



A strategy for industrialisation of Cassava in Africa

Proceedings of a Small Group Meeting

14–18 November 2005

Ibadan, Nigeria



AFRICAN AGRICULTURAL TECHNOLOGY FOUNDATION
FONDATION AFRICAINE POUR LES TECHNOLOGIES AGRICOLES

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Research to Nourish Africa

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List of abbreviations

AATF	African Agricultural Technology Foundation
CGIAR	Consultative Group on International Agricultural Research
DDG	Distillers dry grains
EPA	Environmental Protection Agency
FAO	Food and Agriculture Organisation of the United Nations
HACCP	Hazard analysis and critical control point
HQCF	High quality cassava flour
IFAD	International Fund for Agricultural Development
IFDC	International Fertilizer Development Centre
IITA	International Institute of Tropical Agriculture
ISO	International Organisation for Standardisation
ISTRAC-AB	International Society for Tropical Root Crops-Africa Branch
NAFDAC	National Agency for Food and Drug Administration and Control
NEPAD	New Partnership for African Development
NIYAMCO	Nigerian Yeast and Alcohol Manufacturing PLC
NSM	Nigeria Starch Mills
RF	The Rockefeller Foundation
SMEs	Small and medium enterprises
USAID	United States Agency for International Development

Preface

The current high cost of cassava production and low quality of cassava products in Africa stems from inefficient traditional production and processing methods, which severely limit the ability of the continent to enter local and export industrial markets and effectively compete with corn starch in global markets. For cassava to play a role in the economic growth of cassava producing countries in Africa, an integrated approach combining large investments in industries using cassava as a raw material (for example food, feed, ethanol and starch) and small and medium scale investments by entrepreneurs in production, processing and delivery of high quality cassava products to the larger industries as well as adoption of labour saving devices in cassava production is considered essential. Indeed, a survey conducted by the African Agricultural Technology Foundation during the 2004 Triennial Symposium of the International Society for Tropical Root Crops-Africa Branch (ISTRAC-AB) revealed a consensus among African cassava experts that the single most important intervention to increase the competitiveness of the cassava industry was the adoption of mechanisation in cassava production. AATF is therefore exploring opportunities of working with partners to improve cassava productivity through approaches that optimise labour requirements during field and processing operations.

This meeting of experts on cassava production, processing, marketing and utilisation from both the public and private sectors was considered timely as it provided an opportunity for an in-depth analysis and identification of key elements essential for formulating a strategy to guide the industrialisation of cassava in Africa. It is my honest belief that the key strategic elements identified during this expert group meeting will go a long way in helping the preparation of a blueprint for the industrialisation of cassava in Africa that would guide African countries in turning cassava into an engine for economic growth.

Mpoko Bokanga, PhD
Executive Director
African Agricultural Technology Foundation (AATF)
Nairobi, Kenya

June, 2006

Introduction

Major studies conducted on cassava at the end of the 20th century have predicted the growing importance of this crop in Africa's economic development. Both the Global Cassava Development Strategy study commissioned by the International Fund for Agricultural Development (IFAD) and the Food and Agriculture Organisation (FAO), and the Vision 2020 study of the Consultative Group on International Agricultural Research (CGIAR) on root and tuber crops have stressed the great potential of cassava to spur rural industrial development, raise rural incomes and contribute to food security.

In Nigeria, for instance, farmers have demonstrated the enormous potential for cassava production by propelling the country to the top position in cassava production worldwide. However, cassava production in Africa is still characterised by low yields compared to other cassava growing regions. Thus cassava production in Africa has not yet reached a maximum. If the demand for cassava and the income generated from cassava increase, farmers will be motivated to adopt productivity-enhancing technologies to increase yields and to expand cassava production even further. Cassava production in Africa is expected to continue to rise at an annual rate of 2.4% per year and to reach 109 million tonnes in 2005 (FAO 1997), accounting for over half of the world's production. In the past 20 years, cassava production in Africa has doubled compared to production in Asia and Latin America, which has increased by only 25% and 18% respectively during the same period. There are indications that this trend will continue up to the year 2020.

Virtually all cassava produced in Africa is used for human consumption. 70% of the amount consumed is first processed into a large variety of products such as paste, flour and chips, and is cooked into foods serving both rural and urban populations as a basic daily source of dietary energy. Demand for cassava as food is expected to grow at an annual rate of 2.5% per year and the demand for cassava as livestock feed at 5%. In the former case, there are observations indicating that cassava is increasingly being adopted as an ingredient in the manufacture of convenient fast foods and snacks for urban consumers.

In several African countries, cassava is being more and more perceived not only as a food security crop, but also as a raw material for various types of industries. Indeed cassava can be converted into a large number of products ranging from traditional and novel food products, to livestock feeds, ethanol and starch and its numerous derivatives. In some countries, there are concerted efforts being initiated, sometimes with strong political support at the highest level. For example special presidential initiatives on cassava exist in Nigeria and Ghana to make cassava the engine for economic growth. The New Partnership for African Development (NEPAD) has also recognised cassava as a powerful poverty fighter in Africa and has recommended a Pan-African Cassava Initiative based on a broad based strategy which emphasises better markets, better organisation of producers for collective action, and better participation by the private sector investment.

For cassava to be a major contributor to development in Africa, the demand for cassava must grow more rapidly than the human population. This can only be made possible if new uses for cassava are introduced and promoted. The Global Cassava Development Strategy recommends that the countries interested in using cassava to promote rural development should pay close attention to the following:

- (a) identification of growing markets
- (b) organisation of a consistent and sufficient supply of uniform high quality products
- (c) production of cassava products of acceptable quality and at competitive prices
- (d) close cooperation of all those associated with the opportunity right from the onset.

