QUALITY MANAGEMENT OF CASSAVA PROCESSING: THE C:AVA GHANA EXPERIENCE

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EXECUTIVE SUMMARY

Food processors rely on modern quality management systems to ensure the quality and safety of the food products they produce. The three key quality management systems in use are: (a) Good Manufacturing Practices (GMP), (b) Hazard Analysis Critical Control Points (HACCP); and (c) Quality Assurance Standards. Delivery of cassava products to end markets (industry) in Ghana in the recent past had some challenges in terms of meeting quality standards. Most processors had their cassava products rejected by end users when they were offered for sale because the products did not meet the quality specifications of the end market. To address the quality issues that confronted cassava processors in Ghana, the C:AVA Ghana Project, sponsored by Bill and Melinda Gates foundation, identified and trained cassava processors on quality management systems to enable their products to meet set standards of processed cassava products. Few cassava processors were also assisted technically by the C:AVA Ghana team to acquire certification of their products and facilities by Food and Drugs Authority (FDA) of Ghana. The quality management interventions demonstrated empowered cassava processors to supply more cassava products to end markets with little or no quality concerns. Out of over 300 cassava products analysed after the introduction of the quality management interventions to cassava processors, 95% of the samples analysed were within the standards set by FDA for cassava products. This led to increased supply of cassava products to the end markets and subsequently earned more incomes for cassava processors. This report on quality management during cassava processing in Ghana is the documentation of interventions made by the C:AVA Ghana Project team in addressing the quality concerns faced by cassava processors. The objective of this work was to; demonstrate that quality interventions promoted by the C:AVA Ghana Project team contributed to increased performance of processors, sensitize processors of quality implications of cassava products and provide quality management information to guide potential cassava processors.

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1.0 INTRODUCTION

The purpose of consuming food is to supply nutrients to the body for the performance of several body functions. Food provides both energy and the materials needed to build and maintain all body cells. Consumers consider food products that contain adequate amounts of food components to be of good quality. It should therefore be the desire of every food manufacturer to produce food products which are of good quality. The food industry has a legal and moral responsibility to produce and prepare food that will not harm the consumer. Over the years, different systems or approaches have been developed by food manufactures to ensure that they produce safe foods and their desire to produce foods of high quality will to a large extent determine the success of the food producer in a competitive environment. Food processors therefore rely on modern quality management systems to ensure the quality and safety of the products they produce.

The three key quality management systems in use are: (a) Good Manufacturing Practices (GMP); these entail the processing conditions and procedures that have been proven to deliver consistent quality and safety based on long experience, (b) Hazard Analysis Critical Control Points (HACCP); this is a proactive technique which focuses on identifying potential problems/hazards and controlling them during the production process and (c) Quality Assurance Standards; these are standards established by the International Standards Organization (ISO 9000) and the European Standard (ES 29000) which entreats food processing, catering and other food-related industries to conform to prescribed and well-documented procedures. Governments have a duty to protect the health of their citizens, therefore they set up regulatory agencies which develop and enforce standards for various food products to guarantee the safety and quality of foods produced and sold on local and international markets.

Cassava (*Manihot esculenta*) is a perennial woody shrub with an edible root which grows in tropical and subtropical areas of the world. Cassava is consumed as a staple crop in many regions of the developing world. It has become the most important root crop in Ghana and is becoming an increasingly important staple food. Cassava is mainly used in Ghana for staples like *gari, kokonte, fufu, agbelima* and *banku*. Cassava's combined abilities to produce high yields under poor conditions and store its harvestable portion underground until needed makes it a classic

"food security crop". The potential of the crop is large because it offers the cheapest source of food calories and the highest yield per unit area. It also has multiple roles as a famine reserve, food and cash crop, industrial raw material and livestock feed. It is a root crop of choice to subsistence farmers because it provides food security and cash income when required.

The diversity of secondary products cassava offers, makes it a very useful root crop. However, once harvested, cassava roots are highly perishable and signs of deterioration begin to appear. Cassava is a perishable commodity with a shelf life of less than 3 days after harvest. Due to the high perishability of cassava, early processing of the roots is an inevitable option once they are harvested. Processing involves different combinations of grating, dewatering, drying, soaking, boiling and fermentation of whole or fragmented roots to remove cyanogenic compounds which impart toxicity to the roots. Processing provides a means of producing shelf stable products (thereby reducing losses), adding value and reducing the bulk to be marketed. Apart from its use as food, cassava is very versatile and its derivatives and starch are applicable in many types of products such as foods, confectionery, sweeteners, glues, plywood, textiles, paper, biodegradable products, monosodium glutamate and drugs. Cassava chips and pellets are used in animal feed and alcohol production.

