

# From One-to-Many

Equipping Rural Micro-Enterprises  
with Postharvest Technology and Service Packages  
that Create New Opportunities  
to Process, Save, and Sell More Food



Bountifield integrated  
with iDE in 2024.  
This report portrays  
Bountifield's experience  
prior to the integration.

**iDE**

[www.ideglobal.org](http://www.ideglobal.org)

A Bountifield International  
2<sup>nd</sup> White Paper  
October 2021

*Funded by the van Lengerich Family*



**BOUNTIFIELD**  
INTERNATIONAL

# Executive Summary

**This paper** tracks the progress of the “Mavuno Bora” pilot project (Swahili for Better Harvest) to improve the efficiencies of smallholder farmers. Mavuno Bora aims to increase the incomes and food security of Kenyan smallholder producers and their families by replacing manual practices with postharvest technologies and services for processing and preserving staple crops. Rural entrepreneurs purchase and utilize small-scale postharvest equipment to help other surrounding smallholder farmers dry, thresh or shell crops on a per kilo basis. This **“one-to-many” business model** directly addresses the constraints of smallholders by their lack of access to tools that process their staple crops more efficiently. Simply stated, they cannot afford to buy motorized equipment on an individual basis.

**The model** has been piloted by Bountifield and enabled through financial support of the van Lengerich Family since 2020. Anchor partners provided co-financing for the purchase of postharvest processing equipment by micro-entrepreneurs. This has unlocked financing for rural entrepreneurs who would otherwise lack the capital to invest. The model is rooted in strengthening local food systems in Kenya. Bountifield provides technical experience alongside well-established local partners to create a new cadre of micro-enterprises that are helping smallholder farmers to process and preserve staple crops more efficiently. Since women in particular are largely responsible for postharvest processing and food preparation, their time and labor spent on inefficient practices is greatly reduced. New employment opportunities are being created for women and youth as business owners and operators that contribute to the inclusive growth of their communities.

**Bountifield**, along with five anchor partners, provided financing, technical services and capacity-building to 17 emerging entrepreneurs, enabling them to provide threshing, shelling and

drying services to farmers for the December 2020 – March 2021 season on a fee-for-service basis. The fees collected were used by the entrepreneurs to cover their costs and commence repayment of their loans. Collectively, more than 4,000 farmers used the threshing, shelling and drying services provided by this first cohort of entrepreneurs to process their crops for sale and home consumption.

**The methodology** for the Mavuno Bora model does not focus on individual farmers, but rather, aims to scale up technologies for farmers already engaged with existing development partners. It creates synergies with local partners and focuses on rural entrepreneurs as key implementing agents to address postharvest inefficiencies in three key areas – **technology, business services, and finance**.

**Technology** testing and evaluation took place throughout 2020 and during the first fully operational phase in 2020 - 2021. Finding the best tools for the job is fundamental to Bountifield’s approach and an essential foundation for the model. A market survey and assessment of equipment followed by performance testing identified two multi-crop threshers and a maize sheller that are readily available in Kenya and capable of processing crops faster, at lower cost and with less wastage than current manual practices.

Prices and associated set-up costs for the three machines introduced were under \$2,000. This is not affordable or a good investment for most farm households, given their relatively small volumes, but is within the reach of many rural entrepreneurs and development projects and the model is affordable as a fee-for-service business.

**Services** to increase the technical, business, and management capacity of entrepreneurs were found to be lacking in the postharvest technology sector and a major contributing factor to the lack of equipment adoption. Equipment testing to assess performance, user training and after-sales services to maintain, repair, and provide spare parts is currently rare in rural Africa, even when equipment is supplied by development agencies or government programs.

Based on this early finding, provision of technical assistance and training to entrepreneurs by Bountifield and anchor partners became a key activity of the model, and essential to enable the entrepreneurs to provide services onwards to fellow farmers. For the moment, it constitutes an **overhead cost** for Bountifield that is only recoverable through external financial support and presents an opportunity to develop and establish a more sustainable model.

**Outreach:** In total, the 17 entrepreneurs provided services to 4,369 smallholder customers, equivalent to an average service provider to farmer ratio of 1:257 for the first harvest season. This high level of outreach is promising, particularly in the context of a pandemic-disrupted market and provides strong evidence that the one-to-many approach has potential for scaling up to commercially sustainable levels in the future.

Preliminary estimates of potential **economic gains for farmers** varied from \$5 per farmer for cassava, to \$21 for green grams per season. This is equivalent to a 28-61% increase in net returns through reduction of labor costs, increase in the market value of processed product, and decrease of physical wastage.

**Time Saved:** Farmers saved a total of 36,319 hours (4,540 days) of labor for threshing, shelling and winnowing. This is a dramatic reduction and great achievement illustrating the impact of Bountifield's model to reduce drudgery, and to increase efficiency and output.

All of the entrepreneurs achieved a positive gross margin, calculated as the net earnings from fees charged for processing less their direct costs, mainly transport, fuel, and labor. The three leading grain processing enterprises in terms of income and gross margin accounted for 40% of the smallholders and 62% of the crop processed during the pilot period. This is encouraging since it indicates that higher economic returns to the entrepreneurs were associated with higher numbers of smallholders serviced and greater quantities of crop processed per smallholder.

*RIGHT: A farmer with bags full of freshly threshed sorghum.*

Overall, the results from the pilot suggest that by combining the outreach of NGOs with a suitable business model, it may be possible to reach some of the most disadvantaged smallholder farmer households with technologies that can change their lives.

**Finance** for the technologies was shared between the anchor partners and took various forms. In the standard model, Bountifield provided 50% of the cost of equipment procurement as a grant and the anchor partners paid the balance. The equipment was then allocated to the entrepreneur on a loan basis, which they pay back in full over 2-3 seasons.

The five anchor partners comprised of two NGOs, two commodity trading companies whose main business is buying and selling grains from smallholders, and a private sector farmer association operating a microfinance savings and loan portfolio for members.

Partners were encouraged to recover the full cost of the equipment from entrepreneurs in order to provide revolving funds for re-investment with new enterprises. However, in practice NGOs were unable to manage loans during this first iteration of the model and consequently, some of the entrepreneurs received the equipment on a grant basis. This practice will be gradually phased out.

The 10 enterprises receiving loans for their equipment (as opposed to grants), paid 27% of the loan balance due by the end of the season despite the challenges of managing a start-up operation and a difficult enabling environment.



Overall, the data collected from the first round of commercial application of the business model and the feedback from partners suggests that finance is available at the level needed. If technical and marketing needs are met, farmers will pay for services and entrepreneurs will be willing and able to pay back and take on further loans. This in turn will lead to a scaling up of postharvest technology adoption and achievement of Mavuno Bora's overall goal to improve the lives of smallholder farmers and their families. The questions we intend to answer in the coming seasons:

1

How much can the model contribute to food security?

2

How much postharvest loss can be eliminated by improved postharvest technologies?

3

Can the model be technically feasible and financially viable at scale?

4

To what extent can the model be fully inclusive of women and young people, and achieve high social impact?

