GEF Small Grants Programme

UZBEKISTAN: Improving Irrigation Efficiency and Lowering Energy Consumption

Project No: UZB/SGP/OP4/Y3/RAF/2009/21

Grantee: Yangiaryk District Water Users Association

Location: Yangiaryk District, Khorezm

SGP Contribution: US $24,971

Cash Co-Financing: US $23,488

In-Kind Co-Financing: US $ 1,575

Project Duration: 08/2009 – 01/2011

Number of people served: 2,500

Focal area: Climate Change

Project Description

Farmers in the large agricultural area of Khorezm have been facing water shortages due to poorly designed irrigation channels. Thus, they often had to employ inefficient, motorized pumps to increase water flow. This project aimed at increasing the efficiency of water flow by using channel levelling and lining as a simple, low-tech, and cost-efficient technology. This allowed farmers to abstain from using the pumps, eliminating 149 tons of CO2 emissions per year. The project is also able to save more than 10 million m3 of irrigation water on an annual basis, allowing for the irrigation of an additional 553 hectares of land. Due to the success of this demonstration project, and SGP's collaboration with local government officials, the technology was incorporated into the district's development strategy which will cover other irrigation channels in the region.

Background

The Aral Sea was once the world's fourth largest saline lake until in the 1960s, when its two supporting rivers, the Amu Darya and Syr Darya, were diverted to support agricultural activities in the surrounding desert region. This has deprived the Aral Sea of water, contributing to its shrinkage of 50% and changes in local climate. The diverted rivers, on the other hand, have been redirected into poorly designed irrigation channels. With a leakage rate of up to 70%, farmers have not been able to meet their agricultural needs. The leakage also raised groundwater levels, while intensifying salinization and degradation of agricultural soils. As not enough water is naturally reaching users, farmers have to employ motorized pumps to draw water.

Navruz-yab channel before levelling and lining

The project focused on the Yangiaryk district of the Khorezm region, which is located in the lower reach of the Amu Darya River of the Aral Sea Basin. Being one of the remotest areas of the region, - located far away from the river -, Yangiaryk experiences water shortages more than any other districts in the region. Its 2,500 inhabitants are highly dependent on agriculture, especially on the cultivation of cotton and wheat. The farmers also cultivate rice and other crops for household consumption and sale.

Yangiaryk's irrigation water is supplied through the Navruz-yab channel, measuring 2.6 km in length with a capacity of 2m3 per second. In principal, this should provide sufficient water for 400ha of irrigated land, however, due to high leakage around 30-70% of irrigation water is lost.

Farmers try to remedy the lack of sufficient water flow by engaging 4 motorized water pumps, which costs farmers more than US $12,000 per year and use an exorbitant amount of electricity. On an annual basis, the four pumps emit around 149 tons of CO2 emissions. In the entire Khorezm region, irrigation pumps consume approximately 80 million kWH annually, which equals more than 49,000 tons of CO2 Emissions. Nevertheless, those farmers located at the end of the irrigation channel often do not receive any water at all. This water situation has devastating consequences for the farmers who, with their low yield, cannot produce sufficient amounts of crops for sale or their household needs.

Project Implementation and Key Activities

The project aimed at increasing the efficiency of the Navruz-yab irrigation channel. With this initiative being the first of this kind in the region, the project was designed to serve as a demonstration project. Besides increasing irrigation efficiency, the project aimed at decreasing usage of electric water pumps and land degradation. In order to reduce pump usage, specialists from the Water Users Association and the Urgench State University drained and levelled the bottom of the irrigation channel to facilitate water flow through gravity and thus reduce the need for electric pumps. The subsequent lining of the channel with PE film was undertaken to reduce water leakage and salination of the surrounding soil.

The irrigation channel is levelled to improve water flow

Community members and farmers themselves carried out these insulation activities under the technical guidance of experts from the Urgench State University. Twenty-eight participants (28), including three (3) women, had been trained through a series of training seminars in the application of the insulation.

About the Technology

For levelling, the slope of the canal, its bottom and the canal acclivities were prepared so that they could provide the gravity flow needed to move water to the irrigated fields. Next, the 10 to 15 centimetres layer of sand was under-laid for the preparation of laying the PE film, with a thickness of 100 microns. A 10 to 15 centimetres layer of sand covered the film on the canal bottom and edge, in order to avoid damaging the film. Finally, soil up to one metre thick was laid over the sand on the bottom of the canal, and 0.5 to 0.6 metres over the canal edges. The conducted measures for isolating the canal bottom produced impressive results. The average efficiency factor rose to 89%. It was possible to save a lot of water and use it for the irrigation of additional hectares, which meant obtaining more yield and more income. An economic cost-benefit analysis estimates that costs will have been recovered within the first year.

