

OFVI guidelines for bioslurry and BEC production and application (Imp3)

African Biodigester Component

Organic Fertiliser Valorisation Implementer

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1 Introduction

Many biodigester owners as well as producers and traders of organic fertiliser already possess substantial knowledge about bioslurry and BEC production. Still, there remains room for improvement. Biodigester users can reap more benefits by applying bioslurry or BEC on crops that respond best (for which the cost-benefit is most beneficial), and by applying farming practices that make optimal use of bioslurry and BEC. For example, the information that biodigester owner households receive from biodigester companies is often too vague to produce good quality BEC. Furthermore, misconceptions persist regarding the comparative effectiveness of synthetic mineral fertilisers versus organic fertilisers, particularly in terms of soil health and long-term impacts. Clarifying these misconceptions is crucial for fostering increased demand for bioslurry and BEC.

Targeted training sessions can help to build on users' knowledge and further enhance their skills. Generally, the training needs in West- and East Africa and in individual countries differ, and there is also a gender disparity in access to training. The existing guidelines in countries like Kenya, Uganda, and Burkina Faso provide a foundation for bioslurry and BEC use; some of the available materials are listed below:

- BSUL booklet on bioslurry application; there are also BSUL 7 videos available on YouTube (see link below), on use of bioslurry for banana, coffee, fish farming, kitchen gardens, mushroom growing, and using bioslurry from dairy, piggery; these videos are testimonies that provide not much detail on technicalities.
 - Banana production: <https://www.youtube.com/watch?v=S2ThZYJop5E>
 - Coffee production: https://www.youtube.com/watch?v=-na_GQ1nqrE
 - Dairy farming: <https://www.youtube.com/watch?v=Z4ObzbBtt5o>
 - Fish farming: <https://www.youtube.com/watch?v=YAD9NAi0ht4>
 - Kitchen gardens: <https://www.youtube.com/watch?v=0Y6k4r17G2c>
 - Mushroom growing: <https://www.youtube.com/watch?v=fntsycuTm1M>
 - Piggery: <https://www.youtube.com/watch?v=9WdNKISw8ok>
- Kenya Biogas Program_2016_Bioslurry Handbook
- Mbarara bio-organic farming techniques (only 'Learning how to mix and pack bioslurry', no content) filename: [RVD iSOFT Training manual 2020.pdf](#)

There is a collective desire to enhance and expand upon these resources. The available materials, including booklets, videos, and training manuals, offer valuable insights but often lack the necessary technical details to ensure the production of high-quality BEC. Therefore, it is crucial to develop comprehensive guidelines to ensure the safe production and use of bioslurry and BEC. These guidelines should address technical aspects and promote inclusiveness, while responding to the gendered context in which bioslurry and BEC are produced, used and traded.

This report presents guidelines for production and application of bioslurry and BEC specifying safety and gender issues within OFVI countries.

2 Objectives and Methodology

This report aims to address the gaps in understanding production and application of bioslurry and BEC, with a specific focus on developing gender-sensitive guidelines that promote safe use. These guidelines are designed to be utilised selectively in various Training of Trainers (ToT) sessions for biodigester companies, public agricultural extension services, agro-input enterprises, and Vocational Training Centers (VTC).

This report first drew on the relevant Inception phase reports (Inc2 and 5) to define the state of affairs in OFVI countries, particularly concerning gender, and to help identify literature to contribute to the guidelines. These were supplemented by other sources, such as handbooks, training materials, and reports, found online or supplied by national partners. Information from these was then distilled into general guidelines, relevant for all OFVI countries. With input from national partners, these will be developed into supplementary country-specific trainings that integrate gender considerations.

3 Results

The households of all OFVI countries are predominantly headed by men, though this trend is more pronounced in West Africa than in East Africa (see Table 1 below). Approaches should target both men (key household decision makers, holders of land rights) and women (engaged in biodigester operation and management, may administer smaller or marginal parcels). Female-headed households in Africa are a diverse group. Some, like married women with non-resident husbands or educated women who choose not to marry, tend to be relatively well-off. Others, such as war or AIDS widows, separated or abandoned women, and single mothers with limited options, often head economically disadvantaged households¹. In most cases, the head of the household is the owner of the bio-digesters.