The most important area of intervention is the building of the processing capacity that will produce high quality products for the identified markets, particularly the food, livestock feed, starch and ethanol industries. It is necessary to conduct an in-depth sub-sector analysis that will identify the roles to be played by all stakeholders in the cassava sector (producers, traders, processors, researchers, policy makers and consumers) and enable the mapping out of a strategy for the development of the cassava industry in Africa.

A survey conducted by the African Agricultural Technology Foundation (AATF) during the 2004 Triennial Symposium of the International Society for Tropical Root Crops-Africa Branch (ISTRAC-AB) revealed a consensus among African cassava experts that the single most important intervention to increase the competitiveness of the cassava industry was the adoption of mechanisation in cassava production. Such mechanisation will enable reduction of labour costs, thus reducing the cost of cassava as a raw material and stimulating reliance on local cassava as a competitive raw material for various industries.

Clearly, therefore, in order for cassava to play a role in the economic growth of cassava producing countries, an integrated approach combining large investments in industries using cassava as a raw material to foster demand for cassava; small and medium scale investments by entrepreneurs to invest in production, processing and delivery of high quality cassava products to the larger industries; and adoption of labour saving devices in cassava production is essential.

The African Agricultural Technology Foundation (AATF), headquartered in Nairobi, Kenya and the International Institute of Tropical Agriculture (IITA), based in Ibadan, Nigeria jointly brought together a team of 20 experts on cassava production, processing, marketing and utilisation from both the public and private sectors with the mandate to identify key elements essential for formulating a strategy to guide the industrialisation of cassava in Africa. The Meeting was held at the IITA campus in Ibadan, Nigeria from 14–18 November 2005. The Meeting targeted the preparation of a blueprint for the industrialisation of cassava in Africa upon which African countries can follow to turn

cassava into an engine for economic growth. During the Meeting, using Nigeria as a microcosm, an in-depth analysis of the major cassava sub-sectors comprising ethanol, livestock feed, food and starch in the industrialisation of cassava in Africa was done.

Reference

FAO (Food and Agriculture Organisation). 1997. FAO Production Yearbook <<http://faostat.fao.org/default.htm>>. Updated October 2007.

Analysis of the status of the ethanol sub-sector in Nigeria

Background

Before 1970, ethanol was generally produced by fermentation of sugar sourced from starch or cellulose, maize, guinea corn, millet and other starchy substrates. During this period, there was no serious business/industrial motive for producing ethanol and as such very little consideration was paid to economics of production, quality assurance/control, and safety considerations to name but a few. By 1972, the Federal Government of Nigeria received a business proposal from Volgelbutsch of Austria to make use of the waste cane molasses from the premier sugar company, Nigerian Sugar Company in Bacita, Kwara State to produce ethanol. In 1973, the Nigerian Yeast and Alcohol Manufacturing PLC (NIYAMCO) was commissioned. This was the first attempt at large scale ethanol production in Nigeria and NIYAMCO's operation depended solely on the availability of cane molasses as a feedstock from the sugar company. Unfortunately, the sugar company collapsed in 1994 seriously affecting NIYAMCO's activities. This meant that an alternative feedstock for ethanol production was needed for the ethanol plant. After some period of experimentation, cassava was found appropriate for the plant because of its availability, higher yield and product quality. Indeed a cost: benefit analysis revealed that it was more profitable to produce ethanol from cassava than from molasses.

Unfortunately, due to poor financial management, NIYAMCO closed down in 1999. Currently, all ethanol used in Nigeria is imported. There are companies importing either sugarcane molasses or crude ethanol for ethanol production in Nigeria.

To date, annual demand for ethanol in Nigeria is estimated at 160 million litres (Figure 1) and this is mainly used for pharmaceutical, industrial and beverage purposes. This is opposed to the annual production of only 10 million litres. This is a phenomenal deficit and it is expected that the demand for ethanol will rise to about 900 million litres per annum. This is because of the current paradigm shift towards the use of ethanol as fuel. Already this is happening in most of the developed countries following the need to comply with the Kyoto Protocol on reduction of greenhouse gases by several countries including Bolivia, Brazil, Canada, China, Nigeria, The Philippines and Thailand.

The main question that the Small Group Meeting discussed during this session is: What strategy should Nigeria use to encourage local production of cassava as a raw material for ethanol production?

