Stories from the Global Call on Agricultural Innovation

Solar Food Dehydrator by Growpoint International

Apollo Karuga Mugambi
African Food Systems Fellow Cohort 3

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Kenya

Funded by the European Union

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ABSTRACT

Apollo Karuga, a recognized Kenyan Food Systems Hero by the UN's FAO, aimed to address Kenya's broken food system by developing an affordable, eco-friendly solution for smallholder farmers to preserve food throughout different seasons. Karuga, through his team at Grow Point International, created a solar food dehydrator designed to reduce moisture in food and extend shelf life.

The dehydrator, made from locally available materials, utilizes a solar panel, black-painted buckets for heat absorption, and wire mesh to hold the food. Temperature readings taken during prototype testing demonstrated its effectiveness in drying fruits like tomatoes, bananas, and mangoes.

The project's success in Kenya and Tanzania has shown its potential to reduce food waste and improve food systems by empowering smallholder farmers. However, challenges in scaling the technology and providing community training and capacity building remain. Despite these challenges, the project has received recognition for its innovation and sustainability.

TAPipedia Tags
food systems, smallholder farmers, capacity building, sustainability, solar energy

Other keywords
Solar Food Dehydrator, Agrifood systems, Innovation, UN's FAO

Context

Apollo Karuga a registered and certified dietitian from Kenya, was recognized as one of the Kenyan Food Systems Heroes by the United Nations' Food and Agriculture Organization (FAO). He was also a panelist at the United Nations' Food Systems summit and is part of the African Food Systems Fellowship program cohort 3. His journey began during his internship at Mbagathi Hospital, where he encountered numerous cases of malnutrition. Apollo discerned that the crux of the issue was not the dietary recommendations he was making to his patients, but rather the dysfunctional food infrastructure in Kenya. Small-scale farmers were contending with food spoilage as a result of inadequate storage facilities and the repercussions of climate change. For example, unseasonal heavy rainfall resulted in flooding, which in turn diminished the availability of farm-fresh, nutritious food.

Understanding the need for an affordable and eco-friendly way to preserve food, Apollo and his team at Grow Point International developed the solar food dehydrator. This equipment, used by smallholder farmers, preserves food across different seasons by reducing moisture content. The solar food dehydrator is sustainable and innovative. Painted black to absorb more heat,

It features a solar panel at the top, harnessing renewable energy to propel air inside the containers. It is transportable and affordable, as it can be constructed from locally available materials. Apollo believes that the solution to the broken food system lies with the smallholder farmers.

The solution to the broken food system lies with the smallholder farmers.

His motivation behind the solar food dehydrator project is to empower these farmers, enabling them to preserve their produce, reduce waste, and ultimately improve the food system. His work serves as a testament to the power of innovation in addressing complex challenges and transforming lives. In developing countries, including Kenya, smallholder farmers often face significant food loss within the value chain, which directly impacts their income and overall food availability. It's estimated that post-harvest food loss reduces their incomes by at least 15 percent. In some cases, smallholder farmers in developing countries can lose up to 40 percent of their harvest due to inadequate storage. The type of crop also plays a role in the extent of post-harvest losses. For instance, minimum losses for oil crops, pulses, and cereals are relatively low (2.0 percent, 4.0 percent, and 4.2 percent, respectively), while fruits, roots and tubers, sugar crops, and vegetables experience higher losses (17.1 percent, 18.4 percent, 18.5 percent, and 20.7 percent, respectively). These losses are often due to poor harvesting and storage practices, lack of training and local services to build skills in handling, packaging, and storage, insufficient post-harvest storage facilities or basic on-farm storage technologies, and unreliable access to markets. At Growpoint International, efforts are being made to develop practical and relatively low-cost solutions to reduce food waste and post-harvest losses. The project was initiated in response to the challenges faced by smallholder farmers in Kenya, including food waste due to poor storage and climate change impacts.

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KEY PROBLEMS

- Food Preservation: The primary problem addressed by the solar food dehydrator project is food preservation. In many parts of the world, especially in developing countries, a significant amount of food is wasted due to lack of proper storage and preservation methods. The solar food dehydrator provides a sustainable and cost-effective solution for preserving food, particularly fruits and vegetables, by removing their water content and thereby inhibiting the growth of spoilage-causing microorganisms.

- Energy Efficiency: Traditional food dehydration methods often involve the use of electric dehydrators or ovens, which consume a significant amount of energy. The solar food dehydrator, on the other hand, utilizes solar energy, a renewable and abundant source of energy, making it an energy-efficient alternative.

- Cost-Effectiveness: Building and operating a solar food dehydrator can be much cheaper than buying and using an electric dehydrator, especially in areas with abundant sunlight. This makes food preservation more accessible to low-income households.

