MARKET
DEVELOPMENT
IN THE NIGER DELTA

DFID Department for International Development

Funding for this programme
is provided by the United Kingdom's
Department for International
Development (DFID)

Monograph Series Vol. 23

MAPPING OF CASSAVA CLUSTERS IN NIGER DELTA STATES OF NIGERIA

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DEVELOPMENT
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Synthesis/Main Report

MAPPING OF CASSAVA CLUSTERS IN NIGER DELTA STATES OF NIGERIA

November 2019

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We believe the information will contribute to sector dialogues and conversations around development in Nigeria.

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EXECUTIVE SUMMARY

Despite Nigeria's leading position as the world's leading cultivator of cassava, contribution of the Niger Delta, availability of market and the sustained efforts to improve the value chain, very little exists on the cassava production capacity of the Niger Delta and the distribution of clusters.

Market Development Programme in the Niger Delta (MADE), which is funded by the Department for International Development (DFID), commissioned this mapping of cassava producing clusters in the Niger Delta to get a basis for effective planning and developing of the value chain and to enable commercial processors understand the availability of raw material and use same to plan their procurements.

The mapping showed that all the states cultivate much cassava and that states such as Bayelsa and Imo, hitherto considered as smaller players, are now major producers. Abia had the highest potential output of 1.545 million mt while Cross River, a higher producer than Imo 13 years ago, seemed overtaken by the latter.

The predominance of small farms implied that commercialization is not increasing and that there is little room for scale economies in mechanization, unless if small technologies would be deployed. In addition, tiny mills of less than 1mt/day were predominant and private-owned, manual and situated near the homestead. But there are openings for investment due to high demand for foodstuff and products without rodent contamination, among other factors. In the Niger Delta, only a few facilities had intermediate products such as tapioca and HQCF; companies established by government have ceased to function due to inefficiency and poor cost control.

Most farmers, notably in Abia, Cross River, Imo, Ondo and Rivers sold in the open market. Farmers used a combination of head carriage, wheel barrows and motorcycles/tricycles to convey raw cassava to the market. Edo and Ondo relied most on pick-up trucks for transportation while animal-drawn carts were not in use at all anywhere in the region. Therefore in making investment decisions, cognizance must be taken of vehicles that are fit for the peculiar terrain of the selected area, for reasons of efficiency and durability of vehicles.

Cassava production is seasonal and demand for its products is very high; the enterprise is also highly profitable, as reflected in the net margin of 98.97% and 99.92% in Abia and Bayelsa respectively to 139.02% and 168.14% in State to 139.02% in Imo and Akwa-Ibom respectively.

Most of the farmers in the mapped locations (72.84%) received training from government extension agents, MADE partners and other interventions. Farmers' willingness to pay for training was high in Abia, Bayelsa, Edo and Rivers but lower in Akwa-Ibom and Delta, both for the manageable reason of inability to afford the cost.

Key support services required for the sector were affordable mechanization, extension, linkage to agro-dealers, finance and access to off-takers. These were available at varying degrees in the states. Mechanized land preparation services were in Edo and Rivers, access to institutional funding was generally low-moderate in all states except in Edo and Rivers; Rivers stood out as a state where primary producers easily linked with buyers of output; lastly, extension services were relatively most available in Akwa Ibom, Ondo and Rivers states.

Investment opportunities include training for farmers, measurement of farm size, private mechanization services, commercialized extension services, sale of agrochemicals, financial services, linkage to off-takers, transport machinery and services and lastly, market information to both parties across the exchange divide.

The cassava value chain in the Niger Delta is quite huge and has abundant investment potentials waiting to be tapped[1].

1.0 INTRODUCTORY INFORMATION

1.1 Background

With a land mass of about 356,700 square miles or 923,770 square kilometres (out of which about 700,000 square kilometres is cultivable), varying agro-ecological zones, alternating wet and dry seasons, an impressive array of flora and fauna, abundant labour and a huge population, Nigeria is no doubt endowed with huge agricultural potentials. However, due to reasons including but not limited to poor and inefficient activities along the entire value chains of many commodities, the agricultural potential is hardly actualized. An additional and equally important feature is the disconnect existing between primary producers and the processors; this scenario is evident in virtually all enterprises, including root crops, especially cassava.

Nigeria is the world's leading cultivator of cassava; total annual output is about 44.5 million mt, with the yield per hectare averaging at about 12 mt. The Niger Delta Region, comprised of nine states (Abia, Akwa Ibom, Bayelsa, Cross River, Delta, Edo, Imo, Ondo and Rivers), has the requisite climatic and edaphic features suitable for cassava cultivation and by extension, other value chain activities. Even with improved varieties and the continued dissemination and adoption of improved practices leading to increasing output, the nation's industrial demand estimated at 8.8 million mt remains largely unmet[2].

