



BOUNTIFIELD
INTERNATIONAL

Gender Impacts of Postharvest Processing Technology:

Insights from Entrepreneurs & Smallholder Farmers in Kenya



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

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On the Cover: A Bountifield woman entrepreneur and her machine operator, one of the few women hired by entrepreneurs for this role.



ACRONYMS

AATF	Africa Agricultural Technology Foundation
FAO	Food and Agriculture Organization
FGD(s)	Focus Group Discussions
GDP	Gross Domestic Product
IoT	Internet of Things
KALRO	Kenya Agricultural and Livestock Research Organization
KNBS	Kenya National Bureau of Statistics
KII(s)	Key Informant Interviews
MFIs	Micro Finance Institutions
NGO	Non Governmental Organization
PH	Postharvest
SMS	Short Messaging Services
SACCO	Savings and Credit Cooperatives Organizations
PTO	Power Take-Off
USAID	United States Agency for International Development
VSLA(s)	Village Savings and Loans Associations
WFP	World Food Program



Introduction

Bountifield International specializes in postharvest technology solutions for smallholder farmers in sub-Saharan Africa and has been working in Kenya to develop entrepreneurs as service providers processing crops in remote communities.

In 2020, we launched the pilot, Mavuno Bora (Swahili for “Better Harvest”), in Kenya. Funded by the van Lengerich family and the Seeding the Future Foundation, its focus has been to unlock access to cost-effective postharvest tools for smallholder farmers by working with rural entrepreneurs. In 2021, we launched the “She Feeds Africa” initiative, in partnership with Zinpro Corporation and Anderson Foundation, to develop women entrepreneurs, creating new market access for them as drivers for equitable, inclusive markets.

To date, Bountifield has equipped 60 micro-entrepreneurs (women and men) in Eastern and Western Kenya to help women farmers process their crops directly on the farm. Within this pool, we are working with 29 women entrepreneurs, helping them to procure quality technology packages and technical support, providing business and digital marketing training, peer-to-peer mentoring and ongoing coaching, as well as connecting them with financing partners for their asset loans. The results are sustainable businesses which they fully own and operate themselves. In addition, we are seeing women entrepreneurs play a catalytic role in helping more women farmers avoid drudgery.

This report offers insights on our experience with gender and postharvest mechanization in Kenya. We hope it will be a useful contribution larger research and action around this theme in Kenya and other countries.

Basis for the Report

We began with a preliminary literature review, followed by interviews with practitioners with whom we are working in Kenya. We read policy and strategy documents both at the county level and at the national level in relation to technology use in the agriculture sector. And we organized Focus Discussion Groups (FGDs) with small groups, primarily comprised of women and youth farmers and entrepreneurs working with Bountifield.

Review of literature provided background on the prevailing context around postharvest processes in Kenya and across Africa.

As many before us have reported, there are significant limitations in existing literature such as:

- Inadequate awareness among local authorities regarding postharvest technology that exists and its presence in the Kenyan market.
- Lack of available gender disaggregated data on women’s experience in postharvest handling, including their access (or lack thereof) to mechanization.



Context

Kenya's economy is still largely dominated by the agricultural sector, accounting for approximately 30% of the country's GDP and providing both direct and indirect employment to nearly 60% of the working population. Despite its contribution to the country's GDP, Kenya is still food insecure. Shockingly, up to 30% of food is lost at the time of postharvest^{1,2}. This has been worsened by the drought that struck the country in most of the year as well as the impact on food and fuel prices stemming from the war on Ukraine.

Farming Practices and Division of Labor

Men, women and youth are involved at different stages of production in smallholder farming:

- **Land preparation:** Whether it is maize, sorghum, millet, green grams or even cassava farming, land preparation is a joint activity that involves both women and men. This is done manually using hand hoes. Men, sons or hired laborers often tend to land preparation and ploughing. Women farmers and their daughters assist in clearing as well as harrowing in preparation for planting. This can vary.
- **Planting:** This is largely performed by women. Men and youth may at times be engaged to transport seeds and other inputs such as fertilizer.
- **Weeding/spraying:** Depending on the pest management method that farmers adopt, this role is usually done by both women and men. In the Upper Eastern region where most farmers farm sorghum, and green grams, men are the ones engaged in this stage. It is likely men who spray the farms while women do the weeding.
- **Harvesting:** This is a combined activity between men, women, and youth. Women harvest maize, sorghum, millet, or pods from the stalks while men stack the product in bags and prepare them for processing and storage.
- **Threshing, shelling, or drying:** This stage of the production process is primarily done by women in most value chains. Be it the drying of roots and tubers such as cassava, arrow roots, and pumpkins or the threshing and winnowing of legumes and pumpkins or shelling of maize, women take the central role in this process, while men engage in other livelihood activities such as house construction, and the buying and selling of commodities.

