FEED THE FUTURE
The U.S. Government's Global Hunger & Food Security Initiative

GHANA TRADE AND INVESTMENT ACTIVITY

GOOD MANUFACTURING PRACTICES ASSESSMENT

AUGUST 2022

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Cover Photo Description: Women processing shea butter in Wa, Upper West Region. Photo credit: by John Buckley, Consultant, GTI.

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Acronyms

AMELP	Activity Monitoring, Evaluation and Learning Plan
BDS	Business Development Services
FDA	Food and Drug Authority
FSMS	Food Safety Management System
FSSC	Food Safety Systems Certification
GDP	Gross Domestic Product
GHP	Good Hygiene Practices
GiZ	German Agency for International Cooperation
GMP	Good Manufacturing Practices
GOG	Government of Ghana
GRA	Ghana Revenue Authority
GTI	Ghana Trade and Investment
HACCP	Hazard Analysis and Critical Control Points
HDPE	High Density Polyethylene
ISO	International Organization for Standardization
Kg	Kilogram
Lt	Liter
MSDS	Material Safety Data Sheet
Mt	Metric Ton
PPRSD	Plant Protection and Regulatory Services Directorate of Ghana
SME	Small and Medium Enterprises
SNV	Netherlands Development Program
ToT	Training of Trainers
UNDP	United Nations Development Program
USAID	United States Agency for International Development
WHO	World Health Organization
ZOI	Zone of Influence

1. Introduction

1.1. Background

USAID/Ghana's Feed the Future Ghana Trade and Investment (GTI) Activity will partner with public and private sector actors to diversify agricultural exports, strengthen small- and medium-sized enterprises (SME) support systems, streamline trading procedures, and improve conditions for transactions, investment, and finance. The GTI project team has designed a flexible and inclusive approach that will catalyze sustainable, innovative solutions generated by stakeholders, consistent with the Government of Ghana's (GOG) Beyond Aid vision and USAID's country development objectives. The Activity will implement the following three objectives in an integrated manner, applying a market systems methodology and using the Activity Monitoring, Evaluation and Learning Plan (AMELP) to better identify the many different paths GTI support may take to achieve its objectives, learn from implementation, and manage adaptively.

- Objective A (Improved Quality and Enforcement): Standardize quality production; enable creation and use of private-led electronic traceability systems; support certification.
- Objective B (Reduced Time and Cost of Trade): Identify bottlenecks through a benchmark time release study; fully utilize Ghana Revenue Authority's (GRA) risk management system; integrate border enforcement agencies.
- Objective C (Increased Investment, especially SMEs): Improve productivity and scale through incentives, linking agricultural SMEs with Business Development Service (BDS) providers and anchor firms; address constraints to finance and investment.
- Objective D: Develop distinct and innovative ideas for additional programmatic interventions.
- Objective E: Scale-up programmatic interventions and increase firm level interventions.

Good Manufacturing Practices (GMPs) are the basic operational and environmental conditions required to produce consumer consumption safe foods. GMPs ensure that ingredients, products, and packaging materials are handled safely and that food products are processed in a suitable environment. GMPs address the hazards associated with personnel and environment during food production. GMPs provide a foundation for any food safety system forming the basis for pre-requisite programs. Once GMPs are established, processors can implement a Hazard Analysis Critical Control Point (HACCP) system to control hazards that may affect the ingredients and packaging material during food processing.

In an effort to achieve GTI's objective to standardize quality production and support certification, the GMP assessment provides a snapshot of various enterprises operating in five (5) value chains of interest to GTI. The assessment included an audit of 25 selected enterprises, providing audit recommendations and guidelines to enable the enterprises to work towards certification. The ultimate goal is to develop training materials to guide the enterprises towards certification and deliver training for the enterprises.

1.2. Objectives of Assessment

The Good Manufacturing Practice (GMP) assessment includes sourcing data from a select number of exporters and their corresponding packing and processing facilities. The Activity sought to understand of the status of practices relevant to GMP standards, within these firms. Practices including hygiene, pest control, sanitation, storage, intake, record keeping, quality control points, water, residue testing, and cold chain maintenance. The assessment's objective is to build a comprehensive understanding of challenges faced by a diverse group of processors and packing facilities, within target value chains across the Zone of Influence (ZOI).

1.3. Methodology

The assessment utilized the GMP reference standard CXC 1-1969 Codex Alimentarius General Principles of Food Hygiene[1]. This standard is a broad reference standard for hygienic production of food items, which incorporates the principles of GMPs.

The assessment, including mock audits, were carried out in accordance with GMP principles including the utilization of direct on-site observation, structured checklists, and open-ended conversational fact finding at each of the enterprises engaged. A GTI consultant prepared a GMP audit sheet (see Annex A) encompassing 118 specific questions that cover the following aspects:

- Facilities and grounds
- Personnel
- Equipment
- Processes and controls
- Cold chain maintenance

Observations were recorded and recommendations for closure of non-conformances submitted to each enterprise in writing. Findings were collated and are disaggregated in section *2. Summary Findings*.