Cassava is rich in starch in the form of carbohydrate and it has multiple uses; not only is it consumed in many processed forms by humans, it is also useful in industry as livestock feed, confectionery components, flour, various forms of starch, adhesives, pharmaceutical additives etc..[3]

Market Development Programme in the Niger Delta (MADE), which is funded by the Department for International Development (DFID), carried-out the following key interventions to support improvement in Nigeria's cassava market:

i) Increasing productivity through the dissemination of good agronomic practices for farmers' adoption

ii) Linking small-holder cassava farmers to commercial processors for enhanced value chain efficiency and increased rewards to the poor farmer and

iii) Development of a commercially sustainable cassava seed value chain whereby farmers (who are linked to processors) would purchase quality planting material provided by profitable village seed entrepreneurs

[1] This document was prepared and submitted to MADE by: Auwalu Haruna of Crystal Associates

[2]IFAD (2012) Federal Republic of Nigeria, Value Chain Development Programme (VCDP); Programme Design Report, Volume I: Main Report, page 4; The International Fund for Agricultural Development, West and Central Africa Division Programme Management Department

[3]Okogbenin, E; Fregene, M; Ceballos, H; Egesi, C; Fulton T; Alves, A (2012): "Cassava Research in Nigeria - September 2012" (ppt). National Root Crops Research Centre. Retrieved 25 September 2013

In spite of continued efforts to improve the cassava value chain, there is very little information about the cassava production capacity of the Niger Delta as well as the distribution of clusters; this is not only a vital link absent in the value chain, but also a fundamental basis for any improvement plan. Accordingly, MADE, with the aim of comprehensively understanding the cassava market, commissioned this mapping of cassava producing clusters in the Niger Delta for effective planning and developing of the value chain and to enable commercial processors understand the availability of raw material and use same to plan their procurements.

1.2 Objectives of the Exercise

a) To identify and map cassava producing clusters in the nine Niger Delta states,
b) To ascertain the location of major cassava processing facilities (for intermediate cassava products – starch, grits, tapioca, HQCF etc) in the Niger Delta,
c) To identify industrial end-users of cassava roots and derivative products within Niger Delta and environs,
d) To facilitate a comprehensive understanding of the local cassava supply market,
e) To highlight the critical market support services existing within the region will be mapped, and
f) To identify perceived gaps and opportunities for investment in critical support services essential to the development of the supply chain.

2.0 METHODOLOGY

The following procedure was employed in carrying-out this mapping exercise:

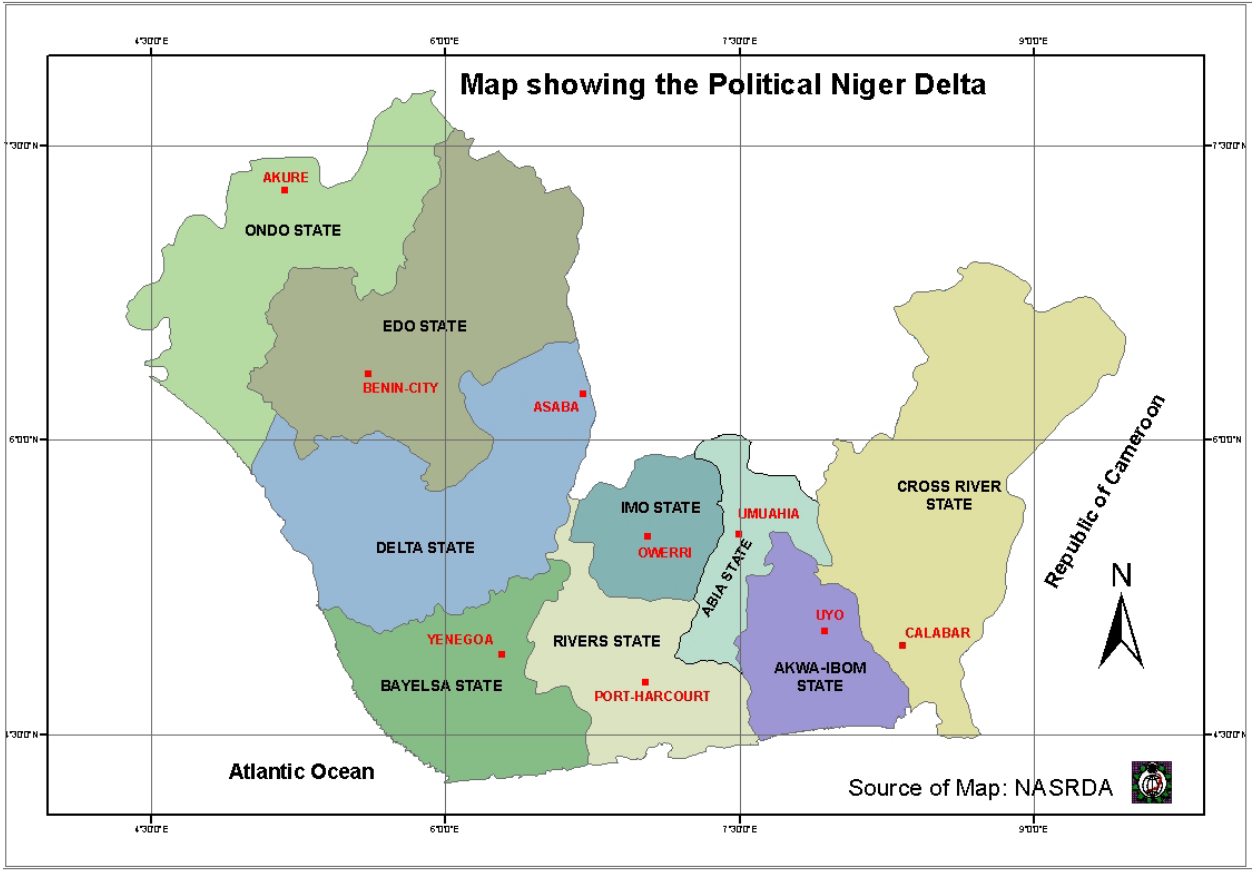
2.1 Identification of states recognized as leading cassava producers in the Niger Delta:
The selected study area had a direct bearing on the research methodology adopted, especially in relation to preponderance of cassava value chain activities.