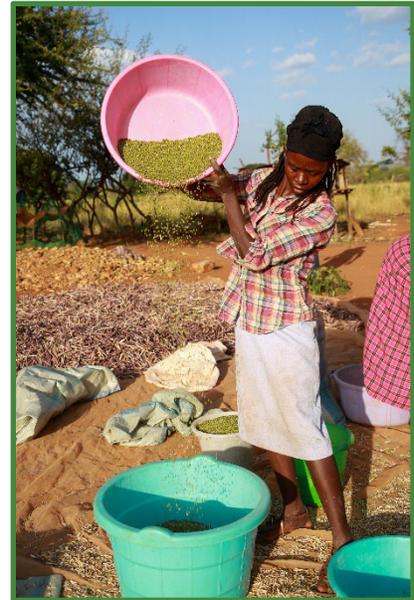


Image 1: A female farmer winnows green grams in Eastern Kenya

The uptake of technology and in particular mechanization is still relatively low in Kenya. According to KALRO (2016), mechanization is more prevalent among larger private firms working in the

¹ EAC, 2022, [EAC records huge post-harvest losses in cereals and root crops](#)

² Bountifield International 2023, Bountifield Kenya Impact Report October 2020 - March [2023](#)



maize, coffee, tea, and horticulture value chains for export. It is largely missing from smallholder agriculture, which represents most of the production serving the national population daily.

Several reasons account for the slow adoption of postharvest mechanization, including:

- The high cost of acquiring mechanized equipment and lack of financing
- Gaps in local manufacturing and distribution capacity
- Inadequate awareness among farmers
- Lack of spare parts, technical training, and post-sales support available
- Prohibitive policy environment both at county and national level to catalyze the uptake of mechanization as a viable commercial undertaking.

As a result, there are few postharvest technologies and services available for crops such as pulses and small grains, primarily grown on small plots of land between 1-5 acres. Most postharvest processing by women smallholders is done manually using rudimentary methods like sun drying and sticks for threshing.

Even when equipment has been purchased by the government or other development projects and then given away to improve food security and rural livelihoods, they are consistently too large, too expensive, poor quality, and with no post-sales support, resulting in farmers receiving equipment they end up not using and then must dispose of somehow on their own.

It is particularly difficult for women. According to a report by FAO³, in Kenya they account for 46% of the active population, of this, 49% work in agriculture. Women farmers play a central role in farming yet lack access to productive resources such as land, inputs, credit, and technology. It is well documented that:

- Women own less land: In Kenya in particular, estimates indicate that as little as 1% of land is owned by women and 5-6% by women and men together⁴.
- Women often manage food security crops such as millet and sorghum and men manage cash crops such as tea, coffee, and wheat.
- Women are processing these crops manually, which is time consuming, laborious, and inefficient.
- Women have less access to credit and financial services: As in other sectors, gender biases exists when it comes to lending to women entrepreneurs/farmers. This impedes their ability to acquire necessary factors of production such as land, working capital or mechanization equipment⁵.

Addressing the inequity in access to productive resources, services, and markets for women farmers (who account for a large percentage of smallholder farmers) is not only a rights issue, but also an efficiency issue. (Fan, S., Rue, C. 2020).

³ FAO (2023), [Gender and Land Rights Database](#)

⁴ Landesa 2014, Women's Land and Property Rights in [Kenya](#)

⁵ FAO (2022), [The Status Of Women In Agrifood Systems](#)



- There is a lagging ecosystem of suppliers and technical support teams for women to access even if they can afford equipment and post-sales support.
 - Social norms limit women's time and mobility⁶: In Kenya women are primarily responsible for household-level responsibilities such as cleaning, cooking, and taking care of children and the elderly. This important care work is in addition to their farming and creates a double work burden. They also lack access to means of transport and mobility off the farm.
- 
- Image 2: Women manual processing sorghum by beating the grain with sticks to separate from the stalk*
- Women have less access to information: A recent study by Krell (2021)⁷ indicated that 56% of the women farmers in Central Kenya own basic phones while only 30% own smart phones despite the region's development. Other regions in Kenya own fewer smart phones. Women have less access to digital tools, training, and information. Digital tools can improve their productivity and income, but also their learning and technical skills.
 - The average age of a Kenyan woman farmer is estimated to be 60 years⁸, which is coincidentally the country's official retirement age⁹. This means that much of the farming community are retirees who are in their sunset years and with less physical energy.
 - There is a clear trend of youth in Kenya deserting smallholder farming because it is so difficult and with minimal returns¹⁰, leaving behind older women to tend the farm.