- Nutrition Retention: Dehydration preserves the nutritional content of food better than other preservation methods like canning or freezing. This means that dehydrated foods retain most of their nutritional value, making them a healthy choice.

Challenges addressed

- *Climate change and disaster risks*
- *Food loss and waste*

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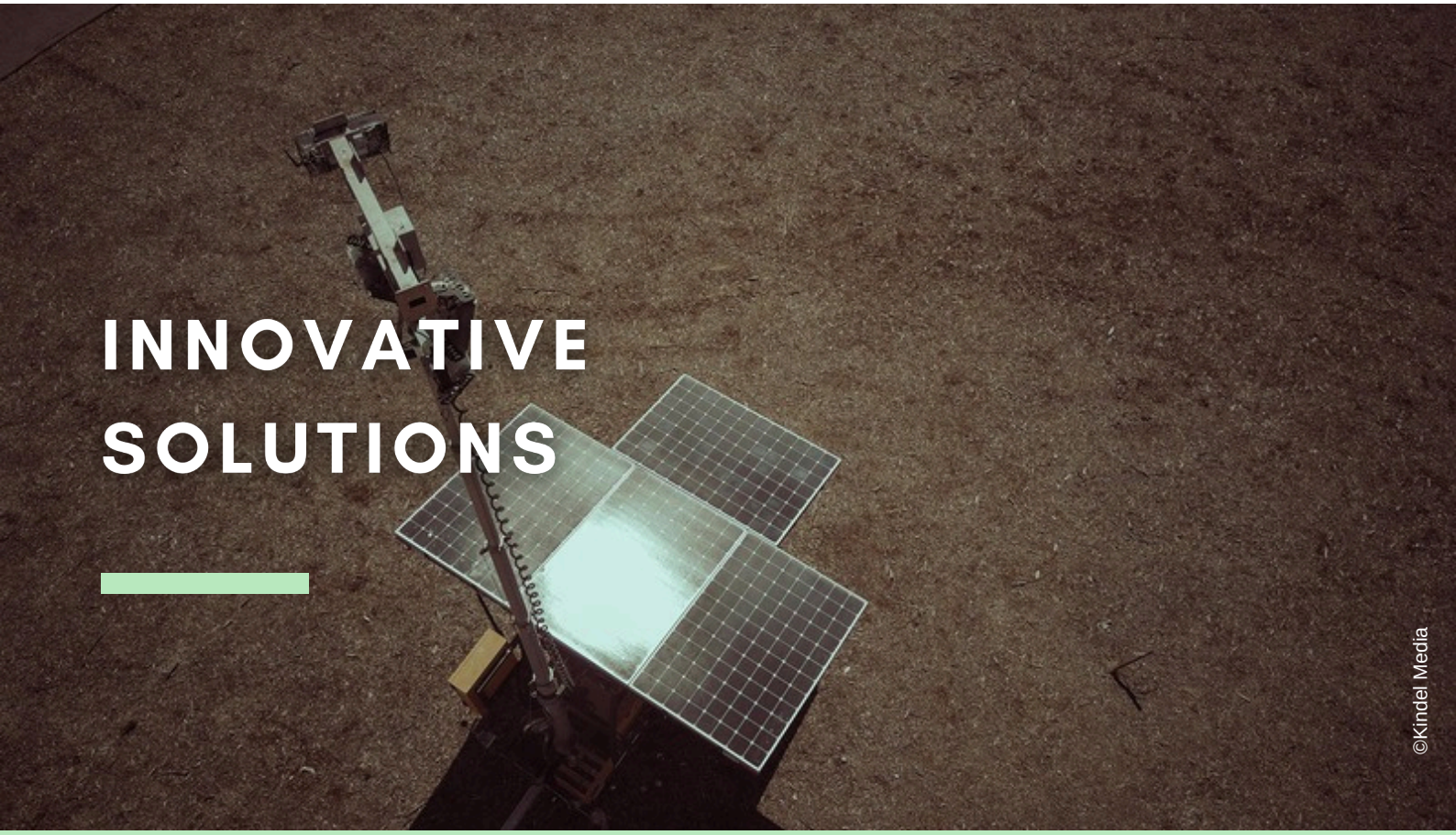

INNOVATIVE SOLUTIONS

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Solar Energy Utilization: The most significant innovation is the use of solar energy for food dehydration. This renewable energy source is abundant, especially in regions with high sunlight exposure. The dehydrator features a solar panel at the top, which harnesses solar energy to propel air inside the containers, facilitating the dehydration process.