The Foundation for Partnership Initiatives in the Niger Delta (PIND), in its Cassava Value Chain Analysis, highlighted Akwa Ibom, Cross River, Imo, Ondo and Rivers as the five principal production states, which jointly accounted for about 80% of the total cassava output of the Niger Delta region as at 2011[4]. Furthermore, the Food and Agriculture Organization (FAO), in July 2013 listed all the Niger Delta states as cassava-producing[5]; therefore the primary production of cassava is a major enterprise in the Niger Delta.

MADE interventions focus on the entire Niger Delta region and on this premise, all the nine states of Abia, Akwa Ibom, Bayelsa, Cross River, Delta, Edo, Imo, Ondo and Rivers were covered under the study, as indicated on the map below.

[4]PIND (2011): A Report on Cassava Value Chain Analysis in the Niger Delta, page 12; Foundation for Partnership Initiatives in the Niger Delta

[5]Asante-Pok A., (2013): Analysis of Incentives and Disincentives for Cassava in Nigeria. Technical Notes Series, MAFAP (Monitoring and Analysing African Food and Agricultural Policies), FAO, Rome; www.fao.org/docrep



2.2 Detailed Study On Location and Features of Cassava Clusters and Processing Facilities

a) Collection of secondary data through the review of literature from various sources: due to the complementarity existing between primary and secondary sources of data, a detailed review of literature was done to reveal all important facts related to the cassava value chain of the Niger Delta and also corroborate the researchers' observations on the field.

b) Collection of primary data using structured questionnaires administered by trained enumerators

c) Use of web-based application for real-time collection of data

d) Key informant interviews with selected processors of cassava

e) Collation, cleaning and analysis of data

3.0 DETAILS OF ACTIVITIES.

3.1 Preliminaries

3.1.1 The Survey Instruments

A structured questionnaire was designed, wherein all the objectives of the mapping exercise were covered; questions contained therein include cluster location by LGAs, number of cassava farmers per cluster, hectarage, membership of formal groups, involvement with MADE intervention, predominant varieties cultivated, seasonality and yield. The questionnaire also sought for the farmers' method(s) of tillage and all agronomic practices, harvest, conveyance and sale outlets.

3.1.2 GPS-Based Data Collection

For collecting the data, we deployed a local web-based mobile data collecting application, which used easily available android phones and was user-friendly and easily deployable, even in remote areas. Key features of the application are highlighted in the annex:

3.1.3 Identification, Hiring and Distribution of Personnel

In regards to distribution of field staff, each of the nine states had three enumerators, who were selected from the pool of MADE's trained enumerators, on the basis of their individual hands-on experience in such surveys, adequate knowledge of the targeted survey areas and the ability to administer the survey instruments.

The conscious drive to include females in the survey team resulted in a male:female ratio of 63%:37%

3.1.4 Capacity Building for Enumerators

Through the pre-survey training, the enumerators received orientation about the mapping exercise, research methodology (with emphasis on contents of the data gathering instruments, identification of cluster locations and leaders,, process of interviewing, sharing information/experience while on the field and handling interviewee objections). Areas such as measurement of quantitative items and differences from one location to another, convertibility and uniformity of information gathered were also discussed. A staff from MADE participated in the training and highlighted the objectives of the overall MADE project and the importance of the mapping exercise, stressing the need for enumerators to properly apply their knowledge of their respective locations and experience earlier gained from previous MADE-related field work.

The pre-survey training also included a session specifically dedicated to the use of android phones to collect the GPS-based data; this session, which was handled by the software/network engineer who designed the application, was a step-by-step practical training on initial steps of signing-on, capturing latitude and longitude coordinates, right through the process of capturing, saving and uploading all data from the hand-held devices to the server.

3.1.5 The Cluster – A Definition

Under this mapping exercise, a cluster has been defined as an aggregation or concentration of farmers cultivating the same crop over a given location. The said collection is occasioned by factors, which may differ from state to state as follows:

a) Prevalence of cassava cultivation in specific locations over a long time, due to certain climatic and/or edaphic factors suitable for the crop;

b) Design by an agency such as Ministry of Agriculture or River Basin & Rural Development Authority, which maps out specific plots with supporting infrastructure (such as watering canals and feeder roads). The same or any other agency may also have encouraged the producers to coalesce into formal or semi-formal groups and

c) Influence of certain value chain activities such as out-grower schemes, proximity of processing centres, notable markets or specific crop interventions.

Clusters were generally similar in having evolved from a combination of two or all three of the aforementioned factors. Irrespective of how a crop cluster evolved, producers may or may not operate in contiguous fields and in most clusters there was someone, who could speak on behalf of all other farmers.

3.1.6 Cluster Identification in the States

In order to correctly locate clusters our first step was to check the states' Ministries of Agriculture & Natural Resources and Agricultural Development Projects (ADPs) for maps of clusters. We also consulted reputable agro-dealers for lists of cassava farmers, in addition to reaching-out to, and explaining the objectives of the exercise to major producers.

