

# Mavuno Bora Kenya: Bountifield International Helps Rural Entrepreneurs Provide Postharvest Processing Services to Farmers



Miranda Grizio & Randol Rodriguez

#### Food Science in Action:

- ✓ Food Processing
- ✓ Food Engineering
- ✓ Food Quality

Benteter, an entrepreneur, with her thresher. Photo courtesy of Bountifield International

**Mavuno Bora** ("better harvest" in Swahili) is a unique pilot developed by Bountifield International to reduce postharvest losses, boost income, and improve food security for smallholder farmers in sub-Saharan Africa (SSA). It encourages the development of rural entrepreneurs by providing access to technology, business services, and financing. These entrepreneurs then provide fee-for-service threshing, shelling, and drying postharvest services to surrounding farmers with the use of small-scale, portable food processing tools. In 2020, Mavuno Bora was launched in Kenya, and in only one harvesting season, 17 entrepreneurs processed nearly 550 tons of staple crops for more than 4,000 farmers.<sup>1</sup> With support from the van Lengerich Family and the Seeding the Future Foundation, Mavuno Bora is positioned to scale and address multiple Sustainable Development Goals (SDGs), including Zero Hunger and Gender Equality, in SSA.

### Introduction

In Kenya, over one-third of the population is food insecure, with nearly half living on less than \$1 per day.<sup>2</sup> The agricultural sector is critically important in Kenya, enabling employment for more than 40% of Kenya's population and over 70% of the rural population.<sup>2</sup> Agriculture is also a top contributor to Kenya's gross domestic product (GDP), with direct and indirect contributions of 33% and 27%, respectively.<sup>2</sup> With 87% of farmers operating with less than 2 ha, Kenya's agriculture is mainly composed of smallholder farmers dedicated to the production of staple crops (such as maize, rice, wheat, and beans) and other traditional foods, including sorghum, millet, sweet potatoes, pigeon peas, cowpeas, cassava, yams, arrowroot, and green grams (mung beans).<sup>3</sup>

Despite the importance of the agricultural sector in Kenya and the several efforts undertaken by stakeholders in the last decades, reports show that agricultural productivity in Kenya has stagnated in recent years for a series of reasons.<sup>4</sup> In the production stage, smallholder farmers and agricultural enterprises struggle to increase productivity and improve quality of agricultural products due to climate change and weather shocks, scarcity of water, pests, and diseases. Once crops are harvested, there are physical and economic losses due to a lack of extension services supporting the adoption of modern technology, no or limited access to finance to facilitate the acquisition of postharvest technology, and a deficiency in quality supply systems for local and national food markets.<sup>5</sup>

In most of SSA, postharvest handling of staple and traditional crops includes practices such as field drying, threshing, shelling, winnowing, transport, and storage. These practices, usually performed by women and youths, are primarily carried out manually and therefore are labor

Table 1: Challenges Impacting Food and Agriculture in Kenya

economic, environmental, social, historical, and technological aspects (Table 1).

At the same time farmers struggle with these challenges, both the population and food markets are growing rapidly in Kenya. As food companies seek more quality supply to manufacture their food products, inefficient postharvest processes at the farm level are creating a bottleneck to growth. To help address these issues, Bountifield International, a U.S.-based nonprofit organization known for its work in small-scale postharvest and processing solutions in developing countries, conceived of a pilot called Mavuno Bora, which means "better harvest" in Swahili.

Political	Low government investment in rural economies compared to urban economies (with NGOs and IGOs that do focus on rural development tending to support agricultural initiatives such as inputs and training, rather than addressing postharvest losses or food preservation methods).
Economic	Lack of available, affordable, and dependable technology in the market and high poverty rates, which hinder smallholders' access to technology and credit. Also, dwindling returns from farming contributing to high rural unemployment and increased migration to urban areas.
Environmental	Changing rainfall patterns, drought, and poor soil fertility, which can lead to the loss of viable farmland and low agricultural productivity (underscoring the importance of postharvest loss mitigation).
Social	Women, who are primarily responsible for postharvest processing work, often lacking access to technology, credit, and information.
Historical	Adherence to traditional smallholder farming techniques passed down through generations, which can lead to a lack of awareness of modern tools and skills to improve food production. Also, historically a lack of smallholder farmer capital and government investment in the sector.
Technological	Reliance on traditional, manual methods of threshing, shelling, and drying crops, which can stifle optimal productive output and food quality, plus few technology options available in remote areas.

Response

In 2020, Bountifield

launched Mavuno Bora in Kenya as an 18-month pilot, with funding from the van Lengerich family and the Seeding the Future Foundation. The goal of this pilot was to provide smallholder farmers in Kenya with access to postharvest and processing tools when they needed it (e.g., seasonally, after harvest) on a fee-for-service basis, thereby helping to reduce

intensive, time consuming, and inefficient. More specifically, postharvest losses for SSA are estimated to be between 35% and 50% of the annual food produced.<sup>6</sup> In 2011, up to 30% of Kenya's key cereals (which includes maize, rice, wheat, sorghum, millet, and barley) were lost within six months after harvest, and such losses were estimated to be equivalent to KES 90 billion (USD 780 million in 2022) annually.<sup>7</sup>

The challenges Kenya's smallholder farmers face in improving their system of food production are numerous and complex, touching on political, postharvest losses, improve food quality, and increase profits. Bountifield partnered with local individuals and small businesses interested in starting or expanding their own rural microenterprises as postharvest service providers.