Sustainable Design: The dehydrator is painted black to absorb more heat, enhancing its efficiency. This simple yet effective design choice contributes to the overall sustainability of the device.

Locally Sourced Materials: The dehydrator can be constructed from locally available materials, making it an affordable solution for smallholder farmers. This approach also supports local economies and reduces the carbon footprint associated with transporting materials from distant locations.

Portability: The dehydrator is designed to be transportable, allowing farmers to move it as needed. This flexibility can be particularly beneficial in regions where Farming plots may not be in close proximity to the farmer's home.

Food Preservation: The dehydrator addresses the critical issue of food preservation by reducing the moisture content in food. This not only extends the shelf life of the produce but also retains most of its nutritional value, unlike other preservation methods.

Factors for Success

Innovative Design: The solar food dehydrator's design is innovative yet simple, making it easy to use and maintain. Its black paint to absorb more heat and the inclusion of a solar panel to harness renewable energy are key design elements contributing to its success.

Sustainability: The project's focus on sustainability, both in terms of energy use and materials, has been a significant factor in its success. The use of solar energy and locally sourced materials not only reduces its environmental impact but also makes it more affordable and accessible to smallholder farmers.

Community Engagement: The involvement of the local community, particularly smallholder farmers, has been crucial. Their feedback and experiences have helped refine the dehydrator's design and functionality, ensuring it meets their needs.

Support from Key Stakeholder: Support from key stakeholders, including Crop Point International and The Outreach Program, has been instrumental in the project's development and implementation. Their resources and expertise have contributed to the project's success.

Leadership and Vision: The leadership and vision of Apollo Karuga, the innovator behind the solar food dehydrator, have been pivotal. His understanding of the challenges faced by smallholder farmers and his commitment to finding sustainable solutions have driven the project forward.

Addressing a Real Need: The project addresses a real and pressing need - food preservation. By providing a solution to this problem, the solar food dehydrator has had a tangible impact on the lives of smallholder farmers, improving food security and reducing food waste.

CRITICAL CAPACITIES

Technical Knowledge: Understanding how the solar food dehydrator works, including its design principles and operation, is crucial. This includes knowledge of how to properly load the food, when and how to use the dehydrator based on weather conditions, and how to maintain and troubleshoot the equipment.

Food Safety Practices: Users of the dehydrator need to understand basic food safety practices. This includes knowing which foods are suitable for dehydration, how to prepare food for dehydration (cleaning, slicing, blanching, etc.), and how to store dehydrated food to prevent contamination.

Adaptability: The ability to adapt to changing weather conditions and adjust the use of the dehydrator accordingly is important. This includes understanding how changes in temperature and humidity affect the dehydration process and how to optimize the use of the dehydrator in different seasons.

Community Engagement: The capacity to engage with the community and share knowledge about the dehydrator is key to its widespread adoption.

Resource Management: The ability to source and manage the materials needed to build and maintain the dehydrator, particularly in a way that is sustainable and supports the local economy, is another important capacity.

Entrepreneurial Skills: For those looking to sell dehydrated foods or the dehydrators themselves, basic entrepreneurial skills like marketing, product pricing, and customer service can be beneficial.

Challenges Encountered

Community Acceptance: Any new technology faces the challenge of acceptance by the community. It requires efforts to educate the community about the benefits of the technology and how to use it effectively.

Maintenance: The solar food dehydrator, while designed to be robust, may require maintenance and repairs. Ensuring that these services are readily available and affordable can be a challenge.

Climate Dependence: The effectiveness of the solar food dehydrator is dependent on the availability of sunlight. In regions with less sunny days or during certain seasons, the efficiency of the dehydrator may be reduced.

Food Quality: Ensuring the quality of the dehydrated food can be a challenge. Factors such as the type of food, the degree of dehydration, and storage conditions can affect the quality and safety of the dehydrated food.

EFFICIENCIES GAINED

Reduced Food Waste: The solar food dehydrator has significantly reduced food waste by allowing farmers to preserve their excess produce. This not only reduces losses but also maximizes the utility of their harvest.

Energy Efficiency: The use of solar energy makes the dehydrator an energy-efficient solution for food preservation. This reduces the farmers' reliance on electricity and contributes to environmental sustainability.

Cost Savings: The solar food dehydrator is an affordable solution for smallholder farmers. It can be constructed from locally available materials, reducing the cost of materials and transportation.

Improved Food Security: By enabling longer storage of food, the solar food dehydrator contributes to improved food security. This is particularly important in regions where food supply can be inconsistent or during off-seasons.

These challenges and efficiencies highlight the complexities involved in implementing innovative solutions and the potential benefits they can bring to communities.