Interviews with Women Farmers and Entrepreneurs

Between February and June 2023 and across seven counties (i.e. Kisumu, Bungoma, Busia, Kakamega, Tharaka Nithi, Makueni and Kitui), Bountifield met with farmers and entrepreneurs participating in our program, mainly to follow up with on their perceptions of impact before and after working with our team, but also to consider how we can continue to help them plan for their future. The size of the FGD's ended up varying between 3-8 people, primarily women and youth farmers and at least one Bountifield entrepreneur. The meetings were informal in nature and organized to promote a dialogue.

⁶ GSMA (2022), [Reaching and Empowering Women with Digital Solutions in the Agricultural Last Mile](#)

⁷ N. T. Krell, (2021), [Smallholder farmers' use of mobile phone services in central Kenya](#)

⁸ AGRA, 2019, [Over 40 above average](#)

⁹ SRC, 2023, [Understanding Retirement Benefits in the Public Service](#)

¹⁰ FAO, 2014, [Youth and agriculture: key challenges and concrete solutions](#)



Farmers' Insights

Challenges Experienced by Farmers Before Receiving Bountiful Services

Across the FGDs, one of the issues that surfaced was the climate difference between Eastern and Western Kenya. For example, the Eastern region is mostly semi-arid with long stretches of drought, while the Western region is more humid. Consequently, the crops that are grown in the various regions are determined by these conditions. While more maize is produced in the Western region, drought-tolerant crops, including sorghum, green gram and cowpeas, are more common in the Eastern region. In other words, women experience climate and farming priorities differently and there is no one size fits all.

Women farmers from both regions shared that manual processing has had a negative impact in terms of time spent, hard labor and health issues. For example, sorghum farmers in Kisumu County reported that harvesting and threshing is tedious and laborious, which discourages them from engaging in large-scale production of the crop.

They shared the multiple health challenges they experience from manual processing and handling. For sorghum in particular, farmers in Nyanza, Lower Eastern as well as Upper Eastern revealed that the process of manual threshing by beating with sticks results in:

- Respiratory complications
- Itching and skin irritation
- Muscle and joint aches

And they reported on their experience with cassava processing, including peeling and chipping the root, then sun drying. Cassava farmers in Asing'e Aggregation Center and Tangakona Commercial Village in Busia County, stated that they usually require three full days sun drying their cassava. As a result of sun drying, they lose a substantial amount of their product due to spoilage.

Reported Impacts Observed by Farmers After Receiving Bountiful Services

The FGD participants reported that receiving access to postharvest services has made a positive and significant difference in lives and livelihoods of women farmers. These include:



Image 3: Cassava chips drying inside a solar dryer

- **Reduction in time and labor:** From interviews with women maize farmers in Bungoma County, Makueni County and Kitui County, it takes on average between 2-4 weeks to shell maize harvests from one acre of land which is on average 5-10 bags. With access to shelling services, they can complete their processing in less than 30 minutes. With the time savings, women farmers report they are now able to better plan their production and prepare their farms for the next farming cycle. In addition to farming, they can manage other responsibilities in the household with more ease.

Cassava farmers in Busia County reported that the rate of postharvest loss has significantly reduced, by as much as 30% since they started to use the dryers introduced by Bountiful. With drying services, women



have been able to find more time for their families and other productive activities on the farm as well as time to rest.

- **Improved health:** As discussed above, women sorghum farmers battle respiratory illness such as coughing and spells of asphyxia arising from inhaling sorghum chaff during threshing and winnowing. This has been greatly reduced with access to mechanized processing services. Additionally, elder women farmers report on their experience with severe muscle and joint pains. They share that with access to postharvest services, this is significantly improved.
- **Expanded production:** Prior to receiving services, women reduced the area under production especially of sorghum, because of the scarcity of casual laborers to assist in threshing, leaving them to do the threshing by themselves. With access to processing services, women put more acreage into production. In the Mukothima area, for instance, women sorghum farmers have expanded their production by an average of one acre. Some of them are going further to lease more land since the threshing work has been mechanized.
- **Crop specialization:** As a result of receiving processing services for certain crops, women have been able to intensify production of green grams, sorghum, and millet in place of other pulses. They report that specializing their crop production is more cost effective and brings a higher return on investment.
- **Improved livelihoods:** Women cassava farmers and maize farmers alike in Western Kenya reported that in addition to processing crops, they started adding other business services such as roasting cassava and selling by the roadside. Some have even started small shops and selling fruit in the local markets. In Western Kenya, women farmers report that they now have time to attend their Village Savings and Loans Associations (VSLAs) meetings, and they are selling their processed cereals in the local market as one example of expanded market activity. Women farmers working with Asing'e Aggregation Centre and Tangakona Commercial Village reported on how having a dryer for their cassava has enabled them to reduce the workload they previously had in drying not only cassava, but also pumpkin and potato.
- **Reduction of expenditures/saved money:** Without access to mechanization services, women farmers often spend a sizeable amount of money preparing food for casual laborers who are engaged to help in the threshing activities. Farmers in Western indicated that they spend on average Ksh 2,000 (\$15) per season on hospitality to the laborers, this is on top of the Ksh3,000 (\$22) they pay for the service for an acre of land. With access



