



Africare's Experience with VitaCow and VitaGoat Food Processing Systems

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Objective: This paper reports on the experience of using VitaCow (VC) and VitaGoat (VG) soy processing technologies in Africare country programs. It outlines the strengths and weaknesses that have been observed in applying these technologies to reduce malnutrition and promote income generation. The intent is that lessons learned and recommendations presented here will inform future installations of VitaCow and VitaGoat technologies in Africare programs and those of other Cooperating Sponsors. This aim stems from Africare Title II ICB objectivesⁱⁱⁱ and is aligned with USAID's strategy to target vulnerable groups when reducing malnutrition (USAID/FFP/DCHA 2005).

Background: Africare has expanded its food security programs to include food processing technologies that are aimed at increasing food security by decreasing malnutrition (in general and for vulnerable populations) and promoting income generating activities. Africare has also

sought ways to promote local processing of food items as a way of encouraging vulnerable groups to engage in business ventures. Africare's attention to these technologies led to a partnership with Malnutrition Matters in order to introduce (for the first time) VitaCow and VitaGoat soy and food processing systems in Africa.^{iv}

Characteristics of the Processing Systems.

VitaCow and VitaGoat are two related types of food processing machines that were designed to convert soybeans into soy milk and its derivatives as well as a variety of other foods (fruits and grains) into processed and/or preserved food products. There are a number of steps involved to process foods, which vary depending on the type of food being processed and the product being made (Africare and Malnutrition Matters 2004^v and Malnutrition Matters 2007). The systems have grinders (electric or cycle/pedal) that are used to mash raw foods. The ground substance is then transferred to the boiler which pressure cooks the food. Once the food is pressure cooked the undissolved parts are separated out, leaving a processed food that does not require refrigeration. For example, VitaCow can be used to make soymilk, jams, jellies, fruit and vegetable juices and soups. VitaGoat was developed as an alternative to VitaCow that did not need electricity, which is unreliable, costly, or unavailable in many of the non-urban areas where food security programs are implemented. A combination of human-powered bicycle action for grinding and a multi-fuel boiler for processing are unique to the VitaGoat system. This makes the VitaGoat appropriate in a number



VitaGoat system installed in March 2006 in Namibia. Photo Credit: Malnutrition Matters

of lower density rural areas, but it also makes the system more complex to operate and somewhat less productive (30 liters/hour for the VG vs. 40 liters/hour for the VC). The different processing system also allows VitaGoat to process dry foods such as nuts into nut butter and cereals and grains into flour.

Support Materials for Use and Management of VitaCow and VitaGoat. Since the introduction of the VitaCow and VitaGoat, Malnutrition Matters has developed a number of technical assistance modules and manuals to help with the introduction and management of the processing systems. These include a VitaCow business guide and three technical modules on mango/tomato processing, supplementary weaning foods, and processing foods adapted for People Living with HIV/AIDS (Africare and Malnutrition Matters 2004) and a VitaGoat technical and operation guide (Malnutrition Matters 2007). Since 2000, Malnutrition Matters has conducted training for operators of new systems in over 15 countries.^{vi} This training typically is conducted once with the initial introduction of the system and its operation in a country NGO or community setting and then those trained by Malnutrition Matters are expected to train operators for additional systems acquired. The training is between three and seven days and includes training in operation and maintenance of the system and marketing of its products. The technical guides and modules are distributed during this training.^{vii}

VitaCow and VitaGoat Systems in Africa. These systems are attractive to Africare because they produce high quality, low cost nutritious foods, help create jobs for semi-skilled workers, and provide income for the individuals or associations and community groups who own them. The options for use of the food products include distribution to institutional clients such as schools or restaurants, sale in the local food market, or storage and preservation of canned goods such as mango juice that provide a source of nutrients and income year round. In addition, the food products are ideal for individuals living with HIV and malnourished children because they are easy to chew, drink, and digest (Africare Health Nutrition and HIV/AIDS Working Group 2007). It can be particularly helpful during outbreaks of livestock disease that limit production of animal by-products such as milk. VitaCow was first introduced in 2002 in Africare country programs and had expanded to a total of

seven countries^{viii} by 2007 (Bryson 2007). VitaGoat has now been introduced in five Africare countries (Mozambique, Guinea, and Chad as 2004 pilots, followed by installations in Namibia and Zambia).^{ix} There are also systems in several other African countries funded by other donors or individuals.