Our channels of communication with major actors in primary production of cassava remained open throughout the mapping exercise.

During the mapping activities, information on clusters was continuously validated using secondary data from Ministries of Agriculture and in some states, using knowledge from interventions by USAID MARKETS (Maximizing Agricultural Revenue for Key Enterprises in Targeted Sites) the Foundation for Partnership Initiatives in the Niger Delta (PIND), International Institute for Tropical Agriculture (IITA) and National Root Crops Research Institute (NRCRI). Furthermore, the enumerators continuously validated from cluster heads, information on their clusters as well as other clusters in their neighborhood.

3.1.7 Sampling and the Basis for Selecting Respondents

It was important to target the right interviewees, to ensure the correct information was gathered; as such, the sampling was not random. Therefore the cluster leaders were the farmers selected for interviewing because they are fully aware of the dynamics of their groups and abreast with typical characteristics such as land size, inputs used, general agronomic practices, access to finance, average yields, successes attained and challenges that may be facing the farmers. These pieces of vital information would not ordinarily be available to a common cluster member.

We targeted a total of eighty one (81) farmers (cluster heads) per state. Drawing from our experience from another project (Mapping of Tomato Clusters in Northern Nigeria), where we had an average of 57 clusters per state (in spite of the vastness of its cropping), we projected an increase of at least 40% to arrive at number of targeted clusters for cassava, given the wider production of cassava as a staple food. More so, since the census method of data collection was to be used, it was better to project to cover many existing clusters, big or small.

In view of the foregoing, the sampling method was purposive (judgmental), focusing on interviewing the leaders of the clusters. However, to strengthen the quality of data generated, in selected instances, the responses of the cluster heads were corroborated by information of other cluster heads in a locality.

The purposive sampling technique though non-probabilistic, remains most effective in cases where it is paramount to study a certain group that is adjudged knowledgeable about an issue. In addition, the technique boosts data quality and reliability, while targeting the knowledge and competence of the informant. We considered this approach as the most suitable if we were to practically capture reliable records of the activities of the clusters from their members that have professional and administrative overview of their activities.

3.1.8 The Mapping

To get the cluster leaders, we combined secondary data from previous activities, KIIs with selected personalities and enumerators' knowledge of cassava value chain activities in the states; on getting to the field each enumerator applied the relevant entry techniques that suited his/her locality of deployment and the enumerator interviewed the cluster head. Real-time data (including pictures and videos) were captured after initial capturing of the GPS coordinates of each point of interview.

After transfer of information from the paper questionnaire to the web-based application using the mobile devices, it was routinely uploaded to the server. In addition, field experience and other relevant matters were constantly shared through the project's WhatsApp chat group for on-the-go referencing and monitoring. MADE officials included in the forum provided invaluable queries, hints, guides and clarifications during the field exercise.

3.1.9 Information on Processing Plants

During the interviews and KIIs, data was obtained about the processing facilities in each state, ownership, kinds of products, current state of operation, closest cassava clusters, sources of raw materials, installed capacity and actual output (peak and off peak).

3.1.10 Estimating the Number of Farmers

Each cluster head interviewed was asked about the number of farmers in his/her cluster; we also asked the cluster head about the gender mix within the cluster. Thereafter, the composition of males and females was compared with the total number he/she stated, to ensure that there was consistency in data collected. The summation of all the farmers per cluster for each state gave the number of farmers for the state.

3.1.11 Key Informant Interviews

These interviews were carried-out with selected entrepreneurs who are sufficiently experienced and knowledgeable about the cassava value chain within their state and other parts of the Niger Delta.

3.1.12 Yield Analysis

From our practical experience, under traditional agriculture (where the farmer applies zero or at best, very few improved technologies), for instance at Ubulu-Uku in Delta State, the cassava yield per hectare is 11.42 tons[6]; on average, the yield for the Niger Delta Region is about 10t/ha but with proper adoption of the recommended practices till harvest, the yield per hectare is 25 – 40 tons. Thus, for statistical reliability, the midpoint of the yield range, ie 32 mt/ha was assumed as potential yield per hectare.

To estimate the actual yield (quantity of cassava harvested from the field in the most recent season), we took the average yield per hectare and multiplied by the total hectarage (for cassava only) in the cluster.

[6]PIND/DDI (2015): Report for July 2015 on Diamond Development Initiatives/PIND Co-Facilitation in Cassava Value Chain Projects/Interventions, page 3

For more exact estimation of farm productivity, we physically measured selected fields using the pacing method, especially where respondents tended to exaggerate their figures on size of arable land. In addition, we also verified inaccurate data independently from other participants in the value chain.