Gendered power inequities are prevalent within households in Burkina Faso, with men often occupying decision-making positions. Therefore, it is likely that men may have more influence over agricultural practices, including bioslurry and BEC production, sale and use. In Kenya, women reported increased decision-making power over farm management in the absence of migrant husbands, suggesting a shift in gender roles in agricultural practices².

The effect evaluation report from Africa Biogas Partnership Programme (ABPP, 2019) phase 2 has stated that, *“Women are more interested in biogas, but they are often dependent on their husbands to finance the biodigester or to get a credit loan. Men are primarily interested in the bioslurry. Risks are that women are not involved or less involved (and thus do not use the biodigester, as was observed in a few cases in Uganda), or that women do not use bioslurry on crops as they are responsible for (e.g. in kitchen gardens)”*³.

This supports the principle that both men and women must be well-informed about the operation of biodigesters and the use of their products.

Table 1. Household heads population (%)

Country	Male headed	Female headed
Kenya (2020)	69%	31%
Uganda (2019)	71.7%	28.3%
Mali (2020)	91.8%	8.2%
Niger (2012)	84.1%	15.9%
Burkina Faso (2018)	91.2%	8.8%

Source: World Bank Gender Data Portal⁴

Tables 2-4 are based on a fast and informal assessment with key stakeholders in the three countries, rather than from a comprehensive survey of a representative sample of households. Therefore the findings might not fully represent the views and experiences of diverse people in these areas. While the data offer helpful information about gender involvement, it should not be generalizable to the entire community.

¹ [Poverty is falling faster for female-headed households in Africa](#)

² https://www.researchgate.net/publication/375638102_Land_Restoration_Amid_Male_Outmigration_The_Cases_of_Burkina_Faso_and_Kenya

³ [ABPP phase 2 evaluation report](#)

⁴ <https://data.worldbank.org/indicator/SP.HOU.FEMA.ZS>

Table 2. Gender involvement in bioslurry value chain in Kenya

Steps	Gender involvement (Male)	Gender involvement (Female)
Bioslurry collection and storage	Adults: 32% Children: 22% Workers: 32%	Adults: 19% Children: 2% Workers: 11 %
Bioslurry or BEC transport	Adults: 22% Children: 4% Workers: 38%	Adults: 18% Children: 2% Workers: 10%
Field application of bioslurry and BEC	Adults: 26% Children: 5% Workers: 33%	Adults: 20% Children: 2% Workers: 14 %

Source: OFVI FVI Report Baseline current bio-slurry and BEC usage and barriers to increased organic fertiliser valorisation Kenya (Inc2)

Table 3. Gender involvement in bioslurry value chain in Uganda

Steps	Gender involvement (Male)	Gender involvement (Female)
Bioslurry collection and storage	Adults: 11% Children: 5% Workers: 47%	Adults: 25% Children: 2% Workers: 10 %
Bioslurry or BEC transport	Adults: 12% Children: 9% Workers: 57%	Adults: 13% Children: 2% Workers: 7%
Field application of bioslurry and BEC	Adults: 13% Children: 8% Workers: 35%	Adults: 30% Children: 4% Workers: 12 %

Source: OFVI Report Baseline current bio-slurry and BEC usage and barriers to increased organic fertiliser valorisation Uganda (Inc2)

Farmers owning biodigesters play a dominant role in the collection of feedstock and production of bioslurry. They may choose to be involved in BEC production, and/or sell bioslurry or BEC to either traders or other farmers. If they apply bioslurry or BEC themselves, they must transport it to their fields.

Table 4. Gender involvement in bioslurry value chain in Burkina Faso

Steps	Gender involvement (Male)	Gender involvement (Female)
Bioslurry collection and storage	Adults: 75% Children: 10% Workers: 0%	Adults: 15% Children: 0% Workers: 0 %
Bioslurry or BEC transport	Adults: 35% Children: 22.5% Workers: 7.5%	Adults: 27.5% Children: 0% Workers: 7.5%
Field application of bioslurry and BEC	Adults: 30% Children: 7.5% Workers: 10%	Adults: 32.5% Children: 10% Workers: 10 %

Source: OFVI Report Baseline current bio-slurry and BEC usage and barriers to increased organic fertiliser valorisation Burkina Faso (Inc2)

Farmers not owning a biodigester may obtain bioslurry and/or BEC directly from farmers owning a biodigester. They may also involve traders who can collect the fertilisers from various sources, convert bioslurry to BEC, and/or transport it over longer distances. Based on these, the following bioslurry and BEC value chain steps are identified:

- Step 1: Feedstock collection and pre-treatment
- Step 2: Bio-digester feeding and operation
- Step 3: Bioslurry production, collection and storage
- Step 4: Bioslurry/BEC trade
- Step 5: BEC production (off-farm and on/farm)
- Step 6: Bioslurry or BEC on farm distribution or transport to other places
- Step 7: Field application of bioslurry and BEC

Based on the report from Inception phase, men are mostly involved during the bioslurry storage, transport and application in Kenya and Uganda, whereas women are involved for the latter step in Burkina Faso. These steps are grouped into three broader phases (Biodigester operation and bioslurry production; Bioslurry storage and use; BEC production and use). Guidelines for each phase, as well as the relevant target groups identified in the Imp3 ToR (farmers with biodigesters, farmers already using compost, other farmers, biodigester company staff, and agri-input suppliers) are mentioned below:

Phase 1 : Biodigester operation and bioslurry production guidelines

Relevant target groups: farmers with biodigesters, biodigester company staff, agri-input suppliers

- Installation
 - Expansion chamber and slurry canal
 - The chamber and canal should be cleaned to avoid blockage; namely in the corners of the expansion chamber, and in the canal when slurry is not flowing out easily
- Getting started - first feeding
 - Feeding can begin 4 days after the construction of the biodigester is complete
 - Cow manure is recommended for the first feeding
 - Storing the manure under a tarp for 10-15 days will improve the digester startup
 - Dilute the manure to a porridge-like consistency (1-2 parts water to 1 part manure), mix well, let stand for 5 minutes, and remove any floating material like sticks and straw. Biodegradable materials can be discarded on the ground, or in a separate waste pile if there is a large volume. Non-biodegradable materials (plastics, metals) should be discarded in a waste pile.
 - Feeding some bioslurry from a working digester will also shorten startup time
 - In the beginning (first 2 months), the bioslurry is more watery, can be smelly, and can attract flies. This may have implications for women concerned about neighbours and reputation. Over time, the bioslurry produced will become thicker and less smelly.
- Feedstock use
 - Collection of diverse organic materials (crop residues, animal manures, food waste) suitable for anaerobic-digestion, considering locally available resources
 - Use clean raw materials - remove debris such as sticks and stones, and do not use manure from animals that have received antibiotic or antiviral treatments in the last 5 days as these may still contain traces of these substances
 - Ensure inclusivity by involving both men and women in the identification and collection of feedstock. Discuss within the household how roles surrounding feedstock collection can be divided based on time availability and synergy with other activities of different household members.
- Feedstock pre-treatment
 - Shredding: Large feedstock into smaller particles to increase availability of organic matter

- Mixing: Combine feedstocks with different C:N ratios to ensure a favourable ratio in the reactor. Maintain a porridge-like consistency

A favourable C:N is needed to prevent the ammonia concentration of the substrate from becoming too high. An overview of C:N ratios of main local feedstocks in OFVI countries is presented in Table 5.

Table 5. C:N ratios of some common organic materials

Maize stover	98:1
Food waste	15:1
Fruit waste	15-35:1
Vegetable produce	19:1
Vegetable waste	12:1
Alfalfa	18:1
Straw	80:1
Legume hay	16:1
Sawdust	200-750:1
Shrub trimmings	53:1
Cow manure	19:1
Poultry manure	6:1
Sheep manure	15:1
Leaves	40-80:1

Source: from Cornell's [On-Farm Composting Handbook](#)

