RECENT DEVELOPMENTS IN CASSAVA PROCESSING, UTILIZATION AND MARKETING IN EAST AND SOUTHERN AFRICA AND LESSONS LEARNED

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ABSTRACT

Cassava is one of the most important food crops in ESA. It is traditionally utilized in many processed forms, the most common being chips and flour. The traditional processing methods produce poor quality products; thereby pose major challenges to utilization and marketing of cassava. Recently, national institutions, NGOs and development agencies have given priority to agro-processing and value addition to cassava at small-scale. New processing technologies for transforming cassava into intermediate shelf staple industrial raw materials such as high quality cassava flour, chips and starch were introduced at project levels. The acceptance of cassava starch, chips and high quality cassava flour (HQCF) as substitutes for imported raw materials in the local industries began to emerge. Although there are several expressions of interests for investment by the private sector, their involvement in small to medium scale processing and value addition largely depended on the magnitude of institutional support or donor funding of processing projects. There is still paucity of private sector investment in large scale processing plants of the kind currently developing in West Africa.
1. INTRODUCTION

Cassava is mostly cultivated by smallholder farmers as a food reserve crop. It is a dependable crop to poor families who use it to prevent starvation when seasonal harvests run out or when other food crops do not survive during natural disasters. Cassava is the second most important food crop after rice in Madagascar where it contributes about 14% of daily calorie intake, second to maize in Tanzania and Zambia after maize. In Burundi and Rwanda it occupies the third position after banana and sweet potatoes. In Eastern parts of Uganda cassava is the main staple and second important among some communities in the Coast and Western region of Kenya.

Traditional Cassava Processing and Utilization

The forms in which cassava is utilized differ from country to country and between communities within the country. Fresh cassava roots are generally consumed as boiled, toasted, roasted, fried, or boiled and mixed with sweet potatoes, round potatoes or bananas tomatoes, with meat or fish as additives. Cassava leaves are consumed as a vegetable or cooked as a soup ingredient. In rural cassava-based communities, both the roots and the leaves are fed to livestock.

The most marketed processed cassava are dried cassava (chips) and flour but rale (gari) is popular in Mozambique. Specific local forms of widely marketed processed cassava include dried chips & flour in Kenya, Malawi, Rwanda and Zambia, dried tubers for animal feeds, pancake, baked/ fried cassava products in Madagascar, chikwangue and dried chips in the DRC, Ikivunde, Ikiobeke and Inyange in Burundi, makopa and kivunde in Tanzania, rale and chips in Mozambique (Mbwika 2002).

The most widespread traditional unit operations involved in making traditional cassava foods are home-based. They involve the use of kitchen tools for peeling, cutting roots to chunk/chipping, slicing, soaking in water (e.g. Zambia) or heaping fermentation (e.g. Tanzania), sun- or smoke-drying, milling, and sieving. Others are frying, dehydration by pressing, sedimentation, decanting, and or cooking, boiling, or steaming. The number of steps used and the sequencing vary depending on the product being processed. However,
the unhygienic processing methods used, such as soaking of several batches of cassava roots in the same stagnant pool of water, sun-drying on bare floors (on-farm), skipping of root washing after peeling, non-fermentation, etc lead to low quality human foods. Poor processing techniques pose the greatest challenges to cassava utilization and commercialization. Poorly processed products attract low market prices and could be unsafe for consumption. Farmers and traders incur huge losses due to poor storability of harvested fresh tubers while incomplete drying of chips cause marketers huge market losses, especially during the rainy season.

Marketing of Traditional Products
Dried chips and flour are the most traded processed commodities (Figure 1). The marketing systems for the cassava commodities are inefficient at all levels, starting from bulking of harvested cassava to handling, transporting, storage, processing, wholesaling and retailing. Market and transport infrastructure is either lacking or poor. Cassava products are traded in small quantities using different measures in different markets for pricing, making prices to differ between markets even in the same district. The lack of standards for cassava products makes grade-based pricing impossible. During the wet season and in areas with high rainfall, drying of chips is often inadequate, causing quality deterioration in storage. The combined effect of inefficient storage and lack of technologies for adequate drying throughout the year leads huge storage losses, and seasonal variation in supplies and prices of cassava products. Scarcity of products at certain times of the year causes high consumer prices while producer prices remain low, thus processing of cassava becomes unprofitable (Figure 2), discouraging farmers from increasing product output. Traders therefore prefer fresh roots trading to processed products.
Figure 1: Typical supply channels of cassava sub-sector in Tanzania
Recent Institutional and financial support