## ONE-TO-MANY

Bountifield designed the one-to-many business model based on field surveys, stakeholder consultations and desk research. Pilot activities in Kenya have been organized to collect data that tests and informs the viability of the model. It was carried out in collaboration with a small number of “anchor partners” with whom we cost shared on small equipment loans (~\$1,300) to rural entrepreneurs. They were selected based on recommendations from partners and included women and men, individuals, and groups. The anchor partners were NGOs, for-profit commodity traders and a micro-finance lender, all with a footprint in the target areas and the ability to invest the relatively small amounts required by each enterprise. During the 2020 - 2021 harvest season, the entrepreneurs provided mechanical threshing, shelling and drying services to farmers and agreed to pay back their loans by charging a fee-for-service. They were supported by Bountifield and anchor partners in a variety of ways, including technical and business training.

# Introduction

This is the second white paper in a series that reports on Bountifield’s “one-to-many” approach for equipping rural micro-enterprises in Kenya with postharvest technology and service packages that create new opportunities for exponentially more smallholder farmers to process, save, and sell more food. It tracks progress being made through a fee-for-service model to increase the incomes and food security of smallholder producers and their families.

The [first white paper](#) described preliminary field work carried out in Kenya during 2020 and provided the information, data and assumptions underpinning Bountifield’s approach.

This second white paper showcases further the results obtained with a selected group of anchor partners and entrepreneurs, providing a summary analysis of the impact and lessons learned from a roll-out of the one-to-many model through January 2021. It contains valuable learnings from working with our many partners – including development practitioners, funders, agricultural equipment suppliers, farmer associations and government agencies.

It also serves to inform other stakeholders in the food system on our approach, designed to accelerate smallholder technology usage by creating public and private sector synergies that achieve a high social return. The paper includes analysis, conclusions and discussion of the qualitative and quantitative data collected to date that will be used to inform the next steps in development and implementation of the model. It employs metrics which relate specifically to the success of the business services approach whilst maintaining a clear focus on measuring the potential impact that could be achieved in the lives of smallholder farm families and communities if the model can be scaled-up sustainably.

*COVER: Members of the Mukothima Boda Boda Travellers youth group pose with the SL-3 thresher mounted on a motorbike, ready for transport.*

# About Bountifield International

Bountifield’s vision is an Africa that is self-sufficient in food production and poised to help feed the world. The organization was borne out of and has been a proud partner of General Mills since 1981. For 40 years, we have spearheaded small-scale postharvest technology projects in rural communities globally and have increased food security, benefiting more than 1 million people along the way.

Today, the organization is focused on sub-Saharan Africa where we see the greatest need for moving smallholder farmers away from manual labor for harvesting, processing, and storing crops, and creating more quality-supply in local and national food markets with postharvest technology and services. By 2030, our goal is to impact 10M people and we believe we have the beginnings of a successful and replicative model to achieve that goal.

Mavuno Bora (Swahili for “Better Harvest”) is a pilot project in Kenya, funded by the van Lengerich family, to improve the lives of women and men, young and old, by unlocking access to cost-effective postharvest tools. We are testing a proof of concept for an innovative business model that unlocks access to a range of postharvest technologies, primarily for staple crops, and improves access to financing for micro-, small-, and medium-sized enterprises (MSMEs).

Learnings from this pilot will allow us to capture results and develop our plans to replicate and expand across Kenya and Africa.

# Understanding The Problem

*With its population of 48 million people, Kenya has been slated for economic growth with new opportunities for expansion in national food markets.*

On the one hand, urban consumers have increased their demand for processed and preserved food. On the other hand, smallholder farmers struggle to supply enough quality food to the market. At the household level, food insecurity is on the rise. Though much of development work has been targeted toward agri-inputs to increase yields, postharvest processing, storage, and marketing are equally essential entry points for addressing food loss and saving quality food yet traditionally receive minimal investment.

During the start-up and pilot of Mavuno Bora, our observation that current practices for harvesting, processing, and marketing of grains in Kenya lead to high physical and economic losses<sup>1</sup> was confirmed by farmers, traders, development agencies, extension workers and researchers. Our original assumption, based on the feedback from these various stakeholders was that losses are the national and local markets. Primarily due, either directly or indirectly, to a lack of access to technologies that would improve the postharvest systems currently in use. At the smallholder level, in the absence of affordable technologies, these systems still depend largely on manual operations for harvesting, handling, and processing of crops, including threshing, shelling, winnowing, and storing.

Lack of investment capital, skills and capacity are other major challenges. Although the work reported here has been conducted in Kenya, it is relevant to trends that can be seen across sub-Saharan Africa.

1 Estimated to be as high as 50% (FAO, 2019)

Figure 1: Bountifield International Theory of Change



# Our Theory of Change

**Bountifield's theory of change based on pre-pilot research stated that:**

*Access, affordability, availability, and utilization of robust, functional and safe to operate postharvest technologies to reduce manual labor, maintain quality, and decrease losses of food crops will increase the competitiveness, incomes, and food security of smallholder producers. With the right postharvest tools, technologies and business package, micro-, small-, and medium-sized enterprises (MSMEs) can meet the postharvest demands of farmers, and reach their full potential in the African technology and food markets.*

Three key assumptions underpinned this:

## 1 Quick and tangible benefits.

Since postharvest investments focus on maintaining quality, adding value, reducing wastage, and increasing the storage life of a crop that has already been produced, they are not at risk from unpredictable weather and other pre-harvest factors that threaten production-related investments. In addition, the creation of a business relationship between smallholders and village level entrepreneurs reduces the costs of crop aggregation and marketing and can lead to an immediate increase in net returns for both parties.

## 2 Labor-saving.

If the postharvest technologies are selected and operated appropriately, manual labor will be significantly reduced and food quality improved. This benefits the whole family but, particularly **women**, since they are traditionally responsible for the hand-processing, storage and purchase of food crops, as well as managing the family diet. In the lowest income households, they are integrally involved in production and often dependent to a high degree on home-grown food crops. This means that any technology that reduces manual labor, prolongs crop storage, decreases food losses, and preserves food quality will have a direct impact on the family budget and time that women have available for other activities. The design of Mavuno Bora also acknowledges that women are well represented as buyers and traders in all food crop value chains and are well positioned to participate as new entrepreneurs.

## 3 Resilience.

If the postharvest technologies are selected and the introduction of easy and safe to operate technology and an inclusive business-oriented approach creates new markets for technologies and service provision. This is an incentive to young women and men looking for employment and new income opportunities both on and off the farm. The one-to-many model contributes to stronger, more resilient communities equipped with labor-saving technologies, embedded technical knowledge and more competitive supply chains.

# Approach & Methodology: The Three Pillars

The methodology for the pilot focused on addressing postharvest inefficiencies in three key areas (pillars) for a range of staple food crops grown, consumed, and marketed by smallholders.

We set out to test the stated assumptions and the validity of the theory of change by collecting empirical and quantitative evidence related to three over-arching questions within each pillar:

## Pillar 1 Technology

What is the right tool for the job? We sought out independent information on the efficiency of tools available and asked whether previous projects assessed the technical feasibility and economic viability of mechanical equipment that included multi-crop threshers, dryers and shellers on the market when they invested in them.

## Pillar 2 Business Services

Can the one-to-many, fee-for-services approach work? To do so, we sought to identify the needs of farmers to confirm if they would be willing and able to pay for services. We also focused on vetting entrepreneurs and providing them with needed skills, coaching and mentoring to become successful and to see a return on their investment.

## Pillar 3 Financing

How can Bountifield unlock financing for the relatively small investments (under \$2,000) needed for most postharvest technologies? If the model can be sustained on an ongoing basis, we need to understand the critical factors needed to do so.