Delivery of cassava products to industry in Ghana had some challenges in the recent past regarding quality standards demands by end markets. Most processors were disappointed when their cassava products for sale were rejected because they did not meet the quality specifications of the end users. Some consignments of cassava products from Ghana were confiscated by regulatory agents in Europe and the Americas when the products were exported because of quality concerns. To address this quality concerns, a team of Food Technologists at CSIR-FRI, with financial support from the C:AVA Ghana Project, provided technical support to cassava processors to equip them to be able to meet the quality specifications of cassava products demanded by the end market. The objectives of this work was to;

(i) Demonstrate that quality interventions promoted by the C:AVA Ghana Project team contributed to increased performance of processors.
(ii) Sensitize processors of quality implications of cassava products.
(iii) Provide quality management information to guide potential cassava processors.

2.0 QUALITY MANAGEMENT INTERVENTIONS

2.1 Identification of cassava processors

Information on major areas of cassava production and processing in Ghana was gathered from SRID-MoFA and C:AVA Ghana service providers. Field visits were then organized by the project team to interact with the cassava processors using unstructured interviews. Processors were then selected to partner the project based on processing facilities available, basic knowledge and experience of processors among other factors.

2.1.1. Key selection criteria for cassava processors

i. The cassava processor(s) should have some basic knowledge of what they process.

ii. The cassava processor(s) should have access to or own some basic processing equipment such as cassava grater and press.

iii. The processing should be an all year affair.

iv. There should be availability of raw materials all year in the community (or nearby communities) where the processing is done

v. The processor(s) should have easy access to markets for their finished products.

vi. The processor(s) should work as an association or should engage some number of employees in the community.

2.2 Formation of processing groups

The cassava processing groups were classified into Community Processor Groups (CPGs) and SMEs. The community processors were made up of processors numbering between 25 and 30 (mostly women) in a community which had a common cassava processing facility (equipped with basic cassava processing equipment) in the community. The SMEs normally have their own processing facility and are able to acquire most cassava processing equipment needed to process diversity of cassava products.

2.3 Training on quality management principles

Safety and quality assurance of food products are very vital aspects of food production and processing. Food processors therefore rely on modern quality management systems to ensure the

quality and safety of the products they produce. Adherence to these principles enhances credibility in the public eye and confidence of consumers in the products of the enterprise, with a consequent increase in market share and company profits. Cassava processors were trained, using participatory workshop approach, on cassava products processing and quality management systems. The SMEs were trained in the premises (using their own cassava processing facilities) and CPGs were trained at a location in their community. The training workshop took between 2 and 4 days depending on the numbers involved. In all, over 150 CPGs and 16 SMEs were trained. The core trainings provided to the processors included;

2.3.1 Cassava harvesting and handling

Learning Outcomes

- An understanding of how the harvesting and handling of fresh cassava contribute in totality to a good quality product.
- How the value of the roots could be lost through spoilage if harvesting and handling is not properly managed

The training concentrated on cassava harvesting and handling. Cassava roots are much more perishable than other major root and tuber crops. Cassava roots generally deteriorate very quickly soon after harvest, mostly 24 hours after harvest. This rapid post-harvest deterioration of cassava roots places serious constraints on their distribution and use, especially where there are delays in marketing, and on the holding of buffer stocks for large-scale processing. Cassava roots must therefore be harvested and handled with extreme care if they are to be kept for more than a week.

2.3.2 Principles of good manufacturing practice

Learning Outcomes

- An understanding of how the handling of fresh cassava, plant layout and design, water sources, personal hygiene and waste disposal systems contribute in totality to a good quality product.
- A good understanding of the general principles of good manufacturing practice and its application in cassava processing.

The principles of good manufacturing practice are formulated to ensure that; (i) the design and layout of processing plants facilitate the ease of movement of people and materials during the course of processing, (ii) water sources, personal hygiene and plant sanitation practices do not constitute a source of health risk for consumers of the processed food products. Advantages of adhering to these principles are that it enhances company credibility in the public eye and confidence of consumers in the products of the enterprise and increase in market share and company profits.

2.3.3 Hazards associated with cassava processing

Learning Outcomes

- An understanding of the factors that affect the quality and safety of cassava products and the steps to take to mitigate those effects.
- To gain an in-depth understanding of the specific control measures to adopt during processing to mitigate the effects of the quality and safety factors.

The potential hazards associated with cassava processing are directly related to (i) the raw material quality, (ii) production and processing practices and (iii) handling of materials during processing by the production staff.

2.3.4. Standard Operating Procedures

Learning Outcomes

- An awareness of Standard Operating Procedures (SOPs), their principal purpose and specific application to cassava processing.
- An understanding of specific SOPs for in-plant sanitary management of a cassava processing plant.

