CROP POST HARVEST PROGRAMME

Identification of an Approach to the Commercialisation of Cassava Fufu Processing in West Africa that Maximises Benefits to Sustainable Rural Livelihoods

R7495

PROJECT FINAL REPORT

(1 November 1999 – 31 March 2003)

Core Partners: Natural Resources Institute, United Kingdom;
University of Agriculture, Abeokuta, Nigeria

Managing Partner: Andrew Westby

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Project Final Report

Section A Executive Summary

Data from the livelihoods survey has provided understanding of the relative importance of the production of wet paste *fufu* and ready-to-eat *fufu* to local livelihoods in five locations, both urban and rural. Wet paste processing takes place on a larger scale than the production of the ready-to-eat fufu, provides higher incomes for processing families, and is closely tied to urban markets. The relationship between method and scale of processing and access to resources was analysed. Access to water, economic and social capital and credit is particularly critical. In only one location was the purchase and renting of technology to facilitate *fufu* processing common practice. Sharing of information by researchers during data collection and subsequent discussions with processors led to the construction of improved water tanks in one location. A thorough review of the pilot level research and the baseline livelihoods/ marketing information has led to the following conclusions. The project will focus efforts on locations that produce wet paste. Low-tech, low cost improvements to processing such as the construction of water tanks and the use of "double fermentation" will be promoted at Ereji as a test case. Capital intensive technical interventions aimed at commercialising *fufu* (e.g. the development of a new dried product), if found to be technically and economically feasible, should be focused on processors at Ode Remo in the first instance.

Two *fufu* driers were designed and built by local fabricators. One of the drier uses electricity, charcoal or gas while the other smaller unit uses only charcoal. The working operations and drying conditions and efficiencies of the driers have been investigated to establish the optimum drying conditions. Smoke, oven and rotary drying methods were also evaluated and was found that rotary dried *fufu* was the most preferred in sensory evaluation studies. Rotary dried *fufu* was recommended for further studies in terms of storage stability and economics of production.

A processing technology has been developed for village level production of dried *fufu* flour using a simple drier that can operate in areas with or without electricity. The drier can be operated with wood or charcoal while a large capacity model is also available that can be operated with electricity. The project team have interacted with local *fufu* producers in many towns across Ogun, Lagos and Oyo states with open demonstrations of our improved *fufu* technology.

Dried products have been subjected to sensory and consumer evaluation exercises in three cities using 300 consumers. Dried *fufu* was preferred in two of the three locations to traditional *fufu,* but in all sites a modified wet *fufu* product was most acceptable.

As agreed by CPHP management, this project is providing co-financing to a slightly broader EC funded project that will build up on extend the outputs of the current project. As part of this new relationship, work has been initiated on the processing of another cassava product related to fufu, tapioca. Preliminary studies have indicated that there is little effect of variety on product quality, but roasting method does have a significant effect.

An on-going issue that has been incorporated into the CASSAVA-SMES project is the definition of how cassava processing could be commercialised to give the maximum benefits to sustainable rural livelihoods. The project has generated significant amounts of baseline data to enable this and a draft framework for analysis is being constructed. The ability to bring in project data from Ghana and the greater amount of time testing technologies beyond pilot scale will allow a much better product to be prepared.

A number of dissemination outputs (including a fufu video) have been prepared. More will be prepared as part of the CASSAVA-SMEs project.

Section B Background

B.1 Administrative data

NRIL Contract Number:	Managing Partner(s)/Institution(s): Andrew Westby Natural Resources Institute
DFID Contract Number: R7495	Partner institution(s) University of Agriculture, Abeokuta, Nigeria
Project Title: Identification of an Approach to the Commercialisation of Cassava Fufu Processing in West Africa that Maximises Benefits to Sustainable Rural Livelihoods	Target Institution(s)
Research Programme: Crop Post-Harvest	Start Date: 1 November 1999 End Date: 31 March 2003
Thematic area: Forest-Agriculture Interface	Budget (i.e. Total Cost): £231,394

Section C Identification and design stage

Poverty focus

How did the project aim to contribute to poverty reduction?

The project aimed to maximise economic returns to smallholder farmers through the development and validation of appropriate fufu processing and marketing systems that enable them to access urban markets. .

Was it enabling, inclusive or focussed (see definitions below[1])?

The project could largely be described as being **focussed** since it addressed an issue what mainly affected smallholder, poor, farmers. Cassava is largely a poor farmer crop and it is for this reason that we considered it to be focussed research.

What aspects of poverty were targeted, and for which groups?

The aspect of poverty targeted was the issue of limited financial returns from agricultural production. The aim was to develop for small holder farmers a means of adding value to their through the introduction of appropriate processing and marketing systems.

Please describe the importance of the livelihood constraint(s) that the project sought to address and specify how and why this was identified.

The demand for the type of research in this project had been articulated in Nigeria. In 1996 the Government of Nigeria set up a Vision 2010 Committee to develop long-term plans for national development. The science/agriculture sub-committee of this group recommended the need for the development of small and medium scale enterprises (SMEs) in food and agro-allied sectors.

The Ogun State Agricultural Development Committee's report of 1997 emphasized the need to commercialise traditional food processing technologies as a mean of developing the rural areas of the country. Additionally the Family Economic Advancement Programme [FEAP] of the Presidency has identified the need for research and other efforts to commercialise traditional food technologies.

At the start of the project a regional consultation for the Global Cassava Development Strategy, the Nigerian representatives ranked the commercialisation of traditional cassava products as the most important market opportunity that Nigeria should address. This was ahead of the development of high quality cassava flour, starch or as a raw material for animal feed. The Ghanaian representatives made a similar recommendation.

In summary the main livelihood constraint was the need to expand demand for cassava production as a means of maintaining and enhacing family incomes. The major

[1] **Enabling**: addresses an issue that under-pins pro-poor economic growth or other policies for poverty reduction which leads to social, environmental and economic benefits for poor people
Inclusive: addresses an issue that affects both rich and poor, but from which the poor will benefit equally
Focussed: addresses an issue that directly affects the rights, interests and needs of poor people primarily

approach to this was to understand as part of the project activities the livelihood constraints and to implement research that would enhance livelihoods.

How and to what extent did the project understand and work with different groups of end users? Describe the design for adoption of project outputs by the user partners?

The project worked with a number of different end users in different locations. These are detailed in the project activities.

Institutional design
Describe the process of forming the coalition partnership from the design stage and its evolution during the project?

This was a new collaboration built upon the initial supervision of a PhD student (lateef Sanni). The project partners recognised the importance of this institutional collaboration and have used this a building block to develop other collaborative research proposals, such as the EC funded "CASSAVA-SMES" project which is a project to which this project provides co-financing.

There were no significant changes in the project team during project implementation.

Is there an explicit institutional hypothesis? If yes, is it trying to attack a failure or inadequacy in a mechanism?

The project pre-dates the national innovation systems approach championed by the CPHP.

What other institutional factors were seen as being important?

A strong collaborative relationship was developed between UNAAB and NRI and this has been successfully developed in a proposal to European Commission that builds upon the outputs of the current project.

Section D Implementation process

How was participation maintained among the different stakeholders (the Managing Partner(s) and the Core other Partners and, where relevant, user communities) in the research process?

The major core partners in the research remained unchanged. The partnership was however expanded and taken across country as part of the development of the EC funded CASSAVA-SMES project. .

The partnership was maintained contractually between the "managing partner", NRI and the "sub-contractors" or other core partners. Contracting for the parallel EC project was done according to European Commission rules where each partner signs the main contact.

What were the major changes that took place during the implementation period. For each one, explain why they came about and how well did the project manage them?

The major

What were the strengths and weaknesses of your monitoring system? How did you use the Information provided by your monitoring system?

We did not have an internal project monitoring system in place – other than the logframe.

What organisations were involved at the end of the project? Were there changes to the coalition (joining/leaving) during the project? If yes, why?

The organisations involved at the end of the project were:

Natural Resources Institute
University of Agriculture, Abeokuta

The partnership in the project was however expanded by linking with project R7580 in Ghana and applying for additional funds from the European Commission for a project entitled "Development of the small and medium scale enterprise sector producing cassava based products to meet emerging urban demand in West Africa" with the acronym CASSAVA-SMES. The final partnership of these initiatives in a formal contractual sense were:

- Natural Resources Institute
- University of Agriculture, Abeokuta, Nigeria
- Food and Flour (Ghana) Limited

- Food Research Institute
- University of Ghana.

Include a complete list of organisations involved, directly or indirectly, in the project and describe their relationships and contributions.

Organisation	Relationship	Contribution
Natural Resources Institute	Project leader	Project management and coordination, Project technical and economic inputs.
University of Agriculture, Abeokuta, Nigeria	Sub-contracted partner	Provision of technical and social science inputs.
Food and Flour (Ghana) Limited	Co-contractor to CASSAVA-SMES project	Inputs to CASSAVA-SMES project
Food Research Institute	Co-contractor to CASSAVA-SMES project	Inputs to CASSAVA-SMES project
University of Ghana.	Co-contractor to CASSAVA-SMES project	Inputs to CASSAVA-SMES project

How will(have) project outputs affect(ed) the institutional setting?
How will the technical outputs of the project (if successful and if adopted) change the organisations and the relationships between them and in what way? Refer to the project's technical hypothesis.

The project outputs were not specifically designed to change the institutional setting at all. All of the outputs were technical in nature. The technical hypothesis of the project was: that livelihood of poor people could be enhanced through interventions in the fufu marketing chain.

Institutional side effects of the project are:

- UNAAB have developed their own pilot plant facility and now produce dried fufu on a commercial basis.
- Project teams in Ghana and Nigeria have been linked as a consequence of this proposal.
- Staff capabilities at UNAAB have been enhanced as a consequence of the project.
- NRI and UNAAB have a strong and on-going collaborative relationships.

Section E Research Activities

This section should include a description of all the research activities (research studies, surveys etc.) conducted to achieve the outputs of the project analysed against the milestones set for the implementation period.

Information on any facilities, expertise and special resources used to implement the project should also be included.

Introduction

The project was designed to deliver four outputs. These were:

1. Analysis of the contribution of traditional cassava processing to rural livelihoods.
2. Validation of the options to improve *fufu* processing and commercialise it.
3. Definition of how cassava processing could be commercialised to give the maximum benefits to sustainable rural livelihoods.
4. Confirmation of uptake pathways for project outputs and dissemination of project outputs.

This report on activities is designed around these outputs.

Summary of research findings and project activities

Analysis of the contribution of traditional cassava processing to rural livelihoods.

Selection of study areas and gathering of baseline data.

Although this work was started with only fufu it was later, as part of the EC project extended to include tapioca.

The first phase, based on fufu and funded by the CPHP, focused primarily in five study locations (Ode Remo, Ereji, Ilaro, Soso and Ilewo Orile) in southwest Nigeria. Each location was selected after an extensive scoping visit to 23 *fufu* processing sites. Considerable effort was placed on the selection of study sites to enable data to be obtained from a range of locations with differing resource bases and varying dependence on the processing of *fufu* and other cassava products.

A preliminary exercise carried out in conjunction with villagers was the creation of a map of each location, highlighting key resource points (water sources, shops, health centres etc.) as well as the location of the households of processors of *fufu* and other cassava products. After initiating dialogue with villagers and explaining the aims of the study, arrangements were made for researchers to stay in the five locations for two, two-week periods (one in the dry season and one in the rainy season). Researchers were tasked with collecting in-depth information on up to 30 family units.

In Ode Remo, Ereji, Soso and Ilewo Orile all active *fufu* processors were included in the study. However in Ilaro, which is more urban than all the other locations, one of the *fufu* processing sites with the best access to Lagos (via Ifo market) was selected (Odo

Oshun). At this processing site, data were collected from 15 randomly selected processors out of the 35 found on the site. Interviews were carried out using household level interview guides. The data collected included background information on access to resources and general livelihood activities and detailed information on cassava processing activities, particularly the production of *fufu*. Wherever possible, information was collected on the relationships between cassava processing and the five 'capital assets' (defined by Carney 1998 in the Sustainable Livelihoods framework as human, social, physical, financial and natural assets), which structures and processes influence livelihood activities and the potential for livelihood diversification.