Methods: Annex 1 provides the list of questions that guided this research. The methods used to produce this report included a review of the published and gray literature on existing and past VitaCow and VitaGoat projects in Africa (both Africare and non-Africare). Between November 18th and December 9th 2008 questionnaires were sent to all Africare country program staff where systems had been installed. Follow up interviews were conducted with available and knowledgeable field staff (see Annex 2). This included translation of English questionnaires into French for French-speaking Africare staff and colleagues.^x

Results and Discussion

Based on the review of the status of VitaCow and VitaGoat systems in Africare country programs, there are several issues that have commonly affected these systems (Annex 3). These include:

- Uncertainty and lack of clarity of the aim of each system,
- Inappropriate placement of systems in remote rural areas,
- The need for business management training and skills for groups operating systems,
- A lack of an established technical support system for repairs, parts, and troubleshooting, and
- The need for a simple tracking system to assess and follow status and impacts of the systems.

Business, Social, and Mixed Applications.

During the assessment of the current status and past experience with VitaCow and VitaGoat systems in Africare programs, two models of operation emerged: one under which systems are primarily used for income generation as a business and one primarily oriented toward their use for improving quality of life related to nutrition, health, or job training (i.e., a more social model). There are also example of programs that have combined both these models to operate systems that provide both a social service and income generation opportunities.



VitaGoat cycle grinder at work grinding soybeans for soymilk, Mozambique.

Photo Credit: Malnutrition Matters.

Under the business model, these food processing systems have been installed to provide a way to generate income in areas with livelihood, nutrition, and health concerns and with vulnerable populations. The role of Africare in this model is to provide some or all of the following: initial capital investment for equipment, training for Africare staff and targeted community members or groups who will end up operating the business, start up costs, technical assistance during equipment break downs for a limited period of time, and procurement of replacement parts. It is intended that systems under this model move toward self sufficiency. Two systems that operated in Cote d'Ivoire,^{xi} one operated in Mozambique, and one operated in Zimbabwe are examples (Annex 3). However, the specific processes for group selection, site selection, training, and management of these systems has not been standardized.

The second model aims to assist a targeted vulnerable group with either skills training or by providing supplemental food of high nutritional value. These systems are not self sustaining in the short or long term. They are intended to be sponsored and supported by an NGO, government or religious organization. Examples include one in Namibia that provided soy milk to people living with HIV (PLHIV) and one in Zambia that has been used to provide business skills training to youth (Annex 3).

The project objectives (social or business) were often unclear. In these cases, groups naturally assumed that the systems should be used to feed themselves first, and any remaining production

sold. These proceeds would then mainly be used to buy other food. A clear distinction between the experiences and social profiles of the VitaGoat or VitaCow owners/operators and beneficiaries was not always made, which contributed to poor project performance in some cases—particularly in the early years of the program. A clear definition of customers was also not usually made, the later mixed in with operators and beneficiaries. While benefits can come from both the business and social models, confusion over the ultimate aim and responsibility of the system may hinder progress towards both aims.

In the case of Namibia, the system was initially operated under a social model. Soymilk was produced and given for free to PLHIV. This had a very positive impact at HIV clinics and with home-based care providers who observed bed rest patients becoming more mobile and with less acute illness after patients received soy milk.^{xii} However, when this system was later transitioned into a profit-making model, the expectation of free milk made purchasing milk less desirable in the community. In addition, volunteers were carried over from the social application and burn out of these volunteers complicated production. Finally, potential customers of soymilk were hesitant to purchase it because there was a stigma associated with it since it was perceived as a drink for PLHIV (Joshua Karuma phone interview, December 4, 2008).

This is not to say that systems can't be profit and business oriented and simultaneously assist vulnerable groups. For example, a group of young mothers in a Lusaka slum are using a VitaGoat system to produce food that they sell successfully to the public and at the same time they produce food to feed themselves and their children that has resulted in improved nutritional status. Guinea and Chad are examples of locations that have used systems both to provide social services and income generating activities. It is important for these types of applications to be installed in areas with sufficient market demand to "cover" the social activities for which the systems are used. Based on experience, the social component in these cases (e.g., feeding school children or the sick), should represent at most 20 to 30 percent of production output in these cases.^{xiii}

Location. Several of the VC or VG systems were setup in remote rural areas. While there is a need to improve both food security and income generation in these areas, people living there regularly do not have access to the inputs that are needed for a sustainable and successful VC or VG installation. For example, there have been reported difficulties with obtaining a reliable supply of soybeans in Namibia and, to a lesser extent, in Guinea. Rural areas often do not have reliable sources of electricity (for VitaCow systems that require electricity). For example, major delays have plagued the VitaCow system in Nigeria, partly due to the need to raise funds for and purchase a generator to run the system (Gua 2008 and Josephine Gua interview December 6, 2008).^{xiv} Furthermore, access to appropriate and effective packaging materials (in the case of business applications of these systems) needs to be considered and may be difficult to obtain in remote rural areas.