2. Summary of Findings

Key stakeholders in the sector were interviewed in person over a three-week period between July and August 2022. A total of 25 stakeholders were interviewed within Ghana followed by site visits for the assessments The individual assessments and mock GMP audits contain in-depth site and firm-specific observations and recommendations. The Mock GMP audit questionnaire sheet can be found in Annex A and the individual assessments can be found in Annex C.

2.1. Fruit and Vegetable Packing

The GMP assessment included site visits to eight packing facilities. A majority of packing facilities stated that they had GlobalG.A.P certifications or were in the process of developing systems for compliance with the GlobalG.A.P certification. Certifications like these allow for enterprises to export products to particular international markets outside of Ghana. Some enterprises were able to produce the certification for review while others were not able to. Food safety systems implementation were lacking in some of the observed facilities, which puts into question the validity of claims of certifications.

When compared to international standards, packing facilities do not provide adequate amenities to staff in relation to the number of staff employed. Lockers and uniforms were not provided and there were few handwashing facilities. When handling fresh food and food products, clean uniforms are ideally provided for the staff to avoid cross contamination. Observed chemicals at packing facilities were purchased from the local market without Material Safety Data Sheets (MSDS) to confirm that the chemicals are food safe. The only observed terminal sanitizing agent utilized for fruits and vegetables was the use of ascetic acid for pH reduction without the monitoring of ascetic acid's efficacy as a method of log reduction in pathogenic organisms. There were two notable observations in which chlorine tablets were used during the initial drenching of fruit and vegetable products. Although the use of chlorine tablets could be negated by the subsequent use of unfiltered or unpurified rinse water, which could reinfect product.

[1] https://www.fao.org/fao-who-codexalimentarius/sh-proxy/en/?lnk=1&url=https%253A%252F%252Fworkspace.fao.org%252Fsites%252Fcodex%252FStandards%252FCXC%2B1-1969%252FCXC_001e.pdf

Cold chain maintenance was not adequately utilized in a majority of the enterprises as most products that were transported over varying distances at ambient temperatures without pre-cooling at the place of origin or farm, nor at the packhouse itself. The majority of packhouses used wooden tables as sorting and packing surfaces, some of which had degraded plastic coatings. These types of packing surfaces could potentially harbor pathogens as wood is porous and lacks sanitizing agents, possibly allowing for the accumulation of biofilms causing cross contamination of products while also negating traceability with respect to the origin of food borne illness causing organisms. Once product is packed, the product is generally held in repurposed refrigerated containers for pre-cooling prior to transportation to the airport in Accra for export via airfreight. The cold chain lacked mechanisms of humidity or ethylene control and included significant dwell times outside of the cold chain during Plant Protection and Regulatory Services Directorate of Ghana (PPRSD) inspections, which require the entire consignment to be unpacked outdoors in ambient conditions, which result in shelf-life reduction. This aspect of the transport process of goods needs to be addressed as the time spent outdoors could easily lead to infection by both pests and airborne contaminants.

PPRSD samples products in the field. One example being PPRSD sampling a number (four to six) of mangoes from each mango tree from the point of origin prior to export. Subsequently, the product is sampled again at the airport with up to ten cases per consignment subjected to both destructive testing (to check for stone weevil) and visual inspection.

2.2. Juice Production

The assessment includes one juice production facility that currently produces frozen pasteurized juices for the local market, with a small trial shipment of 500 liters (lt) having recently taken place to the middle east. Raw material is sourced from farms and transported on open vehicles to the packing facility. Products are then sorted and washed in plastic tubs dosed with choline tablets prior to being macerated and pasteurized, cooled, packed, and frozen for distribution.

The packing facility had one hand washing point at the entrance to the facility and utilized wooden surfaces. Wooden surfaces would need to be replaced as wooden surfaces do not suit a high-care production facility due to their ability to harbor pathogens. The facility's water supply comes from an on-site borehole and requires at least chlorine dosing for processing and water utilization for sanitation. The packing facility lacked terminal sanitizing agents when cleaning, raising concerns of cross contamination between batches.

The juice production company requested assistance with the development of a Food Safety Management System (FSMS) along with training staff in GMPs, Good Hygiene Practices (GHPs), sanitation, and food safety.

2.3. Fruit and Vegetable Dehydration

Two dehydration facilities were assessed. The first facility produces dried and ground chili powder for the local market. Chilis are grown on the farm owned by the facility and sold locally, with surplus chilis then dried on tarpaulin in open air. Once dried, the whole chilis are taken to the market in Wa where the chilis are initially ground and then dried again in the open air prior to a final grind. The market where the miller is located is crowded without sanitation, with animals wondering freely, and nearby wastewater in open channels resulting in extremely unhygienic conditions. The milling process needs to be brought indoors with the purchase of proper hygienic equipment.

The second facility assessed is newly built with the purpose of drying mango, coconut, pineapple, and banana for export to the Netherlands and Switzerland with a daily production target of 15 metric tons (mt). The company has run a limited number of production trials and plans to start training staff and producing products in September 2022.

The facility is well constructed with only minor observations related to structure, including the use of permeable paints on the walls and the use of cambered flooring which seem to lead away from the drains which may result in the pooling water.

