BACKGROUND

The production, processing and marketing of cassava provides a major source of income for at least 70 million people, often women and the poorest, in Nigeria. Cassava is not only strategically important as a food source and famine reserve, combining high calorific efficiency with versatile low cost/input, reliable and flexible production, but is now seen as a pro-poor vehicle for economic development (NEPAD, 2004). Hence, some levels of development in cassava processing, utilization and marketing are highlighted below:

1. CASSAVA PROCESSING

As reported by Nweke (2004), unlike in the past when cassava is a famine reserve/rural food crop, it is now a food and cash crop. The Nigerian cassava industry is transiting from the use of traditional technology and traditional low-yield varieties to improved technology (involving a broad adoption of high yielding varieties and mechanization of certain processing stages) and diversified products based on market demands (food, industrial and livestock).
The introduction of mechanical machines for most unit operations of cassava processing has greatly eased labor intensiveness of the trade, freeing up more time for women for other income generating activities and to attend to other family responsibilities. Significant relationships between the cassava processors' perception of the effectiveness of cassava processing innovations and adoption of hand driven grater; power driven grater, hydraulic press and iron frying pot in south west Nigeria has been reported by (Adebayo and Sangosina, 2005).

Most micro-processors and small-scale processors are involved in the processing of cassava into traditional cassava foods or intermediate cassava products such as cassava chips, HQCF, starch, etc. Medium scale factories involved in the processing of cassava into HQCF, starch, high grade fufu for export, etc have also been established near cassava farming communities by local entrepreneurs. The integrated cassava project of IITA has introduced a three-tier processing system from 2004 to date. These are mobile processing enterprise (MPE), micro-processing center (MPC), and small-medium-scale processing center (SME) in the Project States in Nigeria (Dixon and Tarawali, 2007).

Other achievements related to development of small and medium processing facilities include:

• Establishment of six primary processing centers. These primary processing centers are located in Sepeteri (Oyo state), Makurdi (Benue state), Owerri (Imo state), Akure (Ondo state), Ankpa (Kogi state) and Ilorin (Kwara state)

• Building and installation of micro processing centers for gari and medium scale factories for cassava flour in all states covered by the program. These micro-processing centers for gari and the medium scale processing factories were equipped with improved and modern technologies to serve as model for private individuals that are willing to invest in cassava processing.
The Federal Ministry of Agriculture has reported an increase in the private sector investment in major large-scale cassava processors, such as Ekha Agro-farms, Matna Starch Industry, Akure, Ondo State, Vesa Farms, Nigeria Starch Mills, and a glucose factory in Ogun State. These companies have invested in large-scale cassava plantations. There was also an increase of foreign investment in cassava flour production as typified by the Dutch Trading Company (DATCO) in Benue and Niger States.

Cassava processing practices have witnessed remarkable modifications in techniques and equipment for peeling, grating, drying, frying and milling (Sanni et al., 2006a, b). There have been some concerted efforts at getting a mechanical peeler (IITA-CEDP Annual Report, 2007). Research is also being undertaken on the use of chemicals to peel cassava. Local cassava processors fabricated a small hand-operated extruder for the production of cassava strips. These strips are composed of a mixture of cowpea and cassava flour. They are popular with school children and are viable business, especially in Nigeria (Sanni et al., 2007).

Traditionally, cassava products are sun dried with solar drying of cassava mash in rural areas. Following the changing habits of consumers and the current wave of urbanization, new dryers (rotary and flash dryers) have been developed.

2. UTILIZATION

Findings from the Collaborative Study of Cassava in Africa indicated that the majority of cassava consumed in Nigeria is fermented (Oyewole and Aibor, 1992; Kuye and Sanni, 1999). These include; fufu, gari, eba. In many African countries, age-old traditional methods are still being employed in traditional fermentation processes. Sanni (1990, 1991) and Obadina et al. (2006, 2008) reported the hazard analysis of critical control points (HACCP) in the commercial production of high quality gari as well as delineating the quality criteria of gari and wet fufu respectively. There was found to be a need to improve
some of the traditional processes (Abiona et al., 2005) in order to enhance the safety and quality of the products.

Pilot initiatives undertaken by Natural Resources Institute (NRI) and its partners in Nigeria have demonstrated the technical and commercial feasibility of producing the new/improved cassava products such as Instant Fufu and Tapioca applying HACCP principles (Sanni and Ayinde, 2003; Tomlins et al., 2007). Improvement of the composition and texture of the cassava products by the addition of emulsifiers have been reported by various authors (Sanni et al., 2004; Adebowale et al., 2005). Raw egg has been found to possess some emulsification properties.

Evidence from past and current IITA pilot projects in Nigeria have already demonstrated the commercial potential of HQCF as a partial replacement for cereal flour and starches in both rural-and urban-based manufacturing industries for the manufacture of baked and confectionery based products (Dixon and Tarawali, 2007). The acceptable level of inclusion for high quality final products (Table 4) was examined (Abass et al., 1998). Up to 30% substitution of wheat flour with cassava flour could still give an acceptable fresh loaf depending on the source of flour (Shittu et al. 2007), even though 10% inclusion of flour in bread has been the mandatory level in Nigeria since November 2004 (www.cassavabiz.org).

