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ASSESSMENT REPORT

IRRIGATION IMPROVEMENT AND INVESTMENT IN PANFILOV RAYON IN KYRGYZSTAN: IRRIGATION IMPROVEMENT AND INVESTMENT

«Promoting Integrated Water Resources Management and Fostering Transboundary Dialogue in Central Asia»

EU-UNDP Project (2009-2012)

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Report on Irrigation Improvement and Investment into Panfilov rayon in Kyrgyzstan

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Report on irrigation criteria to select the pilot project

Kyrgyzstan with its dry climate and uneven distribution of water resources throughout its territory – in this case in Panfilov rayon – irrigation and reclamation play very critical role. Accumulation and keeping of water in water basin are one of important components of these activities.

A filed visit has been organized in December 2009 with involvement of representatives of UNDP, leader of Panfilov rayon, two leaders of village districts, Director of Agrarian Development Department, officers of Water Resources Department, and other specialists of the rayon. Three sites were presented to the Commission review:

1. Full rehabilitation of canalX-5 Kurama village district;
2. Rehabilitation of pond "0" and rehabilitation of irrigation network of Chaldybar village district adjacent to this pond;
3. Construction of on-farm canallette network for Frunze village district.

Canal X-5 was constructed and put into operation in 1964 together with construction of DRB No.1 "Jailma". Its length is 4.8 km including 0.8 m in U-3 slabs, 4.0 km in prefabricated reinforced concrete canallettes LR-100 & LR-80. Irrigated area serviced by canal X-5 is estimated to 239 ha for needs on individual farms.

Since it's putting into operation this canal has not been rehabilitated at all. The facility was registered as assets of Panfilov's collective farm. Since start of allocation of lands to private property, the areas serviced by this canal, were delivered to private ownership. The canal was left without a specific master, who must annually implement technical maintenance and ongoing repair works. As a result prefabricated reinforced concrete canallettes were damaged and broken down, in total over 60 pcs of canallettes are missing. This makes water supply to field impossible.

The suggestion to **construct new canallette type on-farm irrigation network** within territory of Frunze village district has been discussed.

The source of irrigation for this area of 158 ha is Western Main Chui Canal (WMCC) at chainage 1467+31 diversion P-27-1. It is earth irrigation network, and in order to decrease water losses for seepage, prevent water erosion within this area, there is need in construction of concrete lined canals.

Mechanical desilting of pond "0" was started in 2008, performance rate was estimated to approx. 20% against designed one, after stop of funding the activities have been suspended, and later these discontinued.

Based on findings of this field visit the Commission having learnt all circumstances, prerequisites, opinions, and requests of leaders of village districts and managers, have decided to include the sub-project "Rehabilitation of pond "0" and irrigation network adjacent to it" within Chaldybar village district into the Project.

The decision was approved and supported by head of Panfilov rayon sate administration, as the works initiated have to be completed, the irrigation network to be rehabilitated, mechanical desilting of the pond is to be done, which would give good conditions for cultivation of agricultural crops within the rayon.

PROBLEM 1

In the course of time all pond used to be silted during their operation. These therefore shall be desilted every 5-10 years as required. Water flow moving in the channel of water stream displaces sediments which are interpreted as solid mineral particles of soil generated as a result of erosion action of primary flow, erosion of bottom and banks of the riverbed. There are suspended and transported load. Suspended load is sediments distributed within the stream across the whole depth, and transported load are sediments moving on riverbed. Those sediments which generated in result of precipitation to bottom are called bed load. No strong distinguishing between different types of sediments. With slowing-down of flow velocity a part of suspended load is precipitated and transformed into transported one, and further it becomes bed load. With acceleration of water flow velocity a part of transported sediments are moved to suspended load, and bed load becomes the transported load.

As practice and measurements proved that this water stream has most of all suspended load, their quantity makes up 90-95%, and transported load is 10-5%. Bed load does not pass through irrigation systems while water intake to canals, and suspended load is arriving with the same quantity which is available in the flow at place of water intake into the canal. In this case a significant amount of suspended load dragged by water flow precipitated in the basin pool which performs a function of settling basin. Sediments are precipitating, turning into bed load and silt.