The facility carefully considered the flow of processes as there is a designated primary raw material receiving area, where screening and sorting of products takes place. The product is then washed with a final rinse. To improve processes and GMPs, the company should add a chlorine dosing pump during the final spray of products, to remove pathogens from the products.

The products then move to a processing area where products are sliced on steel desks. Equipment for prepping the product for drying were yet to be received so could not be assessed. Raw materials for drying are placed on high density polyethylene (HDPE) trays for drying and moved to the work-in process staging area. Dehydration cycles take between 14 hours to 16 hours. Dehydration process includes the utilization of a furnace adjacent to the facility, which burns oil nut shells, coconut husks, and shea cake.

The dried product is then packed in polyethylene bags and boxed before shipment. At the packing facility, a room is allocated as a laboratory, although the testing equipment had not yet been obtained and procedures had not yet been established. There are no foreign object detection procedures or equipment currently in place. The glass partitioning that is set above packing and processing areas needs to be screened to avoid cross contamination from the processing areas and the packing areas.

The company that owns the second packing facility requested assistance with the development of an ISO22000:2018 compliant food safety management system as well as training in GMPs, GHPs, sanitation and food safety.

2.4. Fruit Canning

The only canning operation and facility was assessed. The canning facility was established in 2019 to can pineapple rings and pineapple chunks. The facility was commissioned in April 2021 to operate with a one metric ton per hour capacity. The facility currently has three international buyers. One buyer in the Canary Islands, one buyer in Austria, and another buyer Slovenia, for whom they co-pack under the buyers' labels.

The canned pineapple is pasteurized in either fruit juice or syrup for 30 minutes at 95^{o}C, reducing the risk of the presence of pathogens. The company utilizes out-growers for their pineapple supply and also has 80 hectares of land, which they have yet to cultivate.

The facility is located next to a busy local market and the facility' grounds are littered with waste from the previous trials left in an open skip. The waste is rotting outside the raw material intake area of the facility and attracts a large number of flies.

The facility lacks a ceiling and there are large unscreened gaps between the walls and roof, which would allow pest to enter the processing area. There is inadequate segregation between primary processing, canning, and pasteurization. There is a gap between labelling area and packing material store.

Water is sourced from a borehole and passes through a membrane filter, reverse osmosis (R/O) plant, inline UV treatment, and chlorinated at 1ppm for production and 3ppm for cleaning. Pineapples are washed outside before being peeled and then cored by a machine. The corer was rusty, and its paintjob was flaking, raising concerns of foreign object contamination.

The company has a well-qualified quality manager who has put together a comprehensive HACCP plan and the company is equipped with a limited laboratory for quality testing. The owner is primarily

seeking access to finance to install a juice form, fill, and seal machine to produce pasteurized fruit juice from the waste generated by the pineapple canning operation.

2.5. Additional Fruit Processing

One enterprise was assessed that carries out further processing of mango into jams, condiments, and frozen products. The enterprise is currently marketing their products locally but are looking to expand into the United Kingdom and European Union markets. The enterprise has benefitted from past donor assistance. Specifically in terms of training, equipment, and facility improvement and is seeking to achieve certification to ISO22000:2018 FSMS in order to access foreign markets. It was difficult to assess the enterprise's process as only the caretaker was present. That being said, the company has innovative products that could easily penetrate external markets. The owner requested assistance with the development of a FSMS as well as GMPs, GHPs and sanitation training.

2.6. Shea Butter Processing

Nine enterprises engaged in the shea nut value chain were assessed, ranging from five micro scale processors producing 25 kilograms (kg) of raw shea butter at a time for sale in the local market, one medium scale group of 200 women, and three large scale aggregators and processors capable of processing 200mt of refined shea butter a day.

Of the 5 microprocessors visited, only two microprocessors were currently active, operating in their backyards using rudimentary cooking facilities and wood fires to cook off the excess moisture and clarify the butter. These microprocessors lacked knowledge of GMPs or GHPs. Operators (all of which were women) were paying for nuts as well as milling the nuts to produce the butter, which left them effectively working at a net loss. When considering the cost of production i.e., milling charges, transportation, labor, and related expenses against overall revenue, the women are operating at a loss.

Other three sites assessed include shea processing centers that have been constructed by donors, primarily funded by United Nations Development Program (UNDP) & the Netherlands Development Program (SNV), but were never commissioned, resulting in the facilities standing idle. Each center has a milling machine, roasting and cooking equipment, drying areas and undercover processing facilities, which are still in relatively operable condition. These facilities are ideally suited to raise the hygienic standard of the shea processing and could be operationalized with a small financial input to connect to power, refine the centers' structure, and provide a means of transporting raw and finished product. Transportation could include a three-wheel motorbike equipped with a load bay. These processing centers could serve as "centers of excellence" or the standard that could be used to expand training initiatives for local populations in quality and food safety management.