3.1.13 Post-Mapping Events

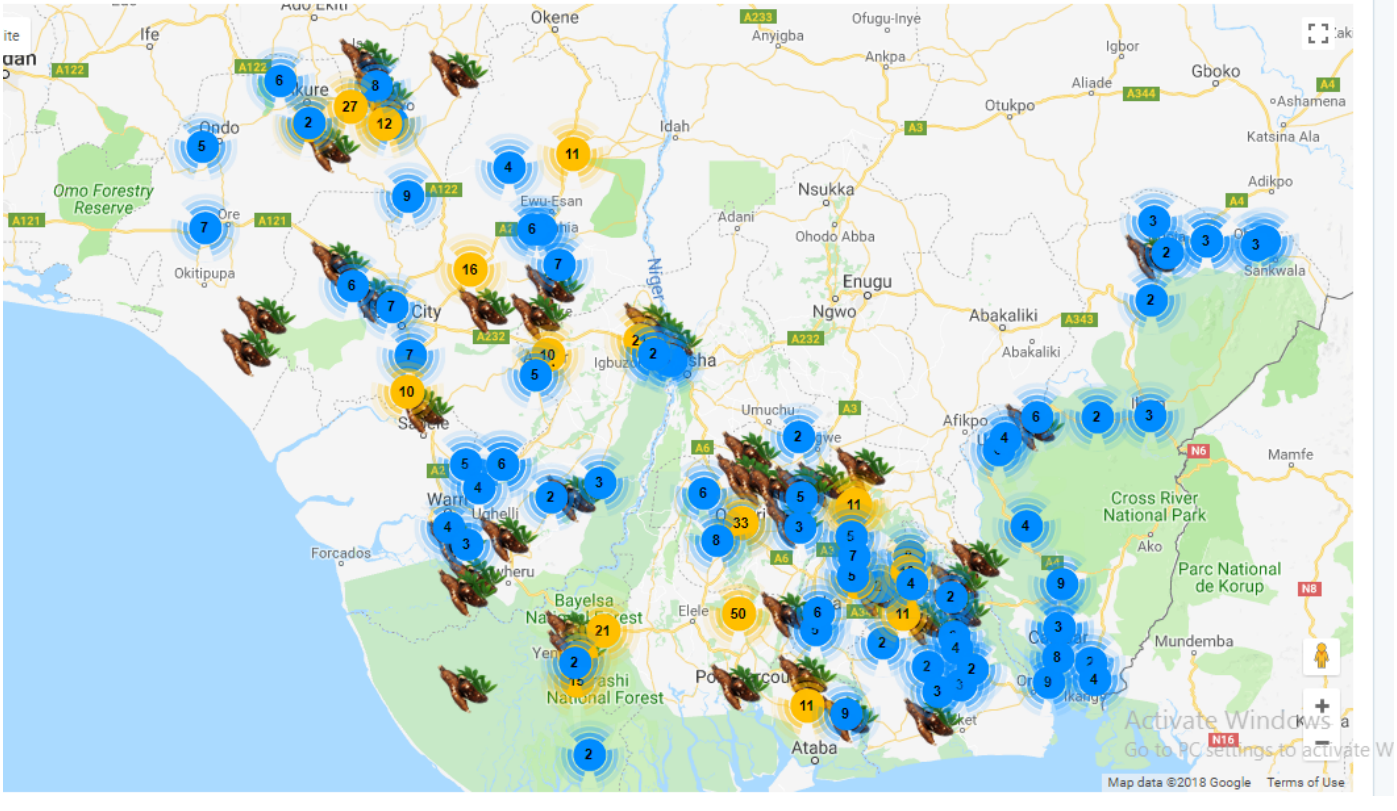
Following the successful completion of field work, uploading of data continued, followed by collation and cleaning; the latter exercise involved periodic communication with the field staff, re-visit to selected locations, discussions with other participants along the cassava value chain, corroboration with contemporary market indices and receipt of inputs from MADE officials.

The analyses undertaken were quantitative and qualitative and aimed at attaining the objectives of the mapping exercise. Prior to developing the report, preliminary results of the analyses were shared with MADE for comments.

4.0 DISCUSSION OF THE RESULTS & FINDINGS OF THE STUDY

4.1 Map of Cassava Clusters in the Niger Delta

The map below, which is the final product of the specifically designed web-based application, shows at a glance, the locations of cassava clusters in the Niger Delta Region.

