RENEWABLE ENERGY FOR DRIP IRRIGATION OF HORTICULTURAL CROPS

PROJECT'S AIM: TO APPLY RENEWABLE ENERGY TECHNOLOGY FOR IRRIGATION PURPOSES REPLACING FUEL BASED WATER PUMPS, SAVING WATER, FUEL AND CO_2 EMISSIONS

Location:
Magu District, shores of Lake Victoria, Tanzania

Technology:
Wind mill water pump
Solar water pumps
Efficient Irrigation

Costs:
Total: €37,880
Participation of WISIONS: €36,000

CO_2 Reduction:
61,000 kg CO2/year

Partners Involved:
Sustainable Energy Services, Environment Management and Development Organisation (SESEDO)
(www.sesedo.or.tz)

Duration:
03/2009 - 08/2010

Picture: SESEDO

This project was implemented on the shores of Lake Victoria in rural Tanzania. Most people in this region rely on agriculture as their major source of income, but the productivity is very low and farmers struggle because of their poor harvests. To improve the production efficiency and therewith the situation of these local farmers SESEDO developed a strategy to introduce efficient irrigation methods within a pilot project. To save water, fuel and CO2 emissions it was decided to install a water pumping systems utilizing solar as well as wind power and an efficient irrigation system. The required water for the project is supplied from the nearby Lake Victoria.

To enable all farmers in the community to participate, the irrigation was not installed on the land of individual farmers but on a piece of land that was purchased by the project partners. Farmers can lease one or more acres of this land for a small fee. To assure long-term economic durability and sustainability of the system a revolving fund was established. Farmers have to pay a reasonable amount of money from their earnings into this fund to cover the costs for maintenance and operation.

TECHNOLOGY, OPERATIONS AND MAINTENANCE

Originally it was planned to install two small solar pumps, but after consultations with the manufacturer and other experts, it was decided that it was more appropriate to install a single powerful solar water pump instead of the two smaller ones. So one big solar water pump (SQFlex Solar from GRUNDFOS Germany) with a capacity of pumping 40,000-liters/ day was bought and installed in 2009. Since solar pumps are very sensitive to sand, a well (4.5 m deep) had to be constructed on the shore of Lake Victoria to filter the water. This proved to be a challenging task but finally a solution was found to keep the level of water well at the water level of the lake: an additional flexible polypipe was inserted into the PVC pipe from the well to a deeper level in the lake.

After the successful implementation of the solar pump the second step of the project was the installation of the windmill water pump. The first windmill model was constructed with rotor blades from textile. Although this windmill helped to run the irrigation system during the dry season in 2009, the textile rotor blades required frequent repairs and the efficiency was quite low. Therefore, the project team decided to purchase a more advanced windmill pump. This windmill pump is more efficient and robust since it utilizes metallic rotor blades and a cylinder pump. For installing this new pump an additional well has to be constructed. So that the new

pump still has to been installed and is currently only used for demonstration purposes.

The last part of the project was the establishment of the irrigation system in form of a network of PVC water pipes and water tanks for 8 – 9 acres of farmland. The installation was done in cooperation with technicians from the Zonal irrigation office in Mwanza. A technician from the local office was also involved in the training of the field facilitators on how to operate and maintain the drip irrigation systems. Furthermore a pump house that has a storeroom, a small office and a room for the security guard was erected on the shore of lake Victoria.

FINANCIAL ISSUES AND MANAGEMENT

An important component of the project was the Revolving Fund scheme. The farmers have to provide 20- 30% of their sales to the fund. The money is partly used to pay the trained technician who is in charge of maintenance and operation of the drip-Irrigation system and the security guard, who is residing at the farm.

The community decided to set the renting fee for the farm at about €3 for every ¼ acre of land. In addition the farmers will have to pay the same amount for the water services every three months. The fees reflect the low income of the farmers but with raising income levels it is planned to gradually increase the renting fees. But these changes will depend on the productivity and demand. The hope is to generate more income over time to be able to acquire more farmland and receive higher returns.

To reach these goals it is important to realize profitable prices for the produced grains, vegetables and fruits. So far the low and fluctuating prices for the crops at the local market presented a huge challenge. An idea to solve this problem is to transport the crops into town centers where higher prices can be achieved. Another approach could be the utilization of solar food processing and conservation techniques to avoid the recurring loss caused by poor market situation at a given period. The project team has already contacted different Solar NGOs to explore available options.

ENVIRONMENTAL ISSUES

The efficient irrigation systems powered by renewable energy technology save water and avoid fossil fuel use. It is estimated that the project activity avoids about 61,000 kg CO2/year.

SOCIAL ISSUES

Alongside the technology implementations the project activities also covered community training and awareness raising. Meetings with community leaders of the surrounding villages were held and 50 field facilitators in the target area were trained. The group involved farmers, both men and women from different age groups, as well as district extension officers and experts from the Zonal Irrigation Office. The establishment of this demonstration project helps to address one of the main problems of agricultural development in Tanzania, which is lack of timely advice, help and education for local farmers. The project supports knowledge transfer from researchers to farmers helping farmers to find solutions in a changing environment.

RESULTS & IMPACT

Ten acres of farmland could be irrigated with the efficient irrigation and the solar pump system. On this farmland the following agricultural products could be successfully harvested: maize, papaya, sugar cane, onions, paprika, cucumber, tomatoes, Chinese cabbage and okra.

So far the success of the project is not only manifested by the good harvests and the rising number of visitors, but also by the increasing demand of farmers who would like to rent irrigated farmland.

REPLICABILITY

Various efforts have been carried out to make sure that the community members and people visiting the project site understand the objectives of the project. On one wall the powerhouse the project activities are illustrations and explained in Kiswahili helping people to learn about the different activities. To reach even more people more than 4,000 leaflets have been distributed to the surrounding communities and visitors, and a special website, with updates and pictures has been created.

LESSONS LEARNED

After the renewable energy technology has been successfully implemented and the efficient irrigation system already resulted in decent harvests it was discovered that there is another factor that is reducing productivity and hindering agricultural development: the lack of advanced farming equipment. The farmers still rely on is hand hoes for the cultivation of their fields. While it takes an average of 7 days to till one acre of land using a hand hoe, a power tiller could till about 5 acres per day. Therefore the project team accesses the possibilities for acquiring funds for purchasing an agricultural power tiller.

Although the farmers are making reasonable profits from selling their harvest, the prices for the agricultural products in the region are low. Especially during dry season the price showed strong fluctuations due to overproduction. One solution could be the installation of a solar dryer to preserve the surplus production.

Source: Final Report submitted to WISIONS by SESEDO (08/2010)

Picture: SESEDO