Environmental Impact

The levelling and lining of the irrigation channel increased irrigation efficiency to 89%. As a result, the project is able to save around 10,450,944m3 of irrigation water on an annual basis, allowing for the irrigation of an additional 553 hectares of land. In addition, as a result of decreased leakage, groundwater levels have stabilized and soil quality has improved, leading to an increase of Yangiaryk's crop capacity by more than 15%. Farmers located at the end of the channel are also now able to get access to the water required for irrigation. Moreover, with improved water flow by gravity, farmers were able to abstain from using the inefficient electrical pumps and eliminate 149 tons of CO2 emissions per year. In the mid and long-term, all project activities will result in efficient usage of resources (water, electricity), and reduce land degradation and CO2 emissions.

Socio-Economic Impact

With improved irrigation and access to water, farmers have been able to improve their yields for cotton, wheat and other crops to the levels necessary to support their families. Some farmers have been able to achieve higher yields producing over 2.8 tons of cotton and 4 tons of wheat per hectare. The higher yields improved incomes (by about 15%) and food security for the farming families. In addition, savings from the energy pumps (costs for electricity and maintenance) allowed families to redirect household funds to other family needs. This resulted in an increase in welfare for Yangiaryk's population. Overall, the project benefitted 2,500 people, including 500 women and 1,500 youth.

Sustainability

The project has enabled farmers to discontinue the use of pumps and increase their income through higher yields and energy cost savings. Continued monitoring and evaluation is assured by SGP remaining in regular contact with the grantee organization and NSC visits to the area of the demonstration project. The association is planning on launching and implementing a revolving fund to cover the maintenance costs of the present channel and fund the diffusion of the technology to other irrigation channels in the district.

After draining and levelling the channel, community members lined the channel with a PE film to avoid leakage

Challenges

The main challenge was that farmers located at the beginning of the channel did not show any interest in the technology, as they always enjoyed access to sufficient water, while those located at the end of the irrigation channel constantly faced water shortages. The project management and University specialists addressed this problem by explaining all positive sides of the technology to the farmers. Eventually, farmers at the beginning of the channel came to realize the cost benefits from discontinuing the electrical pumps.

The Role of SGP

The technology of levelling and lining irrigation channels with a PE film to improve gravity-led water flow is considered to be innovative for Uzbekistan. The approach had been previously explored and tested in small scale projects, primarily for scientific activities. SGP Uzbekistan decided to support the first practical application of this simple, low-cost technology as a demonstration project on the Navruz-yab irrigation channel. Projects results have since been widely shared all over Uzbekistan through SGP's wide network, including through training sessions involving government officials, a newsletter and an economic cost-benefit analysis of the project.

Beyond Project Impact: Replication, Up-scaling and Policy Influence

Yangiaryk is a small area in the large irrigation puzzle of the Aral Sea Basin. The project successfully demonstrated how a simple, low-cost technology for a small irrigation channel can save more than 10 million m3. Given there are thousands of other, similar irrigation channels in the country, the technology has the potential to save millions of m3 of water. Due to the extensive dissemination of the positive project results, the technology was incorporated into the district's development strategy which will cover other irrigation channels in the area. In the meantime, SGP is planning on supporting the up-scaling of the project through the implementation of a revolving fund.

Contributions to National and Global Environmental Benefits

The project conducted is in line with one of the main objective of Uzbekistan's Country Programme Strategy (CPS) aiming at the sustainable use of resources and decrease of CO2 Emissions. Moreover, it can be stated that project contributes to the GEF6 objective of "Climate Smart, Innovative Agro-ecology" since it helps farmers abstain from using inefficient, electrical pumps, that were responsible for production of 149 tons of CO2 emissions, nearly eliminate leakage of irrigation water to the soil, decrease ground water levels, decrease soil salinization and reduce land degradation.

Lessons learned

It is important to get all important stakeholders on board to ensure the success of the project. Explaining the environmental, agricultural and cost benefits to the water users, including to those who did not suffer from water shortage, helped convince them to support the project activities. Furthermore, the project successfully demonstrates that a simple, low-cost, low-technology intervention such as leveling and lining an irrigation channel can bring enormous environmental as well as economic benefits.

Insulating the channel