Outcomes and Measurable Impacts

Improved Food Access: One of the primary outcomes of the project is improved access to food. By enabling longer storage of food, the solar food dehydrator has contributed to food security, particularly in regions where food supply can be inconsistent. This is especially important during off-seasons or in times of unpredictable weather patterns caused by climate change. Some of the successful stories of our project is we were able to make a huge solar food dehydrator from a single 1000litre drum with all the elements of the prototype such as painting the solar food dehydrator black in order to absorb heat and keep the food inside dry. Having made a 1000litre the solar food dehydrator with such an immense volume, more people were in a position to take leverage the huge drum in the village at Singida, Tanzania to store food and keep it dry and reduce food wastage. In Kenya, Apollo sensitized his neighbouring smallholder farmers at Kiambu County on the importance of food preservation by using a homemade solar food dehydrator that is affordable and requires do it yourself (DIY) skills to be successful

Reduced Food Waste: The dehydrator has significantly reduced food waste among smallholder farmers. By preserving their produce, farmers are able to minimize losses due to spoilage, thereby maximizing the utility of their harvest.

Energy Efficiency: The use of solar energy makes the dehydrator an energy-efficient solution for food preservation. This not only reduces the farmers' reliance on electricity but also contributes to environmental sustainability.

Economic Benefits: The affordability of the dehydrator, coupled with the reduction in food waste, has economic benefits for the farmers. It allows them to preserve excess produce which can be sold in the market, providing an additional source of income.

Nutrition Retention: Dehydrated foods retain most of their nutritional value, making them a healthy choice. This has potential impacts on the overall health and well-being of the communities using the dehydrator.

Environmental Impact: By using solar energy instead of fossil fuels, the solar food dehydrator helps in reducing the carbon footprint, contributing to environmental sustainability.

Community Empowerment: The project has empowered local communities in Kenya, Kiambu County by providing them with a sustainable and cost-effective solution for food preservation. It has also fostered a sense of self-reliance among the farmers.

These outcomes and impacts underscore the transformative potential of simple, innovative solutions like the solar food dehydrator in addressing complex challenges such as food security, waste reduction, and climate change.

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LESSONS LEARNED

Community Involvement is Key: The success of the project underscored the importance of involving the community at every stage, from design to implementation. This ensures that the solution meets the needs of the users and increases the likelihood of its adoption.

Sustainability Matters: The project highlighted the importance of sustainability, both in terms of the materials used and the energy source. Solutions that are environmentally friendly and make use of local resources are more likely to be accepted and have a lasting impact.

Education and Training are Crucial: The project showed that providing education and training on how to use and maintain the dehydrator is crucial for its successful use. This includes understanding the principles of food safety and dehydration.

Innovation Can Be Simple: The solar food dehydrator is a relatively simple technology, yet it addresses a complex problem. This shows that innovation doesn't always have to be high-tech or complicated to be effective.

Address Real Needs: The project was successful because it addressed a real need in the community - food preservation. Solutions that address real, pressing problems are more likely to be adopted and have a meaningful impact.

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Links to additional materials

YOUTUBE

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Acknowledgements

Apollo Karuga: As the innovator of the solar food dehydrator, Apollo Karuga played a crucial role in the project. His insights as a registered and certified dietitian guided the design and functionality of the dehydrator to meet the needs of smallholder farmers.

Grow Point International: This organization provided the platform for the development of the solar food dehydrator. They supported the project from its inception, providing resources and expertise.

The Outreach Program: As a stakeholder, The Outreach Program played a significant role in the project. They may have provided support in various forms, such as funding, resources, or community outreach efforts to promote the use of the solar food dehydrator.

Smallholder Farmers: The farmers are both the beneficiaries and key stakeholders in the project. Their feedback and experiences were invaluable in refining the design and functionality of the dehydrator.

Local Communities: The local communities, particularly in regions where the dehydrators were deployed, are also key stakeholders. Their acceptance and use of the dehydrators are critical to the project's success.

Government and Non-Governmental Organizations: Government agencies and NGOs involved in agriculture, renewable energy, and food security may also be key stakeholders. Their policies and programs can influence the adoption and impact of innovations like the solar food dehydrator.

THE TROPICAL AGRICULTURE PLATFORM

The Tropical Agriculture Platform (TAP) is a G-20 initiative launched in 2012 to promote agricultural innovation in the tropics. TAP has formed a coalition of more than 50 partners, led by the Food and Agriculture Organization of the United Nations (FAO) and generously supported by the European Union (EU). The main goal of TAP is to strengthen agricultural innovation systems (AIS) in developing countries through coordinated multi-stakeholder interventions.

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Global Call for Agrifood System Innovations and Stories of Capacity Development for Innovation

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