To build trust with respondents, glean further information and confirm some of the of the more formal interviews, researchers spent considerable periods of time carrying out participant observation, which involved visiting *fufu* processors and their families at their processing sites, their homes and farms. After the initial analysis of findings, a small-scale validation exercise was carried out in the three locations producing wet paste *fufu* which were emerging as the main focus of the project: Ereji, Ode Remo and Ilaro. Focus group discussions were held with a random sample of *fufu* processors. Researchers also used this opportunity to feed-back the overall findings of the project to date and potential future activities.

The current livelihood activities pursued by both men and women to generate income in the five study locations were determined (Table 1)

Table 1. Key livelihood activities for income generation. Responses have been dis-aggregated by gender in each study location

Gender	Ereji	Ode Remo	Ilaro	Ilewo Orile	Soso
Men	Farming Hiring out labour Hunting	Farming Cassava processing (*fufu*) Sale of water Hiring out labour (farming) Civil service work Petty trading Artisan-ship	Farming Civil service work Teaching Artisan-ship Large-scale trading Petty trading Transport sector employment Hiring out labour	Farming Teaching Artisan-ship	Farming Hunting Hiring out labour
Women	Farming Cassava processing (*fufu*) Collection/ sale of firewood Petty trading Hiring out labour (farming, *fufu* and *gari* processing)	Farming Cassava processing (*fufu* and *gari*) Home gardening Hiring out labour (cassava processing) Petty trading	Farming Civil service work Teaching Artisan-ship Petty trading Cassava processing (*fufu* and *gari*) Hiring out labour	Farming Teaching Cassava processing (*lafun, gari* and ready –to-eat *fufu*) Petty trading	Farming Cassava processing (ready-to-eat *fufu*) Hiring out labour

A number of factors were found to influence the choice of livelihood activities as well as the potential of residents to diversify their livelihood choices in all locations (Table 2). Wet paste processors operate on a range of scales (Table 3).

Table 2. *Relative importance of factors affecting livelihood activities.*

Factor	Ereji	Ode Remo	Ilaro	Ilewo Orile	Soso
Access to land	Vital for the key activities of farming and *fufu* processing.	Important for farming , ownership of water supplies and *fufu* processing sites.	Not important- range of off-farm livelihood activities available.	Important for key activity – farming.	Important for key activity – farming, especially production of kola nuts.
Access to labour	No problems in labour availability.	No problems in labour availability, though cost of casual labourers highly competitive.	Problems in labour availability for some activities due to range of employment opportunities.	Few labour constraints.	Few labour constraints.
Access to water	Critical. Water supply is limited in dry season and has to be Purchased.	Very important – water is limited and has to be purchased all year round	Important. In town water is purchased all year round. Specialised livelihood activities (e.g. *fufu* processing) utilise natural sources.	Freely available all year round.	Freely available all year round.
Access to credit	High dependency on informal credit (esp. family support and deferred payments for goods).	Some dependency on informal credit (esp. family, deferred payments for goods, moneylenders). Relatively high levels of capital available.	Important (esp. family and friends).	Important informal credit (informal groups savings, co-operatives and deferred payments for goods).	Important informal credit (savings group and cooperatives)
Access to markets	Limited access, especially in rainy season. Traders visit village from outside.	Essential. The town's good access to markets is critical to most livelihood activities.	Essential. Good market access influences most livelihood activities.	Important. Limited access constrains livelihood options.	Important. Limited access constrains livelihood options.
Infrastructure	Poor roads limit access. Lack of services (e.g. electricity) perceived as major constraint.	Very good infrastructure at all levels.	Very good infrastructure at all levels.	Poor roads. Electricity and communication systems in place.	Poor roads and electricity.
Ethnicity	Most residents are native Yoruba.	Yoruba and Ibo present. Some links between livelihood activities and ethnicity.	Heterogeneous ethnic population but no links with important factor.	Not important – most residents are native Yoruba.	Not important. Most residents are non-native, but homogenous group.

Table .3. Dominant characteristics of wet paste *fufu* processing in three of study locations where product is produced.

Characteristic	Ode Remo	Ereji	Ilaro
Nature of location	Peri-urban	Rural	Peri-urban
Social group which dominates processing	Medium scale: Female and some male non-natives; Large-scale: Male natives	Female natives	Female natives and non-natives
Processing method	Ibo method - two-stage fermentation ("dry sieving")	Yoruba method	Yoruba method
Period of processing	All year round	All year round	All year round
Use of improved processing technology	Graters; concrete water tanks (owned or rented)	Some water tanks (owned - recently introduced)	None
Size of workforce	2-20	3-12	4-7
Total range of output	(28 – 480) x 60kg bags per month (1,680 - 28,800 kg per month)	(8 – 24) x 60 kg (480 - 1,440kg per month)	(35 – 150) x 25 kg (875 – 3,750 kg per month)
Income	N 19,600 – N 336,000 per month (US$ 196 – 3,360)	N 2,640 – 15,840 per month (US$ 26 – 158)	N 9,100 – N 39,000 per month (US$ 91 – 390)
Management of enterprise	Individual women and individual male entrepreneurs	Individual women	Individual women
Main markets	Lagos	Lagos	Ifo
Market access	Good	Good	Good all year round
Market relationships	Pre-ordered. Processors transport goods to traders.	Pre-ordered. Buyers purchase at processing site.	Not pre-ordered. Processors sell at market place.
Access to informal credit	Deferred payment for cassava. Loans from family/friends.	Deferred payment for cassava. Loans from family/friends.	Loans from family /friends.
Access to formal credit	Money lender	None	None
Importance of f*ufu* processing as income-generating activity	Small proportion of population very dependent	All households very dependent	All processors very dependent

Fufu processing makes an important contribution to household security in all locations. However, the overall importance of fufu processing to household incomes and the levels of commercialisation of fufu enterprises were found to differ quite markedly. One early finding of the study was that in locations where wet paste fufu is produced for sale (Ereji, Ilaro and Ode Remo) the output of this enterprise is much higher than that of ready-to-eat processors.

The previous understanding amongst researchers was that fufu processing was a predominantly rural activity, less integrated in market systems than other cassava products. This study found quite a different situation. In locations such as Ode Remo and Ilaro, and even more remote places such as Ereji, wet paste fufu processors have long-standing connections to urban markets and market their produce on a relatively large scale. It is estimated that the largest scale wet paste processors who sell at Lagos earn up to US$3,360 per month, although a more common income is in the range of US$196-378. These figures do not reveal the overall level of profit. Even wet paste processors further from market points who do not sell directly at Lagos but rely on middlemen or intermediary markets can earn up to US$390 per month.

Women processors described *fufu* processing as a flexible activity that can be taken up easily with little investment. It can therefore be used to raise money as a precursor to venturing into other livelihood pursuits. In fact, some processors in Ilaro and Ode Remo described how they plan to use the income generated from *fufu* processing to progress into other livelihood activities. In some cases, therefore it is seen as a stepping stone to more lucrative enterprises.

The key constraints to *fufu* processing identified by respondents in most location were: unavailability of cassava roots, shortage of water and competition due to the increase in the number of new entrants. Processors have found different ways to adjust to these constraints, which are inevitably linked to the local livelihood system in each case. For instance, in all locations processors wherever possible maximise their relationships with cassava farmers to enable them buy roots on credit. Those who can afford it may hire transport and purchase roots outside the local vicinity where supplies may be better and/or prices more to their advantage. In Ode Remo, where water is in short supply, traditional *fufu* processing methods would probably be unfeasible on a large scale. Instead, native processors have adopted the Ibo processing method imported by in-migrants to the town. This 'double fermentation' method requires substantially less quantities of water and processors have a reliable Lagos market for the high-starch wet paste produced. In Ereji, which also faces water supply problems, processors re-use water as much as possible and have used their high levels of community organisation to lobby and pay for a tube-well to be installed in the village.

At Odo Oshun, the specialised processing site in Ilaro, membership of the site's *Fufu* Processors Association is compulsory for every one of the tight-knit group of processors based at this site. The Association provides an important source of social capital for all members, even to the extent that it can ensure all processors receive a consistent income from the key market point at Ifo. In this highly organised system, the total level of production from each processing site is mutually agreed to maintain demand and ensure an optimum price is maintained for the wet paste produced.

The following recommendation were made from the research:

- Efforts to improve *fufu* processing should focus on locations that produce wet paste. This is because currently the wet paste production and marketing system has the widest impact on local livelihoods.
- The market dynamics of the Ibo-influenced "double fermented" product needs to be confirmed through consultation with traders in Lagos and elsewhere.
- If the potential to absorb increased output of the "double fermented" product is confirmed, the use of processing techniques to produce this form of *fufu* should be promoted, particularly at locations that have problems with water supplies. This may involve linking processors with appropriate traders.
- Low-tech, low cost improvements to processing observed at certain locations, such as the construction of water tanks and the use of double packaging to prolong the shelf life of *fufu,* should be promoted at other relevant locations.
- New, capital intensive technical interventions aimed at commercialising *fufu*, if found to be technically and economically feasible, could most easily be targeted at large scale processors. They have substantial financial capital and appear to be interested in expanding their activities. However, there is a risk that this approach may provide more direct advantages to richer members of the community (although, of course, more employment opportunities may be created). Efforts can be made to encourage the participation of less elite groups, by utilising the co-operative mechanisms for pooling resources.

Analysis of marketing systems

The marketing outlet approach was the framework employed in this study. The approach relies on the identification of key supply areas and traces outlets up to their respective destination markets. In-depth analysis of five, quite diverse processing locations in Ogun State was undertaken to capture a variety of marketing chains and arrangements at operation in Southwest Nigeria. The principal data and information for the study were gathered through formal questionnaires and informal semi-structured interviews with key informants. Interviewees included processors, primary market assemblers, urban wholesale and retail traders, transporters, food vendors and restaurant owners. Two forms of *fufu* are traditionally processed on a commercial scale in Ogun State: wet *fufu* paste and ready-to-eat *fufu*.

Fufu processing is by and large a small-scale activity, and more so in the case of ready-to-eat product. Several factors interact to prevent significant scaling-up of individual *fufu* processing and marketing activities. These include financial resource constraints, the difficulties and cost of procuring large amounts of fresh cassava, the lack of mechanised *fufu* processing technologies, and the impossibility of storing *fufu* for reasonable periods of time due to product perishability. The latter is an especially important constraint, since it forces processors and traders to be conservative in the quantities produced and purchased for sale. Despite this, aggregate volumes leaving each *fufu* processing location can be quite significant in view of the large number of people involved in this activity.

Market-oriented *fufu* processing is carried out in both rural and urban contexts. Primary processing, which entails transforming fresh roots into a wet paste, essentially takes place in villages or small towns located within important cassava production areas. Secondary processing on a commercial scale, consisting of cooking the ready-to-eat *fufu* balls from the wet paste for market sale, gains importance as distances to medium and large consumption centres become shorter. Because the wet paste is easier and less costly to handle and transport than the ready-to-eat product, it is usually processed further away from major consumption centres. Overall, however, neither the wet paste nor the ready-to-eat product can be processed in a cost-effective manner very far from consumption centres.

There are two predominant market channels for the wet paste processed in Ogun State: a direct one, linking the point of processing to wholesalers in Lagos, and an indirect one, whereby the wet paste is first assembled in a primary market before being channelled to Lagos. When buying directly from processors, wholesalers may either come to the processing location or wait for the product to come to them. They then sell the wet paste to a wide range of retailers, who are often involved in secondary processing, selling the ready-to-eat product to consumers. Retailers include street vendors, canteens, restaurants and hotels. Consumers also buy wet paste for home processing directly from wet paste wholesalers and retailers.

Because of the more localised nature of ready-to-eat *fufu* marketing chains and the comparatively smaller quantities of the product leaving processing areas, there is practically no primary assemblage. The product normally moves from the processor to the retailer, and then from the latter to the consumer. Some ready-to-eat *fufu* traders act both as retailers and wholesalers, selling to consumers as well as restaurants, canteens, food vendors and institutional clients.

The marketing chains for *fufu*, whether in its wet paste or ready-to-eat form, present some interesting features that are worth noting. First, the product changes few hands along the chain. Second, processors sell mainly to wholesalers and are rarely

in direct contact with the consumer, relying essentially on intermediary agents to market their production. Third, commercial processing of *fufu* in rural areas of Southwest Nigeria is common and to a great degree driven by proximity to large urban markets, to where most production is channelled. Finally, no cross-border and overseas exports of wet paste or ready-to-eat *fufu* are taking place, as this is not a viable option for highly perishable and relatively low-value commodities. In contrast, dried forms of the product have a much longer shelf life, and some export-oriented production by a few medium- to large-scale processors has developed.

