SCALE UP CONFERENCE - SESSION 7

Applications – Assessing New Technologies/Innovations for Possible Scale Up

Abstracts Compiled (arranged by group, session, and poster number)

Group 1, Session A, Poster I

Hygrometer-Moisture Detection Technology for Maize

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One of the main factors that affects the growth of fungi in stored maize is grain moisture content. This indicates that a straightforward way of managing fungi and the production of aflatoxin is to reduce the moisture content at which maize is stored. Research has established that storing grain at below 13 % moisture content will slow fungal growth, reducing the risk of aflatoxin production (Ng'ang'a, et al., 2016, Williams, et al., 2014). Evidence suggests that farmers and traders are unable to accurately determine by traditional subjective methods when maize is dry enough for safe storage. As identified by Prieto (2017) in a study in Senegal, there is room for devices that can provide objective information about maize moisture. Meters used to measure moisture are expensive, costing more than a US $100, and not easily available in many parts of the world. A hygrometer-based method was developed by researchers at Purdue University, which incorporates a cheap household device that provides humidity and temperature measurements and retails for $1.50 in the USA.

Tubbs et. al. (2017) established that for maize grain an equilibrium humidity reading of 65% indicates a moisture content between 12.5 % and 13.5% (conditional on temperature). The potential users of this technology are smallholder maize farmers and traders in developing countries.

An important step towards financial sustainability is to start negotiations with a supplier in China to ensure a reliable bulk supply of the hygrometers. It is certain that the cost will reduce once imports begin on a bulk scale.

Group 1, Session B, Poster II

Cyclone Pearl Millet Thresher

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Pearl millet is a nutritious staple cereal grown and widely consumed across sub-Saharan Africa. Every day, millions of rural women pound and winnow pearl millet panicles, extracting clean unbroken grain using the same simple tools they have used for thousands of years - the mortar, pestle and winnowing basket. This work is dusty, tedious and exhausting, it is difficult for women to provide food for their families.

After many years of research, prototype designs and testing, we have developed the “Cyclone” Pearl Millet Thresher, a small quiet solar powered machine that efficiently extracts clean grain from pearl millet panicles.

Women are comfortable using this type of machine, and more community members could thresh pearl millet because less skill and physical strength is required. Unlike the mortar and pestle, the “Cyclone” Pearl Millet Thresher seems to be a tool that women, men, children and elders are willing and able to operate. Faster, easier, and less dusty than manual threshing, it saves time, energy calories and eliminates health problems. It might even be possible for farmers to grow more pearl millet and produce a surplus of clean grain, which could be sold to generate income.

*Group 2, Session A, Poster III*

**Chimney Solar Dryer**

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Fruits and vegetables are often harvested during peak periods when market demand is insufficient to use all the product and prices are low. Drying products provides a mechanism to stabilize fresh produce for later sale and consumption. Open-air drying is the traditional solar drying method, but products are unprotected from rain, contamination, and predation. Many enclosed solar driers have been developed, but have not been widely adopted due to high costs and low efficiencies. The “Chimney Solar Dryer” is a cost-effective design that dries fruits, vegetables, and even fish quicker than other designs by concentrating heated air around the product and increasing airflow rates. Trays of product are placed on a black table and covered with clear plastic to form a low tunnel. The end of the tunnel is connected to a chimney that generates the flow of heated air over the product. The Chimney Solar Dryer can easily be constructed using local materials; we continue to refine the design to reduce costs and increase efficiency. Improved instructional tools for best practices would improve adoption for the technology. Stakeholders can be trained to build driers and have opportunities to offer drying services or partner with businesses selling drying-related supplies.
**Group 2, Session B, Poster IV**

**Integrated Mobile Cassava Peel Processing Machine**

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Nigeria, the world’s largest producer of cassava, currently harvests over 54 million Metric Tonnes (Mt) of cassava tubers annually. Over 80% of her rural poor depend on cassava/cassava products as a main source of food/nourishment, income and employment. More than 95 per cent of its uses require peeling which generates up to 14 Mt of waste annually with an estimated worth of over 129.2 Billion Naira (369 Million USD). Unprocessed cassava peels is very rich in in Energy (Starch/Carbohydrate) but has a shelf life of 3 days and contain high amount of cyanogenic glycosides which can be toxic to both animals and humans.

Our technology/machine processes cassava peels in three distinct stages which include grinding, de-watering and drying. This drastically reduces cynogenic glycosides with improved shelf life of up to six months. This technology addresses feed scarcity, food security, clean environment, and improved livelihood/income for our farmers who are mostly women. This machine is easy to operate, gender friendly and suitable for a wide range of demographics. Parts replacement is cheap and can be sourced locally. Scaling up this technology will ensure an annual release of 2.5 Million Mt of maize from the Animal Feed Industry for human consumption.

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**Group 3, Session A, Poster V**

**Technology Package for Prevention and Control of Mastitis in Dairy Animals**

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Dairy animals are key for rural livelihoods in Nepal but often suffer from mastitis, a production disease causing economic losses to farmers, challenges to the dairy processing industry and possible health hazards to consumers.