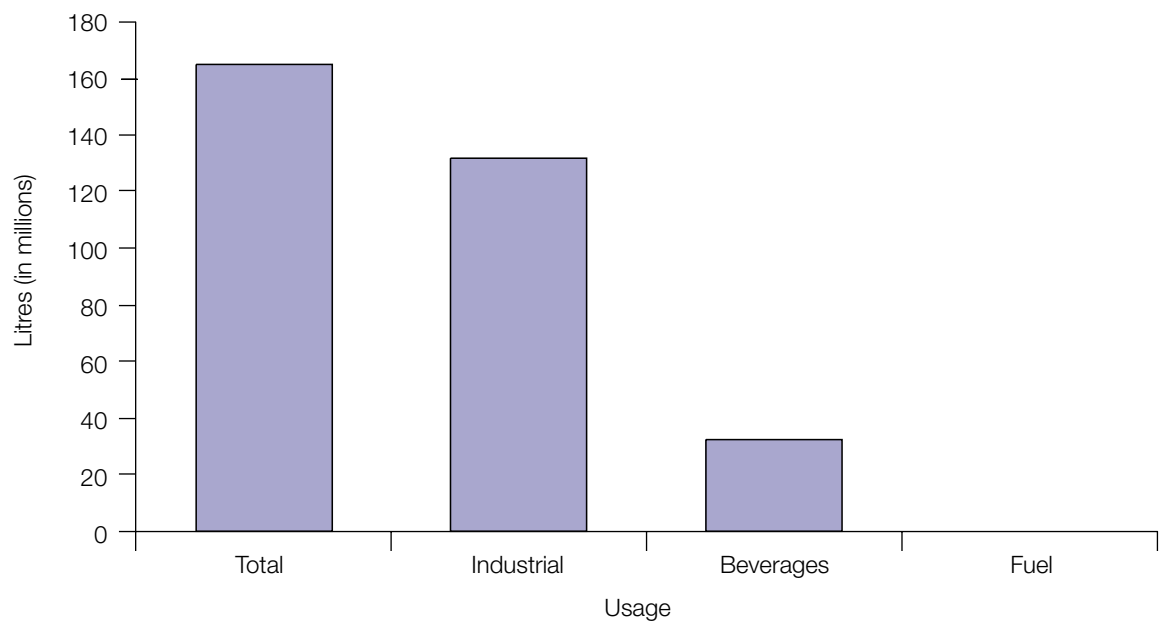


Figure 1. Ethanol demand in Nigeria. (Source: Fed. of Statistics, 2005)

Discussion of issues

Market segments

A huge market for ethanol exists in Nigeria. This has necessitated import of the product mainly because it is cheaper to import rather than produce ethanol locally. This is attributed to the fact that Nigeria cannot as yet produce cassava as efficiently as is the case in Brazil, Nigeria’s major source for imported ethanol.

To stimulate local production of ethanol, the Meeting observed that some incentives are needed such as provision of tax holiday to prospective indigenous investors and a corporate tax waiver. Tariffs and surcharges should also be imposed on imported alternatives to protect local industrialists while at the same time discouraging sourcing ethanol from abroad.

Financing/investment

During the discussions, it emerged that mistrust between financial institutions and lending institutions in Nigeria is rampant; and that the sanctity of financial transactions is in many ways questionable, leading to an environment that has not been attractive to investment. Although several incentives for investment exist in form of government policy frameworks such as tax holiday, pioneer status, capital gain, corporate tax waiver, withholding tax waiver, and reduced duty on agricultural equipment and inputs, all these are not legally binding and have not helped potential investors. The Meeting noted that the government needs to do a lot to put in place a functional legal and financial framework that is favourable to investment.

Feasibility studies/model business plan (in public domain)

While feasibility studies are key to obtaining credit for investments, most such studies carried out in Nigeria so far are considered to be largely theoretical by most lending institutions that hardly honour them on matters related to issuance of credit. Indeed, most lending institutions insist on commissioning their own feasibility studies at a cost borne by the clients. The Meeting noted that most banks have difficulties in understanding the agricultural/economic language used in most business plans. It was recommended that the government should facilitate provision of information on investment profiles in priority areas since at the moment there is a big gap between the prevailing policy statements and the actual policy implementation on the ground. In particular, the government should seek to put in place an infrastructure that would make the country an important investment destination.

Use of by-products associated with producing ethanol from cassava

There are several by-products associated with the production of ethanol from cassava including carbon (IV) oxide (CO_2), unfermentable solids (that is Distillers Dry Grains-DDG), fermentable solids and fusel oils. All these by-products have the potential of being converted into economic use. For instance CO_2 can be used in soft drink manufacture, DDGs and fermentable solids can be converted into livestock feeds and bio-gas while fusel oils can be re-cycled or used in perfumery.

Energy cost

Cheap and regular energy supply was cited as indispensable for industrial growth and ethanol production is no exception. The 'epileptic' energy supply common in Nigeria was identified as not being conducive to industrialisation. In general, energy accounts for 20–25% of the cost of production in Nigeria. To supplement this, generators, coal and sawdust can be used as alternative sources of energy. However, the profitability of these alternative sources was not made very clear in the meeting. Burgesses from sugarcane is also widely used as a source of energy, especially in South Africa and Brazil. In India, cassava peels which constitute about 10% of cassava root biomass is often converted into briquettes and used as a source of energy. The workshop observed that alternatives to ethanol could potentially be used in Nigeria.

Environmental considerations: Planning to implementation

Setting up industrial plants is contingent upon environmental impact assessment (EIA) reports documenting amongst other things waste treatment procedures, residue management and effluent management. In Nigeria the Environmental Protection Agency (EPA) enforces these requirements by issuing permits to establishments that are compliant. In fact, one starch-producing company was closed down for two months

for non-compliance with environmental regulations. Overall, enforcement of environmental regulations is still considered to be weak in Nigeria.

Analysis of the status of the starch sub-sector in Nigeria

Background

Starch is an important raw material for a range of industries including textile, paper, adhesive, cosmetic, pharmaceutical and food. The demand for starch usually increases as countries become more and more developed. For instance about 34 million tonnes of starch was traded worldwide in 1993. Of this maize starch accounted for 77%, while cassava starch was 11%. However, cassava starch has unique characteristics that make it preferable to starch from other crops; it has a low gelatinisation temperature, produces clear thin boiling gels and has good resistance to retro-gradation.

