Technology Fact Sheet for Adaptation

Micro irrigation system for efficient water use and management (gravity fed drip & mini and micro sprinkler irrigation)[i]

Technology: Micro irrigation system for efficient water use and management (gravity fed drip & mini and micro sprinkler irrigation)	
Sector :Agriculture	
Subsector : food crop sector	
Technology characteristics	
Introduction	Small scale micro irrigation for lifting, conveying and applying irrigation efficiently include gravity fed drip and pressurized sprinkler irrigation used to improvewateruse efficiency and food production. They may be gravity fed or pressurized system. Water source can be from borehole, reservoirs, field pond or potable source. Unlike surface or furrow irrigation, it improve water use efficiency by 50-70 % under sprinkler and up to 90 % under drip irrigation. Mini sprinkler is used for open field production, while drip and micro-irrigation is used for field crops, greenhouse, nursery , orchards and container plants
Technology characteristics/highlights	This technology mainly earmarked for small scale farmers with less than 2 ha under vegetable or fruit production. It comprises of - Water source which can be from boreholes, tank, reservoir, field pond. - Design of irrigation system - Installation of irrigation system which consist of pipes, valves and small drippers or emitters for drip irrigation and a and network of pipes with spray heads and a pump if not gravity fed - a filtration system in case water quality is poor - The drip system can be used for fertigation and improve fertiliser use efficiency - Trained and skilled labour for installation of irrigation system and in operation and maintenance of irrigation system
Technology characteristics/highlights	Drip irrigation technology uses less water than sprinkler irrigation (30-40 % water saving), / is not affected by wind . It enables to irrigate irregular structured fields (odd-shaped and narrow areas), It optimize the use of fertilizers and water (water-use efficiency exceeds 90% / minimizes crop stress by slow release of water close to the root zone as per the irrigation requirement of the crop. It minimizes wetting of foliage and foliar diseases. It applied water in low volume to plant roots providing optimal growth conditions. Mini-sprinkler irrigation is appropriate for all types of soils and open field vegetables production. It is movable/ requires labour, can be adapted to different field shape. /size. Its efficiency is around 50 to 70 %. It provides efficient coverage for small to large areas Both irrigation system may be gravity–fed or pressurised by a pump.
Institutional and organizational requirements	– Irrigation Authority and AREU have technical capacity to design the irrigation system based on crop, / shape and size of the field / the topography of the land soil profile/ infiltration rate/ water source–accessibility(surface or ground water) – Investment will also be required to build workers capacities in order to accurately manage operation and maintenance of the irrigation system – Several suppliers with wide experience exist locally – Water users associations exist to monitor water resources and quality

	– DBM provide Loan scheme is available for financing purchase of irrigation equipment (80% of project cost up to a ceiling of Rs 2 Million at 8.5 % p.a up to 8 years)
Operation and maintenance	– Drip irrigation requires regular flushing of irrigation pipes to prevent build up of sediments & cleaning of emitters to avoid blockage from chemical deposits and requires a filter to prevent clogging. – Sprinkler irrigation requires regular cleaning of the component parts. Seals on pipes and sprinkler nozzles should be checked to avoid water leakage. – Training in installation, pipefitting , operation of the system ,general repair, maintenance and irrigation scheduling
Endorsement by experts	Both drip and sprinkler irrigation system are recognized as climate change adaptation measure to optimise use of water which becoming a scarce resource
Adequacy for current climate	The technology can support farmers to adapt to climate change by providing efficient use of water supply particularly in areas where water is limited. Drip irrigation reduces demand for water and reduces water evaporation losses. It is applicable to all annual/seasonal moisture deficit agro-ecological zones with flat to gentle slopes
Scale/Size of beneficiaries group	The technology is applicable to all farming scales (small farms to plantations)having access to irrigation water (approximately 2000) and can also work in conjunction with rainwater harvesting and greenhouse producers who can use gravity fed irrigation technology for fertigation in production of high value crops . There are currently some 270 greenhouse producers.
Disadvantages	– Initial investment cost associated with pumps, pipes, tubes, emitters and installation is higher than other systems – Irrigation systems will depend on terrain characteristics, soil structure, crops and water source. – Drip systems may be affected by heavy rainfall that floods emitters and can be damage by rodents or dogs – It can be difficult to combine drip irrigation with mechanised production as tractors and other farm machinery. – Root development may be restricted by the limited soil area wetted. – Regular maintenance inspections are needed to maintain system effectiveness. – Efficiency of sprinkler irrigation system is reduced by wind which affects the distribution pattern. – Labour is required to move the sprinkler system. – Limited regulations for the distribution and allocation of water as a mechanism for conflict resolution. – Irrigation equipment may be stolen from fields.
Capital costs	
Cost to implement adaptation technology	Irrigation system options Drip irrigation = Rs 300,000/ha for hardware + maintenance cost Rs 500/ha/yr Sprinkler irrigation= Rs 200,000/ha for hardware+ maintenance cost Rs3000/ha /yr Family drip kit - Rs10,000 (recycle blue plastic tank + drippers) for 250 m^2 Gravity fed drip kit - Rs 30,500 for 1250 m^2 (no power required) **Estimated cost of implementing the micro-irrigation technology per beneficiary Rs 7 585 (USD)** Total cost for targeted area = Rs 187,125,000
Additional cost to implement adaptation	The additional cost of per beneficiary =Rs 2,000 Total additional cost (Rs 2000X2680)