Researchers\(^1\) developed a technology package to prevent and control mastitis consisting of (1) identifying knowledge gaps; (2) developing good husbandry practices, including mastitis detection and control technologies; and (3) training technicians and farmers. The package was researched in Nepal’s mid-western region, and showed a reduction in sub-clinical mastitis prevalence (from 55% at baseline to 28% at endline in dairy cows \([n=432]\); from 78% to 18% in...

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\(^1\) Led by Heifer International Nepal as part of the Feed the Future Innovation Lab for Livestock Systems.
buffaloes [n=216]), six months after implementation. The package will first be diffused to 20 social entrepreneur women operatives across Nepal, impacting approximately 10,000 dairy animals. The package could be scaled further within Nepal and beyond to improve incomes and production of higher quality, safer milk.

**Group 3, Session B, Poster VI**

**Kero Porridge Flour**

(*“A Gift of Being” – Social enterprise*)

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INGABEYACU Company, Ltd.

INGABEYACU is a youth led social enterprise that aims at reducing the Postharvest losses and malnutrition problem in the community using the local resources. Our request is 20,000 US Dollars to make sure that we expand the machinery plantation, marketing strategies and also buying the equipment that will help in the community café sustainability. According to UNICEF, world widely Malnutrition rate remain alarming: Nearly half of all death in children under 5 are attributable to under nutrition, translating onto the loss of about 3 million young lives a year. ([https://data.unicef.org/topic/nutrition/malnutrition/](https://data.unicef.org/topic/nutrition/malnutrition/)). 56.1% of perishable products in Rwanda are being lost during the harvest, storage and distribution, ([URL://horticulture.ucdavis.edu/information/postharvest-loss-assessment-tomatoes-rwanda](URL://horticulture.ucdavis.edu/information/postharvest-loss-assessment-tomatoes-rwanda)). Concerning the malnutrition problem in Rwanda is that in each province, 39% of children under 5 years and pregnant women are malnourished. The proposed solution is to produce Kero porridge flour; the complementary porridge flour made in vegetables and different cereals like carrots, beetroots, soybean, sorghum and maize. Through Community café, there is an open discussion to learn how practically the different stakeholders (local governments, educational institutions like UR, NGOs like compassion international Rwanda, Private Sector Federation – Chamber of Young Entrepreneurs, Early child Development Centers- Rwanda, Farmers Cooperatives etc...) may strategically

**Group 4, Session A, Poster VII**

**Mobile Utility Grain Storage to Reduce Postharvest Loss**

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Chronic grain postharvest and input loss (PHL) is a problem development packages address by building warehouses for storing jute sack, or airtight soft plastic bag, hard plastic drum, metal can, and average local production. As averages are rare, stationary warehouses are often almost empty or overflowing and far away from “harvest fields, monitoring or primary processing” locations. Due to the dynamics of farming and tenure- insecurity it is risky for any grower to build/maintain warehouses and SSA grain production remains sub-optimal.

Mobile storage addresses PHL with utility that like farm wagons can be relocated. However, unlike wagons, utility storage parks cost-effectively so: 1) raised floors mitigate contact with water and mold that originate in soil, 2) vented roofs stop rewetting and open wide for easy Integrated pest management, and 3) sloping floors reduce the labor of primary processing and cleaning.

Most Development ignores how metal utility surplus storage costs decrease: 1) as capacity increases, 2) over the time that storage is full, 3) as monitoring and primary processing are optimal, and 4) when leases are as dynamic as tenure-insecure farming.

Supporting mobile utility storage would introduce grower storage rights to scale up SSA farming cost-effectively and sustain magnitudes more foreign exchange.

Group 4, Session B, Poster VIII

Hub-and-Spoke Food Processing Innovation System

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An important part of agricultural value-chains leading to economic development and improvement in nutritional health is the market sector involving food processing. The transfer of processing technologies, and broader technology packages, to strengthen urban and rural processors has been problematic in sub-Saharan Africa. We describe an innovation in how food processing technologies can be effectively disseminated as a development tool to improve livelihoods in rural communities and for urban entrepreneurs. A larger goal is to provide better markets for local farmers.

Our “Hub-and-Spoke” Innovation Centers in Niger, Mali, Senegal, and Kenya have a central food technology-based “Hub” at a national agricultural research institute or university that supports “Spoke” innovation centers representing rural and urban processors, which may be individual SME’s or women’s associations. The Hub provides functions including research and development, technical training and support, and business training. These centers provide the technologies and know-how to make high-quality commercializable products that people want to eat and can move in the marketplace, and mechanization to scale up processing to meet demand. The Spoke centers process products using technologies and formulations developed at the Hub, and they also innovate themselves. There is also a recent focus on nutrition, with use of natural and local fortificants, as well as mixed with synthetic premix, to
produce low-cost nutritious products. With this approach, we have documented growth of entrepreneur processors and rural processing, along with the development of rural markets.

Financial stability of the innovation centers, particularly the “Hub”, comes both from processor payment and from the national institute support, which provides scientists and technologists to work in the Hub innovation centers.