Fufu marketing systems appear to function in a relatively effective manner. The high degree of co-ordination between processors and buyers through pre-arranged orders leads to a close match between supply and demand and minimal losses along the product chain. Trust is a major factor driving such arrangements. Generally speaking, therefore, present marketing arrangements and transport systems enable processors to quickly dispose of their produce while at the same time allowing for a rapid turnover of traders' stocks.

Market access does not seem to constitute a major constraint to processors. The presence of a considerable number of middlemen in processing sites and intermediary market centres, existing processor-trader links and networks, the availability and regularity of all weather transport vehicles, and the perceptions of market participants all point in this direction. The fair degree of specialisation found among processors is also a strong indication that processors enjoy relatively good access to close-by sub-urban and urban markets.

While market access may not be an issue for processors in the studied locations, it may represent a significant barrier to entry into commercial *fufu* processing for many who are currently not involved in such activity because of remoteness or failure to nurture direct relationships with specific buyers. Given the extremely perishable nature of the product, easy and regular access to markets is a fundamental pre-condition if market-oriented *fufu* processing is to occur.

Moreover, it is unclear whether the market is at present able to accommodate significant and widespread increases in *fufu* supplies. Whilst it is possible to ascertain that the market for wet paste and the ready-to-eat product as a whole has not contracted in the recent past, the study found no evidence that it is expanding at a significant pace. Similarly, although prices at different levels in the marketing chain do not seem to have followed a declining trend, the evidence collected does not indicate dramatic increases. Finally, contradictory perceptions amongst different operators regarding market trends indicates that different locations and different market participants within the same location may be facing variable experiences in respect to demand and prices.

Although the marketing system has proven effective in transferring *fufu* supplies from processing to consumption centres, processors (and farmers) tend to command a relatively low share of the wholesale and retail price, and quite often have no option but to sell on credit. Only processors who manage to control the transport up to the destination market seem to be able to escape low prices and to capture a significant share of the wholesale price. Possible causes behind the above source of inefficiency in the marketing system include the relatively small quantities traded, poor access to market information by processors, their need to have a ready market to prevent product losses, the risk of product spoilage that is passed on to buyers, the inability of processors to intervene further up the marketing chain and high transport costs.

The highly perishable nature of both the wet paste and the ready-to-eat *fufu* has emerged as a recurrent and cross cutting issue throughout this study. On the demand side, the extremely limited storage possibilities reduce the convenience of *fufu* to traders and consumers, thereby restricting market size and limiting the potential for demand growth. On the supply side, processors must be cautious not to expand the size of their operations beyond a point in which unsold inventories and product spoilage can become a recurring phenomenon, resulting in heavy financial losses. Finally, the short shelf life of *fufu* has clear negative effects on the prices and margins processors and many assembly traders are able to command.

Hence, the case for developing a shelf stable form of *fufu* that could be stored by processors, traders and consumers over a longer time period has been established. However, great care must be taken when evaluating this option and the rationale for introducing it in the study areas or other parts of Southwest Nigeria. More specifically, the feasibility of developing market-oriented *fufu* flour production amongst relatively small-scale processors, the dissemination of appropriate technologies and the development of market linkages are issues that deserve careful analysis.

This study has also identified several other possible intervention options aimed at increasing the contribution of *fufu* to sustainable livelihoods in Southwest Nigeria. These include the provision of relevant market information, market linkage facilitation, and the development of well-targeted financial services. However, detailed analysis is required prior to embarking in any intervention in these and other areas in order to assess their likely impact and sustainability.

Sensory acceptability of dried fermented fufu (carried out in collaboration with UNAAB in Nigeria)

A total of six *fufu* samples made from either the wet or dried form were evaluated by a sensory panel and 311 consumers from Abeokuta, Lagos and Ibadan in Nigeria. Overall *fufu* prepared from the wet form was most preferred and a commercial dried *fufu* was the least preferred. However, consumer preference was influenced by a number of factors including the urban centre where the consumer was interviewed (those in Lagos tended to prefer *fufu* prepared from the dried form to the wet form, gender (men preferred *fufu* more than women), age (preference increased with age) and how often the consumers reported eating *fufu* (preference was highest among those who ate *fufu* most often). Factors such as ethnic group, education and occupation did not have a significant influence on preference. Hierarchical cluster analysis showed that consumers in these urban centres did not all rate the *fufu* products in the same way; there were majority and niche segments with respect to preference. Consumers in the majority segments tended to prefer all or most of the *fufu* products while the smaller niche segments either preferred *fufu* prepared from the wet form or the dried form. There were also interesting social differences with the largest segment coming from all social groups while the smaller niche groups comprised a higher proportion of females; those preferring the dried products consumed *fufu* away from home while those preferring the traditional wet products consumed at home and were younger. This illustrates the complexity and sophistication of consumers in these urban locations in Nigeria. There is a clear preference for the dried *fufu* product and its uptake will be enhanced by focusing on these particular groups. Those groups who did not prefer the dried product also present opportunities.

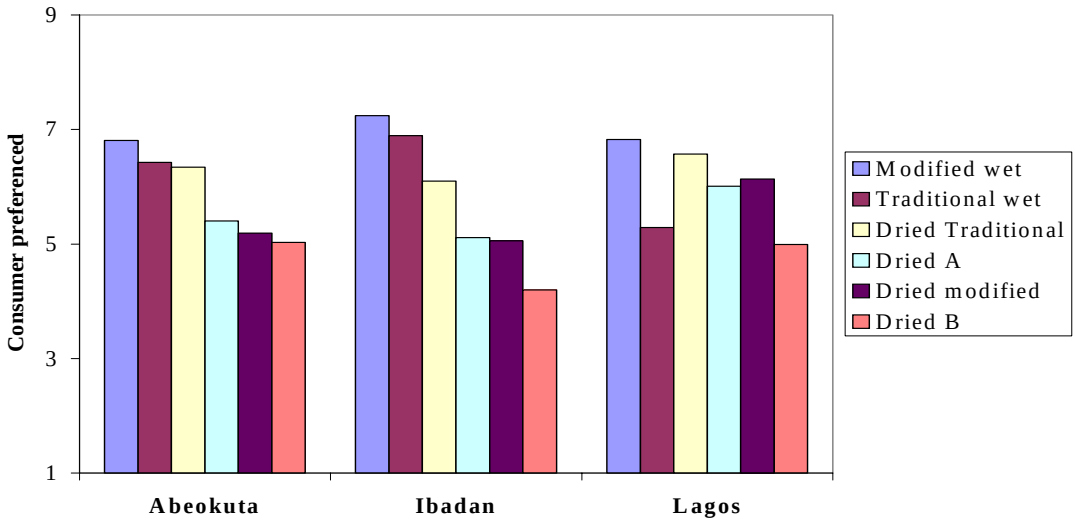


Figure ??. Acceptability of fufu types in three locations in Nigeria.

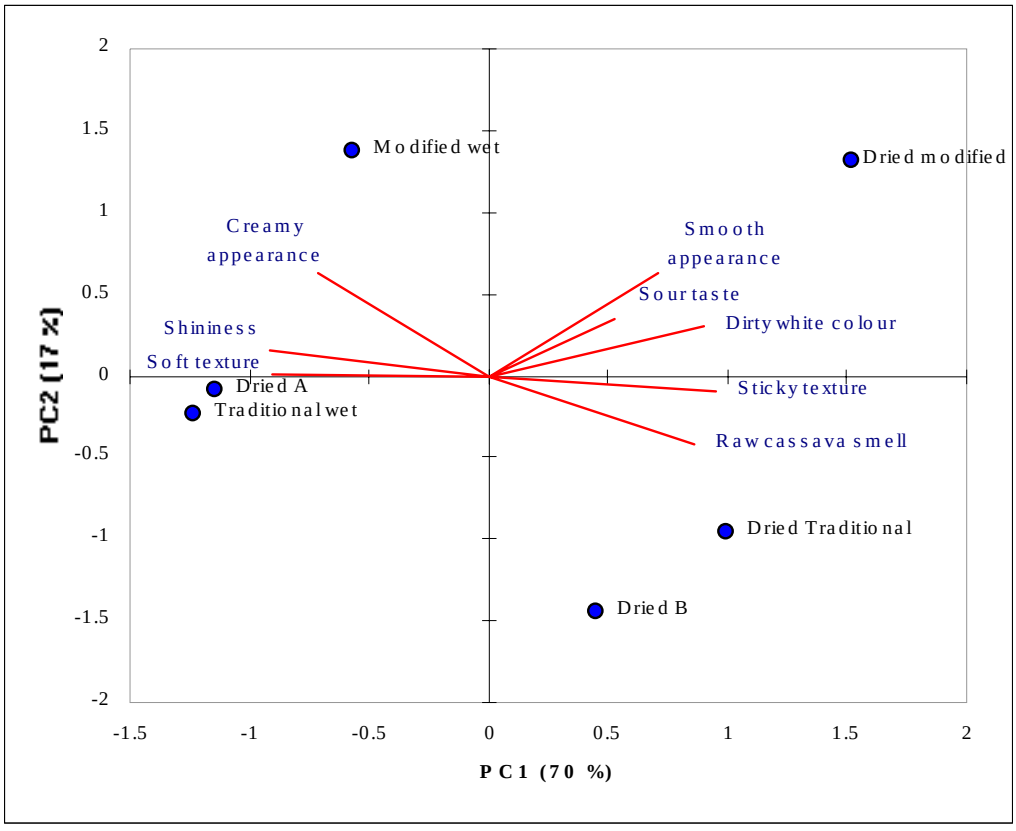


Figure ??. Principal component analysis showing positioning of wet and dry *fufu* samples.

The sensory panel was important for understanding the differences between the *fufu* products from a sensory aspect and indicated which sensory parameters need to be improved for the dried *fufu* products to increase market acceptance. The most preferred *fufu*'s scored higher for creamy appearance, shiny and soft. Those that were not liked tended to have higher scores for sour, dirty white colour, sticky and raw cassava odour and these would need to be altered for these products to become more acceptable to the majority of consumers.

The dried form is a new product that is not traditional, Consumer preference results showed that while the cooked *fufu* prepared from the wet form was most preferred overall, there were significant differences with location; those in Lagos tended to prefer *fufu* prepared from the dried form. Preference was also influenced by gender, age and how often consumers ate *fufu*. Hierarchical cluster analysis divided the consumers in majority and niche segments with respect to preference. Consumers in the majority segments preferred all or most of the *fufu* products while the smaller niche segments preferred *fufu* either in the wet or dried form. The largest segments comprised all social groups while the small niche groups contained a higher proportion of females. Sensory evaluation indicated that preferred *fufus* scored higher for creamy appearance, shiny and soft while the least preferred scored higher for sour, dirty white colour, sticky and raw cassava odour. A sensory model developed to predict consumer preference applied to the majority consumer segment (39% of consumers) only.

Work package 3a. Fundamental studies on the fufu fermentation.

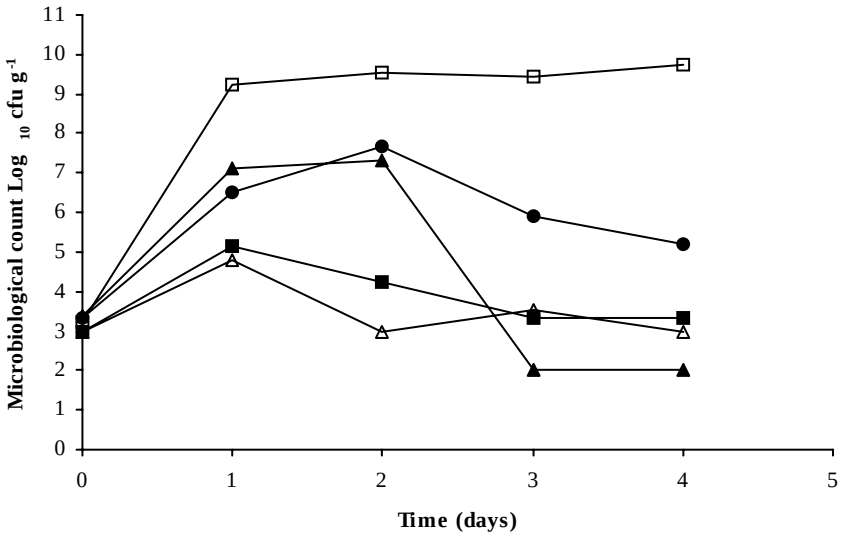
Fundamental studies the fufu fermentation have been carried out at NRI. Understanding the mechanisms of root softening are essential to improving the quality of the product. Changes in the microbial populations of the root and soaking water during the fermentation of cassava under water were established. The changes are shown in the figures below. Aerobic spore-forming bacteria (*Bacillus* spp.) and *B. cereus* peak at 10^5 cfu g^{-1} (wet weight) after one day and then gradually decline to 10^3 cfu g^{-1} (wet weight) as the fermentation proceeds.