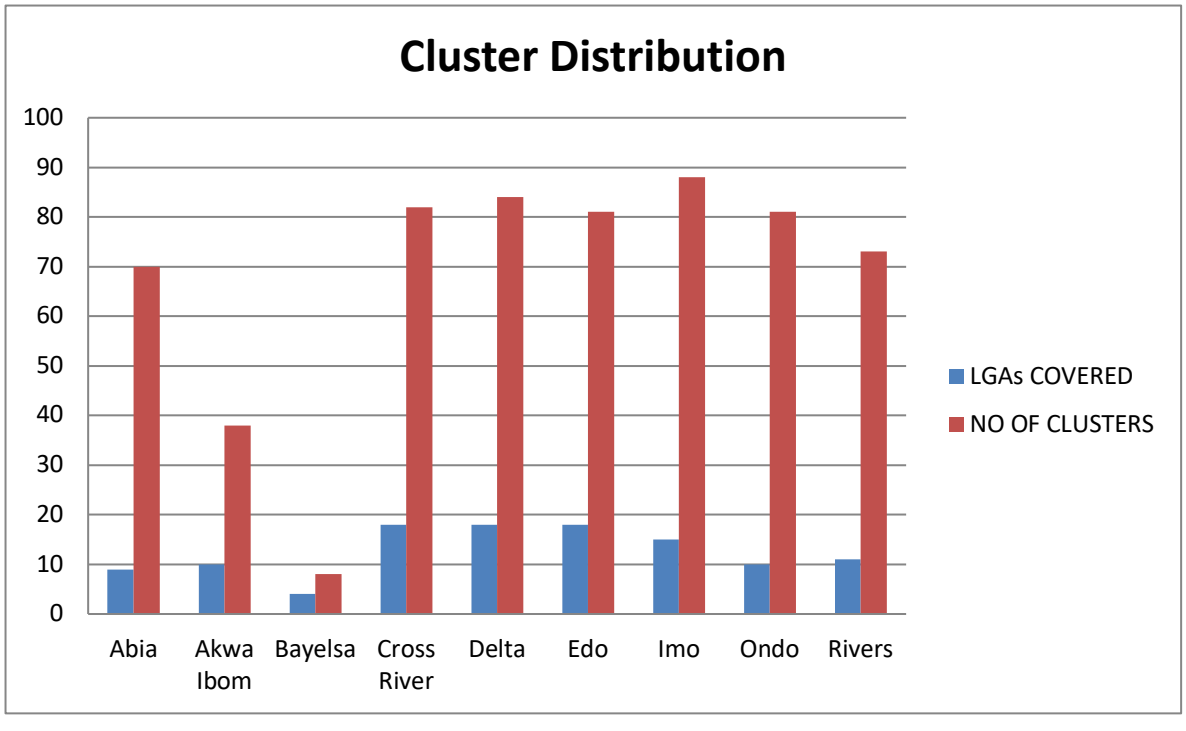


The cluster map above, displays location markers, with each marker indicating cassava clusters. In addition to the report is the zipped-up and specially designed web application, together with its read-me file, which specifies how to install and read its contents of the mapped locations. Furthermore, the figure below shows on a state-by-state basis, the number of LGAs covered and total number of clusters mapped. The cluster map and the figure below jointly demonstrate that all the Niger Delta states have high numbers of cassava producers, even though Bayelsa was distinctly low; the state has multitudes of

cultivable small-scale farms in scattered and remote locations. These features tend to limit the ability of existing farmers to link-up with off-takers, a situation that could be a dis-incentive to entrepreneurs who wish to partake in cassava cultivation.

Despite the low figure of farmers, cassava is extensively cultivated in all the LGAs of Bayelsa State, where every rural household owns a cassava farm. In addition, cassava is considered as a major enterprise in the state and the government is interested in developing it and also encouraging investment into the cassava value chain. The government's desire to boost the participation of local farmers in cassava cultivation is reflected in on-going distribution of stem cuttings from improved varieties under the guidance and support of the state's Agricultural Development Programme (ADP)[7]. Therefore the incentives being provided by the state government are aimed at encouraging more farmers to adopt efficient technologies in cassava cultivation, for increased output and linkage to off-takers.

Fig. 1: Summary of Cluster Distribution Across the Niger Delta



[7]https://www.agrobusinessngr.com/agriculture-opportunities-in-bayelsa-state/ Agriculture Opportunities in Bayelsa State; reported by Abdulsalam Olawale, Abdulsalam OlawaleJuly 2, 2016

The constant availability of high quality raw materials (as influenced by the number of farmers and/or output of fresh cassava roots) is a factor that attracts processing mills; Invariably, it is the existence of farmers that influences the evolution and development of a cluster and it is also an important factor in determining where to site a processing plant.

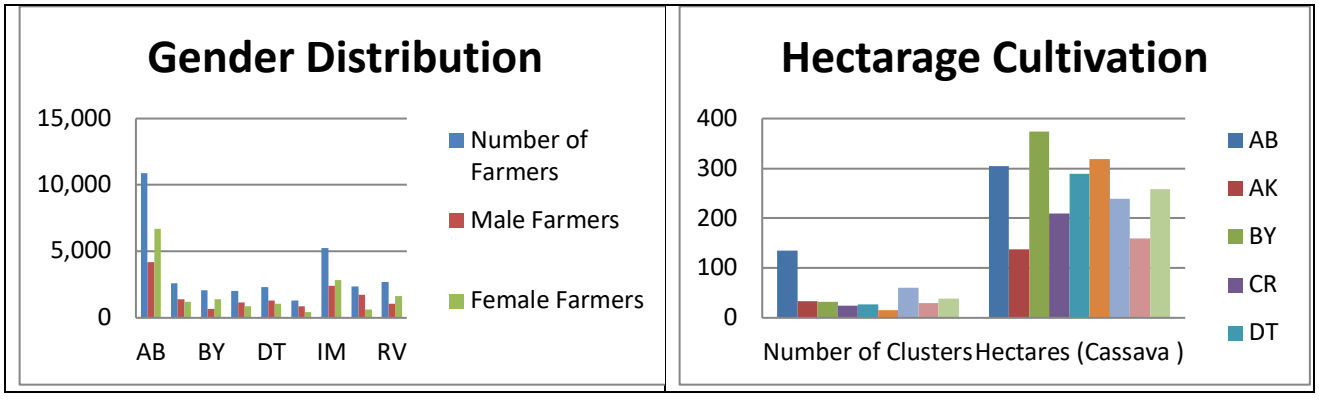
Cassava Farm at Isokan/Ilara Cluster in Ondo State

4.2 Clusters of Cassava Producers in the Niger Delta States

4.2.1 Number of Farmers, Gender and Area Cultivated

The Fig. below shows Abia as the state with the highest number of cassava farmers (10,903) under the mapping activity, followed by Imo with 5,252 while Rivers and Akwa Ibom were in the middle range. The state with the least number of farmers (1,287) was Edo.