One medium sized processing center was visited where a group of 200 women were engaged in aggregation and processing of shea nut which was then sold to an exporter. The facility had benefitted in the past from technical assistance from their major buyer but had installed their own mechanical kneading machine and improved efficiency stoves with flues for cooking. The owner stated that the group would benefit not only from financial assistance to expand capacity but also training for staff related to GMPs and GHPs, with the objective of achieving certification as certification is required in order to export to the target market.

Two very large companies were visited that were engaged in aggregation of either raw nut for direct export or semi-processed unrefined shea butter. The unrefined butter undergoes further processing in the Netherlands by a third party under their certification in order to enter the European market. This additional cost could be reduced by forming co-operative agreements with locally based refining plants. The exporter of raw nuts currently ships 30,000 mt of nuts a year to both the United States of America and Europe, and the exporter is currently building a processing facility in Tamale to process

refined shea and soya. The facility has yet to be commissioned and the owner stated they would need assistance with food and quality management system development and training in the near future.

The one completed refinery assessed was capable of processing 200mt of refined shea butter a day with hexane extraction but was idle due to a lack of operating capital to purchase nuts for processing. The plant has been neglected as a result with detritus from previous production runs left in place. The water supply is currently compromised due to a lack of spare parts for the purification plant.

2.7. Cashew and Ground/Peanut Processing

The first facility assessed focused primarily on ground nut butter production in 600 grams (gm), 1.6kg, 4.7kg, 10kg and 20kg pack sizes. The facility additionally produces candied peanuts, peanut cookies, and Tom Brown (a compound drink of yellow maize, Guinea corn, and ground nuts consumed as a breakfast porridge) for the local market. The equipment utilized was funded through German Agency for International Cooperation (GiZ). The facility is currently struggling to continue operations as spare parts are not readily available locally and spare parts need to be manufactured on-demand, resulting in lengthy process breakdowns.

The construction of the processing shed is not conducive to safe food processing, as the processing shed's structure is comprised of unsealed floors and half-constructed walls, open timber frames, and completely lacks a ceiling. There is screening for pests, but substantial gaps between the roof and structure easily permit entry of pests. With respect to staff hygiene, hand washing is conducted in basins outside the facility. Given the storage conditions for the raw materials and the conditions in the facility, the product stands as is a high risk of aflatoxin contamination. Finished product testing is done annually by the FDA and the facility does not conduct quality nor safety testing.

The second facility currently roasts and packs cashews and peanuts, produces and packs cashew and peanut butter, and dries and roasts agushi (melon seed) before grinding agushi into a powder which is used as an additive for soups and stews. Milling and the storage of bulk raw materials are off-site. The facility forms part of a residential building with future plans to build a standalone unit on the property. The processing room is kept neat and tidy. The owner manufactures her own sanitizer and detergents, which she also sells to local businesses and to the local market. The owner requested assistance in developing a FSMS as well as training in GMPs, GHPs, sanitation, and food safety.

The third facility visited is located in a residential suburb and produces a range of roasted cashew nuts and granolas in retail packs, sugar free yoghurts, cream cheese, and labneh for local supermarkets and hotel chains. The owner is planning to build a dedicated processing center to increase production with an objective of exporting products.

The processing of nuts and granolas is done in a screened outdoor area subject to ambient conditions. Although care is taken in terms of cleanliness and hygienic processing. The main concern is the lack of allergen declarations as the yoghurts contain wheat kernels and a variety of dried fruits and nuts as a ready-to-eat composite meal.

The company has received training in the past but stated that they had waited two years for training and assistance in the development of a FSMS, particularly HACCP, as a foundation in order to export products. The company requested assistance in this regard as well as further training in GMPs, GHPs and sanitation.

2.8. Roadmap to Acquiring International Standard Certification

The roadmap for international standard certification varies with each enterprise, and detailed findings and recommendations by enterprise are provided in Annex C. After assessing each of these enterprises, a general overall roadmap for each enterprise would start with upgrading the food

production premises prior to developing systems for certification. For instance, the utilization of wooden surfaces should be replaced with non-porous work surfaces, as wooden surfaces have the potential of harboring pests, pathogens, and foreign body contaminants.

The next step would be to conduct a series of GMPs, GHPs, high care sanitation, and food safety awareness trainings for staff. These trainings can be conducted utilizing a training of trainers (ToTs) method, coupled engaging quality representatives and communal leaders (especially in the shea butter microprocessor demographic) in order to raise awareness of the dangers of poor working habits and unhygienic conditions to both processors and consumers.

The development of a mentorship certification achievement program would significantly benefit certain enterprises. The mentorship program could include providing technical assistance to a select group of enterprises, that meet certain criteria, to achieve international standard certification in order to export products and hence increase sales. This technical assistance would include the development of HACCP plans, operational prerequisite programs, and control documents for verification purposes.

Before requesting certification of the FSMS, the enterprise must meet specific criteria such as the development and implementation of pre-requisite programs like pest control and sanitation and integrate these into the system. Once the full system is implemented and validated, with an adequate body of records having been generated to prove due diligence, the enterprise can seek certification. the certification audit is completed in two stages: Stage 1 and Stage 2.