### The Bountifield Model: How it Works

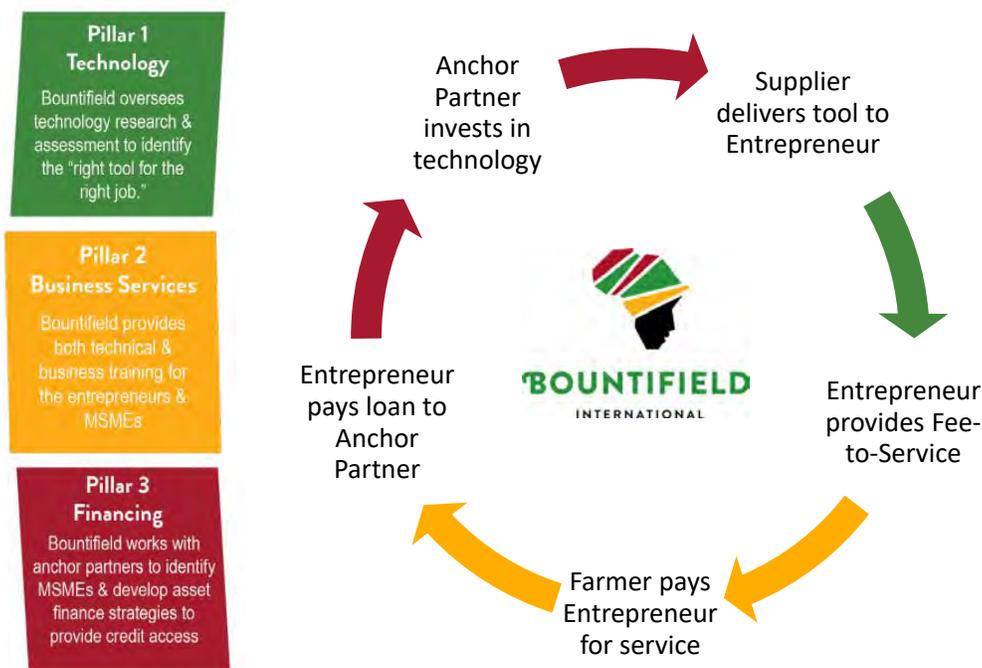


Figure 2: Bountifield's Mavuno Bora Model

# Results

## Pillar 1

### Technology: "The Right Tool for the Right Job"

**Crops and technologies:** Maize, sorghum, green grams, and cassava are the main food crops that Kenyan smallholder farmers produce in sufficient quantities to require threshing and drying services. Since maize is produced in almost every area of the country, our original assumption was that tools for maize shelling would be more readily available to producers. For this reason, as well as nutritional, resilience, and marketing factors, we focused initially on multi-crop threshers for sorghum and legumes, and a commercial-scale cassava dryer. Target areas in western and eastern Kenya were selected where these crops are grown in relatively large quantities, and because environmental conditions vary.

**Sorghum and Green Grams:** Pre-pilot research and discussion with equipment suppliers led us to identify two machines that could be procured in time and in sufficient quantity to meet the start of the main harvest season in December 2020. These were the SL-3 multi-crop thresher, imported from China, and the locally manufactured MT-500. Other machines assessed did not meet our basic criteria<sup>1</sup> or needed to be ordered and shipped from countries with delivery times of many months.

Both machines appeared to be fit for purpose in pre-pilot testing and were procured by the entrepreneurs according to their preference. However, it soon became obvious that in commercial practice the SL-3 thresher outperformed the MT-500, both in the quantity of grain threshed per hour and the quality of winnowing.



*Early on the SL-3 multi-crop thresher showed superior performance with a greater output and higher quality of winnowing.*

<sup>1</sup> Criteria included specifications, availability, durability, financial viability, cost, servicing, and access to parts. It also included limited field testing and user surveys.

**Table 1: Output for various crops (kg/hr)**

CROP	SL-3	MT-500
SORGHUM	900	600
GREEN GRAMS	600	200

Based on this data and feedback from users, the SL-3 was recommended as the best tool currently available for threshing these crops. It is a more robust and cost-effective thresher than the MT-500, with superior operational efficiency. As far as could be established through discussion with farmers, traders and field workers, **this was the first time that screening, evaluating, and testing of a new technology under field conditions had been carried out rigorously.**

**Maize:** Within the first month of the pilot, it became clear that there was a high demand and a business opportunity for maize shelling. Five of the selected enterprises were assisted to source additional funds for maize shellers to complement their threshing services. Since maize shelling requires a different technology for threshing small grains, the entrepreneurs required a dedicated machine. This was an early demonstration of the need for volume, flexibility, and the right technology to optimize prices and profitability. It was a ‘win-win-win’ finding because it enabled the entrepreneurs to increase their turnover, maintain prices at fair levels for growers, and secure new orders. For entrepreneurs and farmers in some areas it also provided alternatives to compensate for a depleted sorghum market due to COVID-19. In general, it **demonstrated the benefits of crop and product diversification to keep businesses going.**

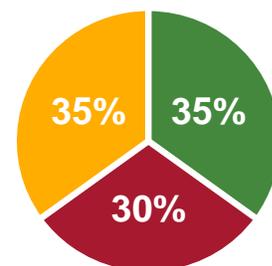
**Cassava.** Four group aggregators that buy cassava for drying and marketing from smallholders were selected as service providers. Cassava is becoming increasingly important as a food security crop in some of the lowest income areas of Kenya because of its caloric value and drought tolerance. However, the current methods for obtaining dried cassava chips for home storage and local sales are highly labor-intensive and produce chips of variable quality. The need for improved drying technology was clear since the aggregation centers currently dry the crop on tarpaulins on the ground leading to contamination and exposure to the elements.



*In practice, the MT-500 multi-crop thresher did not perform as well compared to the output of the SL-3 thresher.*

Since cassava dryers are a new technology in Kenya, we engaged a contractor to design and build a hybrid solar-biomass dryer for testing. The prototype went through several modifications, but the aggregators were able to process enough fresh cassava to demonstrate clearly that the dryers have potential to reduce the drying time and labor cost as well as producing a higher quality product than the traditional method.

### Selected Enterprises by Gender



■ Men ■ Women ■ Group (M/F)

## TECHNOLOGY PLACEMENT

The original target of the pilot was to work with 20 rural enterprises made up of individuals, existing businesses, or aggregation groups, with each offering at least one threshing technology for grains and legumes or a dryer for root crop processing.

During the season, 5 of the enterprises also acquired specialized maize shellers as an addition to their threshers in response to demand.

**Table 2: Selected enterprises by technology**

TECHNOLOGY	#	CROP
THRESHER	16	Sorghum
SHELLER	5	Maize
DRYER	4	Cassava



*The MS-100 maize sheller was added to the portfolio of tools in response to demand for this crop.*



*ABOVE: Inside the dryer there are tiers of platforms to keep the cassava off the ground during the drying process.*

*LEFT: The original design for the hybrid solar-biomass dryer went through several modifications but still provided positive impact for cassava drying as a solar dryer.*

When the season started, not all the potential entrepreneurs were able to set up and operate the fee-for-service business as planned. There were various market, production, technology, and business-related reasons for this:

- Some agro-dealers lost interest because the activity required significant attention without the same returns as their existing business or other sources of income over the short-term.
- Maize was the only crop available for processing in some areas. Neither the SL-3 nor the MT-500 could be modified successfully for maize even though some enterprises attempted this with negative results.