- pH maintenance: digestion is inhibited due to acid if pH <6.2, and by ammonia if pH >7.6
 - Check pH of slurry using a digital pH metre or litmus paper. If these are unavailable, another alternative is to use vinegar (or lemon/lime juice) and baking soda (or wood ash):
 - Take two small samples (a few tablespoons) of slurry in different cups
 - To one cup, add a tablespoon of vinegar or juice from a lemon or lime. To the other cup, add a tablespoon of baking soda or wood ash.
 - Wait a few seconds to see if either cup fizzes/produces foam. Fizzing with vinegar or lemon/lime juice suggests alkaline (basic) slurry. Fizzing with baking soda or wood ash suggests acidic slurry. No reaction with either suggests the slurry is closer to neutral.
 - Adjust slurry pH by adding lime or ash to correct acidity (to raise pH, if pH < 7) and vinegar to correct alkalinity (to lower pH, if pH > 7), aiming for a balanced range of 6.5 to 7.5.
- Bio-digester feeding and management
 - Mostly, men are involved in this activity. Gender- inclusive training should be promoted, addressing any stereotypes or biases related to bio-digester feeding.
 - Maintain a continuous supply of organic matter (feed every day)
 - Feed the right volume (too much will lead to smelly/undigested bioslurry; too little will lead to failure to expel slurry and production of maggots)
 - If maggots are present, it usually indicates that the environment is too moist and rich in nitrogen. It could also indicate that you are feeding too much (digestion cannot keep up with inputs). Try balancing this by feeding dry, carbon-rich materials like dry leaves, straw, or shredded

- paper. Or try reducing the amount you feed the biodigester.
- Feedstock to water ratio: Usually 1:1
- Mixing techniques:
 - Ensure proper agitation in the inlet.
 - Use a sufficient quantity of dung daily.
 - Block the inlet to the digester during dung mixing.
 - Ensure thorough mixing of animal dung with water and/or urine.
 - Allow the substrate to settle in the tank for a few minutes before charging it into the digester.
- Operational and maintenance procedures:
 - Regular monitoring of parameters like pH, temperature and gas production
 - Periodically inspect and maintain bio-digester components
 - Conduct routine cleaning to remove any accumulated debris or excess solids
- A schedule can be established for regular feeding that accommodates the routine of both men and women
- Suggest promoting biodigesters as a 'home/livelihood improvement technology' rather than a 'cooking solution' to increase male interest
- Encourage and support women to actively participate in bioslurry trade as entrepreneurs.
- Engage men to promote the sharing of benefits such as bioslurry use and income with women in their households

Phase 2: Bioslurry storage and use guidelines

Relevant target groups: farmers with biodigesters, farmers already using compost, other farmers, biodigester company staff, agri-input suppliers

- Collection and storage
 - Proper collection is necessary for:
 - Maximising nutrient retention
 - Avoiding volatilisation, leaching and contamination
 - Storage should have covers (large leaves, wood planks, tarp) and impermeable liners (brick, tarp)
- Distribution on-farm
 - Promote equal participation of men and women in the distribution process, from planning to execution.
 - Consider the needs of women in designing distribution mechanisms, such as convenient timing and accessible locations that minimise time and effort required for women as well as men
- Application of bioslurry in the field
 - Can be applied in dried, liquid or composted form
 - Liquid bioslurry
 - Apply via furrow, foliar, or around standing crops like coffee.
 - While using liquid form as a spray or application in the standing crops, it should be diluted with water at least 1: 3 ration to avoid toxic effects like burning the leaves in plants
 - Composted bioslurry
 - Mix into soil during preparation or apply around standing crops.
 - Dried bioslurry
 - During drying, nutrients will be lost by volatilization so, time factor should be considered during application, as immediate application is the best way to optimise results.
 - Methods: Broadcasting, subsurface injection or drip irrigation
 - If using broadcasting, the slurry should be incorporated in the soil immediately after application to avoid losses
 - If using drip irrigation, ratio of bioslurry to water should not exceed 1:8⁵

⁵ <https://www.sciencedirect.com/science/article/pii/S0378377422005352>

- Timing and rate of bioslurry application should be considered
 - Avoid application in period without crop growth or with high rainfall (Sahel: Jun-Sep; East Africa Nov-Dec and Mar-May)
 - Optimum weather to apply: cool times (morning or evening) and period with no wind to reduce nutrient loss
- The preferences and capabilities of both men and women should be considered.
- For the application of bioslurry, mostly females are involved, development of women-friendly instructions, application technologies/equipment or gender-responsive equipment should be promoted. For example, graphics may be used to show ratios for applications and dilutions if needed
- Establish demonstration farms that showcase the benefits of bioslurry and BEC application, with a focus on women farmers.
- Highlight successful stories of both men and women engaged in bioslurry production to inspire others and break gender-related barriers.

