MILLERS AND GRINDERS: RURAL WOMEN AND PRODUCTIVE TECHNOLOGIES

A NIGERIA WAY CASE STUDY
THE NIGERIA WAY LEARNING SERIES

The WAY Learning Series is an ongoing initiative to share lessons learned as the project is being implemented, with a particular focus on identifying and understanding factors that impact women’s business success and overall wellbeing in Bauchi State. Topics include women’s time use, girls’ self-perception after participating in skill-building opportunities, how cooperatives function as business platforms for women, and women’s perceptions of themselves as entrepreneurs.

The Learning Series is shared widely with the development community and with project stakeholders, including partners, clients, and government.

ACKNOWLEDGMENTS

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Youth Entrepreneurship and Women’s Empowerment in Northern Nigeria – Nigeria WAY – supports women and youth agroprocessors in three value chains in Bauchi State: rice, soybean and groundnut. The project focuses particularly on women and youth-led businesses, with activities aimed at improving productivity, adopting environmentally sustainable business practices, and increasing access to markets, financial services, market information, business networks, and partnerships.

The Federation of Muslim Women Associations in Nigeria (FOMWAN) and the Association of AgroProducers in Nigeria (ASSAPIN), two member-based alliances operating in Bauchi State, mobilize clients for the project. The project operates in seven Local Government Areas (LGAs), specifically selected because of their importance in Bauchi’s economy, feeding two key markets in Bauchi State – Bauchi and Azare – which bring together buyers, sellers, and processors for soybean, groundnuts and rice, among other crops. Businesses in Bauchi are largely small and informal, and the market remains nascent, with government – not the private sector – as a primary driver.
In this socially conservative state, women and young people face many obstacles in achieving business success. Mobility is limited for many women, and gender norms restrict the roles available to them. At the same time, endemic poverty increases the need for their economic participation. With increased access to productive technologies and business services, greater financial inclusion and inclusive community dialogues, Nigeria WAY supports women and youth-led businesses to transform their contribution to their households and communities.

**EXECUTIVE SUMMARY**

Nigeria WAY’s Agrotechnology Fund (ATF) is designed to provide increased access to and usage of productive technologies for women processors. Access is increased by forging market linkages between women processors and the agrodealers who sell the equipment. The project facilitates increased usage of technology by stimulating demand among women, ensuring every piece of equipment is accompanied by training for its proper usage. Selected technologies were piloted during WAY’s second year of implementation in order to understand how best to ensure that women can own and use these technologies, as well as to assess the impact on their time and labour.

In May 2020, the Nigeria WAY team conducted a snapshot survey of 21 women to better understand the choices they make when considering technology purchases. This snapshot survey provided valuable insights into women’s strategic decision making around equipment. Given the opportunity to access productive technologies, over 2000 women have already purchased equipment through the Agrotechnology Fund. They are using these technologies in innovative ways to reduce their workload, enhance their businesses and benefit their families.
**Nigeria WAY Clients**

The Nigeria WAY project targets women: The Nigeria WAY project targets three groups of businesswomen:

- **ENs, or entrepreneurs**, are informal, subsistence-level businesses. These businesswomen tend to be risk averse, have low levels of capital, and are mainly doing business because of poverty and a need to contribute to family upkeep. Their businesses are geared to domestic and family needs, have few or no assets, and use family labour where needed. She does processing work by hand with few tools and her main expense is raw materials.

- **Enterprising ENs** are less risk averse and are able to respond to shifts in the market, switching products when raw materials become more expensive. They are interested purchasing assets and growing their businesses. These women are self-motivated to grow their businesses.

- **SSBs, or small-scale businesses**, have active business premises, paid labour and capital of less than NGN 10,000,000. This paper focuses on ENs and enterprising ENs.

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**NGERIA WAY AGROTECHNOLOGY FUND**

Nigeria WAY’s Agrotechnology Fund (ATF) is designed to provide increased access to and usage of productive technologies for women processors. Access is increased by forging market linkages between women processors and the agrodealers who sell the equipment. The project facilitates increased usage of technology by stimulating demand among women, ensuring every piece of equipment is accompanied by training for its proper usage. Nigeria WAY’s Agrotechnology Fund is similar to the Technology Fund implemented as part of MEDA’s GAC-funded GROW project. Using smart incentives, GROW successfully made specific equipment available to support women in their soybean production and processing which they purchased.