Activities were focused on several counties throughout Kenya, including Kitui, Machakos, Makueni, Meru, and Tharaka-Nithi in the east and Kisumu, Homa Bay, Migori, Kisii, Busia, and Kakamega in the west. Bountifield's on-theground team in Kenya consisted of a team lead, two agribusiness coordinators, and an agricultural technician, with administrative support provided by Emerge Centre for Innovations-Africa (ECI-Africa).

Central to the model was identifying and sourcing the most effective and suitable tools for meeting the farmers' needs. To determine the most appropriate technology, Bountifield tapped into its extensive knowledge of East African agricultural systems based on its prior postharvest projects and experience with farmers. Furthermore, a market assessment was done to understand which postharvest tools were available in the market, as well as their potential for responding to access to parts. Processing capacity was an important element of the initial specification review to ensure optimal value to farmers and entrepreneurs. For example, the multi-crop thresher's capacity of 4-6 MT/day (4.4-6.6 tons/day)<sup>8</sup> is less than what might be required for a food processing facility but greater than what a farmer could achieve through traditional manual methods. Performance evaluation, field testing, and user surveys played key roles in the final decisions.

The field of food science was an integral part of the Mavuno Bora pilot. This included food



Maize sheller used in Mavuno Bora pilot. Photo courtesy of Bountifield International

market gaps and improving the livelihoods of the targeted communities. A few examples of the tools identified for the pilot project were a multicrop thresher (for millet, sorghum, cowpeas, and green grams), a sheller (for maize), and a solar dryer (for cassava) (Table 2).

Factors influencing the selection of the specific models included specifications, cost, availability in Kenya, durability, ease of use and servicing, and

Table 2: Examples of Tools Selected for Mavuno Bora Pilot in Kenya

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ΤοοΙ	Crops
Multi-crop thresher	Millet, sorghum, cowpeas, green grams
Sheller	Maize
Solar dryer	Cassava

processing, to save farmers time and labor and to reduce postharvest losses that occur when crops are not processed quickly as they might otherwise be impacted by rain, fungal growth, and pest contamination in the field and during storage. In addition, food engineering was the basis for selection and evaluation of the tools. Food quality was another key aspect; besides the potential for reducing mycotoxins such as aflatoxin through more timely processing, the use of the sheller and thresher, for example, were found to result in less breakage compared with manual processing methods.

In order to identify entrepreneurs who could become postharvest service providers through the Mavuno Bora pilot, Bountifield carefully evaluated over one hundred applicants. For the evaluation, information on established indicators was collected to score and rank the



Figure 1. Potential Economic Gain for Smallholder Farmers Processing Green Grams. Reprinted with permission from Bountifield International



entrepreneurs on four dimensions (business capacity, leadership and management, financial capacity, and processes and procedures) by connecting, remotely and in-person, with the entrepreneurs and the communities where they operated. Twenty enterprises were selected through the evaluation—30% female, 35% male, and 35% joint male/female enterprises.1 Bountifield ensured entrepreneurs had on-going support during the pilot and were provided with the technology, business services, and financing needed to create a sustainable business. This comprehensive support was essentially a "business in a box" that could allow them to quickly develop a microenterprise that involved identifying smallholder customers, scheduling appointments, and transporting portable postharvest tools to the farms (typically by motorcycle) to process the customer's crops. A typical microenterprise might need two or three tools to meet local needs.

Bountifield not only coordinated the entrepreneurship program but also contributed 50% of the start-up loan for an entrepreneur's postharvest tools. The other 50% of the loans was provided by anchor partners, which included microfinance institutions like Savings and Credit Cooperative (SACCO) and commodity buyers like Sorghum Pioneer Agencies, as well as other NGOs. This close engagement with the private sector and existing organizations was designed to help ensure a sustainable solution with economic benefits across the value chain. Entrepreneurs were also networked with each other, including through digital technology (such as WhatsApp, Facebook, and bulk SMS), which allowed them to share their challenges and solutions, helping them to learn along the way and grow their businesses.

Mavuno Bora's one-to-many approach equipped rural entrepreneurs with a ready-made business



Thresher operators preparing to travel to their smallholder customers. Photo courtesy of Bountifield International

that could allow each enterprise to provide indemand services to potentially hundreds of farmers and also quickly generate income, develop valuable skills, and support the growth and prosperity of their community. These efforts are ultimately expected to strengthen the value chain and greatly improve the ability of Kenya's smallholder farmers to supply the country's growing food market, both locally and nationally.