Fig. 2: Number of Farmers, Gender & Hectarage Cultivated



Overall, the gender composition of farmers was skewed in favour of males in similarity to many other agricultural enterprises in which males dominate field work. The low participation of females in primary production in agriculture could be due to inability to get land, in addition to the challenge of low access to to finance.

The extent of female involvement in cassava cultivation ranged from 68.34% in Bayelsa to as low as 26.62% in Ondo State. The only other state with a female composition of less than 35% in its population of cassava farmers was Edo at 34.27%. This is consistent with the findings of Nwaobiala et al (2014) in

their study of farmers in two Niger Delta States where the International Fund for Agricultural Development (IFAD) had been deeply involved with cassava farmers[8]. Furthermore, an appreciable component of female farmers usually attracts investors in search of places in which to establish women-targeted programmes.

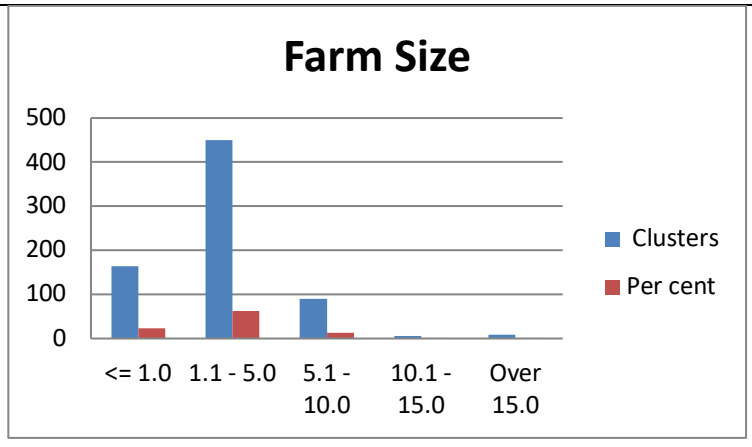
Bayelsa State had the highest total land area under cassava cultivation (374.35 hectares) followed by Edo (318.1ha) and Abia (305ha); Akwa Ibom was the least with 137.9 ha. This result may be surprising but still appears plausible, because not only is cassava recognized by Bayelsa State as a major crop, there are high numbers of small-scale farms in scattered locations. In addition, the government has remained determined to develop the value chains of cassava and other agricultural commodities in the state. .

Female Cluster Head (Arbor Obi in Ika South LGA Delta State)

Specifically, on the Fig. below, statistics on the average cassava farm size for a farmer in the cluster revealed that 85.4% of the farmers cultivate 5ha or less. This buttresses the fact that most of the cassava produced in the Niger Delta comes from small-scale farmers cultivating small farm holdings.

3: Frequency Distribution of Farm Size

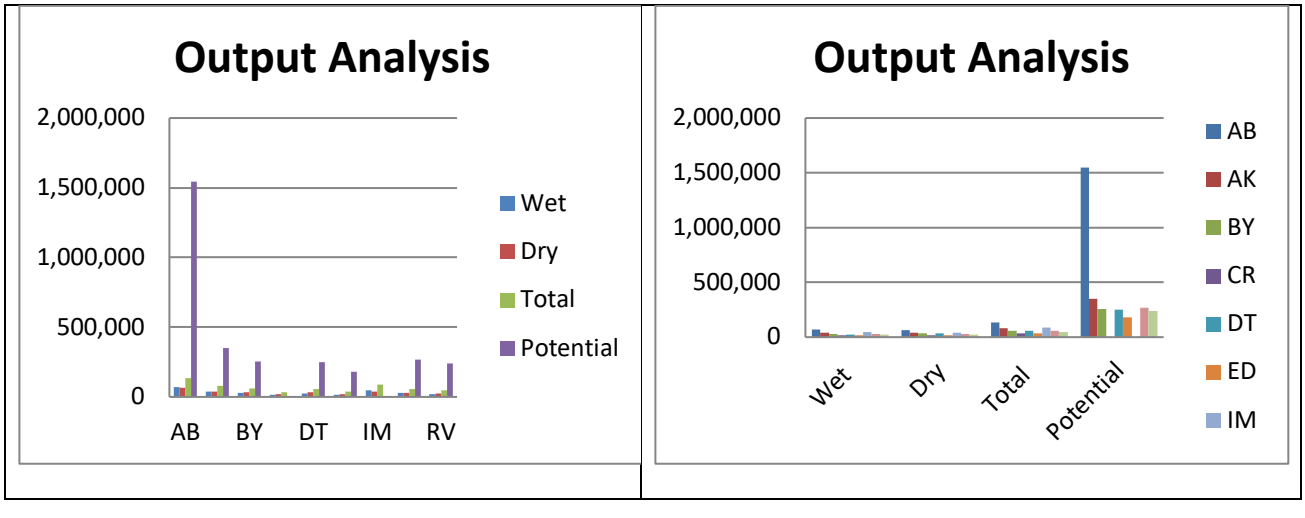
[8]Nwaobiala, C. U, Ogbonna, M. O and Egbutah, E. U (2014): Assessing Levels of Participation among Farmers in IFAD/FGN/NDDC Community-Based Natural Resource Management Programme in Abia and Cross River States, Nigeria; Discourse Journal of Agriculture and Food Sciences www.resjournals.org/JAFS ISSN: 2346-7002 Vol. 2(5): 136-141, May, 2014