The existence of many small scale starch factories scattered around the country is a business opportunity for transport and warehousing entrepreneurs. It also makes it possible for the development of large scale trading of cassava products, including for export. For a low cost commodity such as cassava, it is only when there is a reservoir of large quantities of product of uniform quality that large scale domestic utilisation or export can be successfully undertaken. To bring this about necessitates coordination between the various stakeholders: industrial users, processors, traders, farmers, credit institutions, transporters and policy makers.

The Nigerian demand for starch has recently been estimated to be around 67,100 tonnes per year. The amount of fresh cassava roots needed to produce that amount of starch is 350,000 tonnes. Out of the five modern large scale cassava starch factories existing in Nigeria, only two are currently in operation. During the Meeting, experience on starch production at Nigeria Starch Mills Ltd (NSM) was showcased. Three key issues were cited as critical in starch production namely:

1. input – good quality raw material for starch production
2. process – machines or equipment needed to address issues of input need to be of the required capacity, otherwise the machines would be idle and therefore unproductive
3. output – market for starch, hence there is need for good quality input as well as reliable and consistent supply.

It would appear that the above requirements are easy to meet since Nigeria is the 'king' for cassava production worldwide. However, the challenge has always been that of converting theoretical advantage into practise. Prior to recommending an appropriate scale for starch production in Nigeria, it is necessary to carry out an in-depth analysis on starch production to determine where the comparative advantage lies. The Meeting explored this based on the issues discussed below.

Discussion of issues

Factory

Starch production has always been large scale especially because of the huge costs involved. This discourages would-be small scale producers from venturing into its production. Typically, small scale production is limited to handling not more than 50 tonnes of fresh roots per day giving rise to 10 tonnes of starch. Ordinarily, under small scale production it is hard to maintain the quality of starch produced and it also becomes uneconomical to sustain production in the long run. Experience from Brazil, for example, indicates that at the minimum production should be on 65 hectares, which should progressively increase to 350 hectares in five years to break even. To encourage emergence of small and medium enterprises (SME) in starch production, there is need to improve on hygiene and explore value adding opportunities.



Figure 2. Large scale cassava farm in Nigeria

The Nigeria Starch Mills (NSM) which processes 250 tonnes of fresh roots per day yielding 50 tonnes of starch per day and 15,000 tonnes per year is certainly a large scale venture. To operate at that level requires premium investment in equipment, some costing as much as US\$ 600,000. The quality of equipment (should be made of stainless steel – for food safety and public health reasons) was emphasised as a very important consideration in starch production.

Land tenure systems

Under the Land Use Decree Act, all land in Nigeria belongs to the State. This has far-reaching implications with respect to rights on land ownership. It is an arrangement that undermines capital investment on land including using of land as collateral for securing credit for investment. Indeed, this was singled out as the cause of lack of respect in honouring contractual agreements. Property rights system in Nigeria is therefore weak and has often forced potential investors to seek extra legal means when entering such contracts. The Meeting observed that there is need to build a robust legal framework (through land reform programmes), which can encourage investors to use land legally and appropriately. Experience of land tenure reform systems in countries such as Kenya, Sierra Leone and Brazil were cited as important showcases from which Nigeria could learn.

Contract farming/outourcing

No solid supply chain structures for raw materials exist in Nigeria and, therefore, any investor needs to have a farm as a buffer for sustainable operations. In addition, contracts are hardly respected. Honouring agreements is problematic in Nigeria and contract farming as a way to ensure supply of raw materials is not feasible. For industrial supply of cassava therefore, it is advisable to target large scale production instead of smallholder production systems.

Finance and raising capital

The Meeting sought to determine what strategy can be used to help access credit facilities, that is what kind of finance is needed for cassava agri-business in Nigeria? Several suggestions were put forth including exploring opportunities for:

- (a) start up firms
- (b) venture capital initiatives
- (c) lease finance options
- (d) development finance options (local and international)
- (e) overseas input credit finance
- (f) buy-back arrangements.

There is a need for the government to intervene in stimulating operationalisation of the above opportunities. For instance multi-national companies such as Nestle and Cadbury have always been willing to invest in starch production provided the government puts in place the necessary infrastructure such as roads, energy and water.

Analysis of the status of cassava food sub-sector in Nigeria

Background

Nigeria imports over one million tonnes of wheat every year. In the 1990s following the depreciation of the value of the naira, the cost of wheat increased substantially driving the cost of production of baked and other confectionary products beyond the purchasing power of the majority of consumers. Wheat users started blending low cost non-wheat flour to bring down their cost of production. The International Institute of Tropical Agriculture (IITA) developed a simple process for producing high quality cassava flour suitable for baking. The flour was successfully tested in bakeries and biscuit factories. Industrial users of cassava flour typically need large amounts of cassava flour of consistent quality to meet all their needs. Quality specifications for high quality cassava flour are indicated in Table 1. Emphasis on quality control and regularity of the supply cannot be over-stated.

Table 1. Specifications for high quality cassava flour

Parameter	Requirement
Moisture	10%–12%
pH	5.0–7.0
Colour	White
Odour	None
Taste	Bland or sweet
Sand and other extraneous matter	Absent
Cyanide (maximum)	10mg/kg
Dimensions	Finely milled

A 20% substitution of the national demand for wheat flour with cassava flour would require 240,000 tonnes of high quality cassava flour (assuming the national demand for wheat flour is estimated at 1.2 million tonnes). Since one tonne of cassava flour is obtained from four tonnes of fresh cassava roots, the amount of roots necessary for the substitution is about one million tonnes. Because cassava production is primarily done on small farms scattered around the country, cassava processing should be done as near the farm as possible to avoid transporting cassava roots over long distances. Also because of the difficulties of assembling large amounts of cassava roots, processing should be done on a small scale of less than 10 tonnes per day. This implies setting up some 400 cassava flour processing factories.