The objective of a Stage 1 Audit is to determine an enterprise's readiness for their Stage 2 Certification Audit. During the Stage 1, the certification body's auditor will review the management systems' documented information, evaluate site-specific conditions, and have discussions with personnel on packing and processing processes at the facilities. The auditor will evaluate if objectives and key performance indicators, or significant aspects, have been met, established, and understood. The auditor will review the scope of the management system and obtain information on processes and operations, the equipment being used, the levels of control that have been established, as well as any applicable statutory or regulatory requirements. Internal audits and management reviews will be evaluated to ensure they are being planned and performed. The overall level of implementation of an enterprise's management system will be assessed to determine if your organization is ready to move forward with the Stage 2 Certification Audit.

During the Stage 2 Audit, the implementation and effectiveness of the enterprise's management system(s) will be evaluated. The Certification Body will determine the degree of compliance with the standard's requirements and report any non-conformances or potential non-conformances that the enterprise's organization will have to correct before the certification can be issued. If the Stage 2 audit is successful, the enterprise's management system(s) will be certified.

It is important to note that the preparation for a certification audit can vary anywhere between six months to one year, as the enterprise will need to implement the system and generate documentation to prove due diligence in the production of the product.

2.9. Challenges in Acquiring Certification

The primary challenge anticipated in achieving certification is the implementation of the food safety management systems developed. The data trail concerning verification and monitoring requires maintenance in order to prove due diligence to auditors from the certification body. Enterprises require testing capacity and trained staff to carry out quantitative and qualitative observations with external third-party testing as validation to support . Third-party testing facilities will also need to be identified and engaged as auditors (or certification bodies) are unable to provide training and audit services to enterprises. An engaged third-party testing facility will be able to audit the enterprise and

provide testing before the certification bodies formal evaluation, to ensure an enterprise can pass the evaluation.

There are a large number of internationally accredited certification bodies available in Ghana, thus obtaining a vendor should not prove arduous, although smaller enterprises may require assistance with the costs associated with certification audits.

2.10 Training/Capacity Building toward Certification

In order to build the capacity of staff to understand and work within the parameters of individual standards, training in in fundamentals related to the production of safe food is required. Training would include modules outlining the different causes and vectors for food borne illness as well as the impact of pathogens, in an effort to promote a duty of care within the operation.

Training in GMPs and GHPs will equip staff with additional knowledge that can be utilized to mitigate negative vectors highlighted in food safety training. A follow-on training in high care sanitation will provide staff with the skills to combat these various vectors in their day-to-day.

A management group from each enterprise should be trained in the development of HACCP plans and should be trained in the standard(s) they wish to certify. These trainings require the inclusion of system development, pre-requisite and operational pre-requisite programs, and manual development to emphasize best practices and the system as a whole.

3. Summary of Recommendations

Detailed recommendations for each of the enterprises assessed and/or audited is available in Annex B and C. The company-specific information is sensitive and confidential, and is available to USAID/Ghana and the GTI Activity team to advance capacity building initiatives. Therefore, the recommendations below have been summarized by target sector, omitting company-specific information and highlighting the primary gaps identified and areas which require improvement.

3.1 Fruits

Many of the fruit processing centers and packhouses did not adhere to GMP standards and the assessments and audits revealed some consistent problems across the SME's evaluated related to the structure, organization, and design of the buildings. For many of these SMEs, it is recommended that doorways, windows, and other openings in the buildings be closed off by either strip or air curtains to prevent the ingress of pests and dust. Ceilings, self-closing doors, and HVAC systems should also be incorporated into production areas to maintain cleanliness in high-care areas while maintaining air flow. It is also recommended that the walls of the production areas be painted with a water-resistant coating for ease of cleaning and mold prevention. Many organizations also face challenges related to employee toilets and handwashing stations, requiring these organizations to organize more handwashing stations proportional to the number of employees that work in the building. The water used in the fruit processing at some enterprises was questionable as it was regularly sourced from boreholes and stored in tanks. Water used in fruit processing should first be purified and then treated with a sanitizing agent such as chlorine before use. Some SMEs are also recommended to find suppliers of food safe chemicals for cleaning contact surfaces. Beyond the structural changes that need to be made, some of the SMEs could benefit from updated technology. New technology related to product testing such as adenosine triphosphate test devices and mycotoxin rapid tests could greatly benefit many of the SMEs and help ensure the consistent quality of the finished products. HVAC units with efficiency high-particle arrest and UV components can ensure air within the

processing areas are clean and the buildings have positive pressure. New thermometers for accurate reads on pasteurizing temperatures can also encourage food safety compliance. Finally, several fruit processors and packhouses could benefit from a variety of trainings and updated protocols. Many of the SMEs did not have copies of the ISO22000:2018 standard until the consultant provided them, having these documents can help the company familiarize themselves with the standards. To address the issue of pest ingress, several SMEs could benefit from a pest control program, the product tests protocols need to be more rigorous if these companies plan to comply with phytosanitary requirements, and cleaning and sanitization schedules need to be completed on a regular basis. Additionally, some of the SMEs struggle with documentation and records to prove due diligence. Finally, almost all of the companies visited requested support with food safety, GMP, and GHP trainings.