Selected technologies were piloted during WAY’s second year of implementation in order to understand how best to ensure that women can own and use these technologies, as well as assess the impact on their time and labour. During this pilot phase it was found that the technologies tend to increase women’s agricultural efficiency, mainly by reducing the burden of labour.

The ATF offers women a chance to select from a catalogue of 14 technologies, each under CAD 500. (See Appendix 1 for a full list.) Technology needs assessments were conducted by several Nigeria WAY partners, including ASSAPIN, Rightlinks and FarmTies to establish the level of need and the types of technologies that women would use for their processing activities. Before being included in the catalogue, all technologies were subjected to the Gender Responsive and Environmental Sustainability rating tool (see Appendix 2 for the full GR&ES tool) to determine their appropriateness in terms of improving women’s processing ability and potential environment footprint. This tool measures the technology against various eligibility criteria, including environmental impact, time- and labour-saving potential, ease of operation and maintenance, accessibility and availability, cost and income generating potential and social considerations including sociocultural appropriateness, ease of use by women and potential for male capture, where men take or steal earnings or

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1 MEDA’s Greater Rural Opportunities for Women (GROW) project improved market access, food security and nutritional status for 23,368 women smallholder farmers and their families in Ghana’s Upper West Region through integration into the soybean sector. The project was implemented from 2012 to 2018.

2 The GROW project’s Technology Fund facilitated women’s access to labour-saving equipment through local private sector providers. In total, 5,196 women purchased 7,376 technologies. The Technology Fund successfully catalyzed change, stimulating adoption of new technologies among women and encouraging suppliers to expand to new client segments, namely women farmers. For more information, see the GROW Learning Series document Putting Technology into the Hands of Women: [https://www.meda.org/s/1010](https://www.meda.org/s/1010)
assets from the women around them. To be included on Nigeria WAY’s list, the productive equipment had to have a positive score on the GR&ES tool.

In the annual survey, only 53% of the women ENs surveyed indicated that they knew about time-saving technologies, so the technology fairs hosted by Nigeria WAY and ASSAPIN are also a way to ensure women can learn about different types of technologies that are available to them.

Even with increased access to supply, the technologies are expensive for women processors, many of whom would be unable to purchase even a single item of equipment without financial support. MEDA’s smart incentives enable women to purchase technology at a discounted rate, with all transactions tracked by vouchers.

**Promoting and Distributing Productive Technologies**

Women receive vouchers for their chosen technologies during specific training events, and redeem them from agro-vendors, who then invoice MEDA for the remaining portion of the price. If women need credit to acquire the technologies, they are linked to MFIs operating in the Local Government Area (LGA), who usually take part in the events organised to showcase productive technology. As part of their contract with WAY, the vendors agree to train all women purchasers on the use, care and upkeep of their equipment. In addition, timing is important; the technologies must be available during the appropriate part of the agricultural cycle, and farmers or processors frequently lack capital at the planting or growing phases.

![Figure 1: Technologies purchased through the Agrotechnology Fund](Image)

3 In Year 3 of the WAY project, women paid 40% of the equipment cost and MEDA paid 60%. In subsequent years, MEDA hopes to increase the amount that women pay, gradually withdrawing the subsidy so women are paying closer to the market rate, in anticipation of the subsidy’s eventual end.
Over the course of ten technology fairs, 2177 women were issued with vouchers (one per woman) across 6 LGAs. In total, by the end of March 2020, 792 vouchers had been redeemed, as seen in Figure 1. Of the 792 pieces of technology sold, 472 are grinders. Overall, the grinders represented 60% of women ENs’ technology purchases. The most popular grinder model was the PX200, purchased by 80% of the clients in this survey.

The objective of this case study is to explore the rationale behind the grinder’s popularity among Nigeria WAY clients, in particular the GX200 model. This case study is drawn from activity reports, phone interviews and financial documentation on the ATF smart incentive initiative. It is divided into three sections: a contextual overview, including a description of the grinders, a methodology description and an overview of results.

What are Grinders?