In remote rural areas it is also often difficult to source replacement parts when the machines break. Bryson (2007) reported that several systems were awaiting repairs and parts in 2007. In the case of breakdowns in Guinea, Africare and Malnutrition Matters collaborated to bring replacement parts from Canada. While this technical assistance minimized the delays in production due to the breakdowns, it is not a sustainable solution once projects end. A better solution would be to invest in the capacity of local carpenters, engineers, or artisans to provide repair services. The local capacity to fix the broken parts varies. A Cote d'Ivoire women's group operating a VitaCow system hired a local artisan to repair a broken sieve and the Namibia system breakdowns have been fixed by a local mechanical engineer. However, for more comprehensive capacity to repair VitaCow and VitaGoat machines trainings should be developed and troubleshooting and repair manuals provided. Spare parts that cannot be manufactured locally could be imported through local private business interests. For example, Conte et al. (In Press) report that local market women in Guinea are interested in developing business of importing spare parts for these machines from Canada.

Remote rural areas often do not have the market demand necessary to support use of a VC or VG system when it is applied as a business venture. These systems can produce between 30-40 liters/hour of soymilk and juices, so it is not

efficient to have them in a place where there is not enough demand for that capacity. A location requires at least 500 consumers per day and production time of at least 3-4 hours per day. Dona Rita, the owner/operator of the VitaCow machine in Mozambique, has had difficulty finding sufficient market demand for products (Ronaldo Sigauque email correspondence November 25, 2008; Bryson 2007). The Namibia system also operates at partial capacity (25%) because there is not enough market demand for the products (Joshua Karuma interview December 4, 2008). Bryson (2007) also found it to be ineffective to place VitaCow or VitaGoat systems in remote rural areas and recommended that urban or peri-urban areas would be better for market demand and would also reduce transit routes (and therefore lower cost).

One solution to the low market demand in some areas may be to diversify the products produced with the systems. Most of the machines are primarily used for soymilk, but the systems have the capacity to process many types of foods. Guinea was successful at using the system to process mango jams and peanut butter.

Management Capacity of Groups. Another constraint has been in the capacity of groups that have been selected to manage the VC and VG systems. Commonly the groups that Africare selects (which may fit the criteria of being vulnerable to food insecurity) have very limited business and management experience. For example, in Mozambique Dona Rita was selected to receive a VitaGoat system because she had demonstrated excellent leadership skills as a Model Mother in the Africare Hearth program, which then led to her selection for operation of an oil press. She did so well managing the press as a business activity that she was then presented with the opportunity to run the VitaGoat system. Despite her impressive record as an entrepreneur, she did not have extensive formal business management training, which may have helped her diversify her products and conduct market demand assessments (two of the areas that have been problematic for this system) (Ronaldo Sigauque email correspondence November 25, 2008).^{xv} The selected groups also tend to have limited experience with production equipment and technology. While Africare arranges one week of training on the systems (which includes a module on business management of the systems), this is not enough to overcome the needs in business management (or repairs and

troubleshooting), if the operators do not have a certain level of business skill to begin with. This often leads to initial mistakes in management and operation, creating production delays, hindering the opportunities for success and even damaging the equipment in some cases. Those Africare-supported VitaGoat and VitaCow systems in Cote d'Ivoire and Guinea, which have been based on business aims and provided ensured adequate training and experience in business management and literacy have been the most successful (Conte et al. In Press; Al-Hassana Outman interview November 20, 2008 and Mamadou Conte interview November 27 and 28, 2008).^{xvi} In Cote d'Ivoire Africare provided literacy training (which included reading, writing, and calculations) three months prior to the arrival of the VitaCow machine and business basics training (which included input and output and profit assessment and bookkeeping) one month prior to the arrival of the VC system (Al-Hassana Outman interview November 20, 2008).^{xvii}

Technical Support. The relative complexity of the technology and the inevitable need for repairs and parts has meant that technical support is essential to the success of the systems. Africare field staff are often too busy to provide the regular technical and managerial support to groups charged with managing the systems. There has also been a lack of technical support (even during the initial set up period when it is most needed) to teach groups how to manage, operate, and repair the systems. As indicated above, technical support is difficult to provide to remote rural areas, contributing to the ineffectiveness of installing these first systems in areas far from urban centers or Africare offices.