There was no any desilting activities done for the pond since 1975. Such sediments accumulated a lot, over 50% out of usable volume of pond.

CRITERION 1

The future project shall be targeted towards mitigation of this problem, i.e. there shall be mechanical desilting of the basin – to level of designed capacity, at least 235.0 t. m . The facility's coefficient of efficiency and the system of the whole shall be improved from 0.5 to 0.95-0.98.

PROBLEM 2

The loss of the uppermost the most fertile layer of soil together with nutrients is called the soil erosion. This leads to degradation of soil fertility, soil damage, and taking of areas out of agricultural turnover.

Soil erosion is complicated process depending from numerous factors. The most critical factors are soil properties, climate conditions, area landscape, vegetation, soil fauna, direction and extent of impact of human activity. As per the nature of damages erosion during irrigation can be planar, striated, and ravine.

Planar erosion presents damage of particles onto surface of soil and their removal via numerous striated gullies. These gullies with depth from several millimeters to several centimeters left after drainage of water. When soil is further cultivated these striated gullies are smoothened, and general landscape of a locality is not changed.

Striated erosion is soil degradation in result of junction of water streams and stronger rivulets which generate rivulet erosions – grooves and hollows with depth up to several dozens centimeters. When soil is further cultivated these erosions are smoothened but remain visible like hollows. Depending on a place of generation and distribution, two types of erosions during irrigation could be distinguished: field and networked.

Field erosion occurs on irrigated fields as a result of mismatch between irrigation technique used and nature-economy conditions. Networked erosion is usually observed nearby canals of irrigation or water catchment-discharge network and hydroengineering facilities. This is caused by leakage of water from these facilities and unforeseen water discharge along depreciated elements of the landscape with elevated inclination of their beds. The networked erosion is usually commenced with striated erosion. Unless erosion control actions are not taken, the striated erosion may dramatically fast develop to ravine erosion. Consequence of water erosion is also siltation of rivers, water reservoirs, canals, as well as damage of settlements. In order to prevent networked and other types of water erosion it is necessary to eliminate water leakage from canals via hydroengineering facilities. Earth canals shall be prevented from accidental failure of dams, in junctions of canals with hydroengineering facilities.

In our case we have to deal with consequences of water erosion that occurred upstream Chui river. The flow saturated with suspended load arrives through water intake structure into the canal with turbidity relevant to turbidity of river water. Since velocities in the canal are less than velocities in a river, the suspended load precipitates, and so-called process of canal siltation takes place, and as a result of this – the reduction of discharge capacity.

Supply of pond "0" is ensured from interrayon and international canal WMCC through new diversion canal P-26 with length approx. 8.0 km; 4.0 km of that are lined with L-shaped reinforced concrete, and outstanding part of this canal (approx. 4.0 km) in earth bed. Suspended and transported river sediments have came to WMCC (Western Main Chui Canal) canal – they precipitate into earth part of the supply canal, generating travelling nature of the riverbed, and large delta - in front of entry to the basin – area of shallow water and rush.

CRITERION 2

Thus the Project has to foresee a removal of travelling nature of the riverbed by mechanical desilting, if possible, this part of canal shall be lined with reinforced concrete, thereby the riverbed is to be straightened, and to establish the canal inclination free of siltation generation, and thus to avoid sedimentation and seepage of water. It is necessary to clean up the shallow water areas (flood plain) at entry to the pond "0". As to control of water erosion caused consequences mentioned above, it is necessary to install intersystem settling basins along the supply riverbed, in which sedimentation would precipitate and water would be clarified with slow velocities flows. Multistep water clarification allows avoiding siltation of all types' canals, release of all suspended load into regulating network and further to irrigated fields.

PROBLEM 3

As of today the pond "0" cannot already manage such amount of sediments, and these - coming into irrigation network, both inter-farm, and on-farm systems, silt this network. EG: Supply canal runs with minimum inclination, there are sections with zero inclination, as a result the flow energy is absorbed, the current becomes calmer, and sediments precipitate in the canal section. At present the canal is silted by 50% .

Now the canals' discharge capacity is 300-400l/sec, the designed discharge capacity should be 900l/sec. The canal length is 6,923 m, the services area is 1,915 ha. Mechanical desilting for the canal was implemented in 2008, but within almost two years this canal has silted again.