Grinders are productive technologies used for processing commodities like soy, groundnuts, corn and millet into smaller and finer outputs. Grinders consist of two components: the mechanical system, which constitute the hopper and the grinding compartment, and the electrical system, which generates power to move the mechanical components. The two sections are usually connected through a pulley system.
Four different types of grinders were included in the technology catalogue. They include:

**GX 200 Petrol Grinders:**
This grinder has a 6.5hp petrol powered motor connected to an A11 hopper using a belt system. It is the smallest in terms of capacity, with a processing rate of 50kg/hour and it is the least expensive of the four grinding machines available through the ATF. It is also the lightest in terms of weight. Due to the limited torque generated by the small motor, this grinder is mostly suitable for wet processing (processing grains soaked in water). Milling dry grains with GX 200 is not usually effective, as the grinder cannot provide very fine powdered output. This grinder, which costs NGN 35,000, constituted 47% of all the technologies sold through the ATF and 80% of the sample population used for this study.

**GX 390 Petrol Grinders:**
This grinder has a 13.5hp petrol powered motor with an A11 hopper. It is very similar to the GX 200, except that the motor provides more torque and speed. It is suitable for processing both water-based and dry grain inputs. Dry grain milling using the GX390 has a finer output than that of the GX200 with a capacity of 100kg/hour. The cost of this technology is NGN 75,000.
175 Diesel Grinders: This grinder has the highest torque of all the grinders available through the ATF. It has a 7hp diesel powered motor with an A11 hopper. This grinder is slower than the petrol-powered grinders and possesses a cooling system to allow longer continuous operation. It also has the capacity to process dry grains at 100kg/hour. The cost of this grinder is NGN 80,000 and it is the heaviest of all the grinders.

Grain Milling Machine: This type of grinder is only utilised for dry grains such as soy, millet, corn, sorghum and rice. It consists of a locally fabricated hopper powered by a 6.5hp petrol motor. It has an internal sieve which produces a smoother and finer powder than the GX classes. It has the capacity to process 100kg/hour and cost NGN55,000.

Postharvest Processing: Grinding or Milling

In the Nigeria WAY time use baseline survey, conducted in December 2019 and January 2020 with 373 women, only 3% of the respondents reported owning and using equipment to reduce time spent on their business activities.4 When asked what machines would reduce the amount of time they spent processing, women most often mentioned grinders. Grinding machines are a very common technology and are used both in households to prepare the domestic diet and in commercial agroprocessing activities.

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Figure 7: Technologies suggested by women respondents which would reduce time spent on agroprocessing

The time use baseline survey confirmed that the labour burden for women is different from men in Bauchi State. Women’s working days are 54 minutes longer than men’s with women spending 4.5 hours per day on reproductive work. Cooking takes up to 2.3 hours per day and a significant amount of that time would be spent in pounding or milling staple foods. Traditionally, women grind most of the water-based food commodities using traditional systems, like a mortar and pestle or grinding stones, techniques which are time consuming and laborious. For dry grains, women transport them long distances to commercial mills in semi-urban areas, where they wait in queues to access grinders. Grinding is a frequent, even daily task, and both traditional techniques and accessing commercial grinders require significant time and energy.

Figure 8: Traditional method of extracting oil from groundnuts

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METHODOLOGY

A snapshot survey was conducted to ascertain why grinders were the most frequently purchased item by women EN clients. Telephone interviews were conducted with 24 EN clients who had purchased different types of grinders through the Agrotechnology Fund; three clients did not respond to the questions, and have been removed from the sample. Eight sets of questions were asked to understand the main reasons for their purchase choice. Questions included confirming the type of technology purchased, usage, income-generating possibilities, and time/labour use. The survey clients were randomly selected from the 6 LGAs where the technology fairs were conducted. This sampling was to account for any geographical differences.

Results from the respondents were coded and entered into and analyzed in Microsoft excel. The Nigeria WAY team analyzed the data together to generate the conclusions and learning.