Malnutrition Matters and Africare have created a number of guidance documents on VitaCow and VitaGoat systems. However, due to staff turnover, many of the field staff and system operators do not know of these documents. Aside from requiring sufficient training and guidance to operate and troubleshoot the systems, successful and sustained operation also requires a local technical network involving long-term stakeholders that can source replacement parts and offer repairs and technical assistance. This should include community members, the private sector, and government extension agents. To make this possible and efficient a number of systems may be required in a region. Conte et al (2008) suggest that in Guinea women are willing



Mango processing with VitaGoat system in Chad.
Photo Credit: Malnutrition Matters.

and ready to make a business of importing parts from the Canadian manufacturer. Africare/Guinea encouraged exchange visits between groups operating VitaCow systems in the country so that they could share their experiences and lessons learned. These exchanges are reportedly effective, but require collaboration and a minimum number of systems to be installed in a region.

Tracking Systems. A combination of staff turnover and the lack of a sustainability/phase out plan have made it difficult to track the status of VC/VG systems that have been implemented. Judy Bryson ran into this in 2007 and it was mirrored with the research conducted during the preparation of this paper. Monitoring and evaluation indicators have not been set up and reports rely on anecdotal stories and the experiences of participating staff. This type of information is lost when staff move on, as has been the case for the system in South Africa.^{xviii}

Recommendations

This assessment of VitaCow and VitaGoat systems installed by Africare has led to six major recommendations for Africare to consider and three recommendations to be considered for a broader Cooperating Sponsor VitaCow and VitaGoat network.

Recommendations for Africare

#1: Develop a clear distinction between use of food processing systems for business/income generation and for social aims (e.g., training, skills building, and decreasing malnutrition). A clear business case must be made for each location/group, which should include a business

plan with analysis of competition, supplies, products, packaging, price, and cost/benefit. Create and use a group screening guide and checklist that addresses:

- Leadership of the group with experience running a business (preferably food processing),
- Africare staff's knowledge of the group and proven experience working together,
- Presence of a handyman in the group,
- Completion of a group business plan based on the SoyCow/VitaCow business plan guidance in the VitaCow Business Guide (Africare and Malnutrition Matters (2004),
- Presence of at least one member that is numerate and has basic bookkeeping skills,
- Completion of contract signed by all members, indicating their ability and/or commitment to provide some of the start up cash (approximately 10-20%).

This needs to be completed before project inception and used to screen groups. The private sector should be considered a target for initial implementation of the systems, as well as for handovers of up and running systems that are business oriented. Groups that manage the systems under a business model should be set up as companies as opposed to social groups, so that profit is the main stated goal. This way, capacity needs such as business planning, management, pricing, bookkeeping would be identified as needs for operating the system. This (along with getting governments involved in social applications) would help in tracking what happens to these systems after projects end.

#2: Consider appropriate sites in introduction of systems. Regardless of whether systems are intended to generate income under a business model, provide supplemental food to malnourished groups, or used to provide job training, the technical support needed to maintain these systems requires that they not be placed in remote locations. Business ventures should set systems up in urban or peri-urban sites. These can still be in rural areas, but with at least 500-2000 people within 1 km of the production site. If soyfoods are the main product, ensure that soybean production is present and/or supported in the area. It would be helpful for tracking and assistance if sites were within 10 km of Africare offices.

#3: Conduct standardized trainings based on successful models that consider lessons learned.

Trainings need to be more extensive, including technical aspects and business management. A minimum level of business knowledge and literacy needs to be established before specific training in VitaCow and VitaGoat systems. In addition, local government extension staff and any relevant private sector players should be included in the training. Africare needs to provide ongoing technical and business support for at least the first six months of a new installation and set up a clear cost schedule for spare parts and technical support to the project after Africare has installed the system. Ensure use of and dissemination of the guides produced by Africare and Malnutrition Matters.

#4: Establish a technical support system. This should include identification of a designated focal point for VitaGoat technology at headquarters so continuity is maintained even if there is staff turnover. It may also be a part of the broader stakeholder community network recommended below. Technical support must be built into the project M&E, at least for the first 6-12 months and phase out plans must be established with groups. An Africare or private sector country technical support staff person must be available—ideally cost-shared among projects. The private sector should fill the gap in technological services and spare parts needs for ongoing maintenance and repair. Groups should pay for some or all of the cost of technical support to ensure sustainability. Extension officers from local government departments need to be involved in projects from inception.