As a result of the constraints in the cassava value chain in ESA, the sector has received enormous institutional/donor supports in recent years. However, the supports are largely in favor of increased production as food reserve in case of inadequate production or supply of cereals. Until recently, little emphasis was on agro-processing and value addition to cassava. In the 1990s the root crops net works (ESARRN, EARRNET, and SARRNET), IITA, FOODNET, NRI, etc. contributed to developing postharvest technologies and creating awareness on cassava potential as an industrial crop. Value addition was supported through technology dissemination, distribution of machinery, and training of stakeholders (NARS, processors, farmers, equipment fabricators and entrepreneurs). Between 1997 and 1998 IITA/FOODNET, NGOs and CBOs distributed processing machines to farmers, groups in Uganda for household processing and commercialization. Later, in 2000-2003 cassava chippers, slicers and graters were introduced to the national institutions in Tanzania, Zimbabwe and Malawi (National root crop programs, Ministries of Agriculture and Food Research institutes) for processing demonstrations. In addition national institutions such as Malawi, Zambia and Tanzania acquired cassava processing machines from Zimbabwe.
From 2000 resources were devoted to cassava processing and marketing projects in ESA by donors and other institutions for wider introduction of novel techniques of processing cassava into intermediate shelf stable industrial raw materials (high quality unfermented cassava flour, rale (gari), chips, pellets, and starch), and refined food items such as biscuits, noodles, bread etc made from composite flour. Such projects included projects funded by i) USAID-DC through CIAT and implemented in Malawi and Tanzania by IITA/SARRNET/IDEAA, ii) Plan International project implemented by IITA/SARRNET in Malawi, iii) USAID-Malawi project implemented in Malawi by IITA/SARRNET, NARS, iv) NORAD/DF project implemented by IITA/SARRNET in Malawi, v) USAID/RCSA project implemented by IITA, CLUSA, and NARS in Malawi, Tanzania, Angola, Mozambique and Zambia, vi) CFC project implemented by NARS and IITA in Tanzania, Uganda, Zambia, Mozambique Madagascar, vii) Private Oil Cie COHYDRO/SONANGOL project implemented by CLUSA and NARS in Angola, viii) RF project implemented by IDEAA and NGOs in Malawi; USAID/RF/IFAD project implemented by IDEAA and WVI in Angola, Moz, Mlw; ix) EU/USAID project implemented by GTZ/SARRNET in Malawi, x) SIDA project implemented by Swedish Cooperative Center in Zambia, Zimbabwe. Many of the projects made progress in increasing awareness of the public about the potential of cassava as both food crop and commercial crop/industrial raw material and identifying potential market outlets, networking with other stakeholders to promote cassava commercialization and utilization. Small processors were organized into groups and their capacity enhanced through training on new processing technologies and linkage to potential end users. Cassava equipment fabrication enterprises have developed in ESA mostly in Zimbabwe, Tanzania, Uganda and Zambia. The sales records of the equipment fabricators (in Tanzania and Uganda) show that real commercial production of cassava processing machines started recently (2002/2003) and the demand and supply of the machines are increasing mostly in Tanzania and Uganda but also in Malawi, Zambia, Burundi and Rwanda. Of the new mechanized processing technologies introduced by the research and development institutions, chipping appears to be the one that has been taken more than grating, particularly in Uganda, Rwanda and Burundi. This somehow reflects the traditional cassava consumption methods. In Tanzania, Zambia and Malawi where more projects
related to use of grating technology were funded by various donors (e.g. CFC project for HQCF), grating technology is also getting accepted as well (Figures 3 and 4).