RESULTS

1. Acquisition and Usage

Of all the respondents interviewed for the survey, 76% reported that they were currently using the grinders for their businesses, 14% gave excuses for not installing and using the technologies and 10% attested to either renting out the technology or selling it to their relations. Those who sold their grinders claimed they needed the extra income. One of these clients sold the grinder for NGN25,000 which is NGN10,000 less than the standard price and NGN11,000 more than what she paid for it to the agrodealer. One of the clients who rented out the technology to her daughter claimed:

“I rented it to my daughter to enable her generate income for her family. She has 6 children and she is not engaged in any trade. Her husband is

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6 This corresponds to 5% of the total clients (n = 472) who purchased grinders under the ATF. Survey numbers were limited because of limitations caused by the coronavirus pandemic.
not that well to do so I gave her the grinder. Periodically she gives me stipends from the income she generates from the grinder.”

Of the 76% who reported active operational status of their grinders, 56% of them reported employing their relations (brother, sister, daughter or son) to operate the technology, while 25% claimed to operate the grinders themselves. Nineteen of this group claimed that both they themselves and their children operate the grinders.

2. Why Grinders

Results from the survey show that women who purchased grinders were influenced by several factors, including but not limited to improving their primary processing activity.

Seventy-one percent of respondents attested to the utility of grinders and its potential to generate alternative income as factors that influenced their choice. Most of these clients are currently engaged in rice parboiling, an activity which does not utilize grinders. In other words, they specifically chose a grinder in order to diversify their processing activities.

Twenty-nine percent of the respondents claimed they purchased the grinders to enable them to increase processing capacity in the value chain they are currently engaged in. It was observed that most of these clients were engaged in the soy value chain. They described using the grinders to make tofu and at the same time the technology brings an alternative source of income, allowing them to providing grinding services for others. It was also observed that most of the
respondents have secondary businesses which might involve processing in a different value chain. Nigeria WAY classifies these women as ‘enterprising ENs,’ women who are less risk-averse and want to buy productive assets for their business primarily, rather than home use.

3. Why the GX 200 Grinder?

Even though the GX 200 grinder is the model with the least torque, it was the most frequently purchased technology, constituting 47% of all the technologies sold through the ATF and purchased by 80% of those included in the snapshot survey.

Results from the survey indicate that 94% of the clients who purchased the GX 200 claimed affordability as the factor influencing their choice; the remaining 6% stated that the model’s availability at the technology fairs was the main factor that influenced their purchase. Follow up questions during the survey also suggests that the presence of the displayed technologies at the fairs affected their choices, especially for those from villages that are farther from Bauchi. The events provided an opportunity to see and access technologies, and were a key motivator to purchase an asset.

![Technologies Acquired by Respondents](image)

*Figure 11: Disaggregation of grinders acquired by respondents*
4. Income generation by the grinders

All survey respondents who have installed and are using the grinders in their primary processing activities also reported some level of secondary income generated, through providing grinding services to others in the community for a fee. As seen in the chart, 18% of respondents claimed the grinders generate an average daily income of less than NGN 500; 41% earned an average daily income between NGN 500 and NGN 1499; and 41% earned more than NGN 1500 per day.

The amount of money a woman can generate by providing services with her grinder, i.e., grinding other people's crops for a fee, is related to the number of grinders in the neighbourhood. Those living in areas recording fewer grinders within their localities reported earning higher income from this activity.

![Income Generated by Grinders](image)

Figure 12: Additional income generated by grinders

5. Time Saved by the grinders

Grinding is typically done twice or three times per day, depending on family size, proximity to grinders and type of grain. Some of the ENs grind soy as often as four times a day, depending on demand for tofu or milk. This is due to the difficulties in storing processed soy, leading to batch processing to avoid spoilage. Owning their own grinder saves ENs time that they would ordinarily spend walking to the nearest commercial grinder and waiting to use it. Though not surprising, it is noteworthy that clients living in remote communities reported higher time savings after purchasing grinders; for them, accessing grinders would require walking or taking public transportation to a neighboring village.
Over half (60%) of respondents who were currently using the technologies claimed that acquiring the grinders has saved them or their children less than an hour for each time they use it, equivalent to two to three hours per day. Most of these respondents live no more than 200 meters from a grinder.

For 27% of respondents, the grinder has saved them between one and two hours every time they do processing activities. Most of these respondents live no more than 500 meters from grinding stations.

Thirteen percent of the respondents claimed that acquiring the technology has saved them an average of more than five hours per grinding session. Most of these clients reside in villages with no grinders; accessing grinding services for these women involves transportation to neighbouring villages which are usually more than 1 km from their houses.