#5: Develop a standardized tracking system of food processing systems. Africare should develop standardized M&E indicators to include in baseline and final assessments. These might include: group per capita income, nutritional status of potential consumers and knowledge of business skills (verified through tests), and if in schools, student attendance.

#6: Re-launch existing VitaGoat systems. In the case of the VitaGoat systems in particular, in order to facilitate a more successful outcome from the systems that are currently or have been implemented Africare should: a) repatriate all systems except a few that should be sold to cover transportation expenses, b) conduct technical assessment on viability and reconditioning, c) re-launch the systems into existing programs taking all above recommendations into account.^{xix}

Recommendations for a Food Processing Network

Collaborate with other NGOs and government agencies to develop a network for food processing systems support. Often these systems require a critical mass in order to develop successful models, learn from best performers, and scale up, as well as make it cost effective to invest in training for a mechanical engineer or parts sourcing system. Collaboration would also make it possible to cost share workshops on business management related to food processing (including bookkeeping and market assessment). It could also encourage manufacturing of spare parts by private and/or NGOs located in places easy to access by groups running CV and VG systems.

Contract comparative studies. Now that there are years of experience and case studies related to VitaCow and VitaGoat, it is time to take a systems approach and look at models and compare approaches across programs and countries. Implementation of a tracking system will facilitate this.

Contribute to development of an annotated bibliography on food processing systems. Given the previous lack of documentation of experiences related to VitaCow and VitaGoat and the potential far reaching benefits of using this and other food processing systems for income generation, skills building, job training, and decreasing malnutrition, better documentation needs to exist. One option is for CSs, agencies, and companies around the world to contribute to a centralized resource site (perhaps similar to the resources housed on the Food Aid Management website). In an attempt to work towards this concept this paper contains a bibliography of resources found during the research. CSs should also provide documents in the official language used in the country if this language is not English. This will facilitate replication and on-the-job training.

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Annex 1: Questions that Guided Assessment of Africare's Experience with VitaCow and VitaGoat Food Processing Technologies

1. Which Africare programs currently have operational VitaCow or VitaGoat systems? How many have completed transfer to communities or individuals?
2. What worked and did not work during implementation and management of VitaCow and VitaGoat systems in Africare programs? What were the constraints and recommendations for the future?
3. What are the macro-scale and micro-scale issues that need to be addressed in the future?
4. What can Africare do in the short-term to assist the VitaCow and VitaGoat systems that have already been implemented?
5. Which groups are most benefiting and using the technology?
6. What are the reporting and tracking constraints for Africare introduced VC/VG technologies?
7. What critical factors need to be addressed on the macro-scale?
8. What types of training are needed?
9. What types of monitoring and evaluation and indicators are needed?
10. Should feasibility studies be conducted or recommended for development prior to installation and what should they consider?
11. Is there a preference for VitaGoat over VitaCow?

Annex 2: 2008 Contacts for Interviews and Questionnaires

Questionnaires were developed based on the most recent information on the VC and VG systems in Africare country programs. These questionnaires were used to gather additional information on the current status of the systems and the lessons learned and recommendations for future installations. The following reports on completed questionnaires and interviews conducted in November and December of 2008. In many cases staff turnover and the lack of a standardized tracking system prevented gathering any additional information as many of the current program staff are not aware of the VitaCow and VitaGoat systems and do not know what has happened to them.

Contact	Country of Experience with VitaCow or VitaGoat	Date Interviewed or Received Completed Questionnaire	Interviewed by
Mamadou Conte (former agricultural production supervisor of GnFSI, Africare/Guinea)	Guinea	November 27 and 29, 2008 December 1, 2008	Della McMillan and Mahamet Saleh Radjab
Josephine Gua (former VitaCow technical support officer, Africare/ Nigeria)	Nigeria	December 6, 2008	Leah Cohen
James Machikicho, (acting sustainable livelihoods manager, Africare/Zimbabwe)	Zimbabwe	December 9, 2008	Leah Cohen
Joshua Karuma (former Project Coordinator, Africare/Namibia, current Country Representative Africare/Malawi)	Namibia	December 4, 2008	Leah Cohen
Ronaldo Sigauque (former coordinator of Manica Expanded Food Security Initiative (MEFSI), current Project Coordinator of SANA, Africare/Mozambique).	Mozambique	November 25, 2008	n/a (questionnaire via email)
Al-Hassana Idriss Outman (former country representative, Africare/Cote d'Ivoire, current country representative Africare/Chad)	Cote d'Ivoire	November 20, 2008	Leah Cohen