Image 4: A young woman entrepreneur shells maize for a farmer with the MS-100 maize sheller



to mechanization, they reported that they have greatly reduced their expenses, spending between Ksh 2000- 3,000 per season based on the quantity of the harvest. The same was reported in Eastern with farmers expenditure on postharvest processing reduced from an average Ksh5,000 (\$35) per season to about Ksh3,000 (\$22).

- **Reduction in food loss:** With manual processing of crops, farmers tend to experience high losses. This loss can come because of spoilage or be caused by damage to the grain when separating it from the stalk. But with the processing technology, all the women reported that they are experiencing significantly lower postharvest losses with cleaner and higher quality grains. For example, there is less chaff mixed in with the grain. And the grain is whole instead of cracked, reducing rancidity which can lead to food loss. With access to moisture meters to test the water content in maize and to ensure that they are threshing at the right time, they have improved their ability to shell more easily without breaking the grain.
- **Diversified diets:** Women reported that with the reduction of food loss, they are now able to save more of their harvest that they not only consume within the household but that they also have more to sell. With increased revenue from sale of excess crops, they have been able to diversify their diet with products such as milk in addition to the staples that grown on their farms.
- **Regenerative practices:** Access to chopping shredding services has enabled farmers to transform their crops into animal feed for household cattle and indigenous poultry. Farmers have also been able to transform maize and green gram stalks and Napier grass into fodder. Women reported that this has reduced the overall production costs they face, thereby increasing their disposable income.
- **Sense of connection with other women:** Many of the women farmers learned about these services available by connecting with one another and through their social networks. They reported their sense of trust among one another and their confidence with women entrepreneurs providing them services.
- **Opportunity for youth:** Youth farmers reported that with the introduction of postharvest mechanization they are more encouraged to stay on the farm to help with the work. Some are now working for entrepreneurs as operators or taking the lead as entrepreneurs themselves.

Insights from Entrepreneurs

As stated in an earlier section of the report, Bountifield has equipped 60 micro-entrepreneurs in Eastern and Western Kenya with fee-for-service businesses, and out of this, 29 are women who have had varying challenges and levels of success. However, our basic findings are that they are good managers. They are savvy, organized, and opportunistic when given the chance.

Challenges Experienced by Women Entrepreneurs

Some of the challenges faced by the Bountifield-trained entrepreneurs include:

- **Difficulty in transporting the postharvest technology:** Unlike many of the male entrepreneurs who own a motorcycle, most of the women entrepreneurs in the Bountifield



network have had to hire a motorcycle to transport the equipment. This has increased their costs. That said, three women entrepreneurs are breaking barriers by owning and driving their own motorcycles even as they may rely on support from young men in loading the equipment onto the motorcycle.



Image 5: A woman entrepreneur with her motorbike

- **Difficulty in expanding to distant areas:** Due to their household responsibilities and challenges with being able to travel without transportation, many of the women entrepreneurs have struggled to serve farmers located far from their homes. On average, most of them have served farmers within a small radius of 25 Km, much shorter distances compared to some male entrepreneurs who traverse as much as 75 Km from one county to another. With more trained operators, available/affordable transportation, and a larger portfolio of equipment, we expect they will be able to expand their reach in providing services to neighboring areas.
- **Lack of confidence in their technical skills:** As with the introduction of any new technology, there is usually a learning curve for users. This was the case with women entrepreneurs from Kitui County and Makueni County who received maize shellers and multi-crop threshers. Technical requirements such as changing engine oil, adjusting the pulley belt and others proved a bit challenging initially. However, with regular technical support from Bountifield's Technology Coordinator and with after-sales support from the technicians working with the supplier, they eased into the process and are now experts who are training others including their operators.
- **Discrimination from financial institutions:** Commercial financial institutions do not yet have tailored financial packages required for women micro-entrepreneurs as postharvest service providers. Banks regularly require entrepreneurs to share formal records from over a year, collateral such as land deeds or other assets which women do not own, and there are long delays in loans being administered. MFIs do provide small loans, however, the loans come with much higher interest rates. VSLAs would seem to be a natural fit, however, their loans are often too small to support the purchase of equipment. Currently, SACCOs in Kenya seem to be a strategic fit for providing small assets loans for women entrepreneurs. Once entrepreneurs expand their business or if they are already 'bankable' to start with and have formal registration, bank records and collateral, then they have many more options, including qualifying for a commercial loan or being able to pay out of pocket. Unfortunately, meeting the loan requirements is one of the biggest challenges that women entrepreneurs face. For this reason, Bountifield has worked with partners, including the Cereal Growers Association (CGA)'s SACCO, to offer tailored loan packages to help women entrepreneurs access the financing they need.



