



REPUBLIC OF KENYA



KENYA INDUSTRIAL RESEARCH & DEVELOPMENT INSTITUTE

SolCoolDry Research, Innovation and Business Hub



Intervention Partners

With support from



Federal Ministry of Food, Agriculture and Consumer Protection

by Decision of the German Bundestag

Project Manager



Federal Office for Agriculture and Food



Project Title

Development of Milkfish (*Chanos chanos*) and Kimarawali (*Stolephorus delectatus*) Solar Drying-Cooling Technology, Value Addition and Quality Assurance (SolCoolDry Project)

Thematic Area

Agri-Industrial enterprises development

Background Information

Mariculture is gaining prominence in Kenya as natural fish stocks (e.g., tilapia in Lake Victoria) dwindle, a situation that has pushed Kenya to import fish. Milkfish (*Chanos chanos*) is currently being produced in culture ponds by farmers at the Coast of Kenya. Fishermen also harvest a local sardine called Kimarawali (*Stolephorus delectatus*). Milkfish farmers depend on fluctuating and seasonal wild stocks of milkfish fingerlings from local mangroves and therefore must maximize their productivity and returns during periods of abundance. Kimarawali catches are also seasonal with high swarming occurring in the months of March to July.

However, the fisher folk lack appropriate technologies to process their fish and are therefore forced to sell their produce when fresh to dealers at uneconomical prices. The farmers also practice poor handling techniques that negate the prospects of accessing high-end markets. This scenario offers an opportunity to Kenyan institutions to partner with German Institutes and private firms to develop a technology package to utilize the latest advances in photovoltaics and drying technologies.



Ice Storage Cold Room

The project developed a solar cooling-drying system for fish. The project introduced a containerized, stand-alone solar technology package consisting of a 100% cooling and drying system, for cooling technology.

The SolCoolDry system consists of two tunnel dryers that 2m wide and 24 meter long. One of

the tunnel dryers is integrated to a hot water system for night time performance.

To produce high quality dried fish of premium nutritional value, texture and flavour, drying is done under standard conditions. Fish farmers will be trained on processing and quality assurance. Fraunhofer ISE and Innotech will partner with KIRDI, Kenya Marine and Fisheries Research Institute (KMFRI) and Technical University of Mombasa (TUM) to design, develop and transfer the proposed technology package.



Processing fish for drying at SolCoolDry Research, Innovation and Business Hub

Justification

Food insecurity among rural communities of the coastal region of Kenya requires urgent intervention that can be supported by the marine fishery resources. Milkfish (*Chanos chanos*) and a local sardine called Kimarawali (*Stolephorus delectatus*) are caught along the sea shores of Kwale and Kilifi Counties. Fisher folks depend on fluctuating and seasonal availability with high swarming occurring in the months of



SolCoolDry System



SolCoolDry System installed at Mwazaro, Kwale County.



Hygienic Fish Drying using the SolCoolDry System



Hybrid Solar Drying of Seaweed

March to July. Milkfish and Kimarawali are generally under-utilized fish species. Kimarawali are low social status owing to its small size and brittleness when dried. Fisher folk in the region lack appropriate technologies to process and add value to fish therefore they sell their produce fresh to dealers at uneconomical prices.

This scenario offers an opportunity for KIRDI to develop a technology package that can utilize the latest advances in solar driven cooling utilizing innovative energy storage materials and technologies such as phase-change materials (PCM), drying and food processing technologies to process and add value to Milkfish and Kimarawali.

In addition, one of the foci of the Sustainable Development Goal (SDG) is to end poverty in all its forms everywhere. The

project is designed to develop and disseminate a solar powered cooling and drying system to improve income and livelihood of smallholder fisher folks.

General Objectives

Introduce a technology package for 100 % off-grid solar powered cooling and drying to improve quantity, quality and value of Milkfish and Kimarawali

Specific Objectives

- 1) Develop a model solar powered hybrid cooling-drying system
- 2) Establish fish handling and processing centres
- 3) Establish a quality system and recommended good production practises
- 4) Produce longer shelf-life milkfish and kimarawali for coastal and inland markets



Methodology

The project carried out a baseline documentation of the local milkfish processing technologies and capacity in order to adapt the proposed technology package to the needs of the target communities.

The project undertook SolCoolDry system design and energetics evaluation of the solar-cooling concept. This involved the design of integrated photovoltaic driven cooling through ice production and solar thermal energy-supported drying.