It appears then that the Presidential Initiative on Cassava (PIC) has stimulated an increase in cassava processing by both microprocessors and medium scale processors, as the initiative has helped create awareness about the multiple potential uses of cassava to produce flour, starch, cassava chips, glucose syrup, animal feed, ethanol, and composite (cassava–wheat) baking flour. For example, the glucose factory in Ogun State commissioned in 2006 is a state-of-the-art cassava-based glucose syrup processing plant, first of its kind in Nigeria. The factory has an installed annual production capacity of 30,000 metric tons of glucose syrup.
Cassava is now used as a carbohydrate base in compounding livestock feed, as a partial substitute for maize (Azogu et al., 2004; Tewe, 2004). Cassava foliage has also been successfully used as a nitrogen-roughage source for growing cattle (Iyayi and Tewe, 1994). Obadina et al. (2005) reported successful fungal enrichment of cassava peels proteins for animal feeds. One of the greatest problems for the uses of cassava for feeding poultry and fish has been the production of hard and floating pellets. Today, there are locally fabricated pelletizers and they are found adequate to produce soft, hard, and floating pellets for ruminants, poultry and fish farms (Raji et al., 2007).

Some of the efforts to improve the protein content of cassava products includes; the fermentation of cassava with protein-enriching bacteria and moulds (Daubresse et al., 1987), direct supplementation of fermented cassava products with the flours of protein-rich legumes (Sanni and Akinlua, 1996), household process for the co-fermentation of cassava with protein-rich cowpea and soyabean (Oyewole and Aibor, 1992). Gari from β-carotene enriched cassava varieties (Maziya-Dixon et al., 2006) is being tested as a vehicle for delivering β-carotene to farmer/producers and other end-users in various cassava-consuming areas. Onabanjo (2007) developed complementary diets from yellow-fleshed cassava varieties, soybean, groundnut, cassava leaf and carrot with improved micronutrient levels (beta-carotene, iron and zinc) for older infants and young children. The use of elemental iron fortificants (Iron (II) Sulfate heptahydrate, Iron (II) Fumarate and Ethylenediaminetetraacetic acid iron (III) sodium salt-NaFeEDTA) for gari and fufu flour has been successfully reported by Sanni (2008). This is an activity that has wider potential for replication in other parts of Africa.

3. MARKETING

The Presidential Initiative on Cassava, which was launched in Nigeria in 2003, brought cassava and its potentials to the national limelight (Sanogo and Adetunji, 2008). The Initiative has as its goal, the promotion of cassava as a viable foreign exchange earner for Nigeria, and also development of the cassava production system in order to sustain the
national demand. Nigeria’s Presidential initiative on cassava focused its areas of intervention on development of cassava production and processing, and processed products marketing.

The PIC was instrumental in uncovering the potential export market for products from cassava. The PIC had generated great excitement, creating new hopes and greater expectations of relevant stakeholders. However, various reports especially after May 2007 have been highlighting difficulties in their implementation. For example, flour milling industries failed to purchase HQCF from processors while some processors also failed to supply quality flour. The sustainability of the PIC depends strongly on the effectiveness of the public-private partnership.

As the main food staple for urban and rural people in West Africa, cassava already makes a major contribution to the national and regional economy. Since 2003, export opportunities for Nigerian cassava products (e.g. *gari*), within the West African sub-region, particularly to land-locked countries like Niger and Mali are being growing. A cross-border trade study (Ezedinma *et al.*, 2007) in Northern Nigeria showed a substantial cassava export to Niger (mostly *gari* and chips) ([www.cassavabiz.org](http://www.cassavabiz.org)). The diversification and expansion of cassava development into new growth markets presents real opportunities for development of standards for cassava products and guidelines for export in Nigeria (Sanni *et al.*, 2005). In the past five years, factories in Nigeria have exported cassava starch to Cote d’Ivoire (Matna company); cassava flour and instant *fufu* have also been exported to the USA, UK, Ireland, Italy etc (Aquada Investment and Olu Olu Industries). However, production and processing costs of cassava in Nigeria are not competitive in the international market thereby making it difficult for Nigeria to continue the export of cassava chips to the Republic of China after the two export trials done in 2005/2006 after which price of cassava chips in China stabilized at $120/ton.
4. LESSONS LEARNT

Favorable policy enhances the new status of cassava as an industrial crop in Nigeria.

All relevant institutions collaborated very well to facilitate the development of cassava processing, utilization and marketing in Nigeria.

Increased private sector investment in cassava processing and diversification in cassava use.

Availability of raw material (cassava tubers) is key to sustainable cassava business.

Dissemination of processing/utilization manuals, flyers, posters by IITA and NARs.

The local (mainstream) fabricators have come up with diverse forms of innovation and improvement to enable the processors to overcome some of their limitations.

Development of standards for cassava products for domestic and export markets.

Strengthening of producer organizations (Cassava Growers Association; All Nigeria Cassava Processing and Marketing Association, Cassava Equipment Fabricators Association of Nigeria etc).

The technologies and machinery, particularly for drying, peeling, etc., have a significant role in advancing cassava development in Nigeria.

Certification of processing factories (layout, food grade equipment etc.) by the National Agency for Food, Drugs, Administration and Control (NAFDAC) and Standard Organisation of Nigeria (SON).

5. CONCLUSION

The perceived challenge at present is that ongoing efforts are not adequate and that the cassava sub-sector needs a further push for it to play a front role in the agricultural and economic development of Nigeria.
A sustainable cassava processing-utilization-marketing system in Nigeria requires a coalition of private-public partnerships, with the private sector investing in market development and procuring needed machinery. The public sector has to provide the needed policy environment, improve competitive technology, and particularly physical infrastructure.
REFERENCES