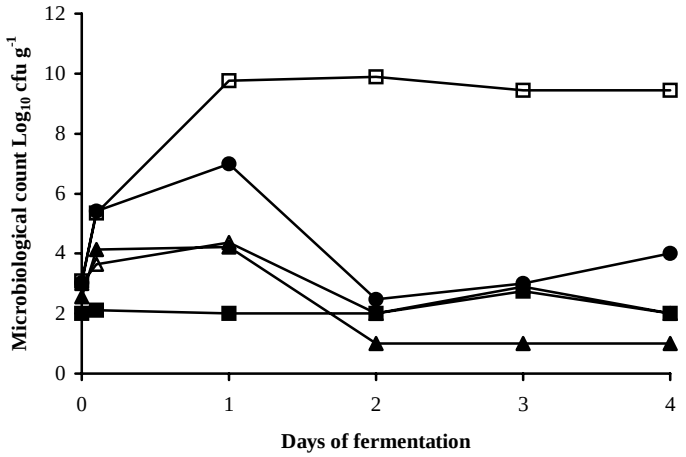
The major new observation was that populations of *Clostridium* spp. reached high levels after 48 hours of fermentation (ca. 10^8 cfu g^{-1}), which are of similar levels to the main group of microorganisms (lactic acid bacteria). It is therefore conceivable that these microorganisms are in fact responsible for the changes in the texture of cassava, which is a prerequisite for the reduction in cyanogen content. However, given that these levels are much higher than those found in *fufu*, it is possible that there is a succession of clostridia and the *Cl. butyricum* isolated from *fufu* are not in fact those responsible for softening.

Using model fermentation systems, it was demonstrated that although *B. cereus* can grow in the early stages of the *fufu* fermentation it is out competed by other microorganisms such that only small residual levels are present in the final wet product. When this product is dried, cooked up into ready to eat *fufu*, which was stored, *B. cereus* was unable to grow – presumably because of the low pH value (pH 4) of the product. *B. cereus* wasn't therefore perceived to be a major health risk in *fufu* despite the ability to isolate its frequency of isolation from samples of both wet and dry *fufu*. *Cl. perfringens* were not detected throughout the process.

Fig. 1 Microbiological analysis of (a) root samples and (b) soaking water samples during the fermentation of cassava under water at 30°C. Experimental data symbols: (□) lactic acid bacteria, (●) anaerobic spore-forming microorganisms (*Clostridium* spp.), (▲) enterobacteriacae, (■) *Bacillus cereus*, (△) aerobic spore-forming microorganisms (*Bacillus* spp.).

(1a)

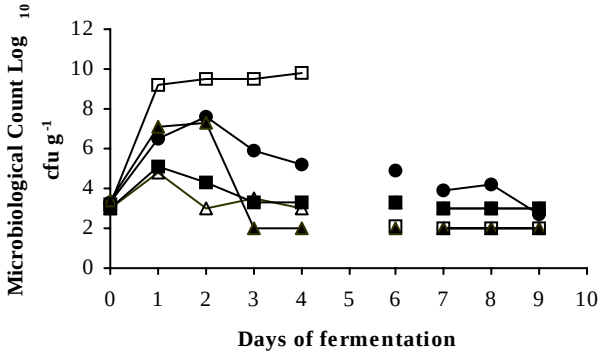

Microbiological count Log 10 cfu g-1
Time (days)


Microbiological count Log10 cfu g-1
Days of fermentation

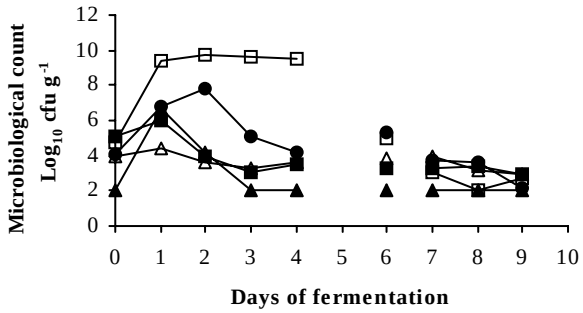
(1b)

Fig. 2 Changes in (a) microbiological composition of root samples in a natural fermentation, (b) a natural fermentation inoculated with *Bacillus cereus* Experimental data symbols: (□) lactic acid bacteria, (●) anaerobic spore-forming microorganisms (*Clostridium* spp.), (▲) enterobacteriacae, (■) Bacillus cereus, (△) aerobic spore-forming microorganisms (*Bacillus* spp.).
Days 0-4 (cassava fermentation), day 6 (dry *fufu*), days 7-9 (storage of cooked *fufu*)

(2a)



(2b)



WORK PACKAGE 3 Small-scale technology development and pilot level validation
This work package in Nigeria focussed on *fufu* and *tapioca*. *Fufu* in Nigeria is a submerged fermented product that is traditionally produced as a wet paste. The cooked wet paste is also marketed. The shelf life of the cooked and uncooked product is short (about 7 days). *Tapioca* is a roasted granular product from cassava starch that is widely acceptable, but currently only produced on a very small scale.

This work comprises two tasks: Task 1. Define possible improvements to traditional processing methods and Task 2. Research on improvements to fufu and tapioca processing

As part of the participatory research at household level (Work Package 1) and discussions were held with cassava processors about possible methods of improving traditional techniques for producing *fufu*. Ideas generated from these discussions informed the technical research activities of the project. Households willing to act as research partners in developing improved, more commercially orientated processing methods were identified. To date, much of the progress in this task was based on the

phase 1 Work package 1 studies in the in five fufu processing locations (Ereji, Ode Remo, Ilaro, Ilewo Orile and Soso)..

As a consequence of the work in work package 1, a number of innovations to the production of fufu were tested on a laboratory/pilot scale.

Production of modified wet fufu

A modified version of fufu processing was tested that had the primary advantage of reducing the amount of water used. Three features distinguish modified method of *fufu* processing from the traditional method:

- Grating of cassava roots after 3 days of submerged fermentation using a mechanical grater.
- A second stage of solid state fermentation (this can be described as "double fermentation")
- Sieving with very little quantity of water.

At the end of each fermentation period, the values of total bacteria counts were 7.6 x 10^4, 1.6 x 10^5, 7.0 x 10^5, and 2.7 x 10^5 for fermented fufu for three days (submerged), fermented fufu for two day (submerged) & 1 day (solid), fermented fufu for three days (submerged) & 1day (solid) and fermented fufu for four days respectively. There were significant differences (P<0.05) in terms of sensory scores in* fufu *made from different processing methods.

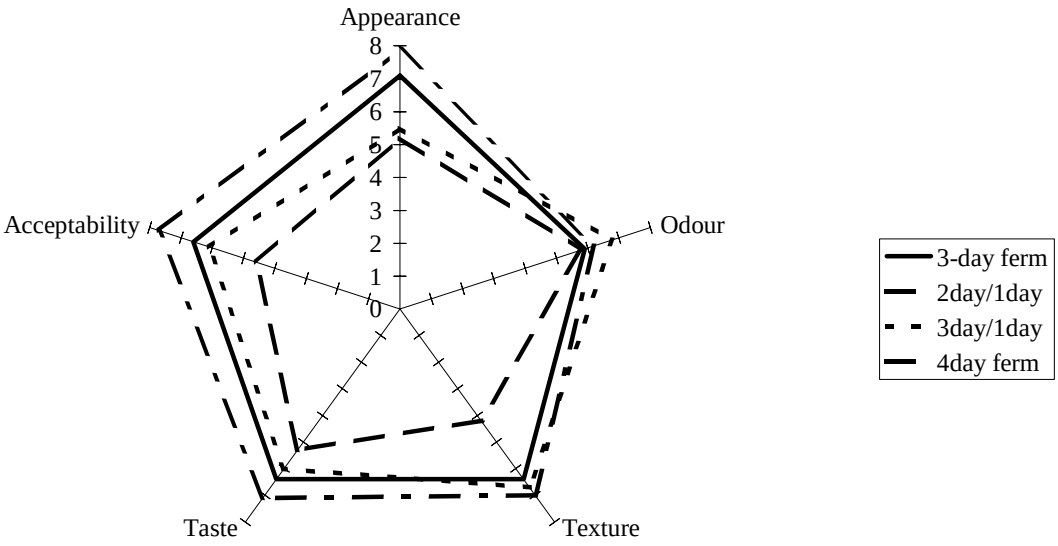


Figure P3.1: ***Influence of fermentation method on the sensory quality of fufu***
3-day ferm- fermented for three days (submerged) & wet sieved
2day/1day- fermented for 2 days, I day (solid) & dry sieved
3day/1day- fermented for 3 days (submerged), 1 day (solid) & dry sieved
4day ferm-fermented for four days (submerged) & wet sieved.
(Oyewole et al 2003)

Use of surface tanks for fermentations

The construction of surface tanks facilitates the soaking of cassava roots and can increase the volume of *fufu* processed per cycle. Different types of tank can be constructed, but the most efficient are those with accessible stoppers/taps to control

water flow and drain off, and those with effective drainage areas. These save on the time and drudgery involved in emptying the tanks by hand. They can be accessed by processors themselves or rented from service providers.

The uptake of surface tanks by processors in Ereji reveals the potential for this technology to be promoted in locations that are new to this innovation.

Twin layers of packaging

The double packaging method was being utilised in Ereji to extend the shelf life of wet paste. It was observed that the innovation becomes necessitated due to less regular market access. The freshly prepared *fufu* is hygienically distributed into various packaging materials right immediately at the Ereji village (place of purchase). The packaging materials used includes, polythene sack and polythene cling film (high density). Fufu samples are contained in polythene cling film and placed in polythene bag and then tied and sown with thread and needle while the other packed fufu sample is contained in polythene bag only and left loose. These packed samples were left or stored in an ambient condition (of about $30^0C \pm 2^0C$) before distribution or stored.

The effect of this system was assessed and our findings reflects that the mean values of moisture content of the tightly packed stored samples decreased from 56.7% to 51.6% while the mean values for moisture content of the loosely packed stored sample at the same ambient temperature decreased rapidly from 56.2% to 44.02% during storage, which may be attributed to the ease of drying taking place through the pores of the polythene bag. The pores size in this packaging material gives room for easy movement of moisture here than the tightly packed sample with polythene cling film that has very small pore openings for moisture movement.

As the pH decreases, the TTA increases in the tightly packaged samples while it is the vice versa in that of the loosely packaged samples. The increase in pH and decrease in TTA of the loosely packaged sample shows a gradual trends of termination of fermentation and move towards alkalinity which eventually starts deteriorating after two weeks of storage. It can be seen from the pH values of the tightly packaged samples which are less than pH of 4, that the stored *fufu* is free from pathogen, since Board (1983) reported that food products of pH 4 or less is generally considered desirable to prevent the growth of pathogens.

From the result, there is no significant difference in the sample stored up till about 6 weeks. The overall acceptability show an acceptable wet *fufu* stored up till about 7 weeks after which a significant difference became obvious. However, a physical observation noted on the loosely packaged sample indicated that the wet *fufu* start to spoil at about two weeks, this could be attributed to the packaging condition which gives room for easy contamination and maggots were found in the *fufu* sample.