Phase 3: BEC production and use guidelines

Relevant target groups: farmers with biodigesters, farmers already using compost, other farmers, biodigester company staff, agri-input suppliers

- Composting systems
 - Building multiple pits ensures a continuous cycle of composting.
 - Build two or more (alternating) pits: while one or more pit can be used for composting, others can be used to collect bioslurry (adjust the size of the pits for storing bioslurry as needed)
 - Location at least 10m from the home (to prevent accidents)
 - Types: Heaps, pits and containers/bins
 - Heap is good for rainy seasons which is done on the ground surface and ideal for areas with significant rainfall to prevent water logging. For best decomposition; the heap should not exceed 1.5 m in height, but the length can vary according to the materials available and wider not more than 1.5 m to make it easy to work on without stepping on it. It should be placed on the ground with its base in a shallow trench to secure the foundation layer. When a sufficient size is reached, it is best to start another heap for fresh materials while allowing the original heap to decompose with the help of occasional turning.
 - The pit is suitable for areas with less rainfall as the pit conserves moisture. The ideal size for a composting pit is around 3 ft. x 3 ft. x 3 ft. (1m x 1 m x 1 m). The depth should not be greater than 1.3 m. to prevent accidents and maintain proper airflow and width not more than 1.5 m for ease of turning. Length can be made more depending on available composting materials based and available space. Follow the size of pits mentioned below in the table for different sizes of bio-digesters. These pits can be constructed with materials like treated wood, brick, or masonry, with walls extending above ground level if desired. Alternatively, if the surrounding soil is firm, the pits can be left unlined.
 - Recommended pit dimensions are presented below in Table 6:

- Layering of compost materials for pits: It is same as heap method:
 - Fill the pit by layering repeatedly a (thick layer at bottom), b, c and d
 - a. Dry matter – straw/stalks
 - b. Wet starter - bioslurry (cover entirely)
 - c. Ash, topsoil
 - d. Green materials - grasses, leaves
 - Cover the pit from top
- Monitoring temperature and moisture in heaps and pits: .
 - Temperature and Moisture Check (Every Two Weeks) for turning and watering:
 - Simple heat test:
 - Insert a stick into the centre of the heap or pits.
 - Feel the stick; it should be moist and warm for healthy composting.
 - Squeezing Test:
 - Compost should feel moist when squeezed in hand.
 - If not, add water to maintain proper moisture.
 - Moisture Correction:
 - If the compost is not moist, sprinkle water evenly during turning.
 - Add water sparingly to maintain moisture, avoiding saturation.
 - Temperature Adjustment:
 - High temperatures: Temporarily lift the cover to allow hot air escape.
 - Low temperatures: Add covering, permit sunlight for heating.
 - Turning and Watering:
 - Turn compost if it is too heated for aeration, normally it is turned up after three weeks.
 - Add water as needed to maintain optimal moisture.
- Ready to use compost
 - Visual Indicators:
 - Compost is ready when it turns a dark brown colour and has a crumb structure
 - Sensory Check:
 - Confirm readiness by a pleasant, earthy smell
 - Time Frame:
 - Typically takes 6-12 weeks, influenced by temperature and turning frequency
- Application of bioslurry and BEC:
- *Points to be remembered*
 - *Separate feedstock from waste at the source. Glass can result in injuries*
 - *Ensure proper C/N-ratio, cut feedstock in small pieces*
 - *Ensure proper amounts of water and air to avoid smell*
 - *Shield from rain, wind and direct sun*
 - *Regularly monitor composting process*
 - *Minimise nutrient losses during storage and application by storing in proper storage structures and applying during the right time with the right rate, and right method*
 - *Digestion and composting will generally go faster in warmer weather*

Bioslurry, derived from various animal manures supplemented, in some cases, with human excreta, poses potential food safety risks due to the presence of pathogens in the feedstocks. While the hygienic quality of bioslurry is generally equal to or better than that of animal manure when comparing bacterial parameters, mesophilic biogas treatments may not consistently achieve a complete elimination of biological hazards. Regulations in developed countries often include pasteurisation steps or specific time-temperature profiles for digestate application, aligning with findings on pathogen reduction during anaerobic digestion. Overall, the hygienic quality of digested products tends to be equal or better than raw manure, though consistency in achieving pathogen reduction is crucial, especially in developing countries with less retention times. For instances where human excreta are part of the feedstock, stricter precautions may be necessary to ensure food safety. However, human excreta and manure typically do not exhibit problematic levels of heavy metals and pesticides. It's important to note that using other waste streams as feedstock may introduce risk of contaminants/heavy metals/persistent organic

pollutants in the digestate which may enter in the food chain, emphasising the need for careful consideration of feedstock composition to mitigate food safety concerns associated with bioslurry⁶.