Figure 4: Sales records of a leading equipment fabricator in Tanzania, Intermech Engineering Ltd., show the demand and supply of mechanized cassava processing machines in Tanzania, Malawi and Zambia.
Between 2003 and 2007, national institutions particularly in Madagascar (FOFIFA), Mozambique (IIAM), Tanzania (TFNC), Uganda (NARO) and Zambia (ZARI) involved in the CFC small-scale cassava processing project coordinated by IITA and worked with the national bureaus of standards to develop standards for flour, chips, starch, rale (gari), etc in the various countries (IITA, 2007).

New Market Opportunities
Results from various processing projects showed that the demand for cassava flour as food in traditional cereal based societies has increased; there is a growing domestic, food security oriented market for cassava. The demand for better quality processed cassava is increasing in ESA because consumers are substituting cassava for other foods like maize and rice during scarcity. Power Foods Industries Ltd. and other similar small milling enterprises in Tanzania sell more than a ton of HQCF to various supermarkets daily. The current global food crisis suggests that the domestic demand for refined cassava products will continue to increase.

Similarly, there are substantial potentials for the use of cassava in industry in ESA. Cassava starch, chips and HQCF are increasingly used as substitutes for imported starch, wheat flour in the local industries (brewing, textile, food, adhesives, bakeries, feed mills, etc), and sometimes on trial basis. Many of the potential end-users (industries, supermarkets etc) have started taking practical steps in the use of cassava products by developing recipes, procedures for using cassava and issuing purchase orders for supply of cassava products. In Uganda, the animal feed and bakery sectors accounted for 98% of the potential market for cassava (Graffham et al., 2000). According to A to Z Feeds Ltd., the demand for cassava chips for animal feed in Tanzania is estimated at 5MT/day for composite feed (70% cassava) and 20MT/day for pellets (60% cassava). In Malawi, Madagascar and Tanzania manufacturing industries are already in favor of use of HQCF for biscuit and snack foods, and in Malawi and Zambia flour are already in use as a extender in glue for timber and paper processing. The use of cassava in the industrial sector in the region is growing but still in its infancy. Unfortunately nearly all the new processing groups, initiated under the various donor funded projects are unable to meet
the demands of the end-users for the cassava products in terms of quantity, quality, continuity of supply and competiveness. Again the private sector has not made significant investment in new processing plants. This is obvious from the sales records of equipment manufacturers. Major buyers of the processing machines are NGOs, National institutions and lately local government authorities in Tanzania only, suggesting that the private sector is yet to get involved (Figures 5 and 6).

Figure 5: Sales records of a leading equipment fabricator in Uganda, Tonnet Engineering Ltd, showing the categories of buyers of cassava processing machines in Uganda, Burundi and Rwanda.
Impact of processing on cassava dependent communities

Processing and marketing of cassava as industrial raw material can offer tremendous economic benefits to smallholder farmers, create jobs, reduce poverty and enhance rural development. Processing activities in the rural communities increase demand for fresh cassava. It enhances farmers’ willingness to adopt improved production technologies particularly new varieties, which can increase cassava productivity and increase national food output.

Private sector Involvement in Cassava Processing and Utilization

Reports show that most cassava starch plants established in ESA in the past, 1960s-1990s (e.g. in Tanzania and Zambia) were closed mainly because of lack of raw materials although major achievements are now being made by IITA and the national institutions in addressing major production problems through development and dissemination of disease and pest resistant materials. In Madagascar, only one starch plant is still operational out of many of its kind in the 1960s. The processing capacity of the factory, whose
equipment is nearly 60 years old, has fallen drastically over the years. These situations are common across Africa suggesting major constraints to achieving efficiency in large scale cassava processing plants; those constraints have not been given attention by cassava development agencies. On the other hand, as from 2003, private sector in some countries began to explore cassava use, local livestock firms began to find ways of using cassava chips in livestock, few breweries (e.g. in Zambia), bakeries and caterers began exploring the use of high quality cassava flour for composite flour, biscuits and snacks. Special committees for acceleration of cassava utilization were formed in some countries such as Tanzania and Zambia. In Tanzania, a public-private consortium was formed to advance the use of cassava in feed mills (Tanzania Animal Feed Information Centre TAFIC). In Madagascar feed mills have been using cassava in animal feed manufacture while recently, feed mills in Tanzania, Uganda and Zambia have started using cassava chips supplied by small farmers for commercial feed production. Apart from South Africa, Madagascar appears to be the only country in the region exporting starch and tapioca, mainly to Re-Union, France and Mauritius.