3.2 Vegetables

Many of the vegetable processors and packhouses visited over the course of this assessment faced similar problems to that of the fruit processors, namely the open spaces that allow for the ingress of pests, lack of adequate staff toilets and handwashing stations, untreated water sources, and a variety of local cleaning supplies that are not necessarily food safe. Additional observations were made that these companies need to address in order to improve their food safety standards. First, many SMEs use wooden tables in their processing and packing operations; these need to be replaced with steal which can be easily cleaned and adequately sanitized between operations. Staff uniforms need to be provided along with a cloakroom for the dawning of this personal protective equipment (PPE) to better prevent cross-contamination. Laundry facilities should also be included to ensure the regular sanitization of employee uniforms. In addition to having water-resistant wall coatings, the floors and ceilings should also be waterproof to facilitate cleaning and sanitization. In addition to concerns regarding the cleanliness of the surfaces and rooms inside the processing facilities, many enterprises are located in residential areas and near marketplaces and the areas surrounding the buildings have not been adequately cleaned up. General cleaning up of the grounds around the building will help ensure that there is no standing water, and running water should be redirected to discourage pest breeding. Many of the enterprises visited also requested support with food safety management training and GMP training. Many of these companies could also benefit from training of the farmers that supply produce. Specifically, there is a need for farmer record keeping and pesticide management and application training.

3.3 Shea

While the shea value chain actors face largely the same issues as the fruit and vegetable actors, there are a few challenges that women's group shea processing enterprises face that are specific to the shea value chain. The shea processing centers in the north of Ghana should be commissioned and transferred to the women's groups in order to ensure the continuous use of the facilities. Connecting these facilities to power and small additions such as three-wheeler motorbikes would allow the facilities to run continuously. Several shea enterprises visited could benefit from a simple starter package, with the basic requirements to accelerate operations, including low-cost processing equipment. The inclusion of improved cooking stoves at shea processing centers would improve productivity and prevent women harmfully inhaling smoke produced during the cooking of the shea into oil. Additionally, one of the groups visited is facing a serious infestation of caterpillars on their shea trees that has resulted in stripped trees that bear almost nothing. Improved pest control practices in place, this will reduce the risks of significant reductions in yield. Support from regional extension officers is needed to support women's groups to sustainably improve tree management and other pre-processing practices. The shea value chain would also benefit from the adoption of a traceability system as many of the companies visited do not have any such system in place. Finally,

financial management and cooperative management training was requested from some of the women's groups as this would help them improve their business practices.

3.4 Cashews

Many of the challenges and recommendations provided for the fruits, vegetables, and shea value chains also apply to the cashew value chain. In addition, there are a few specific recommendations that many cashew enterprises could benefit from. Most significantly, cashew processors need to ensure that the airflow in their facilities is sanitary, and this can be improved by replacing ceiling fans with HVAC units with efficiency high-particle arrest and UV components. This will help ensure that the airflow is clean and sanitary. The cashew companies visited also specifically requested additional support with training on shelf-life extension and HACCP in addition to the GMP, GHP and FSMS training requests that were found across all of the value chains.

Annex A: GMP Mock Audit Sheet

Facility Good Manufacturing Practices Checklist					
Enterprise Name:		Date:			
Site Representative:		Contact number:			
Location:					
	Facilities and Grounds				
No.	Component	Yes	No	N/A	Remarks
1	Are the grounds about your plant under your control kept in a condition that will protect against the contamination of food?				
2	Are areas within the vicinity of the plant kept free from litter and waste with grass and weeds trimmed?				
3	Are roads, yards and parking lots maintained to prevent sources of contamination?				
4	Is there adequate drainage of outside areas that may contribute to contamination?				
5	Are systems for waste treatment and disposal operated in a manner to protect against contamination?				
6	Are steps taken to prevent sources of food contamination from bordering grounds not under the control of the facility?				
7	Is there adequate lighting in all dressing and locker rooms and toilet areas?				
8	Is there adequate lighting in all areas where food is processed, packed, or stored and where utensils and equipment are cleaned?				
9	Are there safety-type light bulbs, fixtures, skylights, or other glass suspended over areas where food is exposed provided to protect against food contamination in case of glass breakage?				
10	Are the plant buildings and structures of suitable size, construction, and design to maintain sanitary operations and to produce safe food?				
11	Does the plant building(s) provide sufficient space for placement of equipment and storage of materials to permit maintenance of sanitary operations and production of safe food?				
12	Does the design of the plant permit the separation of operations in which contamination is likely to occur which may include a separation of				