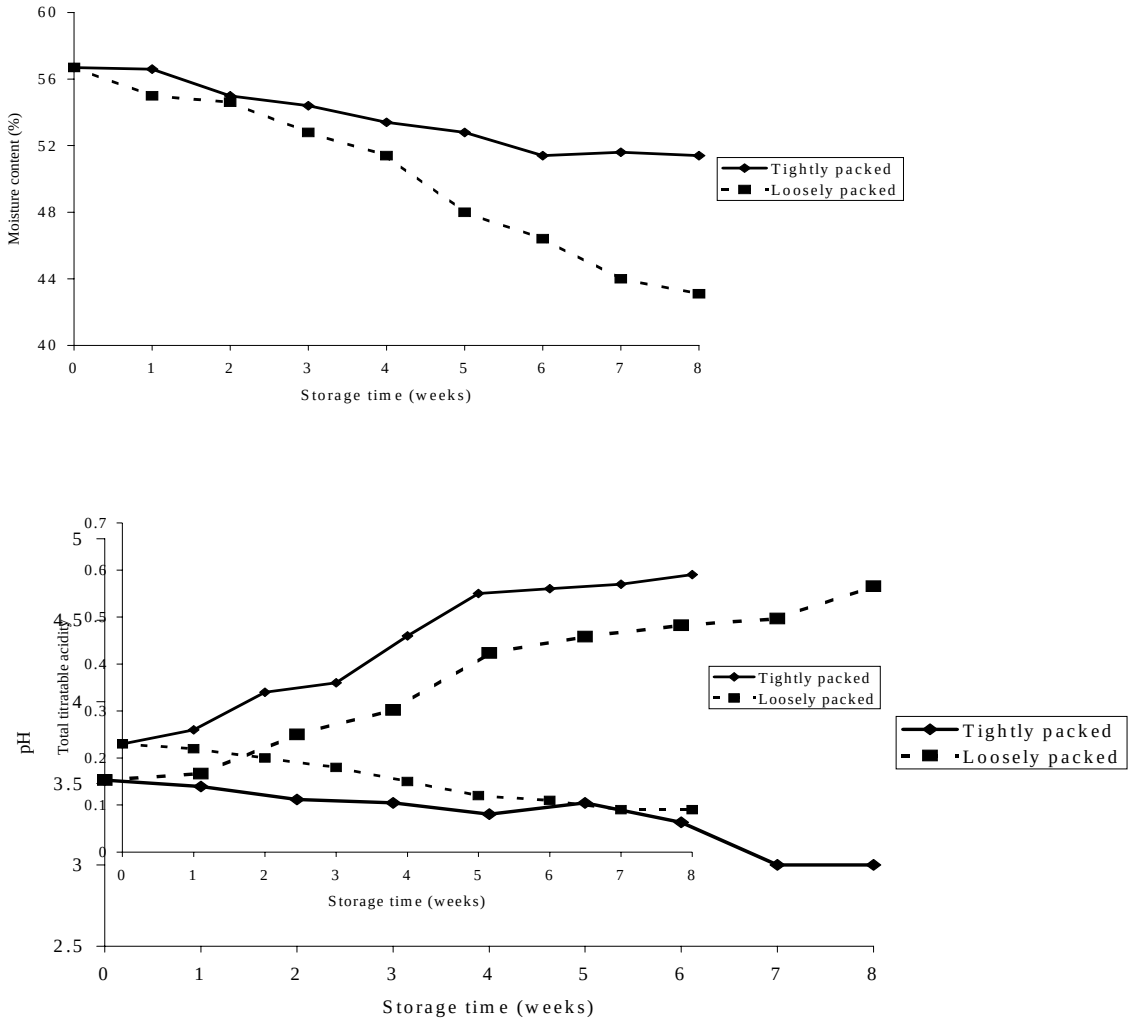


Figure P3.2: *Effect of tight and loose packaging on the moisture content, pH and Titratable acidity of wet* fufu *(Oyewole et al 2003)*

Drying

The production of dried fufu was one of the potential innovations identified as part of the Work Package 1 and Work Package 2 studies. Various options have been considered so far in the project.

Natural drying

Exposing cassava mash as is being done at Ilaro on a polythene sheet directly to the sun for drying is referred to as 'sun drying'. The project observed that drying at rural or domestic level cannot be done artificially because of the high capital investment in equipment and energy required and hence open sun drying is done. Sun drying is beset by several inherent drawbacks such as susceptibility to damage due to inclement weather, slow drying rates and contamination. Because of these limitations and the high cost and low utilization of more efficient traditional dryers, the adoption of a modified sun drying process called solar drying has been considered for drying of fufu in rural areas..

Meanwhile, following changing habits of consumers and the current wave of urbanization, there is the need for promotion of commercialization of traditional foods like cassava products. Hence, various strategies for scaling-up the fufu business was studied through sourcing and testing for appropriate drying system.

Artificial Drying

If a controllable source of energy is used to dry, the drying is referred to as artificial or mechanical drying. There is a further classification in which the air used for drying is heated both by solar means and controlled means such as electricity, renewable fuels or fossils fuels. These methods are referred to as hybrid drying (Sanni, 1999).

Institutional Dryer

The project observed the current approach by the Federal Industrial Research, Oshodi, Lagos, Nigeria in adapting gari processing plant that was built since the 80s for the drying of FIIRO fufu. The pilot plant was also observed to be available for contrac drying for some investors. To confirm the dryer's productivity in terms of food quality, effect of drying methods (using FIIRO rotary drier, cabinet drier and sun drying methods) on the yield, moisture contents and acidity of dried fufu. Experienced fufu eaters in Nigeria accepted rotary (FIIRO dryer) dried fufu above sun-dried and cabinet-dried fufu samples (Sanni and Akingbala, 2000). Even though FIIRO rotary dried fufu was of good quality, the cost and accessibility of this dryer by the local fufu processors, limits its use.

Investor Dryer

Consumers are ready to buy fufu flour made from a locally fabricated rotary dryer that could be fired by Charcoal or gas and rotated by electric fan or manually rotated. This was made possible originally by Addis Engineering Nigerian Company, Lagos and could also be sourced at Stallon Nig Ltd, Lagos, Nigeria. The dryer consists of an insulated drying chamber (drum like).

To ascertain the performance of the recently fabricated rotary dryer, lots of wet fufu cake were dried at 60^{o}C for 7h in the Oven (Astell Hearsons JBF 040, England) and at 135^{o}C for 30 minutes in the locally fabricated manual rotary dryer with a loading density of 5kg/m^{2}. The drying process was carried out until a constant weight was attained for the *fufu* samples. After drying, the samples were milled and assessed for quality. Also, another lot of fufu was moulded into balls smoked. The smoked *fufu* balls were then peeled to remove the smoke coatings and broken into lumps. The lumps were then milled to give *fufu* powder. Apart from given good chemical quality, *fufu* flour sample from rotary dryer was highly rated in terms of overall acceptability compared to others.

Also, to ascertain the performance of medium rotary dryer that could be operated with Charcoal or gas but rotared using electricity, dried fufu samples from Federal Industrial Research Oshodi (FIIRO) : Using adaptable rotary dryer at 180^{o}C for 30min was compared with dried fufu samples from Top most Foods (Ife): Locally fabricated rotary dryer used, 185^{o}C for 20min; dried fufu samples from Ibadan: Fluidised bed drying at 120^{o}C for 25min; dried fufu samples from August Foods (Agege): Not specify. Suspected contract drying ; dried fufu samples from Abeokuta: Sun drying after spraying lime juice, 23-35^{o}C, 3days and, dried fufu samples from Quary Abeokuta: Not specify but suspected contract drying.

Our findings revealed that the moisture content ranges from 6.8 to 9.7% (db) with Ife dried fufu recording the lowest while Ibadan dried fufu having the highest. The pH for the dried fufu samples ranges from 4.1 to 6.8 with dried fufu samples from FIIRO, Ife, Agege, Quary Abeokuta having lower values that are not appreciably different from each other compared to dried fufu samples from Abeokuta and Ibadan respectively.

The extent of retrogradation on cooling has shown by the set-back value, was more pronounced in the *fufu* samples collected from Quary Abeokuta, and Abeokuta while the least set back values were recorded for dried fufu samples collected from Agege, Ife, Ibadan and FIIRO respectively. The lower value is an indication of high retrogradation tendencies for *fufu* samples with lower initial moisture content before drying.

The values of viable bacteria count ranges from 2.0 x 10^2(cfu/g) to 1.2 x 10^4 (cfu/g) with FIIRO fufu recording the highest value whike the viable mould count ranges from 1.0 x 10^2 (propagules/ml) to 1.2 x 10^3 (propagules/ml) with those from Quary Abeokuta recording the highest value. The present study is in agreement with the International microbiological standards for bacteria plate counts of less than 105 cfu/g of food (Owhe-Ureche et al 1993). *Fufu* flours made from Ife and FIIRO were more attractive and acceptable than the rest *fufu* samples. Thus, technically, justifying the need to adapt rotary drying for fufu business.

Table P3.4 properties of six dried* fufu *samples from Southwest Nigeria

Properties	*FIIRO* Fufu	*Ibadan* Fufu	*Ife* Fufu	*Agege* Fufu	*Abeokuta* Fufu	*Quary Abeokuta* Fufu
Moisture content (%db)	*7.3a*	*9.7a*	*6.8a*	*8.5a*	*9.6a*	*8.7a*
pH	*4.3b*	*6.8a*	*4.8ab*	*4.1b*	*5.5a*	*4.1b*
Set-back value (Ve-Vp), BU	*30*	*13*	*10*	*-60*	*260*	*220*
Overall acceptability	*7.8a*	*6.5b*	*7.9a*	*6.7b*	*6.0b*	*6.1b*

Preliminary testing of products

Meanwhile, the team had completed processing scheme that made two sets of dried fufu. The products were introduced to the community through the University Consultancy Centre. We are happy to inform that responses from end users had been encouraging. Some initial outputs from these efforts have been reported by Sanni et al 2003b and Sanni et al, 2003c.

A one-week project Dissemination Workshop was held between 24th and 28th March, 2003 at the University of Agriculture, Abeokuta, Nigeria. The workshop was combined with the Inception Meeting of the CASSAVA-SMES project. Key stakeholders numbering 124 persons including Directors of Root and Tuber crops research in Nigeria, researchers in industrial aspect of root and tuber crops, cottage/small and medium entrepreneurs in Nigeria, and policy makers actively

Section F Project effectiveness

This section of the evaluation report uses the rating criteria for the purpose and your outputs previously used in your annual reports.

	Rating
Project Goal	X
Project Purpose	3
Project Outputs 1. Markets for cassava flour determined	2
2. Potential for cassava-growing communities to access market opportunities assessed	2
3 Most sustainable means of farmers organising themselves and the implications of this approach for institutional support identified.	2
4. Processing systems adapted to the needs of cassava farmers and validated in participatory trials	2
5. Knowledge from this project and appropriate knowledge from other CPHP projects disseminated.	2

1= completely achieved
2= largely achieved
3= partially achieved
4= achieved only to a very limited extent
X= too early to judge the extent of achievement (avoid using this rating for purpose and outputs)

Outputs

What were the research outputs achieved by the project as defined by the value of their respective OVIs? Were all the anticipated outputs achieved and if not what were the reasons? Your assessment of outputs should be presented as tables or graphs rather than lengthy writing, and provided in as quantitative a form as far as is possible.

Output	**OVIs**	**Achievement of OVI**	**Reasons why not achieved if not fully achieved.**
1. Analysis of the contribution of traditional cassava processing to rural livelihoods.	1.1 Case study villages selected by end of Q1, Y1 (Figure 3)		
	1.2 Baseline data collection completed and analysis completed by the end Year 2 Second Quarter (Y2 Q2)		
2. Validation of the options to improve *fufu* processing and commercialise it.	2.1 Market demand identified by end Y1 Q2		
	2.2 Technical improvements for traditional processing methods defined by end Y2		
3. Definition of how cassava processing could be commercialised to give the maximum benefits to sustainable rural livelihoods.	Impact of commercial by 2 possible means defined by end Y3 Q4		
4. Confirmation of uptake pathways for project outputs and dissemination of project outputs.	Research framework produced by end of project.		
	Definition of commercialisation approaches which optimise impact on rural livelihoods produced by end of project.		
	Relevant information on improved methods of *fufu* processing and marketing of product made available to relevant partners by end of project		

All of the project outputs were achieved to a large degree, although a number of the dissemination outputs came after the end of the project.

For projects aimed at developing a device, material or process, and considering the status of the assumptions that link the outputs to the purpose, please specify:

a. What further market studies need to be done?

Market studies to extend the approaches to other areas would be necessary.

b. How the outputs have been made available to intended users?

See report on activities in section above and also Annex II..

c. What further stages will be needed to develop, test and establish manufacture of a product by the relevant partners?

The main further stage is that of replication of some of the key project outputs .

d. How and by whom, will the further stages be carried out and paid for?