The prospect for high quality cassava flour (HQCF) production in Nigeria was discussed during the Small Group Meeting based on a case study from Benue where the concept of using a mobile cassava processing unit was showcased highlighting the following:

- (a) the importance of inter-generational continuity in industrial innovation and entrepreneurship citing various family examples from Brazil and Okeke family
- (b) cooperative approach to cassava business
- (c) potential for modifying starch through R&D efforts, for example production of glucose syrup from starch
- (d) a socio-cultural commitment to promotion of use of *gari* (based on the use of cola nut as an example)
- (e) the issue of quality standards – there is need to uphold this through endeavours such as ISO standardisation, and compliance with National Agency for Food and Drug Administration and Control (NAFDAC) and Codex guidelines.

A number of challenges were pointed out as still hampering production of HQCF in Nigeria including the following.

- (a) The critical need for machinery/equipment since local fabricators may not come up with the right equipment given the technical challenges/considerations they have to grapple with such as hydraulic press, pelletiser and peeler.
- (b) The critical need to exploit use of cassava by-products, for example manufacture of high fibre products for diabetics, soy-fortification, glue production, etc.



(a) Peeler



(b) Pelletiser



(c) Hydraulic press



(d) Flash dryers

Figure 3 (a, b, c and d). Some machinery used in processing cassava roots to a range of cassava products.

Discussion of issues

Production and processing of HQCF

Demand for HQCF for use by food industry offers enormous potential for small scale producers of cassava flour. The challenge, however, is the emerging urbanisation and quality issues that go with the production of HQCF. The Meeting observed that it is critical for equipment made from stainless steel to be routinely used in the production of HQCF to meet NAFDAC and HACCP requirements. Unfortunately, this did not appear quite feasible at micro processing (1 tonne) and small scale processing (5 tonnes) level, owing to the high investment costs. Apparently the door is closing rather rapidly to have everybody comply with NAFDAC and HACCP requirements. However, it was noted that IITA has a post harvest specialist currently working on the issues of quality standards and NAFDAC standards. These efforts partly seek to raise awareness and encourage small scale *gari* producers to organise themselves into cooperatives.



Figure 4. Products made from high quality cassava flour

The Meeting observed that regulations are currently quite stringent in Nigeria, yet regulatory agencies should be facilitators for regulatory compliance and not barriers to the development of the industry. As a matter of fact, the cost of regulatory compliance in Nigeria was cited as being prohibitive. It is time this was brought to government attention so that modalities for implementation of regulations could be worked out.

One way of meeting NAFDAC requirements is perhaps through setting up of micro-processing centres. In addition the following could also be explored:

- (a) fryers must of necessity use stainless steel for food safety and public health reasons
- (b) peeling: this is an issue that requires technical ingenuity. The no peeling approach would only work best in the case of white skinned tubers
- (c) frying process: some concerns were raised on the source of energy for frying in the light of emerging environmental concerns. It was observed that there was a critical need to explore alternative energy sources other than the use of firewood. Use of gas was considered to be too expensive. A suggestion was made that cassava waste can be converted into biogas which can then be used for frying
- (d) other suggestions included promotion of afforestation by first growing tissue culture trees and use of diesel fires.

Enterprise development in producing HQCF: Challenges and recommendations

It was suggested that to stimulate enterprise development, the following should be done.

- (a) Women associations should be encouraged, a case in point being the Agip spearheaded initiative.
- (b) The training of trainers approach should be encouraged.
- (c) Basic entrepreneurship scheme such as book keeping and structured management of SMEs should be promoted.
- (d) Large scale enterprises should be helped with marketing intelligence/survey.
- (e) The informal sector should be strengthened.
- (f) Formation of cooperatives for *gari* marketing should be encouraged.

Analysis of the status of cassava-based livestock feed sub-sector in Nigeria

Background

Cassava is widely used in the livestock feed industry. The European Union imports three to four million tonnes of dry cassava chips/pellets for use in livestock feeds annually. Usually a mixture of 80% dry cassava root chips and 20% soybean meal is made and is used as a substitute for barley, the most common grain used in livestock feeding in Europe. Likewise, cassava could be used in livestock feeds in Nigeria.

Substitution of maize with cassava in feed rations has been made using linear programming to minimise the cost of feed rations. Savings of up to 10% in feed cost could be obtained for poultry feed and about 20% for pig feed (Tables 2 and 3).

Table 2. Maize and cassava-based feed formulations for poultry (chicks, starters) by least cost linear programming

Ingredients	Maize	Cassava Level 1	Cassava Level 2
Maize	40.5	33.0	–
Cassava flour	–	10.0	45.0
Cassava leaves	–	–	10.3
Soybean meal	20.0	–	–
Toasted soybeans	–	20.0	27.0
Groundnut cake	6.0	10.0	–
Corn offal	17.0	11.0	7.0
Wheat offal	6.8	6.3	–
Fish meal	4.0	4.0	5.0
Other	5.7	5.7	5.7
Cost (N/tonne)	34,908.5	34,493.5	31,457.5
Cost reduction (%)		1.2	9.9

It has been estimated that, currently, the livestock feed industry uses 1.2 million tonnes of maize. As calculated for the cassava flour demand, substituting 20% of the maize used by the livestock feed industry with cassava would require the setting up of about 400 cassava chips making factories processing about 10 tonnes of cassava roots per day.