Standard operating procedures (SOP's) are written methods that specify practices to address general hygiene and measures to prevent food from becoming contaminated due to various aspects of food environment at the processing facility. Standard operating procedures (SOPs) should be written out for operations that impact directly on the quality and safety of products.

There should be procedures for the control of operations, maintenance, plant sanitation, personal hygiene, cleaning operations etc.

2.4 Quality compliance monitoring

The cassava processors trained on quality management were visited quarterly to monitor quality of the products they processed as well as to check on compliance of sanitation conditions of their processing facilities. Over 300 processed cassava products (HQCF, HQCC, Gari, *Kokonte*) were sampled and analysed at the laboratories of CSIR-Food Research Institute, Ghana for quality. The tests carried out included Moisture content, Particle size, pH, Colour, Starch content, Total coliforms and Salmonella. Out of the 300 samples collected, over 95% of the samples analysed were within the standards set by FDA for cassava products. This was an improvement compared to the conditions prior to the interventions by the project team.

2.5 Product certification

For manufacturers to legally have their products on the shelf for sale in super markets in Ghana and for export, one of the regulatory conditions to meet is to have the products and facilities registered by Food and Drugs Authority (FDA) of Ghana. Most cassava processors hitherto did not meet the criteria for certification. With the interventions on quality management and other technical support provided by the CAVA Project team, a number of cassava processors were registered by FDA and some are in the process to acquire certification for their cassava products and facility.

3.0 OUTCOMES

The quality management interventions enumerated made the C:AVA Ghana project to mobilize several tons of fresh cassava roots into High Quality Cassava Flour (HQCF) and *gari* value chains that were supplied to various industries. The interventions created employment opportunities for Ghanaians and increased the incomes of small holder cassava farmers. The interventions are also in support of the current Government's policy of 'One District One Factory".

Table 1: List of Processors trained

Name Of Partner	Key Person	Position	Contact
JOSMA Agro Industries	Mrs. Janet Gyimah-Kesse	CEO	0244465353 (josmaagro04@yahoo.com)
Coastal Groves	Mr. Daniel Danquah	CEO	0244277035 (cgl_dd@yahoo.com
Tropical Starch	Alhaji Musa Ali	CEO	0242616317
Caltech Ventures	Mr. Chris Quarshie	CEO	0244326148 Ho.office@caltech.com
Food Hub	Patrick Okyere	CEO	0208149447 Patrickokyere8@gmail.com
Praise Export	William Asante	Manager	0243101378 mercy@praisexport.com
Ernimich	Rose Mensah	Director	0548011392
Green Acre Farms	Patience Tetteh	CEO	0244102987
Marbet	Mr. Gilbert Asiamah	CEO	0244820818 Maretcoltd2000@yahoo.com
AMYA Agro Plus.	Dr. Marie Batiano	CEO	0241574096 mariebationo@yahoo.com
Andico Godsway	Mikel Cophie	CEO	0245125107
Arthur Grains	Paul Arthur	CEO	054438013
Miva Life	Charles Amoah	CEO	0244361996
Women in Need	Hannah Essel	CEO	0547616737
St. Baasa Ghana Ltd	Nana Twum Owusu-Pemah	CEO	0203452121 stbaasa@yahoo.com
OXY-Industries	Enoch Ampratwum	CEO	0264636322 0xymero@yahoo.com

4.0 CHALLENGES AND LESSONS LEARNT

The following challenges were identified during the project period.

- Most cassava processors lack basic knowledge of cassava quality management principles in cassava processing. This made it difficult for the processors to appreciate the need to change their attitude towards quality management issues in cassava processing.
- Most cassava processors lack efficient equipment for drying of cassava products. They therefore resort to open sun drying most often which compromised on the quality of the products especially HQCF.

- Most processors lack basic quality monitoring equipment such as moisture and pH meters. The lack of financial resources to pay for basic laboratory services does not allow the processors to check quality of their produce. These challenges affect the delivery of cassava products to the end market.

5.0 CONCLUSION

The quality management interventions demonstrated empowered several cassava processors to supply more cassava products to end markets with little or no quality concerns. Out of over 300 cassava products analysed after the introduction of the quality management interventions to cassava processors, 95% of the samples analysed were within the standards set by FDA for cassava products. This led to increased supply of cassava products to the end market and subsequently earned more incomes for cassava processors. The improved business of the cassava processors who adhered to the quality management systems had also led to implementation of quality management practices by other cassava processors in the industry. New entrants to the cassava processing business would also learn lessons of quality management as a key factor in succeeding in cassava processing.

6.0 RECOMMENDATIONS

In order for cassava processors to meet certification of their cassava products and facilities, they must be willing to learn and adhere to quality management principles involved in cassava processing. They must also be ready to invest in quality management systems and resources to meet the specifications of end markets. This would enable them to access any cassava products end market globally to increase their profitability and credibility.

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