THE UNIVERSITY OF THE WEST INDIES
MONA CAMPUS, JAMAICA, WEST INDIES

CLIMATE CHANGE TECHNOLOGY BRIEF

SOLAR POWERED PRESSURIZED IRRIGATION SYSTEMS – ADAPTATION IN AGRICULTURAL SECTOR

TECHNICAL DESCRIPTION

Pressurized irrigation system using sprinkler or drip irrigation can deliver water directly to the plants' roots, and can aid in providing an ideal moisture level for plants. Unlike flooding techniques, drip systems enable farmers to deliver water directly to the plants' roots drop by drop, nearly eliminating, reducing or even eliminating water waste, it is suitable for clay soils and can be set up to operate with gravity flow. This technology can be coupled with fertiliser application in the form of fertigation which can also reduce fertiliser cost through minimizing wastage, as well as minimising on-point sources of pollution due to run-off after rain events. There is also the potential for this type of irrigation to be set up with rain water harvesting mechanisms to have independent water supply and irrigation for small holder farmers.

The use of solar power can make these systems independent and the technology can be adapted to the size of the farm and the climatic conditions from season to season, and can also be operated independent of the national potable water supply. Additionally, building adaptive capacity via solar power within drip and sprinkler systems allows farmers to improve the timing and distribution uniformity of irrigation, which can enhance crop yield, such that transpiration per hectare increases. The prospect of higher returns per hectare, however will encourage some farmers to expand planted areas or to switch to higher-value, more water intensive crops.

CLIMATE RATIONALE OF THE TECHNOLOGY

The agricultural sector could be severely impacted by sea level rise and resultant salt water intrusion into coastal agricultural settlements which exist in both Trinidad and Tobago. Extreme weather events and resultant flooding of farm lands is particularly important as many of these lands are located in low lying areas that have historically been impacted by flooding. It is expected that there will be an increase in these occurrences for many agricultural communities. These effects will create a reduction in the capacity of farm lands in the future and the output of food will be decreased. Trinidad and Tobago also currently have a high food import bill. The availability of food for import could decrease in the future and the cost of imported food could increase making adaptation and resilience building for local agriculture a top priority for the future. Climate impact models project a decrease in rainfall which means less water available for irrigation purposes, and therefore water conservation would be necessary both for the agricultural sector as well as water resources management. Solar powered systems will also add a mitigation component by reduction in emissions from power generation.

AMBITION OF THE TECHNOLOGY

SCALE FOR IMPLEMENTATION AND TIME-LINE

The intention is to develop a pilot/demonstration project involving an initial target of 50 small-scale farmers selected from vulnerable rural areas to illustrate viability and affordability within a five year timeframe.

The following actions have been identified to this end:

1. Implement appropriate fiscal incentives, including in appropriate arrangements with insurance companies and commercial banks to:
    i. Provide preferential interest rates on loans and repayment terms, to finance solar irrigation systems, including the construction of irrigation infrastructure (dam, reservoir, and canals) and improve irrigation system conveyance to field and within fields (provision for new pipes, feeder canals and filter system);
    ii. Provide preferential insurance premiums for investments;
2. Increased capacity of extension services to educate farmers on the benefits of solar drip irrigation systems, including on maintenance of systems;
3. Provide market conditions to facilitate greater penetration of relevant equipment

EXPECTED IMPACTS OF THE TECHNOLOGY

The benefits of solar powered- dripped irrigation include:

- Greater resiliency against extreme heat, drought and varied rainfall patterns with the system through efficient water use. The water saved can be allocated in times of scarcity which increases food security.
- Useful in areas with a prolonged dry season that have reliable water source such as reservoirs.
- Reduced GHG emissions for water dispelling/pumping. The operation of the water pump is free of GHG emission. In addition, the application allows for reduced pollution, more targeted fertiliser use, more precise irrigation and greater application technique for water conservation.
- Energy independence in remote areas.
- Access to water during dry-spells during dry season.
- Improvement of income, food security and nutrition

At the farm level, solar powered irrigation technology can constitute a reliable source for pumping of irrigation water in remote areas, particularly in areas that are not connected to the electricity grid or where regular supply of liquid fuels and maintaining service is not guaranteed. In many rural communities with

inconsistencies with water supply and experience water scarcity, this technology can help buffer the effects of drought and to overcome water stress during dry seasons, when groundwater is the only available water source, or when surface water has to be hauled over long distances.

POLICY ACTIONS FOR TECHNOLOGY IMPLEMENTATION

EXISTING POLICIES IN RELATION TO THE TECHNOLOGY

The National Climate Change Policy (NCCP) has among its objectives, the integration of adaptation into national development as well as enhanced agricultural production and food security in light of identified climate vulnerabilities. The Vulnerability Capacity Assessment (VCA) identifies the climate risks in the agricultural sector as well as actions to address the risks.

PROPOSED POLICIES TO ENHANCE TECHNOLOGY IMPLEMENTATION

The national development plan to 2030 points to modernization of agriculture as a crucial factor for the economy's international competitiveness. The technology is also supported by policies aimed at water conservation and management such as the Integrated Water Resources Management Strategy.

COSTS RELATED TO THE IMPLEMENTATION OF POLICIES

The cost for establishing 50 demonstration systems is USD 250,000.00.

USEFUL INFORMATION

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LINKS TO TNA REPORTS

National Climate Change Policy:

https://www.preventionweb.net/files/60670_trinidadandtobagoclimatechangepolic.pdf

Carbon Reduction Strategy:

https://www.planning.gov.tt/sites/default/files/CRS%20_Strategy_Final.pdf

Nationally Determined Contribution:

https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Trinidad%20and%20Tobago%20First/Trinidad%20and%20Tobago%20Final%20INDC.pdf

Nationally Determined Contribution Implementation Plan:

https://transparency-partnership.net/system/files/document/200114_GPD_Trinidad_and_Tobago_RZ.pdf

Vulnerability and Capacity Assessment Report:

https://www.planning.gov.tt/content/vulnerability-and-capacity-assessment-report-trinidad-and-tobago-jan-2019#:~:text=As%20the%20basis%20for%20the,Agriculture%20and%20food%20security

Technology Needs Assessment: https://tech-action.unepdtu.org/tna-database/?fwp_tna_database_type=tna_report&fwp_tna_reports_region=trinidadandtobago