The new EC funded project (CASSAVA-SMEs) will bring together and further validate and expand to a broader range of products the results of this project and R7580495. The two CPHP projects will co-fund CASSAVA-SMEs. This means that the CPHP projects will benefit from the outputs of the EC funded work. Further work is planned on optimising product quality, assisting manufacturers to develop integrated quality assurance systems, further reducing costs, promoting the products and developing a linkage between rural producers and urban manufacturers. A private sector company is participating in the EC project with the express intention of setting up such a linkage. A no cost extension of this project to March 2005 with an interim FTR prepared now has been requested to ensure that the maximum benefit is gained from this relationship.

e. Have they developed plans to undertake this work? If yes, what are they? If not, why?

The EC funded Cassava SMEs project has developed a detailed set of activities which will dovetail into, and expand the scope of, the existing work. Please see above for details.

Purpose

Based on the values of your purpose level OVIs, to what extent was the purpose achieved? In other words, to what degree have partners/other users adopted the research outputs or have the results of the research been validated as potentially effective at farmer/processor/trader level?

The purpose of the project was that "Strategies developed which improve food security of poor households through increased availability and improved quality of root crop and horticultural foods and better access to markets". With OVI's of
1.3 By 2002, more efficient and cost-effective methods of small-scale processing validated.
1.5 By 2002, new market opportunities validated, capable of increasing value of commodities produced by the poor.

The project has validated a low cost means of producing cassava chips for an urban market. The approach – very similar to that proposed in the "partnerships for innovation" – was used to good effect to being together a key set of organisations to achieve impact. The market developed had the capability to develop a new market which increased the value of the commodity. More importantly the approaches and lessons learned have been included in other initiatives.

Goal
What is the expected contribution of outputs to Project Goal?

The goal of the project was that

"Poor people benefit from new knowledge applied to food commodity systems in forest-agriculture interface areas"

The project has developed and validated techniques for processing of cassava at the group level using appropriate technology adapted at the local level to meet the needs of farmers and processors. Some poor people, in initially a limited geographic area have benefited from this knowledge. Achievement of the goal will require wider dissemination and uptake of the approaches. There is however a need to more locally scale out the approach. This was the subject of a further proposal not taken up by the programme.

Within the forest agriculture interface cassava is an important part of the cropping systems in most sub-Saharan African Countries. Cassava's potential contribution to raising local incomes, creating employment opportunities and contributing to food security has been recognised as part of the Global Cassava Development Strategy, the NEPAD cassava initiative. The outputs of this project have the potential to make a significant contribution to these initiatives.

Wider dissemination and promotion of the project outputs should ensure that poor people can benefit from this new knowledge on cassava utilisation in forest agriculture interface systems.

Section G – Uptake and Impact

Organisational Uptake (max 100 words)
What do you know about the uptake of research outputs by other intermediary institutions or projects (local, national, regional or international)? What uptake by which institutions/projects where? Give details and information sources (Who?What?Howmany?Where?)

Aspects of the project have been taken up the CFC project on cassava commercialisation in East and Sourthern Africa. This project was planned to start at the same time as this project, but it was delayed by four years.

Secondly, the outputs have been promoted within several other initiatives including the HarvestPlus Challenge Programme, the Commission for Africa's Report on Irrigation and Post-Harvest Systems – commissioned from NRI. . The project leader presented the findings of the project at a HarvestPlus Challenge Programme Meeting in Rome in May 2004 and these outputs have been incorporated in the "Reaching End Users" work plan. Field work on this should start in 2005 with NRI as a core international partners. In this case the approaches will also be fed across into sweetpotato commercialisation. In addition the outputs have contributed to thinking the post-harvest and marketing componet of the Global Cassava Development Strategy.

End user uptake (max 100 words)
What do you know about the uptake of research outputs by end-users? Which end-users, how many and where? Give details and information sources

Our on-farm project work indicated that a number of the partner farmers with whom the project work took up some of the technologies. This could not have numbered more than 20. If end users are defined as research and technology transfer organisations then both LZARDI Ukiriguru and TFNC have taken up the project outputs and disseminating them in other initiative, such as the CFC project on cassava commercialision in East and Southern Africa led by IITA.

Knowledge (max 100 words)
What do you know about the impact of the project on the stock of knowledge? What is the new knowledge? How significant is it? What is the evidence for this judgement?

The new knowledge generated by this project relates to systems for the commercialisation of cassava. The approaches are at the leading of edge of the root and tuber crops post-harvest research as reflected by the invitations to the Project Leader to provide key note addresses at the triennial symposia of the international Society for tropical Root Crops, the Cassava Biotechnology Network and the HarvestPlus Research End Users Component Meeting in Rome. It is currently too early to judge the scientific uptake of the new knowledge generated..

Institutional (max 100 words)
What do you know about the impact on institutional capacity? What impact on which institutions and where? What change did it make to the organisations (more on intermediate organisations). Give details and information sources.

We believe that we increased the ability the Tanzanian national programme to work with rural credit providers. From LZARDI and TFNC's perspective the project further built up

technical and management skills in carrying outfit field work and developing staff resources.

Policy (max 100 words)
What do you know about any impact on policy, law or regulations? What impact and where? Give details and information sources

This project has had an impact on the Global Cassava Development Strategy managed from FAO in Rome. The aim of the Strategy is to influence future investments in cassava. The outputs of this project have influenced the post-harvest and marketing component that is managed by NRI and CIAT. The outputs of the project has also played a part in influencing the irrigation and post-harvest infrastructure component of the Commission for Africa's work on Agriculture.

Poverty and livelihoods (max 100 words)
What do you know about any impact on poverty or poor people and livelihoods? What impact on how many people where? Give details and information sources.

It was not expected that this research project would have direct immediate impact on poverty and livelihoods. The intention was to develop and validate a processing system with the potential to improve incomes of producers and processors. We know that some of the farmers with whom the project worked have taken up the processing technology and are working to produce the product for a supermarket. This information was gained as part of the project outputs.

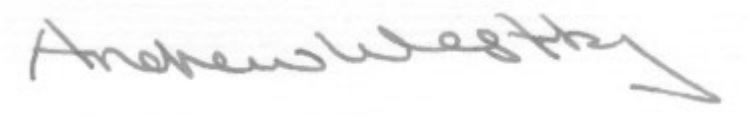
Environment (max 100 words)
What do you know about any impact on the environment? What impact and where? Give details and information sources.

The technology selected in this project – manual chipping of cassava roots is environmentally neutral in its impact since it does not produce more waste that traditional processes and it does not produce effluent that has to be treated. A longer term impact is potentially on whether there is an impact on cassava product and whether or not this has an impact on the soil fertility that would in its own right have to be managed.

Signature

Bearing in mind the nature of the outputs of this project. It would not be expected that there would be any major environmental impacts.

Signature



Andrew Westby

ANNEXES

I Copies of the stakeholder, gender, livelihoods and environmental form included with the concept note.

These documents were not prepared for this specific project because it predated the partnerships for innovation approach.

II Project Logical Framework: The logical framework from the project memorandum was as reproduced below.

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Goal			
Poor people benefit from new knowledge applied to food commodity systems in forest-agriculture interface areas.	- By 2002, increased numbers of poor households, in two target countries, who use improved storage and agro-processing techniques in an environmentally sustainable manner. - By 2002, increased numbers of poor households, in two target countries, benefit from improved marketing and credit systems. - By 2005, increased contribution to nutrition of poor households from own produced food. - By 2005, increase in income from the sale of fresh and processed crops by poor households, in two target countries.	National and local adoption rate surveys. National food security data.	Poor people invest benefits to improve choices and options for livelihood strategies.
Purpose			
Strategies developed which improve food security of poor households through increased availability and improved quality of root crop and horticultural foods and better access to markets.	1.3 By 2002, more efficient and cost-effective methods of small-scale processing validated. 1.5 By 2002, new market opportunities validated, capable of increasing value of commodities produced by the poor.	Annual Research programme reports. External refereeing. External O/P reviews at . Target institutions' reports.	Resources managers, producers and processors are able to adopt new knowledge. Enabling environment exists for widespread adoption of new knowledge. Capabilities of target institutions maintained at least at current levels. Food production constant or increasing.
Outputs			
1. Analysis of the contribution of traditional cassava processing to rural livelihoods.	1.1 Case study villages selected by end of Q1, Y1 (Figure 3) 1.2 Baseline data collection completed and analysis completed by the end Year 2 Second Quarter (Y2 Q2)	Project level O/P reviews Project technical reports Project publications	Season(s) studied typify the general situation Conditions do not exist which make case study villages atypical of the general situation
2. Validation of the options to improve *fufu* processing and commercialise it.	2.1 Market demand identified by end Y1 Q2 2.2 Technical improvements for traditional processing methods defined by end Y2 Q3.	Project level O/P reviews Project technical reports Project publications	.
3. Definition of how cassava processing could be commercialised to give the maximum benefits to sustainable rural livelihoods.	Impact of commercial by 2 possible means defined by end Y3 Q4	Project level O/P reviews Project technical reports Project publications	
4.Confirmation of uptake pathways for project outputs and dissemination of project outputs.	Research framework produced by end of project. Definition of commercialisation approaches which optimise impact on rural livelihoods produced by end of project. Relevant information on improved methods of *fufu*	Project level O/P reviews Project technical reports Project publications	

	processing and marketing of product made available to relevant partners by end of project		
Activities	**Inputs**	**Means of Verification**	**Important Assumptions**
1.1 Select study areas 1.2 Gather base line data to identify the existing contribution of cassava processing to household livelihood systems 1.3 Define possible improvements to traditional processing methods	£219,894	Project quarterly and annual reports.	Householders in the villages, SMEs, and producer groups identified are willing to participate on the project.
2.1 Confirm current and potential future market for *fufu*. 2.2. Optimise improvements to *fufu* processing at a pilot level. 2.3 Market test improved products and undertake preliminary analysis of economics of production 2.4 Identify processor/group/ entrepreneur research partners 2.5 Validate improved processing options with a small number of processors.			Householders in the villages, SMEs, and producer groups identified are willing to participate on the project.
3.1 Analyse the implications of commercialisation 3.2 Evaluate the impact of commercialisation 3.3 Define strategies which maximise the benefits to rural livelihoods			Appropriate technical options identified. Processors willing to pilot new technical options. Successful completion of baseline data gathering and analysis. End-user interest in the strategies defined and materials produced.
4.1 Produce a framework for assessing the impact of technical interventions in the post-harvest sector within the context of the Sustainable Rural Livelihoods Framework. 4.2 Define an approach to the commercialisation of a traditional food product based on an assessment of impact on rural livelihoods. 4.3 Disseminate information on improved methods of *fufu* processing for home consumption and commercialisation purposes. 4.4 Disseminate appropriate information to financial service providers			Successful completion of other project activities

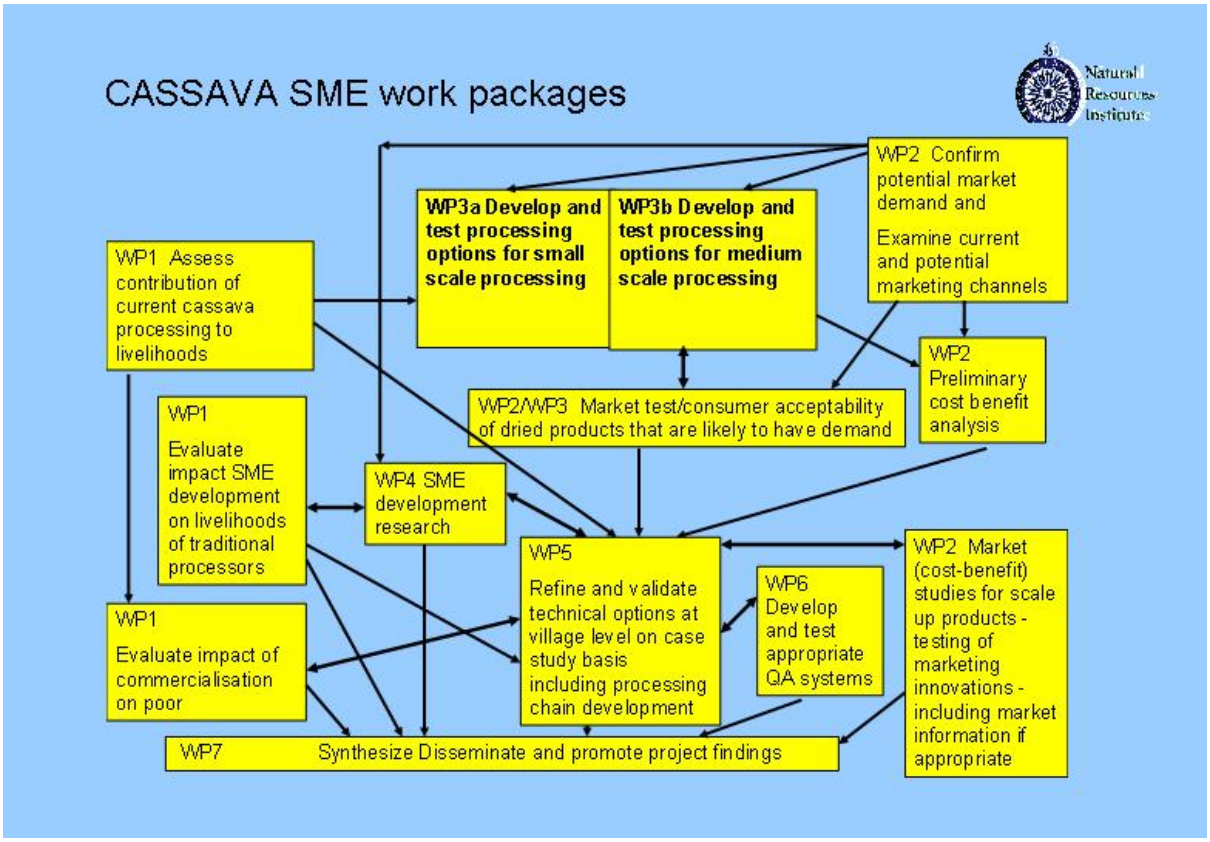
Note: Outputs should be numbered 1, 2, 3, *etc.* Activities should relate to these outputs and be numbered 1.1, 1.2, ...2.1, 2.2, ..