The market for biofuel is substantial in ESA hence its production from cassava provides substantial growth market for fresh cassava but the biofuel industry is yet to take off but there are growing interests by the private sector (e.g. Export trading Company Ltd. in Tanzania). The FAO is also exploring economics of biofuel production from cassava in Tanzania. While there is a successful large scale starch plant in South Africa, other companies that showed interests in similar industrial processing of cassava to starch (e.g. MeTL and Rufiji Farm Estate Ltd., in Tanzania), glucose syrup (Starcas Limited in Uganda) are yet to start. There is still a paucity of private sector investment in the sector; the constraints to investment are yet to be investigated.

**Major challenges of transiting cassava into an industrial commodity**

Experience from IITA’s commercialization research in ESA showed that although significant contribution to designing and testing of technologies and institutional approaches that integrate market opportunities and processing technologies with efficient or competitive production practices have been made, these technologies and institutional approaches still require further development and refinement to jump-start commercial
investment in cassava value addition. It has become obvious that there are many characteristics of cassava production and supply systems that affect the efficiency of processing, contributing to non-uniformity in quantity, quality and regularity of supply of primary cassava products to end-users. These may also be responsible for the phobia for investment by the private sector.

A quick assessment of past processing related projects involving groups of farmers showed that processing activities slowed or seized soon after donor funds ended. Although processing technologies were often successful at the beginning, improving farmers’ income, but several of the processing sites do encounter difficulties resulting from dependence on sun-drying. Due to the small-scale nature of cassava processing technologies introduced so far, small-scale farmers and processors are often unable to process during the rainy season or meet the quantity, quality, continuity and safety standards required by the industrial users or the quality standards set by the national regulatory agencies.

Low supply of cassava roots for processing, due either to low production or preference of farmers to sell roots to fresh cassava markets, causes inefficiencies in the operations of processing enterprises. Nonetheless, cassava processing enterprises could be very profitable provided there is regular inflow of fresh cassava roots and the plants operate at optimum operating capacity since these greatly affect total revenue. Profitability can be greatly improved upon if stakeholders can be facilitated to access lower priced credit facilities.

In terms of infrastructure, availability of water, availability or lack of support infrastructure such as roads and transport systems were found to have serious consequences on the efficiency, feasibility and viability of the processing enterprises. Major technical constraints still exit in the area of equipment manufacture in the region, particularly regarding availability of cassava dryers, chipping discs, engines and good quality materials for machine construction - all of which are still imported. The limited expertise for the manufacture of these processing machines limits access to them by farmers and processors. In addition, expertise for equipment maintenance is lacking in most localities.
In most cases, purchase of machines was an investment beyond the reach of the majority of small-scale cassava farmers and processors. Poor credit facilities and high interest rates may make acquiring simple processing equipment risky for smallholder processors and farmers and may hinder the development of the economic potential of cassava. With the existence of a dormant market for processed cassava derivative products, enabling farmers and processors to access reasonably priced credit facilities would bring real benefits to the farmers and processors and develop the cassava producing communities. Cassava still suffers from many myths and half-truths ranging from its being perceived as not nutritious, a poor man’s food, and a potentially poisonous food. These have negative consequences on the image of HQCF and its marketability. However, all these problems are avoidable with a wider dissemination of appropriate cassava processing techniques and quality assurance checks. Other problems relate to the unorganized markets for cassava products, uncompetitive prices offered by end-users, lack of transparency and limited entrepreneurship skills amongst small-scale processing groups, and the people’s poor attitudes and traditional values regarding business which affect their ability to sustain market linkages.

Conclusion
While it is true that considerable constraints remain, it is obvious that there is significant scope for the realization of enhanced productivity and diversification of cassava through local processing. Necessary steps have to be taken to promote integration of cassava into the manufacturing industries as a reliable raw material or its promotion as an export crop in order to achieve economic growth for a significant number of primary producers, processors and traders. This will also ensure availability of good quality food products for both rural and urban consumers. Therefore the current fragile state of cassava sector would need policy support for its development to be enduring, investment opportunities already identified need to be nurtured while the marketing systems must be made efficient.
REFERENCES

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