A presentation on the current status of the livestock feed sub-sector and potential for use of cassava as a raw material was made during the Small Group Meeting where it

Table 3. Maize and cassava-based formulations for pigs’ feed supplements (by least cost linear programming)

Ingredients	Maize	Cassava Level 1	Cassava Level 2	Cassava Level 3	Cassava Level 4
Maize	30.0	–	–	20.0	–
Maize bran	–	–	–	10.0	10.0
Cassava flour	–	35.0	–	20.0	35.0
Cassava peels	–	–	40.0	10.0	10.0
Cassava leaves	–	–	–	–	–
Palm kernel cake	43.0	38.0	13.0	13.0	10.0
Palm oil	–	–	10.0	–	–
Wheat offal	–	–	24.0	14.0	17.0
Wheat bran	14.0	14.0	–	–	–
Others	13.0	13.0	13.0	13.0	13.0
Cost (N/tonne)	19,795.0	18,895.0	18,395.0	16,765.0	15,995.0
Cost reduction (%)		4.5	7.0	15.3	19.2

emerged that most of the livestock in Nigeria is traditionally managed except a small proportion of poultry (with an estimated 13% being intensively managed and consuming 91% of total livestock feed produced in the country).

Discussion of issues

Use of cassava by-products in animal feed

Potential exists for using a range of cassava by-products such as leaves and peelings in the production of livestock feed although this has not been fully exploited. Since cassava residue could become a menace, there is need to explore ways for residue management such as depositing residues in pits to trigger anaerobic fermentation in the wet season then allowing for the stuff to be dried and ground for use as livestock feed especially for ruminants such as sheep and goats. Such wastes could also be useful in fattening of cattle that typically trek long distances to the slaughter-house wasting away in the process. If such wastes can be sourced from protein rich cassava varieties, then it can be very advantageous.

Scale of operations

It was proposed that there was a need to develop a system that enables immediate payment after delivery of cassava chips, possibly through middlemen as a marketing intervention. It was also observed that cassava grits are farm gate friendly, but are more energy intensive and may be costly for large scale operations.

The question of drying costs was noted as important in the production of livestock feed. Several options for drying were cited including:

- (a) use of concrete floors like is the case in Thailand but this could also require warehousing facilities which are costly to set up
- (b) use of wooden trays, although this is not a feasible option
- (c) pelletising approaches, but only if the necessary machinery can be made available. Pelletisers are costly – costing from US\$ 5,200 to US\$700,000 in China depending on capacity. Fabrication of local pelletisers did not give rise to quality products as some of these degenerate into flour during packaging
- (d) production of cassava chips/chunks for sun drying.

Formulation of livestock feed based on cassava with other enrichment ingredients such as maize was also proposed. However, this needs to be based on least cost formulation approach.

It was observed that an interplay of factors would generally be the ultimate determinant of price.

As recommendations, it was proposed that:

- (a) there is need for sensitisation on the utility of some feed products in the market
- (b) use of cassava-whole plant silage technology should be explored as an opportunity for possible exploitation at small scale feed production level
- (c) there is need of bringing processors and farmers together through existing or new organisations as useful in supply chain management
- (d) there is need for enhanced coordination of cassava industrialisation initiatives in the country. A meeting towards this end was planned for January 2006 in Abuja
- (e) as an R&D issue, focus should be placed on use of par boiled cassava to be dried and cut into chips.

Analysis of potential for large scale production of cassava in Nigeria

Background

Two presentations were made highlighting the following:

- (a) optimum agro-ecological zone for cassava production in Nigeria is the savannah zone
- (b) weed management is critical during large scale cassava production and is the major farm operation that takes most man-days
- (c) careful choices need to be made regarding farm machinery taking into consideration the practical realities on the ground. Mechanisation of cassava farm operations was considered critical because of the following reasons:
 - the cost of labour has increased four times in real terms in Nigeria during the last 15 years making the cost of cassava production very high
 - very few people nowadays want their families including children to provide labour on the farms. Indeed the youths are no longer interested in farming unless this is demonstrated to be profitable through the use of mechanised farm operations
 - agricultural farm labour attracts the lowest wage rate in Nigeria estimated at 500N. However oil companies in the Niger Delta pay 3500N as daily wages.

Discussion of issues

Mechanisation of cassava production operations

In response to the presentations, discussions were held targeted at addressing the following questions.

- (a) What technologies are out there for the farmers?
- (b) What machinery can be accessed to help small scale farmers?

In response to the questions above, it emerged that some machinery were developed at IITA such as prototype manual lifters/harvesters with potential for commercialisation for the benefit of cassava farmers. However, they may not be needed by the typical small scale farmers. A practical approach is to have some of these machines rented through a service provision scheme for better return on investment by service providers. Several success stories on service provision exist, for instance use of stem-cutters from Malaysia that can be easily fabricated and adapted for local conditions in Nigeria. However, this has to be done with full respect to intellectual property rights, for instance through joint-venture initiatives that can lead to producing such equipment locally.

It was noted that, although service provision is a viable option, it can also be constrained by several factors such as the ones listed below.

- (a) Lack of proper land preparation, that is stumping or removal of stones.
- (b) Planting of cassava in non-linear rows that is not compatible with mechanised farm operations.

The recent private sector-led effort aiming at facilitating acquisition of machinery through higher purchase scheme (30% down payment) is a step in the right direction. In addition it was proposed that there is need for public-private sector cooperation with regard to service provision with the public taking the role of providing subsidy on cost of machinery. This is already happening. The workshop recommended that R&D is needed for development of efficient harvesters.