III Partner (user) organisations workplan for adopting project outputs

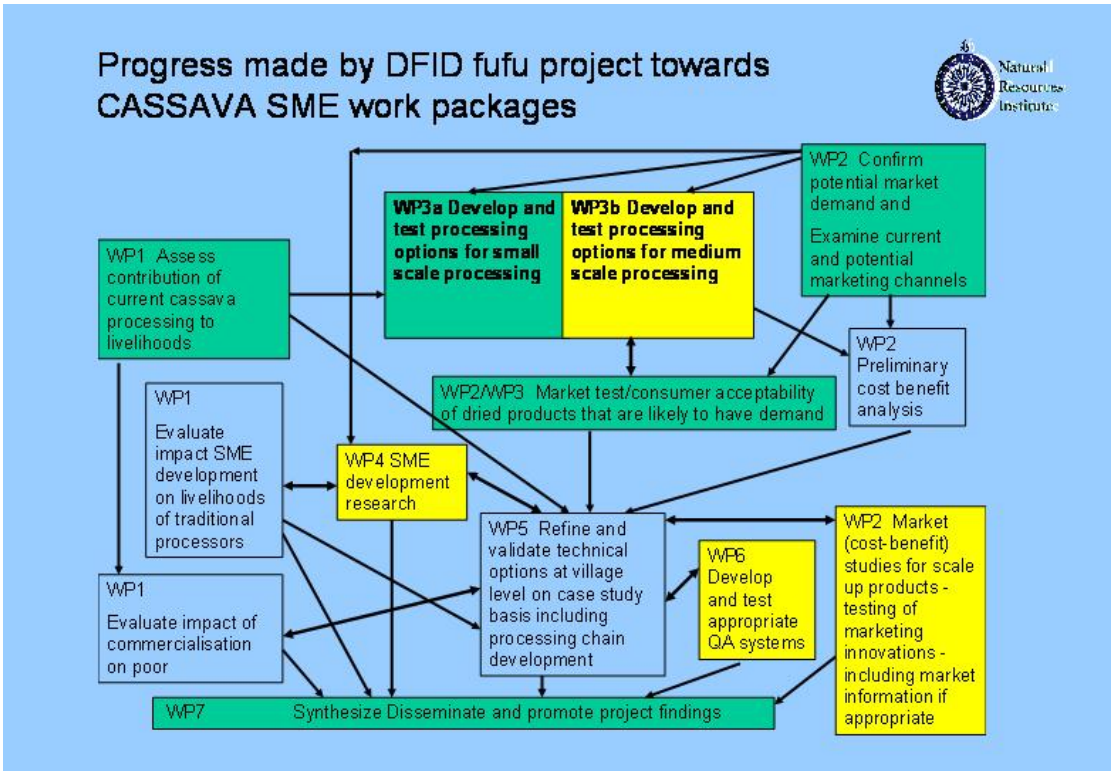
The adaptation of the project outputs is tied up with the implementation of the European Commission funded CASSAVA-SMES project.

In this respect, it is important to explain the relationship between this project R7495 and the on-going cassava-SMES project.

The work packages in the EC funded CASSAVA-SMES project are as follows:



This project addresses the following of these workpackages in Nigeria



Boxes highlighted in yellow are not covered in this project. Boxes highlighted in green show a major contribution and those in blue in lesser contribution. The aim of the CASSAVA-SMES project is to take up and use the outputs of R7495 and R7580 in a more comprehensive regional project.

Further development as a consequence of the DFID and the EU project.

- The technology and approach developed by R7495 and the CASSAVA-SMES project s being expanded by IITA in Nigeria with funding from USAID and Shell Petroleum Development Company in the Cassava Enterprise Development Project (CEDP) and Pre-emptive Cassava Mosaic Disease Project funded by the Federal Government of Nigeria, Niger Delta Development Commission, NNPC and 12 State Governments. USAID and the Shell Petroleum Development Company are investing some US$11 million with the Government of Nigeria is expected to contribute additional US17 million.

  The CMD project is production driven while CEDP project is postharvest and market driven- support and micro and small scale agro-processing activities. A major success of this Integrated Cassava Project is the introduction of Nigerian law of the inclusion of 10% cassava flour in Bread production from January 2005. Other success factors are the current approach being adopted by the ICP in transferring Cassava Postharvest technologies, which is based on the DFID/EU funded cassava project in Nigeria and Ghana.

  The EU/DFID made an important contribution to this wider project in three ways:

- ✓ **Dryer technology**: The early development of production of high quality fufu flour using locally fabricated rotary and flash dryer, which has been successfully fed into the current Integrated Cassava Project being hosted by IITA. The ICP project has funded an additional 19 rotary dryers and 2 Flash dryers. ICP is to order for six more in 2005. 4 flash dryers have been purchased by private investors with 3 more in the pipeline. Photographs of the flash and rotary dryer's are shown below.
- ✓ **Food safety training**: Also, a successful HACCP Schemes approach in the EU/DFID project is currently being transferred to the ICP Project. This provided the opportunity for linkages in collaboration between IITA and EU SME partners. A joint HACCP training was organised between IITA and EUSME at IITA, Onne between 17 and 19 January 2005. 40 participants which were drawn from regulatory agencies (SON and NAFDAC), local processors, research Institutes, and private investors (see photos below) attended. It was resolved to continue collaborating and sharing knowledge with the EU/DFID cassava SME's.
- ✓ **Training manual for SME cassava processors**: The training course will lead to the development of a training manual for SME producers of cassava products.

IV Copies of diaries, coalition meeting reports etc

Specific diaries and coalition meeting reports were not maintained since this project started prior to the coalition (Partnerships for Innovation) project approach.

V Feedback on the process from Partners(s) and users (where appropriate)

Feedback was collected from farmers as a part of carrying out the project and this was used internally in the project.

Project work on the EC funded CASSAVA-SMES project continues until December 2005. This project and that project are interconnected.

It is also important to look at the outputs in a wider context. Root and tuber crops research and development activities have greatly developed over the past 10 years. This project has formed a part of this process. The main change is that root and tuber crops research has become demand/market orientated. Professor Westby has played a main role in this process – partly in the guise of the Global Cassava Development Strategy (http://www.fao.org/ag/AGP/AGPC/gcds/GCS.htm). These changes were for example reflected in the nature of papers given at the International Society for Tropical Root Crops – Africa Branch meeting in Mombassa in November 2004. The international feedback on this work (as a part of a body of work) supported by the DFID Crop post-Harvest Programme is reflected in the following invited presentations

Westby, A., White, J., Ngendello, T., Oyewole, O., Dziedzoave, N.T., Graffham A. and Van Oirschot Q. (2001). Approaches for the development of small scale cassava processing and local food industries that meet the needs of the poor. In Pp. 9-12.. Root Crops: the Small Processor and Development of Local Food Industries for Market Economy. Proceedings of the Eighth Triennial Symposium of the International Society of Tropical Root and Tuber Crops: Africa Branch (ISTRC-AB), 12-16 November 2001. Edited by M.O. Akoroda. Ibadan: ISTRC-AB.

Westby, A. (2004) Linking farmers to markets with HarvestPlus focus commodities in Africa. Keynote invited paper presented at the Harvest Plus Challenge Programme Meeting on "Reaching End Users", May 2004, IPGRI, Rome.

Westby, A., van Oirschot, Q., Tomlins, K., Graffham, A., White, J., Gallat, S., Collinson, C., Ndunguru, G., Ngendello, T., Kapinga, R., Sanni, L., Ayinde, I., Mlingi, N., Adebayo, K., Johnson, P., Oyewole, O., Jumah, A. (2004) Innovative approaches for cassava R&D: Post-harvest in Africa Invited keynote presentation. http://www.ciat.cgiar.org/biotechnology/cbn/sixth_international_meeting/pdf_presentations/Andrew_Westby.pdf

Westby, A., Van Oirschot, Q., Tomlins, K., Ndunguru, G., Ngendello, T., Kapinga, R., Sanni, L. and Oyewole, O. (2003) Root and tuber crop post-harvest systems: lessons learned and future Interventions to contribute to food security and poverty alleviation. Invited thematic paper presented at the 13th triennial Symposium of the International Society for Tropical Root Crops, 8-15 November 2003, Arusha, Tanzania. http://www.istrcsymp-tz.org/ISTRC%20Presentation4.pdf

Westby, A. Van Oirschot, Q., Tomlins, K. Ndunguru, G., Ngendello, T., Sanni, L., Pessey, D., and Oyewole, O. (2004) Bridging the gap between post-harvest technology development and commercialization of root and tuber crops in Africa. Invited thematic paper at the ISTRC-Africa Branch Triennial Symposium, 31 October – 5 November 2004, Mombasa, Kenya.

In addition Professor Westby is helping the HarvestPlus Challenge Programme to develop the marketing and processing component of its “Reaching End Users” component. This component draws heavily on lessons learnt from CPHP-funded root crops projects.

The fact that Professor Westby was selected for contribution to the HarvestPlus challenge programme is a reflection of the esteem in which this and other pieces of CPHP funded research are help within the international community.

VI Tabulated description of disseminated outputs (format from green book)

Westby, A., White, J., Ngendello, T., Oyewole, O., Dziedzoave, N.T., Graffham A. and Van Oirschot Q. (2001). Approaches for the development of small scale cassava processing and local food industries that meet the needs of the poor. In Pp. 9-12.. Root Crops: the Small Processor and Development of Local Food Industries for Market Economy. Proceedings of the Eighth Triennial Symposium of the International Society of Tropical Root and Tuber Crops: Africa Branch (ISTRC-AB), 12-16 November 2001. Edited by M.O. Akoroda. Ibadan: ISTRC-AB.

Westby, A. (2004) Linking farmers to markets with HarvestPlus focus commodities in Africa. Keynote invited paper presented at the Harvest Plus Challenge Programme Meeting on "Reaching End Users", May 2004, IPGRI, Rome.

Westby, A., van Oirschot, Q., Tomlins, K., Graffham, A., White, J., Gallat, S., Collinson, C., Ndunguru, G., Ngendello, T., Kapinga, R., Sanni, L., Ayinde, I., Mlingi, N., Adebayo, K., Johnson, P., Oyewole, O., Jumah, A. (2004) Innovative approaches for cassava R&D: Post-harvest in Africa Invited keynote presentation. http://www.ciat.cgiar.org/biotechnology/cbn/sixth_international_meeting/pdf_presentations/Andrew_Westby.pdf

Westby, A., Van Oirschot, Q., Tomlins, K., Ndunguru, G., Ngendello, T., Kapinga, R., Sanni, L. and Oyewole, O. (2003) Root and tuber crop post-harvest systems: lessons learned and future Interventions to contribute to food security and poverty alleviation. Invited thematic paper presented at the 13th triennial Symposium of the International Society for Tropical Root Crops, 8-15 November 2003, Arusha, Tanzania. http://www.istrcsymp-tz.org/ISTRC%20Presentation4.pdf

Westby, A. Van Oirschot, Q., Tomlins, K. Ndunguru, G., Ngendello, T., Sanni, L., Pessey, D.,and Oyewole, O. (2004) Bridging the gap between post-harvest technology development and commercialization of root and tuber crops in Africa**.** Invited thematic paper at the ISTRC-Africa Branch Triennial Symposium, 31 October – 5 November 2004, Mombasa, Kenya.