- Drought in some areas reduced crop production to levels which were uneconomical for setting up a threshing business.
- COVID-19 regulations restricted alcohol consumption and consequently the market demand for sorghum by breweries fell in some areas. Several of the entrepreneurs were depending on this market to provide high volumes of sorghum for threshing.

Meeting these challenges required **flexibility by all the stakeholders** and they were eventually overcome by measures such as moving non-operating machines to alternative enterprises; swapping or supplying a new machine where necessary; or finding a new source of finance. In total, 17 threshing and shelling machines and 4 cassava dryers were successfully brought into operation, with services provided for a fee to smallholders.

Discussions with the entrepreneurs and partners revealed that the equipment suppliers they regarded as actively engaged in training, problem solving, and other types of after-sales support would get their business when it came to buying or servicing additional tools. This was confirmed in practice in their selection of maize shellers and other supplementary equipment in mid-season and in plans to expand in 2021. Although **after-sales service from agribusinesses is rare in smallholder markets**, the emphasis placed on this during the training and business development of Mavuno Bora was a significant factor in the success for some of the entrepreneurs. The pilot demonstrated clearly that technology suppliers and other service providers who provide after-sales services to users of their equipment have a **competitive advantage** that can promote their businesses by increasing the level of trust, leading to both new and repeat business.

*LEFT: Benteter Kavisa, champion entrepreneur, added maize shelling to her service package mid-season.*



## INSPECTION, MAINTENANCE AND REPAIRS

Equipment inspecting, testing, and evaluating, coupled with user training, were critical parts of Bountifield's approach and contribution to the business model. These activities were carried out in cooperation with a specialist technical partner, as well as engineers from the equipment suppliers and staff of the anchor partners. Bountifield's technical team serviced, maintained, and repaired all equipment as well as instructed users in basic maintenance. For example, the supplier of the SL-3 multi-crop thresher demonstrated the screen-changing process to entrepreneurs and their operators and mechanics so that a range of different crops could be threshed as the season progressed.

Field visits to inspect the SL-3 machines in operation confirmed the benefits of **pre-season testing and operator training** since machines were generally found to be in good working condition. The main technical problems encountered during the pilot were associated with modifications carried out independently by several enterprises to try and use the MT-500 for maize shelling, resulting in

## WOMEN LEADERSHIP FOR CASSAVA DRYING ENTERPRISES

All four of the cassava drying enterprises have representation of women as leaders or managers. These women have steered the drying process with the solar dryer for a higher quality product.

*"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*

damage to the machines. This provided a good example to illustrate one of the key messages emphasized in pre-pilot training of the entrepreneurs – **"use the right tool for the job"**.



A technician works on the MS-100 maize sheller.

## PILLAR 1 - TECHNOLOGY LEARNINGS

*The pilot demonstrated clearly that there is a need for specialized technical support for the introduction and adoption of postharvest technologies by smallholders and rural entrepreneurs. A few lessons included:*

- **Availability.** Few crop threshers and maize shellers suitable for smallholder markets are readily available in Kenya. Many are advertised but not held in stock by suppliers and take months to import.
- **Performance tracking.** Prior to Mavuno Bora, little or no performance data was collected and made available to buyers of small-scale equipment by suppliers or development practitioners. More often than not, the performance data being shared with consumers does not match up with the results in practice.
- **Affordability.** Prices and associated set-up costs for the three machines were under \$2,000. This is not affordable nor is it a worthwhile investment for most farm households but within the reach of many rural entrepreneurs.
- **Manufacturing.** There is little or no domestic capacity to manufacture threshers or maize shellers that can compete with imported equipment. Since supply chains and delivery times are long for imports and this is not likely to improve in future, there is a long-term opportunity for developing local manufacturing capacity.



*Field of cassava plants.*

- **Customer service.** Choice of imported equipment, and technical knowledge of the technologies, is limited and consequently after-sales service is poor. This represents an opportunity for suppliers to offer training and follow-up, and specialized providers of technical services in rural areas.
- **User training.** Operators were new to the technologies but in most cases were able to use the machines competently following several hours of demonstration and training. Peer-to-peer help during the first days of operation was also an effective way to avoid technical problems.
- **Efficiency.** The labor-saving value of the machines and the improved quality of grains was evident to operators and farmers even before economic results had been achieved.
- **Drying root crops.** Bulk cassava dryers are a new technology for Kenya and more research and development is needed. Preliminary results of the prototype were encouraging, showing that a waterproof, ventilated, controlled temperature environment has the potential to produce higher quality chipped cassava in less than half the time per unit weight than traditional open-air systems.



*This Honda engine is used for both the SL-3 multi-crop thresher and the MS-100 maize sheller.*

# Pillar 2

## Business Services

***Underpinning the Mavuno Bora model is Bountifield’s hypothesis that large numbers of rural families, including women, men, young and older people, will benefit directly and indirectly through the development of profitable businesses that are primarily dedicated to supplying them with postharvest technologies and services.***

The sustainability of the model depends on whether these MSMEs have capacity and can make a business case. Bountifield has developed a rigorous process of scouting and in-depth assessment of the entrepreneurs. While 105 entrepreneurs were identified by anchor partners, after the vetting process only 20 were selected and 17 were active. Bountifield performed an initial evaluation, followed by a business case validation & due diligence process. We identified capacity gaps and completed field verification visits.

The MSME capacity assessments carried out by Bountifield highlighted areas of significant gaps, particularly in financial analysis and management, marketing techniques, and business growth strategy. Bountifield designed a “boot camp” for MSMEs which represents 2-3 days of training and skills building in one place, reinforced by continuous coaching tailored to the needs and capacity of each enterprise. Bountifield organized a team to stay in close contact with the entrepreneurs. Bountifield’s

technicians monitored the use and performance of the equipment. Bountifield monitored the business activity and provided troubleshooting as needed. Strategic indicators were tracked according to:

**1** Numbers of smallholders benefiting

**2** Age and gender of beneficiaries

**3** Economic benefits to entrepreneurs and farmers

**4** Quality and value of crops processed

**5** Time saved



*A group of entrepreneurs poses during a bootcamp training.*

## IMPACT ON SMALLHOLDERS

**Outreach and scalability.** In total, the 17 entrepreneurs provided services to 4,369 smallholder customers, equivalent to an average service provider to farmer ratio of 1:257. This high level of outreach was promising, particularly in the context of a pandemic-disrupted market and provides strong evidence that the one-to-many approach has potential for scaling. Table 3 shows the number of farmers who received a service directly. With an average household size of 5 family members in Kenya, the pilot benefitted an estimated 21,845 people during the first harvest season from the inception of the Mavuno Bora program.