It was recognised that the use of fertiliser and other farm inputs is critical for cassava production, which should be private sector driven. There is also a need for quality control and regulatory compliance issues. Towards this end, the workshop was informed of the forthcoming summit on fertiliser input provision, facilitated by International Fertilizer Development Centre (IFDC), the Rockefeller Foundation (RF) and United States Agency for International Development (USAID) to be held in Abuja, Nigeria in June 2006. The Meeting was also informed that two Canadian firms have expressed interest in establishing factories in River State for production of fertiliser locally.

Policy options and potential for entrepreneurship in cassava production and industrialisation in Nigeria

Background

A review of the evolution of agricultural policy in Nigeria since 1961 including the recent pro-poor policy shift associated with the Obasanjo administration was made during the Small Group Meeting. It was pointed out that currently, most government policies are designed to stimulate private sector development for example:

- (a) the micro-economic policy is primarily targeting monetary issues and seeks to among other things ensure low interest rates thereby helping stabilise interest rate fluctuations
- (b) the agricultural policy is focused on poverty reduction and seeks to give farmers effective protection in line with the provisions of international conventions and agreements
- (c) the infrastructure policy which provides guidelines in the transport sector, telecommunication, energy etc, endeavours to improve infrastructure in the rural areas
- (d) manufacturing policies have elements geared to providing incentives for investment in manufacturing.

Other important government policy initiatives comprise:

- (a) National Economic Empowerment and Development Strategy
- (b) Presidential initiative on cassava led by the Federal Ministry of Commerce

Discussion of issues

During the discussions that followed, several proposals were made including:

- the need for public participation/input in policy formulation through lobbying and creation of champions.
- the existing agricultural policy framework need not necessarily be tied to the Obasanjo administration since although things may look rosy cosmetically, in practice there is often very low response from government to help farmers. Indeed, there are a host of contradictory issues in many policies of government
- a suggestion that a private sector-led policy formulation effort is likely to work best. This is the way things worked for Brazil with respect to development of the starch industry
- the need to address marketing adequately since the market always drives the industry especially in the globalised economy.

Summary and recommendations

The following are the recommendations from the Expert Group Meeting.

1. There is a critical need for formulating a strategy to guide the industrialisation of cassava in Africa. The strategy should:
 - (a) be geared towards the goals of reducing cassava production costs and increasing the output of high quality industrial products to strengthen the continent's position in an increasingly competitive world
 - (b) guide the formulation of policies and implementation of activities designed to assist the various actors in the cassava value chain. It should tackle the problems of an emerging cassava industrial sector and adopt practical solutions that will lead to the set goals
 - (c) address the potential demand for industrial products without jeopardising the availability of traditional food products from cassava, encouraging each country to develop its industry according to its available resources and market opportunities within a global competitive framework, and support private sector investments in vertically integrated agri-business ventures involving large scale farms and agro-industries to meet the expanded demand for domestic, regional and international markets
 - (d) establish a legal framework that will facilitate the acquisition and use of land for large scale farming, and the setting up of funding facilities and financial incentives for cassava enterprises development, backed by enabling and widely publicised legislation with streamlined implementation procedures
 - (e) advocate the strengthening of mechanisms for facilitating access to proprietary and public domain technological innovations and proven technologies for efficient cassava production, processing and utilisation through enhanced R&D capacity, innovative intellectual property rights negotiations and effective public/private partnerships
 - (f) target improving market access opportunities through the development of sustainable market information systems, provision of adequate market infrastructure and removal of domestic, regional and international trade barriers. This will be achieved by supporting legal frameworks that encourage the growth of a vibrant and competitive cassava-based industry in Africa.
 - (g) give due regard to environmental protection, waste management and by-product utilisation while taking steps to improve the competitiveness of African industries in the context of global competition.
2. The strengthening of infrastructure (for example energy, water, roads and communications) in the areas of greatest industrial potential for cassava so as to improve the competitiveness of emerging cassava-based industries and to attract industrial investors, both local and foreign, into this sector.
3. The strengthening of manpower development institutions and capacity building programmes are needed to enhance expertise in enterprise management and provide various skills required for the development of cassava-based agro-industries.

The Expert Group recommended that a comprehensive strategy document based on the above elements be expeditiously formulated under coordination by the convening institutions.

List of participants

Adesugba, Adesoji

Deputy Director, Nigerian Investment Promotion Commission
Plot 1181, Aguiyi Ironsi Street
Maitama District
PMB 381, Garki
Abuja, Nigeria
Tel: +234 0803 378 72722
Email: adesugba@yahoo.com
Website: www.nipc-nigeria.org

Akele, Stanley

Head, Green River Project
NAOC Ltd
Tkwerre Road Mile 4
Port Harcourt Rivers State
Nigeria
Tel: +234 84 236400/19 Ext. 3562
Email: Stanley-akele@naoc.agip.it

Ali, Zainab

Special Assistant to the Executive Director, The African Agricultural Technology Foundation
PO Box 30709 – 00100 GPO
Nairobi, Kenya
Tel: +254 (20) 4223700; Cell: +254 (0)733 750040
Fax: +254 (20) 422 3701
Email: zali@aatf-africa.org
Website: www.aatf-africa.org