# **Results**

As of December 2020, in 12 months Mavuno Bora's pilot project in Kenya had successfully developed 19 enterprises with the potential to reach an estimated 43,800 farmers.<sup>1</sup> The anchor partners contributing funding to the 19 enterprises consisted of 50% NGOs, 25% microfinance institutions, and 25% private sector commodity buyers.

Between December 2020 and March 2021, even in the middle of a pandemic-disrupted harvesting season, 4,369 farmers used threshing, shelling,

and drying services among 17 enterprises—a promising 1:257 service ratio, for a total of 546.26 tons of processed crops.<sup>1</sup> These farmers realized a 28-61% increase in net returns (depending on the crop) from reduced labor costs, increased market value of a processed product, and

"Before Bountifield, we used to dry our cassava on tarpaulins and gunny bags which led to poor quality, long drying periods, and subsequent rejection of our product. The process took a week to dry. With the dryer in place, we have improved the quality of the cassava delivered to our buyers. Our bargaining power has been enhanced because of our ability to service orders with high quality dried cassava."

-Josephine Okolodi, Asinge Aggregation Center<sup>1</sup>

reduced wastage.<sup>1</sup> In many cases, less breakage, which resulted in a higher quality product, allowed them to sell the crop at higher prices. The reduction of labor by using the postharvest processing services was estimated at 36,319 hours, which not only immediately increased efficiency and productivity in the sector, but also freed up farmers' time to devote to other activities important for their businesses, families, and communities.<sup>1</sup> Moreover, the program has shown high suitability to empower women and youth, with an estimated 46-54% gender distribution among farmers using the services.<sup>1</sup>

The enterprises that had received equipment loans were able to pay back 27% of their loans by the end of the first harvesting season.<sup>1</sup> In addition, farmers had more confidence that they could get their crops processed quickly (thereby minimizing the risk of postharvest loss), which resulted in some farmers choosing to expand their crop acreage. A third-party social return on investment (SROI) analysis, which looked at potential impacts on factors like increased future

> lifetime earnings, improved nutrition, and increased wellbeing, determined that for every \$1 donated to Bountifield for Mavuno Bora, there would be a \$6.42 social return on investment.<sup>9</sup>

# **Lessons Learned**

- Partnering with the private sector and NGOs, as well as commitment to the testing and approval of equipment functionality, are key in Bountifield's business model as they increase the commitment and trust among partners.
- Equipment delivery also requires training and quality control to ensure proper and safe use of equipment, optimum performance, and consistent and quality product to sustain the market.
- Equipment purchase and donation by the government can disrupt markets and equipment supply chains.
- As the private sector and entrepreneurs often have short-term expectations (compared with mission-driven organizations like Bountifield), it is important that projects include ways to quickly create value.
- A ready market for the processed crops is essential. Therefore, a holistic approach to the market is key to offsetting the risks of losing major buyers.
- Since rural economies are subject to constant change and unexpected risks, a pipeline list of additional anchor partners and funds for projects is critical.
- As natural factors such as COVID-19 and the impacts of climate change still represent large, unexpected risks to this business model, an approach that can adjust and seek resilience is essential to developing a robust and sustainable model.

# **Next Steps**

Bountifield International CEO Alexandra Spieldoch says Bountifield aims to replicate and scale Mavuno Bora across Kenya and, ultimately, across Africa. "Our vision is an Africa that can feed itself and is poised to feed the world," says Spieldoch. Bountifield is working to expand the number of anchor partners to further strengthen the program's sustainability, with the plan to bring a positive impact to 10 million African people by 2030.<sup>10</sup> Proof of concept for an innovative business model like Mavuno Bora can also generate interest in the development community and attract investment as a promising opportunity in rural and agricultural development. In fact, an additional Bountifield project, "She Feeds Africa," which not only creates access to small-scale technology and business support, but targets investment in women as food entrepreneurs is underway and was recently awarded 3 years of funding from the private sector.<sup>11</sup>

As Bountifield expands Mavuno Bora, there will continue to be important roles for food science. For example, since developing countries often face challenges with grain quality and mycotoxins during storage, Bountifield is adding training on better storage practices and the use of moisture meters to reduce the risk of contamination. Work is also underway to improve the efficiency of the solar dryers.

"Thanks to Bountifield International's Mavuno Bora Project for empowering our youth through facilitating access to mobile threshers to smallholder farmers who otherwise are unable to access other technologies designed for large-scale operations. I see a big opportunity to expand access to mobile threshers among women and youth farmers throughout the county."

-Beatrice Nkatha Munyi, Sorghum Pioneer Agencies Limited<sup>12</sup>

Ultimately, Mavuno Bora is expected to make farming more attractive economically to the next generation, while also providing an appealing entrepreneurship opportunity for motivated individuals, including rural youth. Both factors contribute to rural development and the development of a virtuous circle that strengthens the agricultural and food systems at the local and national levels. As entrepreneurs become selfsufficient, they will become key players in the market and able to access financing, purchase technology, and hire employees without further assistance from Bountifield.

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