Canal and settling tanks/basins are desilted by three principal ways: mechanical, hydraulic, and combined.

Mechanical desilting uses earthmoving machinery, excavator, dozers, and others. Hydromechanization is also utilized. But such approach to desilting requires special installations for entry of earthpumping gears into a settling basin or a canal, meantime in such way of desilting the soil excavated shall be piled to areas not usable for development, and hydromass shall be transported by pipelines and released into water stream. Hydraulic way of desilting is the best. Under such approach there is no need in machinery, but this can be applied only provided that velocities sufficient for displacement of hydromass to the place of its release are secured. So based on possibilities available the most suitable way is mechanical desilting.

The project has to foresee a possibility for mechanical desilting of canals of first order, namely the Supply canal, thereby its discharge capacity would be improved to the designed one, and the canal's coefficient of efficiency would be also increased to 0.95.

PROBLEM 4

All water basins, water reservoirs have outlets – compulsory structures for pond facility designed to usable discharge of water from basins, and also, if required, for full evacuation of the water reservoir. Usable water discharges into downstream riverbed are required for the following cases: water supply of water users, because of industrial development, water supply development, if any, to supply water for irrigated lands downstream the water basin.

An integral part of outlet structures is mechanical equipment – gates, trashracks, grabbing beams, fixed lifts. Mobile lifting and transporting mechanisms, and other facilities and devices required for operation of hydroengineering structures. The gates are mobile constructions with assistance of those one can partially or entirely close outlets. These allow regulating of water level upstream and skip of discharges required, discharging the ice and floating elements from upstream to downstream. Embedded parts of gates are the fixed elements embedded into the body of structures, to secure correct movement of gates and water tightness along contact between gates and body of structure.

At present outlets of the pond "0" are technically defective. Gear boxes for shields lifting are out of order, so the shields do not tightly adjoin to concrete parts of the facility due to damage of sealants. There is risk of dam overflow. Escape shield does not operate and not equipped. This threatens the electric power substation, and a settlement located downstream the pond. Steel fencing around these facilities is stolen, which is unacceptable according to safety rules.

CRITERION 4

The expected project has to envisage a solution to address this problem. Outlets and escape shield should be rehabilitated; transhracks and sealants are to be installed. This would allow better operation of gates, avoiding fall of floating wastes into the facilities, prevent seepage, increasing safety, prevent erosion and damage of the dam, and overflow of water. And a risk of inundation of the power substation and settlement concerned will also be avoided.

PROBLEM 5

There are different ways of desilting of ponds and water basins. Water basins are desilted by three principal ways: mechanical, hydraulic, and combined.

Mechanical desilting uses earthmoving machinery, excavators, dozers, and others. In case of desilting with excavator into dump, for large size of the cup - by soil overhauling or pushing by dozer to excavator, with excavator with loading and transportation by vehicles, pushing liquid silt by dozers towards outlets, and others. Hydromechanization is also utilized. When mechanical desilting ways are to be selected, the following criteria shall govern the actions: where to remove and deposit the soil, if mechanical desilting is carried out with transportation with vehicles. The soil excavated is to be deposited into dump-pits nearby the water basin. For huge volume of desilting activities there is need in significant areas for deposition of soil excavated. These areas need to be taken from agricultural use. It is therefore necessary to foresee a possibility to use good soil – part for rehabilitation of the dam, dam build-up, that also will enable increasing usable volume of the water basin, and bed load can be used as fertilizer for fields of farms and house-attached land plots of population.

CRITERION 5

The project has to envisage lands allotment for transportation and deposition of soil (in case of desilting along with soil transportation); there should be the land allotment certificate coordinated with a land manager in Chaldybar village district. It needs to foresee a possibility to use good soil for rehabilitation of the dam, dam build-up, and bed load can be used as fertilizer.