The following outputs were reported in the PCSS:

ADEBAYO, K., WHITE, J.L., AYINDE, I. A., SANNI, L. O., OYEWOLE, O. B., DIPEOLU, A. O., WHITE, J. L. and WESTBY, A. (2003) Fufu processing and sustainable livelihoods in southwest Nigeria. Paper accepted for the FOODAFRICA initiative, May 2003. (19 Pages in manuscript).

DIPEOLU, A.O., AYINDE, I.A., ADEBAYO, K., OYEWOLE, O.B., SANNI, L.O., PEARCE, D.M., WANDSCHNEIDER, T.S., WHITE, J. L. and WESTBY, A. (2003) Challenges facing the cassava processing industries in meeting urban food needs in Nigeria. Paper accepted for the FOODAFRICA initiative, May 2003. (15 pages in manuscript).

SANNI, L.O., AKINGBALA, J.O., OYEWOLE, O.B., BAINBRIDGE, Z.A., GRAFFHAM, A.J. and WESTBY, A. (2002) Effects of air drying conditions on the chemical, pasting and sensory properties of *Fufu*, a fermented cassava product p.100-103. In *Proceedings of theTwelfth Symposium of The International Society for Tropical Root Crops: Potential of Root Crops for Food and Industrial Resources,* Ed. M. Nakatani and K. Komaki.

SANNI, L. O,, ONITILO, M., OYEWOLE, O. B., DIPEOLU, A. O. , ADEBAYO, K., AYINDE, I. A., TOMLINS, K. and WESTBY, A. (2003) Effects of cassava varieties and processing methods on the qualities of tapioca in Southwest Nigeria. Paper accepted for the FOODAFRICA initiative, May 2003. (14 Pages in manuscript).

SANNI, L. O., OYEWOLE, O. B., AKINYEMI, A. O., BANKOLE, M. O., DIPEOLU, A. O. , ADEBAYO, K., AYINDE, I. A., WHITE, J. L., TOMLINS, K., WESTBY, A. (2003) Physicochemical, Microbial and Sensory Qualities of dried fufu from various fufu processors in Southwest Nigeria. Paper accepted for the FOODAFRICA initiative, May 2003. (10 pages in manuscript).

SANNI, L. O., OYEWOLE, O. B., OLUWAKUYIDE, F.A.., DIPEOLU, A. O., ADEBAYO, K., AYINDE, I. A., WHITE, J. L., TOMLINS, K. AND WESTBY, A. (2003) Effect of Smoking, Oven and locally fabricated rotary Drying on the Qualities of Fufu. Paper accepted for the FOODAFRICA initiative, May 2003. (11 pages in manscript).

WESTBY, A., WHITE, J., COLLINSON, C., KAPINGA, R., AND GRAFFHAM A. (2002) Matching the potential of root crops as commercial commodities with the needs of the poor. p.14. (Abstract). In *Proceedings of theTwelfth Symposium of The International Society for Tropical Root Crops: Potential of Root Crops for Food and Industrial Resources,* Ed. M. Nakatani and K. Komaki.

5. Internal Reports:

ADEBAYO, K. (2001) The Role of *Fufu* Processing in Local Livelihoods - A Case Study of Ode Remo Town, South-west Nigeria. Project Technical Report. Abeokuta: UNAAB. pp. 35.

ADEBAYO, K. (2001) The Role of *Fufu* Processing in Local Livelihoods - A Case Study of Ilaro Town, South-west Nigeria. Project Technical Report. Abeokuta: UNAAB. pp. 18.

ADEBAYO, K. (2002) The Role of *Fufu* Processing in Local Livelihoods - A Case Study of Ereji, South-west Nigeria. Project Technical Report. Abeokuta: UNAAB.

ADEBAYO, K., WHITE, J. L., DIPEOLU, A. O., AYINDE, I. A., WANDSCHNEIDER, T. S., SANNI, L. O., OYEWOLE, O. B., TOMLINS, K. and WESTBY, A. (2003). Fufu processing and the sustainability of livelihoods in Southwest Nigeria. Technical Report, but planned for Journal Submission. (19 pages in manuscript)

ADEBAYO, K., WHITE, J. L., DIPEOLU, A. O., AYINDE, I. A., WANDSCHNEIDER, T. S., SANNI, L. O., OYEWOLE, O. B., TOMLINS, K. and WESTBY, A. (2003) Innovativeness and stakeholdership in the *fufu* processing systems in southwest Nigeria. Technical report, but submitted to the Journal ASSET. (18 pages in manuscript)

DIPEOLU, A.O, ADEBAYO, K, AYINDE, I.A, WHILE, J.L, PEARCE, D.M, SANNI, L.O, OYEWOLE, O.B and WESTBY, A. (2000) Current and potential future markets for fufu in south west Nigeria. Project technical report, UNAAB and NRI.

DIPEOLU, A.O., ADEBAYO, K., AYINDE, I. A., OYEWOLE, O. B., SANNI, L. O., PEARCE, D.M., WANDSCHNEIDER, T.S., WHITE, J. L. and WESTBY, A. (2001) *Fufu* Marketing Systems in South-West Nigeria. Report R2626. Chatham: Natural Resources Institute. pp. 46. http://www.nri.org/research/rootcropsA0898.doc

DIPEOLU, A.O., AYINDE, I.A., ADEBAYO, K., OTEWOLE, O.B., SANNI, L.O., OEARCE, D.M., WHITE, J.L. and WESTBY, A. Viability analysis of cassava processing in South Western Nigeria. Project technical report, UNAAB and NRI. pp. 36.

DIPEOLU, A. O.; AYINDE, I. A.; ADEBAYO, K.; OYEWOLE, O. B.; SANNI, L. O.; PEARCE, D. M.; WANDSCHNEIDER, T. S., WHITE, J. L.; WESTBY, A. Viability Analysis of Cassava Processing Options in Ogun State Towards Poverty Alleviation. Presented at 17th FAMAN Conference organised between October 22 and 24, 2002 at the Sheraton Hotel and Towers Abuja, Nigeria. (16 pages in manuscript).

OYEWOLE, O.B., SANNI, L.O., DIPEOLU, A.O., ADEBAYO, K., AYINDE, I.A., WHITE, J.L., TOMLINS, K.I. and WESTBY, A. (2001) Factors influencing the quality of Nigerian *fufu.* Poster presented at the 8th Triennial Symposium of the International Society for Tropical Root Crops-Africa Branch. 12-16 November 2001. (Poster presented – but written version also supplied for proceedings)

OYEWOLE, O.B., SANNI, L.O., DIPEOLU, A.O., ADEBAYO, K., AYINDE, I.A., WHITE, J.L., TOMLINS, K.I. AND WESTBY, A. (2002) Effect of traditional variations in processing and storage on the quality of Nigerian *fufu*. For submission to the Journal of the Science of Food and Agriculture. (22 pages in manuscript).

SANNI, L.O., OYEWOLE, O.B., DIPEOLU, A.O., AYINDE, I.A., ADEBAYO, K., WANDSCHNEIDER, T.S., WHITE, J.L. , TOMLINS, K. and WESTBY, A. (2002) Consumer acceptability of traditional (wet) and dried Nigerian fufu. Project internal report that could be submitted to *Food Control or Food Quality and Preference*, (18 pages in manuscript).

TOMLINS, K. I., SANNI, L. O., OYEWOLE, O. B., DIPEOLU, A. O., AYINDE, I. A.[2], ADEBAYO, K. , WANDSCHNIEIDER, T. S., WHITE, J. L. and WESTBY, A. (2002) Urban consumer acceptability of traditional (wet) and dried Nigerian fufu. Project internal report that will be submitted as a publication to the Journal of the Science of Food and Agriculture*. UNAAB,NRI. 13 pages in manuscript.*

WESTBY, A. (2001) Commercialisation of Cassava Fufu Processing in West Africa that Maximises Benefits to Livelihoods: Website http://www.nri.org/research/rootcrops-proj-a0898.htm English. (G)

WESTBY, A., OYEWOLE, O.B., WHITE, J.L., DIPEOLU, O.A., SANNI, L.O., ADEBAYO, I.A. and AYINDE, I.A. (1999) Issues in selecting study locations for the *fufu* commercialisation project in Nigeria. *Fufu* Project Working Paper 1, UNAAB and NRI.

WESTBY, A., WHITE, J., NGENDELLO, T., OYEWOLE, O., DZIEDZOAVE, N.T., GRAFFHAM A. and VAN OIRSCHOT Q. (2001). Approaches for the development

of small scale cassava processing and local food industries that meet the needs of the poor. Presented at the 8th Triennial Symposium of the International Society for Tropical Root Crops-Africa Branch. 12-16 November 2001. (included data from other CPHP projects)

WESTBY, A., WHITE, J., NGENDELLO, T., OYEWOLE, O., DZIEDZOAVE, N.T., GRAFFHAM A. and VAN OIRSCHOT Q. (2001). Approaches for the development of small scale cassava processing and local food industries that meet the needs of the poor. Presented at the 8th Triennial Symposium of the International Society for Tropical Root Crops-Africa Branch. 12-16 November 2001. (included data from other CPHP projects)

WHITE, J.L. and ADEBAYO, K. (2002) Preliminary Analysis of Potential to Improve/Scale up *Fufu* Processing Activities in Study Locations. Project Internal Technical Report. Pp. 6.

WHITE, J. L., ADEBAYO, K., DIPEOLU,O. A., AYINDE, I. A., OYEWOLE, O. B., SANNI, L. O., WESTBY, A., WANDSCHNIEIDER, T. S. and TOMLINS, K. (2002). Fufu processing and livelihoods in Ogun State, Nigeira. Report of a baseline as part of Project A0898 carried out for the United Kingdom's Department for International Development (DFID). NRI and UNAAB Report. 34pp.

6. Other Dissemination of Results:

ANON (2002) Development of the small and medium scale enterprise sector producing cassava based products to meet emerging urban demand in West Africa (CASSAVA-SMES). Project summary prepared for EC INDO-CAT 1pp.

OYEWOLE, O.B., SANNI, L.O., DIPEOLU, A.O., ADEBAYO, K., AYINDE, I.A., PEARCE, D.M., TOMLINS, K. and WESTBY, A. (2001) Improved processing technology for the fermentation of cassava fufu. Oral paper presented at the 11th World Congress of Food Science and Technology, Seoul, South Korea.

TOMLINS, K. (2002) Seminar: Consumer acceptability: positioning a product for maximum volume or maximum liking in a niche. Natural Resources Institute, 20 November 2002.

WESTBY, A. (2001) Improved processing technology for processing of cassava fufu. Oral Presentation to His Excellency Prince Bola Adesumbo Ajibola KBE, Nigerian High Commissioner to the United Kingdom.

A workshop will be held in Nigeria (24-28 March 2003) to promote the project outputs to date and to develop the new CASSAVA-SMEs project into which the outputs from this project will sit. The following papers will be presented at that meeting:

ADEBAYO, K. and WHITE, J. L. (2003) Sustainable livelihoods in traditional food processing: case studies of five *fufu* processing locations in South West Nigeria

DIPEOLU, A.O. and AYINDE, I.A. (2003) Fufu marketing in Nigeria

OYEWOLE, O.B. and SANNI, L.O. (2003) Cassava processing in Nigeria-the constraints and challenges.

TOMLINS, K. (2003) Consumer Acceptability of dry fufu.

WESTBY, A. (2003) Development of the small and medium scale enterprise sector producing cassava based products to meet emerging urban demand in West Africa

A video documentary presentation has been prepared which is a 30min-summary of the project history with a view to reaching a wider audience with the potentials and possibilities provided by the project.

Listing and reference to key data sets generated:

The main datasets are the raw data from the on-farm studies. It is the project participants intention to make available in the public domain all of the data generated – either through making available project reports or through NRI's or the CPHP's web-site after due time has been given for the partners to publish their work either through international meetings or through peer reviewed journal articles.