	operations by location, time, space, partition, air flow, or other effective means?				
13	Are there proper precautions to protect food in outdoor bulk containers?				
14	Are floors, walls and ceilings constructed to facilitate adequate cleaning?				
15	Does drip or condensate from fixtures, ducts and pipes cause or potentially cause contamination of food, food contact surfaces or food packaging materials?				
16	Are aisles and working spaces unobstructed and of adequate width to permit employees to perform their jobs and protect against contamination?				
17	Are buildings, physical facilities, fixtures, etc. maintained in a good state of repair?				
18	Is plumbing of adequate size and design to: carry sufficient quantities of water to required locations; properly convey sewage and liquid disposable waste from the plant; provide adequate floor drainage; and prevent backflow or cross connections between piping systems carrying fresh and wastewater or sewage?				
18	Is sewage disposal made into an adequate sewage system or disposed of by other adequate means?				
20	Are rubbish and offal conveyed, stored, and disposed of in a proper manner?				
21	Is the facility's water supply sufficient for the intended operations and from an adequate source?				
22	Is water used in processing food or cleaning equipment safe and of adequate sanitary quality? Is running water at suitable temperature and under pressure?				
23	Is reused water maintained in a manner to prevent the increase of contamination of food?				
24	Are there adequate, reasonably accessible toilet facilities?				
25	Are toilet facilities maintained in a sanitary condition and in good repair?				
26	Do toilet facilities have self-closing doors?				
27	Are doors to the toilet facilities designed not to open into areas where food is exposed to airborne contamination or have double doors or positive airflow systems?				

28	Are hand-washing facilities adequate, convenient, and furnished with running water at a suitable temperature?				
29	Are hand-washing facilities furnished with adequate hand cleaning and sanitizing preparations?				
30	Are hand-washing stations equipped with sanitary towel service or suitable drying service?				
31	Are devices and fixtures in toilet facilities designed to protect against recontamination of clean, sanitized hands?				
32	Are there readily understandable signs directing employees to wash and, where appropriate, sanitize their hands?				
33	Are refuse receptacles constructed and maintained to protect against contamination of food?				
34	Is there adequate screening or other protection against pests?				
35	Are pests excluded from all areas of the food plant?				
36	Are effective measures taken to exclude pests from processing areas?				
37	Are there restrictions and precautions to ensure that the use of insecticides and pesticides will not contaminate food, food product surfaces and food packaging material?				
Personnel					
No.	Component	Yes	No	N/A	Remarks
38	Does management take all reasonable measures and precautions to ensure disease control through medical exam, observation, exclusion, and reporting?				
39	Are employees instructed to report health conditions that might contaminate food, food product surfaces or food packaging materials to their supervisor?				
40	Does management take all reasonable measures and precautions to ensure cleanliness through hygienic practices?				
41	Are employees trained to protect against contamination of food by properly wearing & suitable outer garments, hair nets, beard coverings, etc.?				
42	Are employees trained to maintain adequate personal cleanliness?				
43	Are employees trained to wash hands thoroughly before work and after each absence from their workstation?				

44	Are employees trained to remove unsecured jewelry and other objects that might fall into food?				
45	Are gloves used for food handling made of an impermeable material and maintained in a clean sanitary condition?				
46	Are employees trained to store clothing or other personal belongings away from areas where food is exposed or where equipment or utensils are washed?				
47	Are employees trained to confine eating, drinking, gum chewing, and use of tobacco to areas where food is not exposed, or equipment and utensils are not washed?				
48	Are employees trained to protect against contamination of food, food contact surfaces, or food packaging materials from microorganisms or other foreign substances?				
49	Do personnel responsible for identifying plant sanitation failures or food contamination have the combination of education and experience to produce clean, safe food?				
50	Do food handlers and supervisors have appropriate training in proper food handling techniques and food protection principles?				
51	Is the responsibility for assuring compliance by all personnel with the requirements & of the GMP regulation clearly assigned to competent supervisory personnel?				
Equipment					
No.	Component	Yes	No	N/A	Remarks
52	Are all plant equipment and utensils designed to be adequately cleanable and properly maintained?				
53	Is equipment designed and constructed to preclude adulteration of food with: lubricants, fuel, metal fragments, and contaminated water?				
54	Has equipment been installed in a way that facilitates cleaning of equipment and adjacent spaces?				
55	Are food contact surfaces made of corrosion resistant and non-toxic material?				
56	Are all equipment and utensils properly maintained?				
57	Are holding, conveying and manufacturing systems designed in a way to be maintained in a sanitary condition?				

58	Are seams on food contact surfaces smoothly bonded or otherwise maintained to minimize growth of microorganisms or accumulation of dirt, food particles, etc.?				
59	Is equipment taken apart for thorough cleaning as necessary?				
60	Are the non-food contact surfaces of equipment in food handling constructed that it can be kept in a clean condition?				
61	Are non-food-contact surfaces cleaned as often as necessary to protect against the contamination of food?				
62	Are freezers and cold storage compartments fitted with appropriate temperature measuring and/or recording devices to accurately show the compartment temperature?				
63	Are freezers and cold storage compartments fitted with automatic controls for regulating temperature or, in the case of manual operations, with an automatic alarm system to indicate a significant temperature change?				
64	Are instruments and controls for measuring, regulating, or recording temperature, pH, water activity, acidity, etc. accurate (i.e. calibrated)?				
65	Are compressed air or other gases mechanically introduced into food or used to clean food contact surfaces or equipment treated to insure that food is not contaminated with unlawful food additives?				
66	Are cleaning and sanitizing of utensils and equipment performed in a manner to protect against contamination?				
67	Are cleaning compounds and sanitizing agents free from microorganisms and safe for use?				
68	Are toxic cleaning compounds, sanitizing agents, and pesticide chemicals used, identified, held, and stored in a manner to protect against contamination of food, food contact surfaces, and food packaging materials?				
69	Are food contact surfaces including utensils and equipment surfaces cleaned frequently to protect against contamination?				
70	Are food contact surfaces used for manufacturing or holding low-moisture food dry and in a sanitary condition at the time of use?				
71	In wet processing, are food contact surfaces cleaned and sanitized before use and after any interruption during which contamination could occur?				