*RIGHT: Farmer displays his cassava crop.*

*BOTTOM LEFT: Entrepreneur Jason Marangu displays sorghum ready for threshing.*

*BOTTOM RIGHT: Mixture of dried cassava chips and sorghum.*



**Table 3: Farmers served with the Mavuno Bora model (January-March 2021)**

CROP	NO. OF ENTERPRISES <sup>1</sup>	NO. OF FARMERS <sup>2</sup>	KILOS PROCESSED <sup>3</sup>
MAIZE	5	1,733	293,260
SORGHUM	6	413	73,865
GREEN GRAMS	5	707	67,941
OTHER GRAINS	6	238	24,589
CASSAVA	4	1278	35,908
<b>TOTAL</b>	<b>17<sup>1</sup></b>	<b>4,369</b>	<b>495,563</b>

<sup>1</sup> Some enterprises processed more than one crop

<sup>2</sup> Estimates based on records and recall from service providers and farmers

<sup>3</sup> Quantities after processing



## ECONOMIC BENEFITS FOR FARMERS

The economic status of smallholder farmers through the introduction and adoption of postharvest technology can be improved by: cost savings through reduction of time and labor; increase in the market value of processed product; and reduced physical wastage. Table 4 shows the estimated gains that farmers participating in the pilot achieved from each of these, based on data, observations and feedback obtained during operations. Overall gains to farmers varied from around \$5 per farmer for cassava to \$21 for green grams. Although the absolute gains are small because of the relatively low quantities delivered for the pilot, this was equivalent to a 28-61% increase in returns to farmers.

Fees for threshing and shelling ranged from an average of Ksh 1.00/kilo for maize to Ksh 4.34/kilo for green grams. Since some enterprises processed more than one crop, the average fee was in the Ksh 1-3 range with many prices in between. However, in almost all cases, the actual rate charged was within 3-5% of the market price for the crop being processed.

At this level, the fee was attractive to most farmers and processors primarily because it reduced the need and cost of labor for the farmers, while also generating a fair margin for the enterprise. The high number of farmers willing to pay for services during the pilot appeared to be based more on their intuition after seeing the technologies in action than on financial analysis. They were willing to pay, if necessary, by monetizing some of

the processed product in lieu of cash to the service provider, simply for the speed, convenience and improved quality of grain or cassava chips produced.

Although maize accounted for 64% of the crop quantities processed overall (Table 3), entrepreneurs and farmers processing green gram, sorghum, and millet experienced the greatest returns. Because these are higher-value crops, **the cost of threshing was lower compared to the levels of income earned and the labor involved.**

Farmers who accessed the service estimated that using the SL-3 thresher they could thresh a 5-acre crop of green grams in just four to five hours, as opposed to 7 days using traditional manual labor and practices. Other crops processed were millet, pigeon pea, soya, sunflower, and amaranth seed. Although they made up only 5% of the total, they confirmed the versatility of the tool and how it provides opportunities for processors to diversify and increase their business in the future. Not even addressing the positive spillover effects on health from avoiding drudgery, food loss or food contamination, the amount of time that farmers – especially women – have been able to save is well worth noting. For example, farmers we served needed 82 hours to thresh sorghum with the SL-3 instead of 728 days it would have taken to get the same output using traditional labor and practices, an improvement of almost 99%.

**Table 4: Time savings achieved by smallholders using recommended technologies**

CROP	NO. OF FARMERS	TOTAL AMOUNT PROCESSED (KILOS)	EQUIPMENT OUTPUT (KILOS/HR) <sup>1</sup>	TOTAL TECHNOLOGY USAGE (HRS)	MANUAL OUTPUT (KILOS/HR) <sup>2</sup>	EQUIVALENT MANUAL TIME (HRS) <sup>3</sup>	TOTAL TIME SAVED (HRS)	TIME SAVED/FARMER (HRS)
MAIZE	1,733	293,260	1,350	217	12.5	23,460.80	23,244	13
SORGHUM	413	73,865	900	82	12.5	5,909.20	5,827	14
GREEN GRAMS	707	67,941	600	113	12.5	5,435.28	5,322	8
OTHER CROPS	238	24,589	600	41	12.5	1,967.12	1,926	8
<b>TOTAL FOR THRESHING</b>	<b>3,091</b>	<b>459,655</b>	<b>N/A</b>	<b>454</b>	<b>N/A</b>	<b>36,772</b>	<b>36,319</b>	<b>43</b>

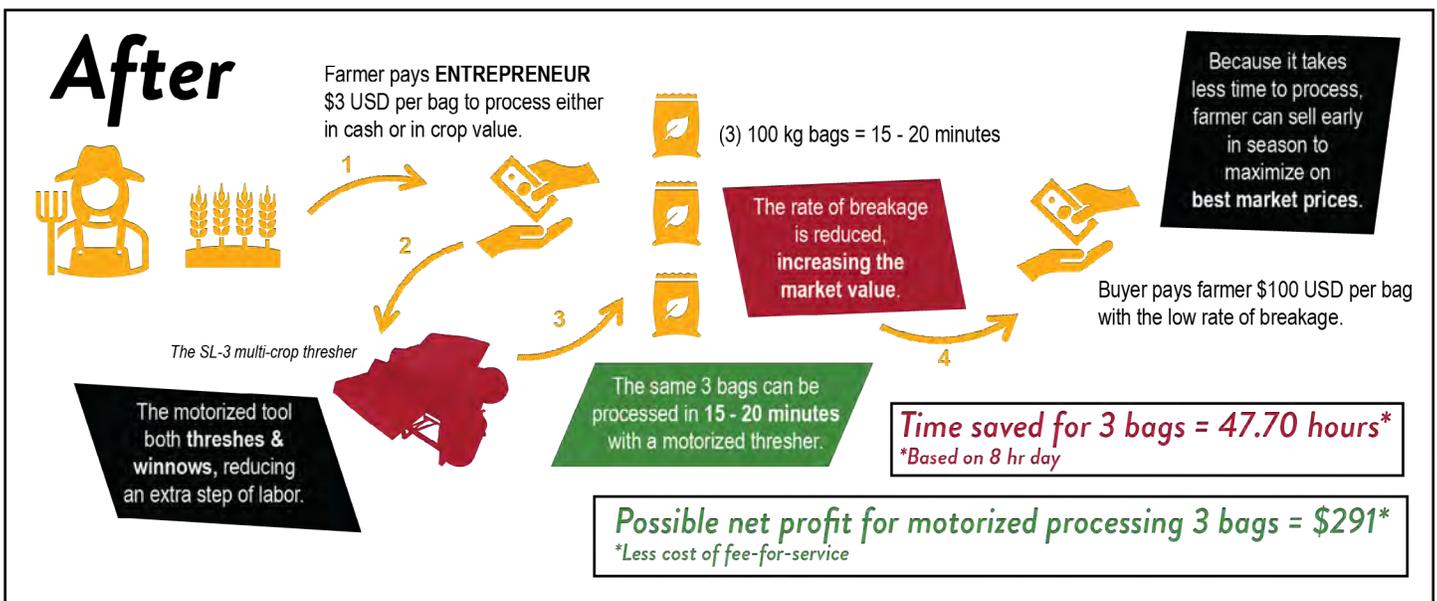
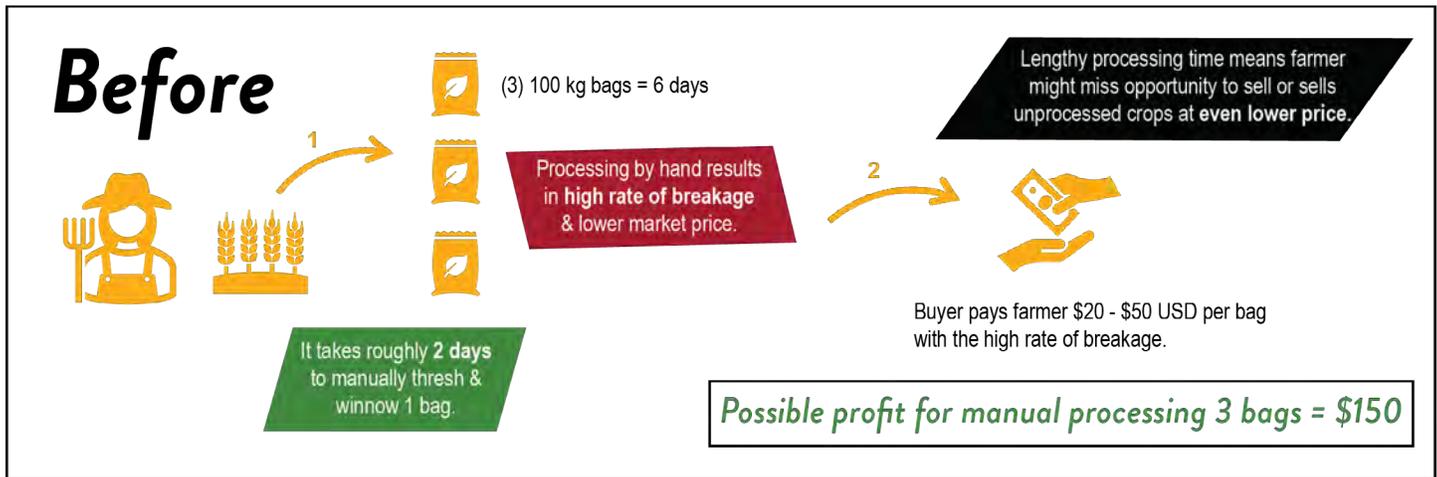
<sup>1</sup>Avg manual threshing/shelling rate taken as 100kilos/day of 8 hours for all crops