Annex 3: Reported Concerns and Considerations Related to VitaCow and VitaGoat Systems in Africare Programs based on November/December 2008 Interviews and Questionnaire Responses

Issue	Mozambique (Title II) VitaGoat	Zambia (non-Title II) VitaGoats	Guinea (Title II) VitaGoat	Cote d'Ivoire (non-Title II, Food for Progress) VitaCows	Nigeria (non-Title II) VitaCow	Zimbabwe (non-Title II) VitaCow	Namibia (non-Title II) VitaGoat
Supply of Inputs (e.g., soybeans)	Not reported on.	Success: No system low downs have occurred in Zambia due to lack of soybeans. Groups often purchase enough soybeans in season to last 3-6 months.	Constraint: Africare worked w/ extension services to acquire and support improved seed and production, impact not tracked, seed center closed, sustainability questioned.	Success: Africare/CI had anticipated need for soybeans prior to installation and had trained 2 women's group in soybean production in Oct 2001, providing training, seed, tools, fertilizer.	Unknown: VitaCow system is not yet operational due to lack of funding for construction of building to house system.	Success: Africare project also had activities promoting soybean production in area and there was a surplus of soybeans that were provided to VitaCow system.	Constraint: Drought in 2006/07 affected agricultural production including soybeans.
Training	Constraint: The women (model mother) who received the machine received operational training on system, had no business training, she has experienced problems with marketing and demand.	<i>Lusaka women's group system:—</i> Success: Their business management skills benefited from having worked together on other business activities (making handbags out of plastic bags) before. <i>Church group system—</i> Success: The management of this system benefits from the financial, business contacts, and business knowledge of one of the leaders. In addition, the youth who run the system have been trained on Life skills and	Success: VitaCow operational training targeted women's groups that already had literacy and business management training. In addition, since several systems are placed in Guinea, Africare has promoted exchange visits for operators of the different machine so they can share their experiences and lessons learned.	Success: Africare/CI anticipated need for training in literacy and business management prior to installation of VitaCow system. Three women's groups were trained starting in Oct 2001 in literacy and in Dec 2001 in business management. VitaCow operation training conducted in Jan 2002 at the newly established "Judy Bryson Training Center" in honor of her initiative to bring VitaCow systems into Africare programs.	Unknown: Production association was formed with committee and they were trained in five areas (product registration, marketing, operation of system and repairs, site preparation, and M&E); M&E was weak as it consisted only of Africare providing assistance for 6 months. Problems with lack of funding for building construction and generator (location does not have electricity) resulted in delays; committee lost enthusiasm over years of delay and re-training will be	Success: Standard training on system operation and maintenance was then supplemented with training for leaders of group on business management and marketing. Later group representative traveled to Zambia to provide training to groups with the first VitaCow system there. Constraint: It was a very large group (too large) and training was only provided to leaders not entire group, which eventually led to group dynamics and management	Success: Local engineer provided training on installation and general maintenance. Business, proposal development, marketing, and constitution development training was provided to production group. In Sept 2007 Africare project ended and production association was trained in business plan and marketing, they were reaching out to NGOs such as Catholic AIDS,

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		livelihoods by Africare in addition to the standard VitaGoat training.			needed.	problems.	Hospitals, and Army bases, and schools through awareness campaigns. Constraint: No troubleshoot guide included.
Capacity for repairs and spare parts procurement	Not reported on	Success: Africare/Zambia formalized the technical support and repairs for these systems by hiring a skilled individual to be responsible for these aspects (more so in the first months of operation as the operators build experience).	Constraint: Africare and Malnutrition Matters had to collaborate to bring in spare parts for system in 2007. However, this is not a sustainable model for repairs and parts once projects end.	Success: Despite no official mechanism for repairs and spare parts, women's groups that experienced breakdown when sieve broke (2 machines) were able to find local artisan to make new sieves for the VitaCow machines. Constraint: In the future, this may be problem if no part procurement or specialized repair training is organized.	NA	Constraint: The machine did not breakdown during the two year period after installation and prior to Africare project ending in 2005. However, in late 2007 the system broke down and repairs have not been possible due to economic conditions in Zimbabwe.	Constraint: Need for trouble shooting guide.
Social model		<i>Church group system—</i> Success: Church group is selling at farmer's market and providing soymilk to school children <i>Youth vocational training system—</i> Success: Youth					Success: When the system was run as a social activity aimed at improving the nutritional status and quality of life of PLHIV, it was very successful. Health care center staff and home-