PROBLEM 6

Water in ponds has flora and fauna, which divided into following groups: bacteria, viruses, fungi; algae; higher water plants and animals. Viruses and bacteria cause infectious diseases among people and animals. Algae (lower plants) in huge amount tend to worsen physical and chemical properties of water, and causes green scum. Water animals – single-celled and metazoan worsen quality of water, and change the color. Higher water plants growing at the bottom and floating ones – worsen chemical composition of water, increase losses for evaporation. Mechanical, chemical, and biological methods are used to control water scum. All water basins are used to overgrow within area of shallow water. Brush on shallow areas may be hot-spots for malarial mosquito reproduction. Ponds and water basins are to be deepened and desilted to kill such hot-spots.

Mechanical desilting of the pond will improve sanitary within the basin, deliver from deterioration of water quality, losses for water surface evaporation will be reduced. The project shall contain activities towards forestation of the basin, as trees and bushes around banks of ponds decrease the evaporation from water surface, reducing useless losses of water. Forestation made at upstream gully the pond shall protect it from siltation.

PROBLEM 7

There is no a specific owner of the territory located within area of rehabilitation works and areas serviced by the facility, who is responsible for technical state of irrigation assets. The inter-farm irrigation network owned by Panfilov rayon office of water resources management authority is more or less in normal state. Annual ongoing repair works implemented within inter-farm network maintain this system technically in good order, but funds spent are not enough to implement the rehabilitation required. Due to a lack of machinery, fuel, and insufficient funds allocated form water supply services fees, both ongoing and full rehabilitation works are not implemented in full volume.
As to on-farm irrigation system the situation is even more emergency; fragmentation of entities (farms) does not allow maintaining of on-farm network technically operable, simply speaking there is no owner – no work, no responsibility for security of irrigation assets. So the canal CH -2-1 with length 3.3 km and diversion channels from this - CH-2-1-1 with length 2.4 km, CH-2-1-2 with length 3.2 km, CH-2-1-3 with length 0.8 km are on-farm and in poor status. Channels are prefabricated reinforced concrete canallettes

LP-80, LP-60 with steel gates (see photo attached), outlets are looted, all steel parts are missing, water supply through the canal is impossible. Moreover there is infringement of rights of small farms, water users against large ones. Large farms are more solvent than smaller ones, they pay water services, and hence are secured with irrigation water in the first place. In this view next criterion 7 is followed.

CRITERION 7

The project has to envisage a possibility for repair and rehabilitation of on-farm canals CH -2-1, CH-2-1-1, CH-2-1-2, CH-2-1-3. There is need in establishment of water users association (WUA) since bigger and stronger organization will enable fixing of the on-farm network to a specific owner, who will be able to keep this in operable, technically good order; water users' solvency will be improved, there will be no infringement of small farms in terms of water distribution. There will be possibility to make repair and rehabilitation of on-farm systems, have access to investment and credits for development of on-farm infrastructure.

CRITERION 8

This irrigation project shall foresee activities towards environment protection. Unfavorable natural conditions for agricultural production shall be changed; optimum water, air, nourishing, and thermal regimes are to be established.
More attention shall be paid to protection of water resources, preservation of water into canals, rivers, water basins in suitable status for cultivated plants, humans, animals, birds, and fish. No emissions with excessive content of salts and ferrous sediments, pesticides shall be released into canals and ponds. Moreover the project shall anticipate rationale use of irrigation water with minimum posses and highest effect.
Activities to safe and develop flora and fauna shall be envisaged through establishment of reserves, protected areas, prohibit use of herbicides and pollution of water. It needs using minimum areas for canals, facilities, roads, and increase maximum the rate of land use. The fertile layer of soil is to be saved during earth works, leveling of surface, and one shall apply such methods of soil treatment that exclude water and wind erosion, protect lands from inundation causing water erosion and choking up the surface with downs.

CRITERION 9

Summarizing above mentioned it is clear that there is critical need in mechanical desilting of the pond "0", and in rehabilitation of inter-farm Supply canal, repair and rehabilitation of on-farm irrigation canals, and with one comprehensive activities we will address a number problems above mentioned (see photo attached). Water provision for irrigation areas will also be improved and irrigation possibility for the same crops not once-twice, but three, four and more times which is critical in the period required for vegetation development of plants.

As a result of criteria above the area population will be able to obtain higher and more sustainable harvests of crops which is strategic thing for Kyrgyz population poverty reduction on the whole.

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