<sup>2</sup>Technology rate based on average observed per day of 8 hours

<sup>3</sup>Time that would be needed to process the same quantity by hand

# Economic Gain for Smallholder Farmers:

## The case for green grams



**An entrepreneur can provide the same service to hundreds of farmers, increasing the income potential of a whole community. This is the basis of the one-to-many model.**

Figure 4: The fee-for-service model illustration is based on price estimates for green grams but the concept is replicable for other crops.

## SOCIAL RETURN ON INVESTMENT

As assumed in the theory of change, the model was equally popular with women and young people, with an estimated 46-54% gender distribution of farmers using the services. In addition to providing income generation opportunities and new skills associated with improved technologies, postharvest services generate labor-saving, improved household storage and health benefits. Since most households in Kenya are net food buyers on an annual basis, they also realized the cost savings and improved food security in being able to store more food crops to have available for home consumption when market prices rise.

## CASSAVA

Group aggregation enterprises for cassava on average served more cassava farmers – 320 per enterprise – than grain enterprises, but the quantity and value of cassava processed per smallholder was around 30% of that for cereals (Table 5). This difference is a significant point since it reflects important variations in economic status between farming communities. Although cassava appears to offer lower financial returns for farmers and processors than for grain producers, the social impact may be higher since households producing and consuming cassava and other root crops are generally more food insecure and with lower scores for socioeconomic metrics for income, employment, and child malnutrition. It also prompts a different but related question of whether the one-to-many approach can bring technology and new income to smallholders at the bottom of the economic pyramid and who have generally been categorized as unreachable for technology and mechanization in the past. **These results from the pilot suggest that by combining the outreach of NGOs with a suitable financial model, it may be possible to reach some of the most disadvantaged smallholder households with technologies that can change their lives.**

*RIGHT: Catherine Otaga oversees cassava processing at Tangakona Cooperative in Busia County.*

## WOMEN ENTREPRENEURS LEAD THE WAY

Quantities of grains and numbers of smallholder customers per enterprise varied widely but the top two performing enterprises were women entrepreneurs who together served 900 smallholders.

As individuals and within groups, women and young people featured as key participants and supporters of the Mavuno Bora approach.

## THE ENTREPRENEURS

The Mavuno Bora model does not focus on individual farmers but uses a private sector approach to introduce and scale up technologies for entrepreneurs who can reach farmers already engaged with existing development partners. This approach brings new efficiencies and opportunities for growth whilst tapping directly into micro-scale development funds and private credit available in rural areas. The rural-based entrepreneurs in the pilot were generally considered “un-bankable” with conventional lenders but had strong social capital in their communities. Bountifield’s financing model is unique and for it to succeed it is essential that the entrepreneurs make a fair return for their business and that smallholders can and want to pay for the service to also increase their own incomes.



## QUANTITIES PROCESSED

The total quantity of grains processed per enterprise varied widely from less than one metric ton (MT) for the entire season, to more than 120 MTs. Quantities processed per farmer ranged from 64 kilos to 913 kilos depending on the approach and experience of individual entrepreneurs and groups. This variability in performance between enterprises was caused by several factors.

**Marketing approach.** An unexpected difference was in the business approach of the entrepreneurs, in particular the specific marketing effort made to promote the new service. In selecting the entrepreneurs, we assumed that those with existing businesses, particularly rural agents for agricultural inputs, would have an advantage since they would be able to leverage their existing business to attract customers for threshing. However, this was not the case. **Overall, those who had no other business and focused on mobilizing farmers in readiness for harvesting and processing did better than established businesses,** who invested less time promoting the new service.

**Gender.** As expected, the type of enterprise and the crop had an impact on the number of customers and the quantity processed (Table 5). Although the enterprise sample was small, overall **women-operated enterprises reached more than 230 smallholders per enterprise, 20% more than those owned by men.**

Men appeared to work with the larger, more successful farmers, processing about 10% more per farmer (210 kilos compared to 190 kilos per farmer). Identifying the reasons for these differences is important for development of the model and more evidence will be collected over the next two seasons.

**Market demand.** It was clear for all the enterprises that demand for their services was directly related to market demand for the crops being processed. Given the high cost of logistics and relatively opaque price information these differences can be significant across the country and difficult to predict. For example, although domestic demand for food crops was high, COVID-19 restrictions affected transport and sales at rural markets where most of the business normally takes place.



Jane Kisia, seen here with an application to enroll in a sorghum growers program with East African Breweries (EABL) was one of the two top performing enterprises in this first season of the Mavuno Bora program.

**Table 5: Quantities processed by enterprises**

TYPE	TOTAL SH <sup>1</sup>	SH PER ENTERPRISE	QUANTITY (KG)	KG/SH
<b>MEN</b>	954	191	200,600	210
<b>WOMEN</b>	918	230	174,205	190
<b>GROUPS-CEREALS</b>	522	174	60,261	115
<b>GROUPS-CASSAVA</b>	1,278	320	36,008	28
<b>TOTAL</b>	<b>3,672</b>	<b>227</b>	<b>471,074</b>	<b>128</b>

<sup>1</sup> Total smallholders (SH) served by each category of enterprise (697 uncategorized, not included)

## MARGINS AND SUSTAINABILITY

Despite these challenges, all the grain processing enterprises achieved a positive gross margin, calculated as the net earnings from fees charged for processing minus their direct costs, mainly transport, fuel, and labor (Table 6). Based on costs and total fees earned, as reported by each enterprise, gross margins were in the 60-78% range. This seems high but is not unreasonable for a high-risk pilot involving capital investment with an unknown depreciation period for the equipment. Nevertheless, it suggests **that if the equipment is well maintained** and depreciation times are extended, the fee could be reduced. More competition and higher processing volumes should also contribute to fee-for-service reductions in future years.