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		vocational training center is operating a system to build business skills and for social purposes. This could be used as a model to conduct youth vocational training in schools in Zambia and may leverage funds for youth employment plans that would appeal to African governments.					based care providers reported reduced illness and increased mobility of PLHIV who were given soy milk. Constraint: As system transition to business model there were problems with market demand and staffing due to reliance on volunteers.
Business model	Success: Despite market demand problems, she has continued to produce at less than full capacity. The quality of life of Dona Rita may have improved but the impact would have been more widely distributed had it been placed with a community-based organization.	<i>Lusaka women's group system</i> — Success: The group has been able to combine an organization that produces food for 300 OVC and 40 women while selling enough food to profitably support their business and earn extra income.		Success: Women's groups targeted had successful income generation, very profitable, earned 1300CFA/day reportedly.	Production association was trained in business management, outcome unknown as system is not yet operational. Still requires grant and donated money for initial capital investments, as is the case with all VitaCow and VitaGoat systems intended for income generation.	Success: The group (110 community member group) was very successful producing and selling soy milk during the time Africare project was active. After project ended, problems with group dynamics and management hindered activities.	Constraint: Transitioned to business model after initially giving out milk to PLHIV. This lowered desired in communities to buy milk because it was associated with HIV and had stigma and was initially free. In addition, volunteer used burned out under this model.
Market demand	Constraint: Dona Rita has struggled throughout time	<i>Church farmer's market sales</i> — Success: Combining roadside stand sales	Success: Market demand in Guinea has been very high. Production has not	Success: Market demand was high,	NA	Success: Market demand was very high, soymilk was popular. This was	Constraint: Low population area and poverty/drought

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	of operation with market demand. She does not have storage capacity for larger scale business and population is low.	and OVC support to a local school. <i>Lusaka women's group</i> — Success: Adapted products to meet preferences of local people. Also linked by supplying products to an established health food store owner in upscale shopping center in Lusaka.	been able to keep up with demand. All they system in Guinea are in urban or peri-urban areas.			partly due to sale of soymilk coinciding with decrease in availability of cow's milk due to deteriorating economic situation in the country.	mean low market demand. Awareness campaign conducted, impact of campaign not tracked. Reached out to army bases, NGOs and schools but timing of contracts missed and will have to wait until next year.
Diversification of products	Constraint: Dona Rita has not done much diversification and may find better market demand for other products.	Success: They also produce peanut butter, tofu, soy yogurt and mix the soy byproduct fiber with corn meal to make a porridge.	Success: Due to problems with supply of soybeans the groups in Guinea diversified and produced mango jam, peanut butter and corn meal. This served as way to continue with sales when soybeans were not available.	Success: Women also produced a type of porridge and "cakes" that were fed to children. Other options could have been explored; it was not reported if they processed fruit.	NA	Constraint: Mainly produced soymilk and while this was successful little attention was paid to other foods.	None reported.
M&E system	Constraint: No M&E system was ever set up.	Success: Africare/Zambia set up an M&E system for the VitaGoat systems and reported regularly via email on the status of the systems to Malnutrition Matters.	Constraint: No M&E system ever set up; benefits are anecdotal, no consistent data to illustrate benefits or magnitude of constraints.	Constraint: The only information that is available on this is sales and the area of land under production in soybeans. Other evidence of success is based on experience of country representative in the	Constraint: Extent of M&E system addressed in Gao's report was that Africare would provide assistance and track progress for 6 months. No indicators or official structure to this M&E system was provided. Once activity was	Constraint: No formal M&E system was set up.	Constraint: No M&E system was ever set up.

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				field.	delay, no official adjustment was made for tracking.		
Other reported issues, considerations and benefits	Storage facility/space needs to be considered; systems should be provided to community based organization (not individuals) to maximize impact and promote community ownership and support.		<ul style="list-style-type: none"> • Kindergarten student provided with soymilk (not tracked). • Income generation reportedly successful for many individuals (not tracked). • Center housing systems because area of fruitful exchange and idea generation (such as new activities to produce Attieke) 		Construction funds have been the biggest constraint.	<ul style="list-style-type: none"> • Group of 120 is too large to manage project effectively; groups of 20-30 are better (as was exemplified by oil pressing system that followed with smaller group) • If donation of equipment is provided again in the future it should require % match by each group member. 	<ul style="list-style-type: none"> • Working with government for water source has provide time-consuming. • Packaging that appeals to upper and middle class needs to be considered. • Volunteers should not be used in business model as they burn out.

