Introduction of irrigation technologies for continuous sweetpotato seed production and supply in Southern Ethiopia

AUG 2018

To assist Farmer Training Centers in SNNPR to become sustainable producers of quality sweetpotato planting material, investments in water harvesting and water lifting (solar pumps, rope and washer pumps) have been made in 26 centers based on a technical assessment.

Fig 1. Solar water pump irrigation system in use with private multiplier (Credit B. Biazin)

What is the problem?

Sweetpotato is the second most important root crop and crucial for food security in southern Ethiopia. However, its production is highly constrained by shortage of planting materials during the main planting period. The vines should be multiplied during the dry season for planting at the onset of the rainy season. Sweetpotato is a drought-resistant and resilient crop. Supplemental irrigation during critical dry spells should be sufficient to ensure vine multiplication during the dry season. However, there is a lack of appropriate irrigation technologies and experience on vine multiplication in Ethiopia.

What do we want to achieve?

One of the result areas of the EU-funded Quality Diet for Better Health (QDBH) project is to ensure the supply of vines to households from local multiplication sites. Through the project life time, the QDBH project shall establish 53 decentralized OFSP vine multiplication sites, operated by managers of Farmer Training Centers (FTCs) and private farmers. These sites shall provide 15,000 local households with the planting material and know-how required for homestead OFSP production.

Where and with whom are we working?

The project is implemented in two administrative zones (Sidama and Gedeo zones) and four districts in the Southern Nations, Nationalities and Peoples Region (SNNPR) in Ethiopia: Dilla Zuria, Kochere and Wonago in Gedeo and Aleta Chuko in Sidama. The project is financed by the European Union. The project is jointly implemented by the International Potato Centre (CIP), People in Need (PIN) and the Rollins School of Public Health (Emory University) in collaboration with government institutions including Southern Agricultural Research Institute (SARI), Bureau of Agriculture, Bureau of Health and and Hawassa University. The irrigation studies are carried out in close cooperation with SASHA (Sweetpotato Action for Security and Health in Africa), another CIP-led project.

How are we making it happen?

The strengthening of irrigation use is done in two ways: creating access to water through water harvesting and introducing appropriate water lifting technologies at the FTCs. At the outset, a critical assessment of water resources potential and alternatives (surface water, groundwater or rainwater) in each of the FTCs was carried out. This encompassed physical observation of the sites and the potential water alternatives, discussions with elderly persons in the localities, review of secondary sources and discussions with Bureaus of Water Resources staff. Once the best alternative water sources were identified, appropriate irrigation technologies were assessed. Cost and affordability by smallholder farmers, labor requirement, manageability (robustness) and access to spare parts and maintenance services were considered.

For water lifting from the sources to the command areas, solar water pumps, hip pumps and treadle pumps were introduced. The solar water pumps were preferred over motor pumps as they do not require fuel,

Fig 2. Water harvesting pond combined with use of a hip pump at an FTC (Credit B. Biazin)

Table 1. Prices of Alternative Irrigation Approaches Considered By the Project

Item	Specifications	Unit Price (Ethiopian Birr)	Unit Price (US Dollars)
Water Harvesting Ponds	Components--percent of total cost: Storage pond, including geomembrane lining--22%; Silt trap--9%; Fencing--30%; Shade construction for the pond--39%	53,803	1,938
Robust and Portable Solar Irrigation Pump for River and Lake Shore	Flow Rate: 0.69 lit/second, Water Lifting capacity: 10 mt deep, Horizontal discharge: 200 m; Irrigation capacity: 500 sq.m	18,500.00	666.21
Hand/Hip Irrigation Pump with Suction Hose (Money Maker)	Flow Rate: 0.7L/sec; Max. suction capacity: 7mt depth; Max. pushing height: 14 mt; Pushing water distance (horizontal) 10 m; Irrigation capacity: 500 sq. m	3,700.00	133.24
Treadle Irrigation Pump with Suction Pump (Money Maker)	Flow Rate: 1L/sec; Max. suction capacity: 7 mt depth; Max. pushing height: 14mt; Pushing water distance (horizontal) 200 m; Irrigation capacity: 800 sq.m	4,700.00	169.25
Rope pumps	Includes pulley wheel, a rope with washers (pistons) attached at regular intervals, and a pipe that enters the well and at the base of the pipe a guide box round which the rope runs and returns to the surface. Does not include cost of digging well.	2,221.52-3,887.66	80-100
Suction Hose	hose 1'' for suction (1 meter)	106.00	3.82
Delivery Hose	hose of 1'' diameter (1 meter)	45.00	1.62

resulting in lower operational costs. The introduced solar pumps have a discharge capacity of 25-35 liters per minute and can be used to irrigate up to 3000 m^2 in full irrigation during the dry season. They can lift water either from shallow wells or surface water sources having a maximum pumping head of 10 meters. Rope and washer pumps were introduced in areas where there is a groundwater potential until 30 meters deep. With a pumping capacity of 15-20 liters per minute depending on the depth, rope and washer pumps can be used to irrigate up to 1500 m^2 land area.

Sites without access to ground or surface water were equipped with rainwater harvesting installations using fiber glass and underground rainwater tanks for storage. The storage ponds are designed as underground trapezoidal tanks lined with geomembrane or hemispherical lined with cement (Fig. 2). They have a storage capacity of 50-60 m^3. Rainwater is collected from rooftops or ground catchments. Water from ground catchments should pass through silt trap dams to reduce the silt load that will otherwise accumulate in the tanks. The tanks are covered with bamboo roofs to reduce the impact of insolation on the geomembrane and water loss through evaporation. The water from the ponds is lifted using hip, hand or treadle pumps.

Clearly, cost of this equipment varies (Table 1). The establishment of a water harvesting pond is a significant investment but should assist FTCs in being effective training centers year-round for OFSP vine multiplication as well as supporting other crops. Solar pumps are 4-5 times costlier than manually operated hip or treadle pumps but are appreciated for not being so labor demanding.

In parallel irrigation trials have been set up. These trials will help to understand the water requirement and water use efficiency of OFSP when it is planting at different times of the year. The results will be used to prepare guidelines that farmers can use to maximize root and vine production.

What have we achieved and learned so far?

So far, interventions have been undertaken in 26 FTCs. This includes 9 solar water pumps, 12 water harvesting ponds and 2 rope and washer pumps. In some of the FTCs, the introduced technologies have already started functioning and supplied supplementary irrigation. They could be used to supply supplementary irrigation not only during the long dry season, but also during the rainy season when there are critical dry spells. In Dilla Zuria, an irrigation trial has been established. We have learnt that beyond training of the extension staff, capacitating local level maintenance service and spare part suppliers is crucial.

What are the next steps?

More irrigation trials will be carried out to support the preparation of appropriate guidelines. The extension staff at different levels will be capacitated through trainings, coaching and mentoring. Field days will be organized for scaling out. Selected garages and workshops will be capacitated in equipment maintenance and linked with the FTCs for continuous routine maintenance of the pumps. As part of the development research, the economic feasibility and adoptability of these technologies by vine multipliers will be studied. A package will be developed as an output of the action research and disseminated for possible scaling out.

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