The three leading enterprises in terms of income and gross margin accounted for 40% of the smallholders and 62% of the crop processed during the pilot period. This indicates that higher economic returns to the entrepreneurs were associated with **higher numbers of smallholders served and greater quantities of crop processed** per smallholder.

### MUKOTHIMA BODA BODA TRAVELLERS

A group of young entrepreneurs who transport people and goods by motorbike, were able to establish a new business threshing sorghum and millet for 204 smallholders. This was a significant addition to their regular earnings and they are already planning a strategy to expand by promoting their services to more farmers before the next season starts. The potential for Mavuno Bora to build skills and provide opportunities for young people who would otherwise have limited possibility of sourcing capital needs to be explored further.

*"The business and thresher operation training provided by Bountifield international helped us to better operate our business. We reached more farmers and aggregated the crops we threshed and sold to East African Breweries Limited (EABL) earning extra profits."*

*Nathan Gitonga, Chairman*

## PILLAR 2 - BUSINESS SERVICES LEARNINGS

- **Return on investment.** The business model is working. Although some enterprises operated at below a commercially sustainable level, all covered their operating costs and more than 60% achieved sufficient volumes and margins that would enable repayment of the capital costs of their machines within 2-3 seasons.
- **Greater volumes.** Based upon feedback from farmers there seems a high possibility that volumes processed can increase if services are maintained at current prices. This feedback and the results achieved by the pilot regarding the reliability of the technologies and the savings in labor costs provide strong evidence that the model is both technically feasible and commercially viable.
- **Women and youth.** Women entrepreneurs performed particularly well and young people were well represented. The two most successful entrepreneurs in terms of commercial returns and smallholders serviced were women. The model was popular with all farmers using the services but young people and women who tend to have responsibility for labor-intensive jobs expressed particular interest in technology adoption and scaling up their farming activities because of mechanization.
- **Promotion and marketing.** Neither Bountifield nor the enterprises themselves invested specifically in tailored advertising or promotion of the technology services in advance of the harvesting season. This was understandable for a first pilot season, but the results and evidence gathered so far suggest that a formal marketing plan, accompanying material and a stronger peer-to-peer network would benefit the enterprises in terms of increasing the quantity of product processed and assist in recruiting new strategic partners for Bountifield to co-finance more entrepreneurs and aggregation groups.

# Pillar 3

## Financing

***The third pillar of Bountifield's approach is to source finance for rural entrepreneurs by using smart subsidies including grants and loans to raise co-investments from anchor partners.***

These partners vary in their motivation, but all have a shared development or commercial interest in supporting smallholder farmers. In the Mavuno Bora model their capital investment is used primarily as loan finance to buy equipment which recipients are expected to pay back in full. In the initial pilot, Bountifield and the anchor partner each contribute 50% of the loan. The requirement that borrowers pay back the loan in full ensures that they are fully committed and that the model is sustainable. Over the long-term, the goal is that finance will come entirely from dedicated financial lenders and investors, but these organizations need to see evidence that the borrower has a viable business and proven credit history. Buying down the risk and generating this history to a stage where a financial partner feels confident in their investments is the role that Bountifield and its anchor partners are playing.

### THE STRATEGIC PARTNERS

The five anchor partners for the pilot were composed of two NGOs, two commodity trading

companies whose main business is buying and selling grains from smallholders, and a private sector farmer association operating a microfinance savings and loan portfolio for members. As expected in a model that aims to raise finance from unconventional sources, there were differences in the way that the five financial partners approached their obligation to co-finance the collection of loans from and provide their support to the entrepreneurs. Four of the five co-invested on time with Bountifield for 50% of the investment capital needed to finance enterprises that they had identified as suitable for participation in the pilot. All the partners provided technical and strategic support to both smallholders and entrepreneurs, to some extent, including training to increase productivity, preparation of crops for threshing, and linkages to markets. All the partners participated in monthly meetings with Bountifield to review progress, discuss challenges and adapt the approach to partnerships based on feedback from farmers, entrepreneurs, and field staff.

**Table 6: Enterprise incomes & margins by type**

ENTERPRISE TYPE	INCOME PER ENTERPRISE \$	GM PER ENTERPRISE \$	%
MEN	408	246	60
WOMEN	774	602	78
GROUPS-CEREALS	524	312	60
GROUPS-CASSAVA	4,404	811	23

## THE NON-GOVERNMENTAL ORGANIZATIONS

The two NGOs provided their 50% share of the finance as grants since they have no internal mechanism for recovering loans in their grant agreements with donors and other development partners. The enabling environment was also difficult for smallholder households and agribusinesses in this year. NGOs faced with humanitarian challenges and communities faced with COVID restrictions and drought could not be expected to prioritize the need for repayment of loans even if they saw the long-term advantage of this approach.

Although grain enterprises recommended by NGOs accounted for less than 3% of the total crops processed, **these enterprises have potential to provide services to some of the most financially stressed and food-insecure households.** NGO support for cassava was successful commercially and involved a high proportion of women and youth at all levels.

## THE COMMODITY BUYERS

Both partner companies were established aggregators and traders with market contracts. To maintain supplies they have procurement agents in the field who can provide informed and practical advice and training to farmers and local traders from whom they also buy crops. Together the three enterprises they supported contributed 14% of the grain crops processed.

As expected with small companies operating with limited cash flow and high trading risks, securing their loan contribution was more difficult and disputes between traders and growers were more frequent. Slow payment by the buyers and side selling by the farmers were common complaints. This is normal with commercial aggregators, and the pilot showed that although these companies can be powerful development partners there is a need to adapt and adopt flexible systems for effective collaboration going forward. For example, it might be possible to introduce **financial intermediaries** to the more successful suppliers and involve **community organizations** to advise on **governance** in areas where there is a high density of smallholders.

## THE MICROFINANCE INSTITUTIONS

The most successful strategic partner in terms of enterprises supported and loan repayments was the national farmers' association that used its savings and loan subsidiary to provide loan contributions. They identified and funded the largest number of enterprises, the most smallholders, and the major proportion of crops for processing. Their enterprises accounted for 84% of grain crops processed in the pilot and so far, they have achieved a reported 27% loan recovery, in just one short season. There are few producer organizations with this capacity but from the evidence collected, it is clear that building the capacity of other non-government, farmer-based organizations could have the highest potential for scale.



*Members of the Mukothima Boda Boda Travellers group process sorghum with the SL-3 thresher.*

# PARTNER TESTIMONIAL

*"Our partnership with Bountifield International has helped our farmer service centres (FSCs) increase their income earning capacity besides enabling them access to working threshing equipment. Some FSCs have qualified to supply sorghum directly to EABL because of this partnership."*

*Samuel Osebe, Vice Chair, Cereal Growers Association*

## LOAN REPAYMENT

The three private sector partners (Cereal Growers Association (CGA), Mwilu, and Sorghum Pioneer Agencies) were active in the beginning to recover loans as the season progressed and the entrepreneurs collected fees for their services. Of the 9 enterprises, all of them have started repaying the loans. On average, they have paid 28% of the balance, and individual payments ranged from 7% to as much as 87% by the end of April 2021.