Bioslurry has higher pH values, elevated pH-value may pose a risk of increased ammonia release from the soil. High concentrations of ammonia released from bioslurry can cause damage to vegetation, soil acidification, eutrophication, and adverse effects on ecosystems⁷. However, due to a lack of quantification, accurately assessing these risks is challenging. Comprehensive research is needed to understand and mitigate the environmental impacts of bioslurry application and over-fertilization in agriculture⁷.

Guidelines for safe production and use of bioslurry and BEC

- Pathogens/illness/food safety
 - Wash hands, forearms, feet, and any other exposed areas with soap after handling bioslurry or compost. If children are present, take care to prevent them from coming into contact with bioslurry or compost. If contact occurs, wash the relevant areas.



- Note that where a tap is not available, someone else may have to use a cup to pour water over the hands. The person holding the cup should already have clean hands.
- Keep the area surrounding the biodigester and effluent/compost pits clean
- Avoid skin and eye contact with bioslurry; wash skin or flush eyes with clean, cool water if contact occurs. If a clean water source is unavailable, collect, boil and cool water and keep this on hand as an eyewash.
- Stop applying bioslurry to crops 3 weeks before harvesting
- Wash fruits and vegetables with clean water before consumption
- Manure from animals that have received antiviral or antibiotic medications present an added risk; this manure is likely to contain traces of these medications and is more

⁶ <https://edepot.wur.nl/307735>

⁷ <https://www.fao.org/3/i3441e/i3441e.pdf>

- likely to contain antiviral-/antibiotic-resistant pathogens. This manure should not be used during the course of the medicine. Extra care should be taken to observe other safety guidelines (e.g. avoiding skin and eye contact, thoroughly washing hands).
 - When turning a compost pile, be mindful of the wind direction, as it releases particles and gas that may trigger symptoms in individuals with asthma or allergies. Avoid turning piles on windy days to minimise potential health risks for nearby individuals, including those involved in the turning process. Consider wearing a mask or other face covering if you are particularly sensitive.
 - Pregnant and breastfeeding women and small children are particularly vulnerable to pathogens. If possible, redistribute household tasks so that these individuals are less exposed to pathogens, for example during manure collection and feeding, bioslurry application, and composting.
 - Extra attention should be paid to these safety precautions when concerning particularly vulnerable people (small children, elderly, pregnant and breastfeeding women, immunocompromised people) and when dealing with human excreta, which contain more harmful pathogens than animal manure
- Accident prevention/physical safety
 - Do not allow children around the biodigester and compost pits, do not jump, run or climb on it.
 - Fence off the storage/compost pits to avoid accidents. You may encircle the area with a deterrent such as scrub bush.

4 Discussion and conclusion

This report set out to establish guidelines of good practices for bioslurry and BEC production relevant to the gendered context in which they will be used. It started by presenting the results of the OFVI Inception 2 report's survey on gender involvement in the bioslurry and BEC production process, which reveal clear discrepancies between male and female involvement in various stages of production from collection and storage, to transport, to application of the bioslurry/BEC. These discrepancies were more pronounced where heads of household were more disproportionately male (i.e., in countries for which data is available, most in Burkina Faso, then Uganda, then Kenya).

As such, guidelines were developed to address gender inclusivity, ownership and responsibility sharing as well as maintain product quality. They highlight specific steps in the production process where there are opportunities to increase gender parity. They also consider gender-specific needs, for example women who are more likely to be responsible for care of small children. The intention for these guidelines is to support the development of high-quality bioslurry and BEC and to do so in a way in which benefits are shared across gender lines.

These guidelines are intended to provide insight into technical and gender aspects of bioslurry and BEC production for people developing training programs. Within the OFVI project, there are no plans to update these guidelines. Training materials will be updated based on needs identified in the first set of enterprise and extension officer trainings and elsewhere in the project. By the conclusion of the OFVI project, materials (including these guidelines and updated training materials) should provide a basis for local partners to replicate and expand training activities. Nonetheless, we hope that these guidelines are incorporated into the long-term workplan of local partners, updating them as more becomes understood about prevailing circumstances related to biodigesters and gender, and as these change over time.