

1. Bucknall, Julia; Klytchnikova, Irina; Lundell, Mark; Scatasta, Monica and Thurman, Mike (2003). Irrigation in Central Asia: Social, economic and environmental considerations. Europe and Central Asia Region, Environmentally and Socially Sustainable Development. Washington, D.C.: The World Bank, 40.

2. Djanibekov, Nodir; Rudenko, Inna; Lamers, John; Bobojonov, Ihtiyor (2010). Pros and cons of cotton production in Uzbekistan. Case study #7-9. In: Food Policy for Developing Countries: Case Studies (P. Pinstrup-Andersen & F. Cheng, eds). Cornell University, Ithaca, New York, pp. 13.
3. Dukhovny, Viktor; Umarov, Pulat; Yakuvob, Haldar; Madramootoo, Chandra (2007). Drainage in the Aral Sea Basin. Irrigation and Drainage 56: 91–100.
4. Groll, M, Opp, Ch, Aslanov, I (2013). Spatial and temporal distribution of the dust deposition in Central Asia – results from a long term monitoring program. Aeolian Research 9, 49–62.
5. Hagedorn, Konrad (2002). Institutional Arrangements for Environmental Cooperatives: a Conceptional Framework, paper published in: Environmental Cooperation and Institutional Change: Theories and Policies for European Agriculture. New Horizons in Environmental Economics. Cheltenham, UK, and Northampton, MA, USA: Edward Elgar.
6. Hagedorn, Konrad (2008). Particular requirements for institutional analysis in nature-related sectors. European Review of Agricultural Economics 35 (3), 357–384.
7. Khamraev, Shavkat; Dukhovny, Viktor; Kadyrov, Abror and Sokolov, Vadim (2011). Water resources management in Uzbekistan. Scientific Information Centre of the Interstate Commission for Water Coordination (SIC ICWC) of Central Asia. Tashkent, Uzbekistan.
8. Thiel, Andreas; Christian Schleyer, Maja Schlüter, Jochen Hinkel, Konrad Hagedorn, Sandy Bisaro, Ahmad Hamidov und Ihtiyor Boboyonov (2013): "Transactions in Social-ecological Systems: possibilities to complement the SES through a transaction costs based perspective?" 14th Global Conference of the International Association for the Study of the Commons (IASC). Mount Fuji (Japan), 03.-07.06.2013
9. Trevisani, Tommaso (2010). Land and power in Khorezm. Farmers, communities, and the state in Uzbekistan's decollectivisation. Berlin: Lit; Global, distributor (Halle studies in the anthropology of Eurasia, 23).
10. UNDP (2007). Water critical resource for Uzbekistan's future. Country office for Uzbekistan. United Nations Development Program. Tashkent, Uzbekistan.
11. United Nations (2008). Uzbekistan country analysis. United Nations country team.Tashkent. http://europeandcis.undp.org/uploads/public1/files/UZB%20Country%20Analysis_final.pdf.
13. Veldwisch, Gert Jan and Spoor, Max (2008). Contesting rural resources: Emerging 'Forms' of agrarian production in Uzbekistan. Journal of Peasant Studies 35 (3), 424–451.
14. World Bank (2013). Data: Agriculture, value added (% of GDP). Available at: http://data.worldbank.org/indicator/NV.AGR.TOTL.ZS/countries.