*A farmer displays the threshed sorghum separated from the grain after using the SL-3 thresher.*

## PILLAR 3 - FINANCING LEARNINGS

- **Diverse partnerships.** With this small sample, it was clear that a blend of private and non-profit anchor partners has advantages. However, there are still major gaps that need to be addressed to obtain synergies between the roles of non-profit development organizations and the private sector.
- **Role of NGOs.** NGOs have small grants available for training and investment in the model but generally do not have the experience or systems to award or manage loans. There may be ways around this, for example by using "refundable grants". The reality is that NGOs are important partners for the social role they play. As such, there is justification for continuing to partner with them to provide grants as well as loans whilst alternative lending systems are developed.
- **Prioritization.** Private sector lenders, including local companies, producer associations and microfinance institutions can be highly effective development partners at the micro-scale of Mavuno Bora but implementation needs to be flexible and responsive to the dynamic nature of cashflow and market constraints.
- **Capacity support.** At the MSME finance levels required for Mavuno Bora to succeed, it is clear from the pilot that if technical and marketing needs are met, farmers will pay for services and entrepreneurs will be willing and able to pay back and take on further loans.

## Case Study

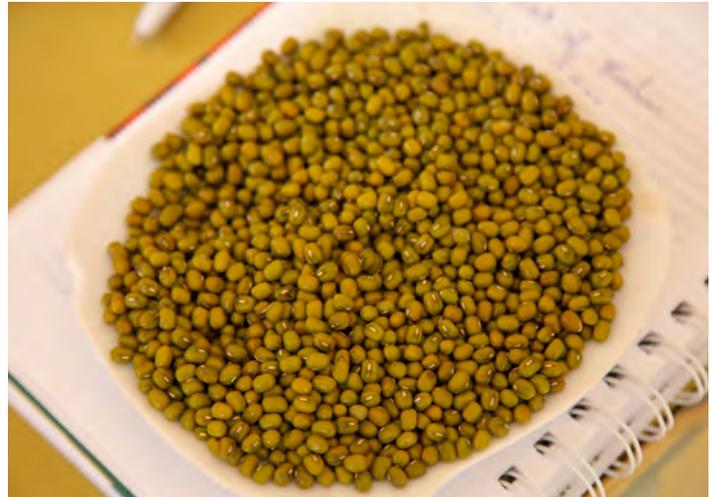
# Improved Profitability for Green Gram Farming

One of the most significant profitability increases we saw in the first season of the Mavuno Bora program was in green gram farming. Previously, manual labor was incredibly costly and labor intensive and deterred farmers from expanding their acreage, despite the high profit potential. Green gram, also known as mung beans, is a legume that is a beneficial crop to contribute to food security because of it grows well in arid regions, which is important consideration for climate change.

Green gram also provides great nutritional benefits<sup>1</sup>. It is a great source of plant-based protein and is a high source of fiber and antioxidants. It can help reduce blood pressure, improve digestion and lowers cholesterol.

Many smallholder farmers reported that having a multi-crop threshing service available had significant impacts on their green gram harvest. Several farmers in Kitui and Makueni counties cited lower costs for threshing compared to manual threshing, including saving them on extra cost of cooking for laborers to thresh and winnow their crops.

1 [Ganesan, Kumar & Baojun Xu. "A critical review on phytochemical profile and health promoting effects of mung bean \(\*Vigna radiata\*\)" \*Food Science & Human Wellness\*, vol 7, no. 1, 2018, pp. 11-33.](#)



"We used to thresh green grams using manual labor. Without wind, winnowing is a nightmare," says retired Chief Inspector Musau. "If the rains come and find our green grams unthreshed, they germinate and that is a major loss to us as farmers. Using the thresher, we get clean products ready for the market." With the availability of mechanized threshers, many farmers stated that they plan to expand their acreage of green gram.

"I increased my acreage under green grams from one acre to four acres," stated Rhoda, a farmer from Kitui country. "I used to spend a lot of money on harvesting. With the thresher, I paid Kshs. 450 per bag compared to the manual threshing where I used to pay Kshs.1,500. I harvested 9 bags from my 4 acres of land. I plan to expand the area growing more green grams and earn more money."

Rhoda also shared that with the increase of income, she was able to pay school fees for two of her children in secondary school and is helping her son get started in green gram farming.

*ABOVE: A sample of threshed green grams passed around during a bootcamp training.*

*LEFT: Retired Chief Inspector Musau poses with his wife on their green gram farm.*



# Additional Questions

***This pilot implementation of the one-to-many model took place under difficult conditions. Nevertheless, it has produced invaluable results and data, as well as raising additional questions that will need to be answered in successive seasons:***

- **How much can the model contribute to food security and improved lives for farming communities that are currently marginalized and at risk from climate change?** More data and analysis are needed at the farmer/household level to understand how much of the product that farmers pay for threshing services will be sold or consumed.
- Postharvest losses of grains and other food crops are frequently quoted as high (often more than 25% and even up to 50%). **How much of this waste can be eliminated by improved postharvest technologies?** Who benefits? What additional technologies should be introduced?
- **Can the model be technically feasible and financially viable at scale?** It appears to require a high level of technical assistance to support the introduction of each new technology. How can this be paid for sustainably? Can the small loans needed for the model be raised in sufficient quantities in rural areas without disproportionate origination costs, management overhead and bureaucracy? More data is needed on costs and margins at all levels, including at Bountifield's.
- **To what extent can the model be fully inclusive and achieve high social impact?** Initial results indicate that it could be highly effective in engaging women, young people and some of the most marginalized communities with significant returns but given the high technical assistance-to-loan-value ratio, and the time required for smallholder technology adoption to reach sustainable levels, grant givers may need to commit for periods beyond three years.



LEFT: A cassava snack product produced by Tangakona Cooperative.

ABOVE: Cassava "crackies," a popular snack in Kenya.

# Next Steps

***The work reported here will be continued and built-upon during the next cropping seasons starting in July and December 2021 and reported in a third white paper in 2022. Based on the results and analysis presented here, Bountifield will be taking specific steps to:***

- Upgrade the M&E systems to collect more data and expand analysis to integrate socio-economic impact metrics, including the involvement of men, women and youth and the impact on rural households.
- Widen the portfolio of postharvest tools and technologies to attract more year-round business and commercial opportunities.
- Develop more financing partnerships and packages for the entrepreneurs.
- Create and conduct tailored market and promotion strategies with partners.
- Disseminate learnings through virtual events (and in person, where possible) to explore mechanisms for sustainability of the model.
- Increase the number of anchor partners to grow the number of enterprises and to scale up services on a sustainable basis.



*ABOVE: A group of entrepreneurs listen closely during a bootcamp business training.*

*BACK COVER: A field of sorghum.*



**BOUNTIFIELD**  
INTERNATIONAL



Bountifield International  
729 Washington Ave N.  
Suite 600  
Minneapolis, MN 55401  
USA

TEL +1 (651) 632-3912  
[info@Bountifield.org](mailto:info@Bountifield.org)

[www.Bountifield.org](http://www.Bountifield.org)

Date of publication: October 2021  
**Published by Bountifield International**  
Lead Author: Nadia Martinez  
Contributors: Alexandra Spieldoch & Stefano Perugini  
Design: Stevie Kloeber