72	Are single-service items (paper cups, towels, etc.) stored, handled, and dispensed in an appropriate manner?				
73	Are sanitizing agents safe and adequate under conditions of use?				
74	Are cleaned and sanitized portable equipment with food contact surfaces and utensils stored in a manner that protects them from contamination?				
75	Are fans and other air blowing equipment located in a manner to prevent contamination of food, food contact surfaces and food packaging materials?				
76	Is there adequate ventilation or control equipment to minimize odors and vapors?				
Processes and controls					
No.	Component	Yes	No	N/A	Remarks
77	Are operations conducted in accordance with adequate sanitation principles?				
78	Is there an appropriate quality control operation employed to ensure that food is suitable for human consumption and that food packaging material is safe and suitable?				
79	Are all reasonable precautions taken to ensure that production procedures protect from contamination from any source?				
80	Do raw materials or other ingredients contain levels of microorganisms that may produce food poisoning or other disease?				
81	Are ingredients that contain microorganisms that may cause disease pasteurized or otherwise treated?				
82	Are raw materials inspected, segregated, or otherwise handled as necessary to ascertain that they are clean and ready for use?				
83	Is full traceability for raw materials available.				
84	Is appropriate chemical, microbial, or extraneous material testing conducted to identify sanitation failures or possible food contamination?				
85	Are containers inspected to ensure they do not contribute to contamination?				
86	Do raw materials and other ingredients comply with local regulations, guidelines, & and action levels for poisonous or deleterious substances?				
87	Are raw materials and other ingredients, including rework, held in bulk or in containers designed to protect against contamination?				

88	Are raw materials held at temperature and humidity levels that prevent food from being adulterated?				
89	Are raw materials scheduled for rework identified as such?				
90	Are frozen raw materials and other ingredients kept frozen?				
91	Is there careful monitoring of physical factors such as time, temperature, humidity, pH, pressure, and manufacturing operations such as freezing, dehydration, heat processing etc.?				
92	Are foods that can support the rapid growth of microorganisms held in a manner to prevent adulteration?				
93	Are refrigerated foods kept at 7.2°C or below as appropriate?				
94	Are heated products temp reduced as efficiently and quickly as possible?				
95	Are acid or acidified foods held in hermitically sealed containers at ambient temperatures heat treated?				
96	Are measures such as sterilizing, irradiating, pasteurizing, freezing, refrigerating, control of pH or water activity adequate to prevent the growth of undesirable microorganisms?				
97	Is work in progress handled in a manner that protects against contamination?				
98	Are effective measures taken to protect finished food from contamination by raw materials, other ingredients or refuse?				
99	Are equipment, containers, and utensils used to process food constructed, handled, and maintained in a manner that protects against food contamination?				
100	Are liquid or dry materials and other ingredients received and stored in bulk held in a manner to protect against contamination?				
101	Are traps, sieves, metal detectors, magnets, etc. used to detect the inclusion of metal or other extraneous material?				
102	Are food, raw materials and other ingredients that are adulterated disposed of in a manner to protect other food from contamination?				
103	When reconditioning of adulterated food is done, is a proven effective method used?				
104	Is reconditioned food examined and found free of contamination before being incorporated with other food?				

105	Are mechanical manufacturing steps performed so as to protect food from contamination?				
106	Is heat blanching, when required, performed in an effective manner and washed, when required, with water of safe and adequate sanitary quality?				
107	Are batters, breading, and other similar preparations treated or maintained in a manner that protects against contamination?				
108	Are filling, assembling, and packaging operations protected against contamination by use of safe and suitable material for food containers and packaging materials?				
109	Are critical control points identified and controlled for filling, assembling, and packaging operations?				
110	Are foods that rely on the control of water activity preventing the growth of undesirable microorganisms processed and maintained at a safe moisture level?				
111	Are foods that rely principally on the control of pH for preventing the growth of undesirable microorganisms monitored and maintained at pH 4.6 or below?				
112	Has ice in contact with food been made from water that is safe and of adequate sanitary quality and manufactured in accordance with GMPs?				
113	Are human food manufacturing areas or equipment not used for manufacturing nonhuman food-grade animal feed or inedible products unless contamination of the human food is not reasonably possible?				
114	Is the storage and transportation of finished food under conditions that protect against physical, chemical, or microbial contamination?				
115	Is food containing defects above current defect action levels mixed with other lots of food?				
116	Does the finished product contain natural or unavoidable defects at low, non hazardous levels?				
117	Have Good Manufacturing Practices been followed in producing the food?				
118	Is packed product transported under suitable conditions?				
General comments and questions:					