The project undertook a technology needs assessment in Kwale, Kilifi and Kisumu Counties to design the SolCoolDry components. This led to a shift in technology design and focus from a solar-powered cold room to a solar-powered ice-making system.



Expected Impact

- (i) Longer shelf-life (at least 3 months) milkfish in Coast and Inland Markets
- (ii) Reduce post-harvest fish losses by up to 25 %
- (iii) Improve income of fisher folk

Project Activities

- (i) Project planning meeting
- (ii) Baselines Survey
- (iii) Profiling fish value chain
- (iv) Preliminary evaluation of KIRDI Solar-Biomass Hybrid Dryer for improvement
- (v) Site selection for SolCoolDry system installation
- (vi) Water analysis for the design of solar-powered ice-making system
- (vii) Energetics evaluation and design of solar powered fish handling system
- (viii) Importation of the SolCoolDry System
- (ix) Setting up of the System at Mwazaro in Kwale
- (x) Completion of installation of the SolCoolDry System
- (xi) System tests and evaluation
- (xii) Capacity building
- (xiii) Production of ice and fried products

Project Outputs

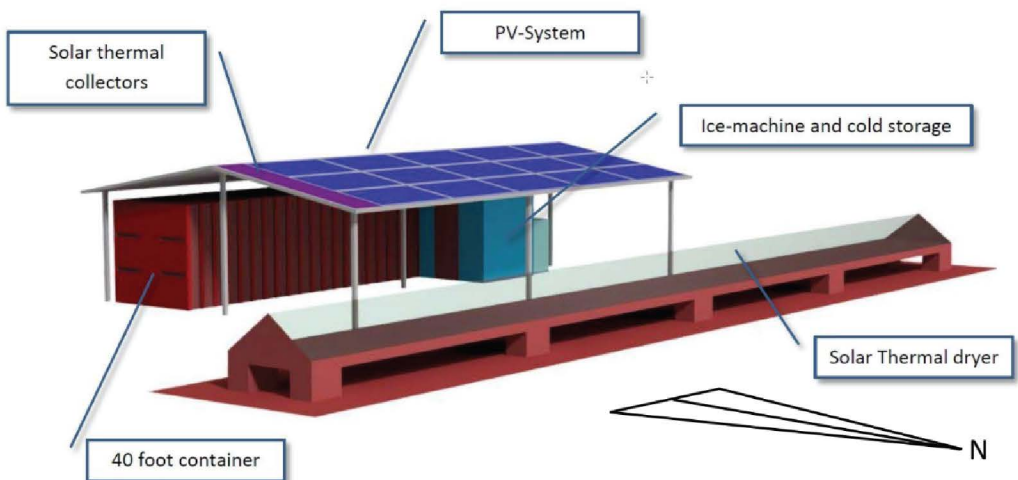
- (i) Model solar powered hybrid cooling-drying platform
- (ii) Fish handling and processing center
- (iii) Quality system and recommended production practises

Collaborators

(i) Fraunhofer Institute for Solar Energy Systems (ii) Kenya Marine and Fisheries Research Insitute (KMFRI), (iii) Technical University of Mombasa (TUM), (IV) Innotech Ingenieursgesellschaft mbH

Research Team

KIRDI - Dr. Linus Kosambo, Eng. Jackis Auka, Ms. Sarah Kwach; KMFRI: - Dr. James Mwaluma, Dr. Peter Odote, Ms. Morine Mukami, TUM: Dr. Huxley Makonde; Fraunhofer ISE: Dr. Ing. Alexander Morgenstern, Dipl. Ing. Norbert Pfanner (Fraunhofer ISE), Dr. Thomas Haussman; Innotech GmbH Albert Esper)



SolCoolDry System Design



SolCoolDry System Product



Drying of Orange Fleshed Sweetpotato chips for making wheat-sweetpotato composite bread

Reach Us:

P.O. Box 30650 - 00100, NAIROBI, Kenya
Tel: +254 (20) 2388216 or +254 (20) 2393466.
Mobile: 0724 214 092

 www.kirdi.go.ke

 directorgeneral@kirdi.go.ke / info@kirdi.go.ke

 [@kirdi_kenya](https://twitter.com/kirdi_kenya)  [kirdi.kenya](https://www.facebook.com/kirdi.kenya)  [kirdi_kenya](https://www.instagram.com/kirdi_kenya)  [kirdikenya](https://www.youtube.com/kirdikenya)

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