Anga, Boma

Chairman, Cassava Agro Industries Services Ltd
Cassava House, No 32, 351 Rd Gwarinpa
23409, Abuja, FCT
Nigeria
Tel: +234 9 2224046; D/L 6730487; Cell: +234 803 3031097
Fax: +2349 2224046
Email: b.anga@cgiar.org; bomanga@yahoo.com; boms@cassavaagroindustries.com
Website: www.cassavaagroindustries.com

Bamikole, Olaoluwa Toyin

Ethanol Consultant, ETHANOL
55 Ibrahim Taiwo Road
PO Box 4262
Ilorin, Kwara State
Nigeria
Tel: +234 0803 3237322; Cell: +234 08054517628
Email: bamikole_toyin@yahoo.com

Blade, Stanford

Director, International Institute of Tropical Agriculture
PMB 5320, Ibadan
Nigeria
Tel: +234 2 241 2626
Fax: +234 2 241 2221
Email: s.blade@cgiar.org
Website: www.iita.org

Bokanga, Mpoko

Executive Director, The African Agricultural Technology Foundation
PO Box 30709 – 00100 GPO
Nairobi, Kenya
Tel: +254 (20) 4223700; Cell: +254 (0)735 99 22 00
Fax: +254 (20) 422 3701
Email: mbokanga@aatf-africa.org
Website: www.aatf-africa.org

Dixon, Alfred

Cassava Breeder, International Institute of Tropical Agriculture
MB 5320, Ibadan
Nigeria
Tel: +234 2 241 2626
Fax: +234 2 241 2221
Email: a.dixon@cgiar.org
Website: www.iita.org

Ezedinma, C

Agricultural Economist, International Institute of Tropical Agriculture
PMB 5320
Ibadan, Nigeria
Tel: +234 (02) 241 2626
Fax: +234 241 2221
Email: cezedinma@cgiar.org
Website: www.iita.org; www.cassavabiz.org

Gorthy, Ram P.

CEO, Nigerian Starch Mills Limited
Ethiophe House, PO Box 1, Ihiala
Anambra State, Nigeria
Tel: +234 0803 535 2162
Email: gorthy@nsmlimited.com; nsm@nsmlimited.com
Website: www.nsmlimited.com

Ilona, Paul

International Trials Manager, International Institute of Tropical Agriculture
PMB 5320 Ibadan
Nigeria
Tel: +234 (02) 241 2626; Cell: +234 (0) 803 3 771877
Fax: +234 (02) 241 2221
Email: p.ilona@cgiar.org
Website: www.iita.org

Nang'ayo, Francis

Regulatory Matters Specialist, The African Agricultural Technology Foundation
PO Box 30709 – 00100 GPO
Nairobi, Kenya
Tel: +254 (20) 4223740; Cell +254 (0)735 992203
Fax: +254 (20) 422 3701
Email: f.nangayo@aatf-africa.org
Website: www.aatf-africa.org

Odebisi, Ayo

Consultant, Godilogo Farms Ltd
PO Box 591, Festac, Lagos
Obudu, Cross River State
Nigeria
Tel: +234 803 7877140
Email: Ayoodebisi@aol.com

Okeke, Chris

Director, Nigerian Starch Mills Ltd
NAL Towers, 2nd floor
20 Marina, Lagos
Nigeria
Tel: +234 1 2630586; +234 0803 4044485
Fax: +234 1 2635585
Email: chrisokeke@aol.com

Olobashola, Jimoh Joseph

International Institute of Tropical Agriculture
PMB 5320
Ibadan, Oyo
Nigeria
Tel: +234 803 4456248
Fax: +234 42 22221
Email: j.olobashola@cgiar.org
Website: www.iita.org

Omany, Gospel

Projects Manager, The African Agricultural Technology Foundation
PO Box 30709 – 00100 GPO
Nairobi, Kenya
Tel: +254 (20) 4223700; Cell: +254 (0)735 992204
Fax: +254 (20) 422 3701
Email: g.omanya@aatf-africa.org
Website: www.aatf-africa.org

Omosaiye, Olu

Consultant, UNIDO
25, Lugard Avenue, Ikoyi, Lagos
PO Box 2235, Surulere, Lagos
Nigeria
Tel: +234 (0) 2692707; +234 (0)803 307 8636 (cell)
Fax: +234 (0) 1 2692707
Email: olu.omosaiye@undp.org

Patino, Marco

Agro Enterprise Specialist, International Institute of Tropical Agriculture
PMB 5320 Oyo Road
Ibadan, Nigeria
Tel: +234 803 384 02268
Fax: +234 2 241 2221
Email: m.t.patino@cgiar.org
Website: www.iita.org

Sanni, Lateef

Post Harvest Scientist, International Institute of Tropical Agriculture
PMB 5320 Oyo Road
Ibadan, Nigeria
Tel: +234 803 384 02268; +234 0803 3469882
Fax: +234 2 241 2221
Email: l.sanni@cgiar.org; lateef-2@yahoo.com
Website: www.iita.org; www.cassavabiz.org

Tewe, Olumide

Teaching/Research, Animal Science, University of Ibadan
Department of Animal Science
Ibadan, Oyo State, Nigeria
Tel: +234 (0)803 382 4167
Fax: N/A
Email: tew264@yahoo.com



AFRICAN AGRICULTURAL TECHNOLOGY FOUNDATION
FONDATION AFRICAINE POUR LES TECHNOLOGIES AGRICOLES

PO Box 30709-00100, Nairobi, Kenya
Tel: +254 20 422 3700, Fax: +254 20 422 3701
Via USA – Tel: 1 650 833 6660, Fax: 1 650 833 6661
Email: aatf@aatf-africa.org
Website: www.aatf-africa.org