6. Impact on repetitive labour

Before purchasing their own grinders, respondents noted that they either walked or sent their children to the nearest grinding stations, carrying loads weighing between six and fifteen kilograms. Owning a grinder eliminates this need for manual transportation of goods. In addition, mechanization reduces the repetitive labour and time women spent using traditional grinding techniques.
CONCLUSIONS AND LEARNING

This snapshot survey provided valuable insights into women’s strategic decision making around equipment. Given the opportunity to access productive technologies, over 2000 women have already purchased equipment through the Agrotechnology Fund. Women made very strategic purchasing choices, with careful consideration to price and usage of the technology. They are using these technologies in innovative ways to reduce their workload, enhance their businesses and benefit their families.

This study confirmed WAY’s earlier research that suggested grinders would be the most attractive technology for women. Women made very strategic purchasing choices, with careful consideration to price points and usage of the technology. As seen in this study, grinders were used in three main ways: to improve processing activities, which was WAY’s original intent; cash generation, such as family members running the equipment and charging for services; and domestic usage.

The Nigeria WAY team drew several key learnings from this study and will consider these in the coming workplan:

**Align Agrotechnology Fund activities more closely with the specific processing activities being promoted by the project.** In other words, relevant technologies should be promoted at training events or technology fairs: for example, rice parboiling training should offer women a chance to also see and purchase technology related that improve parboiling processes.

**Nuance targeting to ensure women are able to access the technologies most appropriate to their goals.** ENs, who typically run survival businesses to meet immediate family needs, tend to invest in technologies that will reduce repetitive domestic tasks; by contrast, enterprising ENs are more likely to purchase technologies to increase efficiency and grow their businesses.
Nigeria WAY’s targeting strategy in coming years will include the following:

ENs

WAY Strategy: Build resilience and reduce drudgery

Implementation: Increased access to technology that decreases repetitive domestic labour

Enterprising ENs

WAY Strategy: Support business growth

Implementation: Increased access to larger scale equipment for business, such as large capacity grinders, increased access to finance (MFIs) for productive technologies, more market linkages, improved business skills and financial management

Put in place modalities for repairing and replacing worn out grinders so that this important asset can be replaced by women (i.e., through their savings). This will be particularly important for enterprising ENs, who will be building businesses around these assets and will want to safeguard their investments.

In summary, this snapshot survey has confirmed the value of grinders to Nigeria WAY clients and the ability of women to purchase productive technologies when access is enabled. Grinders are useful in both the domestic and business spheres, likely a factor in the popularity of this equipment. The study demonstrated the degree to which women entrepreneurs make careful and creative decisions around their investments.
Figure 13: An improvised pestle and mortar exhibited during the innovation fair.
## Appendix 1: List and Description of Technologies for ENs and SSBs

The following technologies were made available to women through the Agrotechnology Fund:

<table>
<thead>
<tr>
<th>Entrepreneurs (ENs)</th>
<th>Small-Scale Businesses (SSBs)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Technology</strong></td>
<td><strong>Description</strong></td>
</tr>
<tr>
<td>Grinders</td>
<td>Mechanically grinds or mills soy, groundnuts and rice – the three value chain products supported by WAY – into finished or semi finished products.</td>
</tr>
<tr>
<td>GX 200, GX 390, 175 Diesel grinders, Grain Milling Machine</td>
<td></td>
</tr>
<tr>
<td>Parboiling Pots</td>
<td>Commercial vats conventionally used for parboiling rice and cooking tofu</td>
</tr>
<tr>
<td>Size 20, Size 30, Size 40 and Size 50</td>
<td></td>
</tr>
<tr>
<td>False Bottom Lid and Cover</td>
<td>A flat circular device that acts as rice / water barrier during parboiling to improve quality</td>
</tr>
<tr>
<td>Grain Moisture Meter</td>
<td>Measures moisture in grains</td>
</tr>
<tr>
<td>Oil Extracting Machine</td>
<td>A locally fabricated machine that squeezes oil from groundnut paste</td>
</tr>
<tr>
<td>Groundnut Decorticator</td>
<td>A manually operated device that deshells groundnuts</td>
</tr>
<tr>
<td>Personal Protective Equipment</td>
<td>Protective gear for soy processing</td>
</tr>
<tr>
<td>Gloves, face mask and boots</td>
<td></td>
</tr>
<tr>
<td>Eco-Cookstoves</td>
<td>A cookstove with 60% energy saving efficiency</td>
</tr>
<tr>
<td>Domestic and commercial cookstoves</td>
<td></td>
</tr>
<tr>
<td>Tarpaulins</td>
<td>A canvas for drying and sealing agro products from sand and moisture</td>
</tr>
<tr>
<td>Soy Kit</td>
<td>A kit with all the necessary equipment for making tofu and soy milk</td>
</tr>
<tr>
<td>Aflasafe</td>
<td>A biotechnology that controls aflatoxin on farms</td>
</tr>
<tr>
<td>Nodumax</td>
<td>A bio inoculant with the capacity to improve soy production by 40-45%</td>
</tr>
<tr>
<td>Sunking Boom Solar Lamp</td>
<td>A solar powered lamp with radio and mp3 capability suitable for transmitting information to clients</td>
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Appendix 2: Gender Responsive and Environmental Sustainability Tool