OVC: orphans and vulnerable children, M&E: monitoring and evaluation

Recommended Citation Format

Harrigan, Brian and Leah A.J. Cohen. 2008. Africare's Experience with VitaCow and VitaGoat Food Processing Systems. *Africare Food Security Review*, No. 18, December, <http://www.africare.org/news/tech/ASFR-intro.php#paper18>. Washington DC: Africare/Headquarters.

Africare Food Security Review
Managing Editor: Leah A.J. Cohen

Editorial Advisors: Della E. McMillan, Harold V. Tarver, and Bonaventure B. Traoré
<http://www.africare.org/news/tech/ASFR-intro.php>

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ⁱⁱⁱ ICB IR1.3: Innovative models for using FFW and high protein nutrient dense products to address food insecurity and improve the quality of life of people living with HIV/AIDS pilot tested in Title II programs and shared with other Cooperating Sponsors.

^{iv} Judy Bryson currently works as a consultant in the Washington DC area for food security programs and previously served as director of Africare's Office of Food for Development unit. She was instrumental in developing this partnership with Malnutrition Matters and bringing the first VitaCow systems into Africare programs. In 2007 (after leaving Africare) she conducted an assessment of the status of the VitaCow and VitaGoat systems in Africare programs (Bryson 2007).

^v The Africare and Malnutrition Matters SoyCow/VitaCow Business Guide has been unofficially translated into French.

^{vi} The original SoyCow system was very popular in Russia. Malnutrition Matters has also introduced VitaCow or VitaGoat systems in a number of other countries and is still expanding with new project in Thailand (email correspondence with Frank Daller, president of Malnutrition Matters).

^{vii} Some locations also have received additional training for a mechanic or repair person on minor repairs to the system and maintenance.

^{viii} The African countries in which the VitaCow processing system was introduced included Benin, Cote d'Ivoire, Nigeria, Uganda, Tanzania, Zimbabwe, and South Africa (Bryson 2007).

^{ix} VitaCow and VitaGoat systems have been installed in many regions of the world, through other private voluntary organizations and the American Soybean Association. Between 2004 and 2007, 44 VitaGoats were installed in Africa, India and North Korea and Russia has been the focus of tens of thousands of VitaCow systems (World Initiative for Soy in Human Health, WISHH, http://www.wishh.org/nutrition/soycow_vitagoat.html).

^x Mahamat Sahleh Radjab (former M&E coordinator and current project coordinator or the Africare Ouaddai Food Security Initiative) translated the original English questionnaire into French and Della E. McMillan (consultant, Africare/Headquarters) translated the French responses into English.

^{xi} The Africare program invested in literacy, calculation and business management training prior to the installation of the two VitaCow systems. The civil war eventually disrupted the operation of the systems.

^{xii} There was no systematic attempt to collect data on the impact of soymilk on PLHIV. This impact was reported both by clinic staff to Africare staff who observed a decrease in visits to health centers and by home-based care providers who noticed increased mobility among PLHIV receiving soy milk.

^{xiii} This is based on Brian Harrigan and Malnutrition Matters' experience of installing and receiving feedback from numerous VitaGoat sites in Africa over the past seven years.

^{xiv} Additional delays in Nigeria have related to the lack of complete funding for construction of the building to house the VitaCow system.

^{xv} Selecting a single individual to be trained and to operate (and benefit) from a VitaCow or VitaGoat system has more limited positive impact compared to selecting a community group. Although selection of an individual in the case of Mozambique may have greatly improved the standard of living of that individual and her family, the impact could have been more widespread if a community-based organization had been selected. This would promote buy-in by the

community in general and allow for training and general capacity building for more individuals who could then work together to solve problems in supply, demand, marketing, and operation and repair.

^{xvi} The VitaGoat system installed in Namibia also focused on training in operation and repairs, business proposal development, marketing, and constitution development; however, the main constraints for this system have been seed supply and market demand.

^{xvii} Although business management training was provided to the community group leaders in Nigeria the excessive delays in making the VitaCow system operational will mean that training will have to be done again.

^{xviii} This would have been the case for Cote d'Ivoire and Guinea had two former staff members who worked on the project not be available for interviews.

^{xix} Note: An Africare Zambia staff person was hired to deal with post-harvest and IGA technologies including the VitaGoat.