technology, compared to "business as usual"	
Long term cost (i.e. 10, 30, or 50 years) without adaptation	Crop failure and low yield and low income , field abandonment, affecting livelihood of farmer, food insecurity, wastage of water and less irrigable area
Long term cost (i.e. 10, 30, or 50 years) with adaptation	The cost of implementing the technology can be easily recovered by higher yield and quality. Micro-irrigation can increase crop yield by 30- 40 % .Construction, maintenance and repair cost will be easily recovered with improve yield in less than 2 years. Improve livelihood of planters & resilience to climate change.
Development impacts, direct and indirect benefits	
Direct benefits	It improves water use efficiency and crop yield and quality. It reduces irrigation water cost / enable year round production / improve or stable income
Reduction of vulnerability to climate change, indirect	Improve food security and resilience to climate change by increasing productivity per unit area and enabling to use the same volume of water to irrigate more crop
Economic benefits, indirect	
Employment **Growth & Investment**	Creation of job to support sale , development of tailor -made irrigation design, installation and maintenance to users can create investment in supplying irrigation equipment and service in installation
Social benefits, indirect	
Income **Education** **Health**	Increase crop yield and quality / increase crop intensity ,thus improving farm income Reduces family labour thus leaving more time for other activities – education Drip irrigation reduces disease pressure as foliage are kept dry. It presents no health risk. Drip allows application of low volume of water to plant roots and hence optimal growth conditions
Environmental benefits, indirect	It helps to optimse use of water resources / can be employed in conjunction with other adaptation measures such as integrated nutrient management. Drip can be used for fertigation, thus minimising risk of nutrient leaching and ground water contamination and reduce run off.
Local context	
Opportunities and Barriers	**Opportunities** – The technology can be employed in conjunction with other adaptation measures – It can be low-cost (gravity-fed) or more sophisticated (automatic and pressurized). – It enables increase areas of arable land./ cropping intensity (no. of crops /year) – It contributes to efficient water use, reduces requirements for fertilisers and increases soil prod uctivity. – Drip allows fertigation /Reduced reliance on agrochemicals for weed control – Require less labour/ enable planter to engage other commercial high-value agriculture

	Barriers – It involves a high amount of initial investment – Limited market for repurchased equipment. – Technical conditions such as soil clay presence, irregular rainfall or steep slopes can increase implementation and maintenance costs or affect drip system efficiency – Uncertainty in availability of water for irrigation due to climate change and increasing pressure from other sectors
Market potential	With water becoming scarce, farmers are concern with the need to optimize use of water .Benefits of micro-irrigation have been demonstrated to growers for production of high value crops. Suppliers of equipment are available locally With water becoming scarce, there is need to scale up this technology in the north, west , south and east of the island to optimize of water use, irrigate more land area and increase productivity by at least 20- 30 %.
Status	With a decline in rainfall, areas where production was previously under rainfed need to be equipped with irrigation facilities. The technology need to be promoted among a larger number of farmers to help them to cope with decrease in optimising irrigation water use.
Timeframe	– Implementation can be immediate but may require some leveling in field – Ready- made plastic tank is available. – Technical skill is available for construction of frame to hold tank 3-4 ft above the ground and design and installation of the pipelines and dripper lines /Suppliers of this technology is available locally
Acceptability to local stakeholders	Technology would be easily acceptable as it would help to improve crop yield and provide a stable income.

[i] **This fact sheet has been extracted from TNA Report – Technology Needs Assessment Reports For Climate Change Adaptation – Mauritius. You can access the complete report from the TNA project website http://tech-action.org/**