GR-ES Rating Tool Result

The WAY team and partner staff assessed each of the technologies made available through the Agrotechnology Fund using the Gender Responsive and Environmental Sustainability rating tool. Technologies are evaluated using 7 categories and scored on 28 sub-categories of social, environmental and usability characteristics. An average score is generated in each category, and these are automatically totalled by a logic function which displays the responsive status for the technology.

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<th>Check Only One</th>
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<td>Social Systems</td>
<td>1 2 3 4 5 S</td>
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<tr>
<td></td>
<td>Availability and Accessibility</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Operation and Maintenance Requirement</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Time and Labour Saving</td>
<td></td>
</tr>
</tbody>
</table>

**Social Systems**
- Socio-cultural appropriateness of the technology
- Less likely to be appropriated/controlled by men

**Availability and Accessibility**
- Ability to procure/produce technology locally
- Low capital intensity
- Compatibility with findings from preliminary technology needs assessment and women’s noted preferences
- Access to vital, appropriate and gender-responsive user information on the technology

**Operation and Maintenance Requirement**
- Ease of movement/transportation of machinery
- Characteristics/dimensions of machinery enable ease of use
- Space requirement for technology
- Safety of equipment and availability of energy supply to power equipment
- Availability and accessibility to after-sales support services
- Affordability of set-up and ease of hand-over

**Time and Labour Saving**
- Minimal investment in time to learn how to use
- Decrease labour drudgery
- Minimize time constraints or workload
## Cost Effectiveness

| Promotes cost-effectiveness | Inter-changeable parts and/or includes multipurpose mechanism | Promotes increase in efficiency of processing |

## Increase Income/Product Quality

| Increase productivity | Improved ability to reinvest | Improvement of quality of products | Higher profit margin |

## Environmental Impact

| Impact of technology on ambient air | Impact of technology on surface or ground water | Impact of technology on health of users | Energy use efficiency of technology | Recyclability and/or re-usability of waste/outputs from technology | Reduce climate risk faced by women | Conserves natural resources |

### Strong Points of the rating:

| 0 | 0 | 0 | 0 | 0 | 0 |

### Things to be improved:

<table>
<thead>
<tr>
<th>Rating Scale</th>
</tr>
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<tbody>
<tr>
<td>1. Poor</td>
</tr>
<tr>
<td>2. Below Average</td>
</tr>
<tr>
<td>3. Satisfactory</td>
</tr>
<tr>
<td>4. Good</td>
</tr>
<tr>
<td>5. Excellent</td>
</tr>
</tbody>
</table>

### Would you recommend the technology?

| Definitely | Probably | Not Certain | Probably not | Definitely not |

### Recommendation

* Appropriate technology fulfills two essential criteria: 1. It must be sustainable; and 2) it must be locally accepted and adapted. Sustainability implies that whatever implement, tool or machine is added to a system to improve efficiency should be locally available or can be produced locally. Sustainability also refers to the possible damage to, or disturbance of, the environment (e.g. to biodiversity)
Figure 14: Domestic processing using traditional pestle and mortar.
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