Reported Impacts of Bountifield Technical and Business Training as Observed by Women Entrepreneurs

Some of the positive results experienced by women entrepreneurs who are providing services to women farmers include:

- **Increased social capital and community status:** While many women entrepreneurs seemed reticent in the beginning, they have been able to increase their confidence and build successful businesses through their social web, including VSLA's they belong to in their community. And they are proud to help other women.
- **Good business management:** The women entrepreneurs tend to be strong business managers. They are consistent with their record keeping, they excel in customer management, and they have a longer-term view of their business, including clear projections and a plan to meet their targets. Quite a few of the women entrepreneurs are paying back their equipment loans faster than the men and they are purchasing more tools to expand their business.

“We feel more comfortable being served by Bentetar because she is a woman like us and so we can trust her to do the service in our homes even when we are not around.” – Green gram farmers from Kitui County
- **Successful marketing:** Through their Facebook pages, social media campaigns, WhatsApp and bulk SMS blasts that Bountifield has helped them set up, women have been able to expand their customer reach at a low cost.
- **Ability to track:** They have been leveraging digital tools to enhance management of their businesses, including keeping track of several operators working for them. On the payment side, they are utilizing M-Pesa to receive payments for services and for repayment on their equipment.
- **Partnership and support from their husbands:** One of the women entrepreneurs from Makindu reported that her husband has been helping her to seek out clients at further distances and at times providing financial support in the form of working capital. In another example, the husband helps customers who are seeking services while his wife manages the finances. And in a third example, one of the male entrepreneurs has trained his wife on how to operate their maize sheller so they can both operate the machinery for customers.
- **Diversified business lines:** The most successful women entrepreneurs have leveraged their other business lines to expand their reach. One of the entrepreneurs, for example, is offering postharvest services in addition to her other business line of selling seeds to farmers and providing extension training.
- **New contracts:** Buyers such as East African Breweries Ltd and Tru Trade, are already purchasing from the women entrepreneurs and in some cases, have increased their orders.



- **Increased confidence:** Women entrepreneurs have been proud to learn from other women leaders through peer-to-peer mentoring. With increased confidence, their businesses have grown. For example, one of the women entrepreneurs in Kitui County has added more equipment and identified other women entrepreneurs to help her to expand her customer reach.

Based on the feedback and responses, it is clear that despite their challenges, the women entrepreneurs are finding success as postharvest service providers but there is room to do so much more to support these women.



Image 6: A woman entrepreneur poses proudly with her SL-3 multi-crop thresher that she uses for sorghum, green grams and other crops.



Conclusion

Based on the literature review and Bountifield's experience with farmers and entrepreneurs, we see a clear demand for postharvest services among women smallholder farmers in Kenya. There is also demand by women entrepreneurs to become service providers and an understanding that women make good business-owners when given the chance.

However, there is much more that can be done and there are still many gaps that need to be addressed. A few examples include:

- Equipment suppliers have not traditionally sold postharvest equipment to smallholders, nor have they provided post-sales support and technical assistance. There is an opportunity to partner with them to support women postharvest entrepreneurs more directly.
- Kenya-based food companies struggle to get quality supply of crops in a timely fashion. We need to tee up women leaders with more contracts, more awareness and more technical support to help them to meet their targets.
- Women lack access to financing. We must bring in tailored financing for women business owners to succeed. This includes digital tools for accessing and repaying loans.
- Local government can and should be working more closely with women entrepreneurs and the private sector to promote their businesses, to spread awareness and to lend confidence to the work that they are doing to help their communities to stabilize and to thrive.

Collaboration and partnership with both the public and private sector actors will reduce duplication of resources and support comprehensive approaches to achieve long-term success. By working to fill the gender disparities and market gaps identified in this report, there is the significant potential to help millions of people achieve food security.



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