4.2.2 Cassava Output

In line with the yield analysis earlier highlighted in Section 3.1.11, actual cassava output was computed (for the wet and dry season), by multiplying the average land area under cassava, the number of farmers in the cluster and the yield per hectare; the results were summed-up for both seasons and then for each state. The results are presented in the Fig. below:

Fig. 4: Actual and Potential Yields (MT)



Based on the results from the mapping exercise, the highest output of cassava comes from Abia State (where the mapped producers accounted for 135,730 mt or 22.94% of the total 591,674 mt), followed by Imo, Akwa Ibom, Bayelsa and Delta; other states, ranked in decreasing order of total output were Ondo, Rivers, Edo and Cross River.

Potential yield for each state was computed by multiplying the total estimated cassava land area with the average of 32 mt/ha (being the midpoint of 25 – 40 mt/ha as the range attainable under conditions of the recommended practices). Accordingly, Abia has the highest potential output of 1.545 million mt while Cross River has the lowest of about 176,000 mt. Over 10 years ago, Cross River was estimated to have a higher potential than Imo State but this mapping exercise tends to suggest that with time, substantial

improvement has been recorded in Imo State, presumably owing to the increased interest of farmers in the cassava value chain.

This result also shows the huge gap between the actual production and the potentials. There is no state operating at 25% of its potentials with the highest gap registered in Abia State, where only about 9% of potential has been attained.

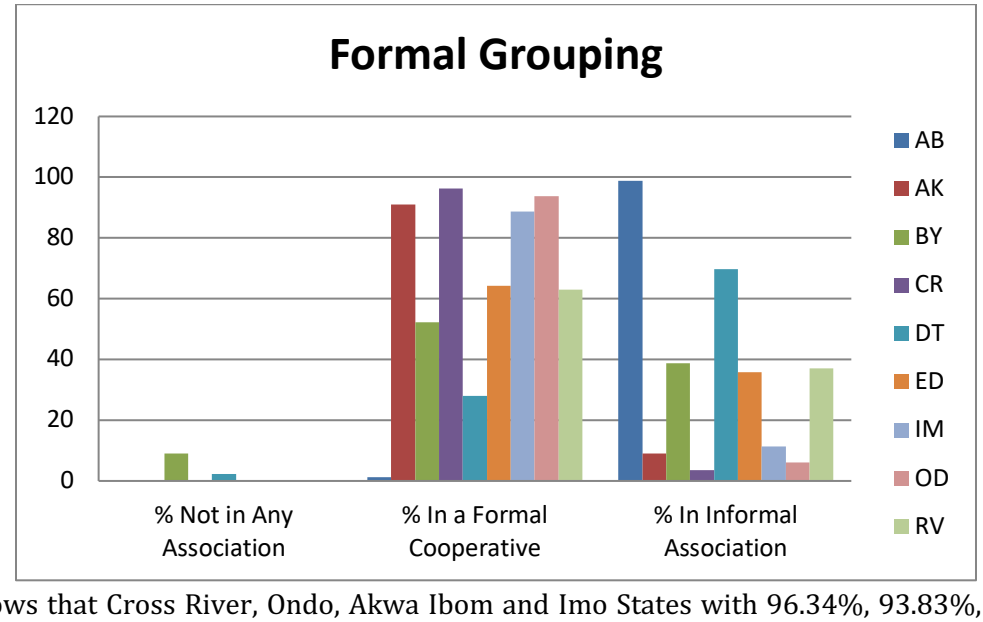
There remained a predominance of small farms in all the states, implying that commercialization may not be increasing in the states; this characteristic could restrict operational efficiency of individual farms but at the same time, there exists a bright side to the scenario because the existence many small farmers offers a wide range of options to buyers of fresh cassava roots at any point in time.

Generally, potential investors should note that wherever there are many small fields, there may not be much room to reap the benefits of scale economies in land tillage and other mechanization activities unless if small technologies are deployed and formal cooperatives are increasingly strengthened amongst the farmers.

4.2.3 Formal Group Action

Farmers' groups serve as vehicles for the rapid and effective dissemination of innovations in agriculture; the more formal the grouping, the higher the likelihood of their members benefitting from carefully planned interventions. In the following Fig. are the distributions of cluster membership of formal cooperatives.

Fig. 5: Formal Grouping of Farmers



The Fig. shows that Cross River, Ondo, Akwa Ibom and Imo States with 96.34%, 93.83%, 90.91% and 88.64% respectively, each had a high prevalence of formal cooperative societies while the least was Abia that had 1.24% of clusters being under formal cooperatives.

Farmers operating in groups (whether formal or informal), tend to benefit more from planned interventions as compared to farmers operating in isolation because when targeted beneficiaries pool together, the effects of a project permeate more easily. Therefore, while the groups serve as catalyst to projects concerning the farmers, potential investors can still proceed very well under any circumstance

because once small-scale entrepreneurs realize that they are direct beneficiaries of an investment proposal or decision, they always likely to quickly respond and cooperate.

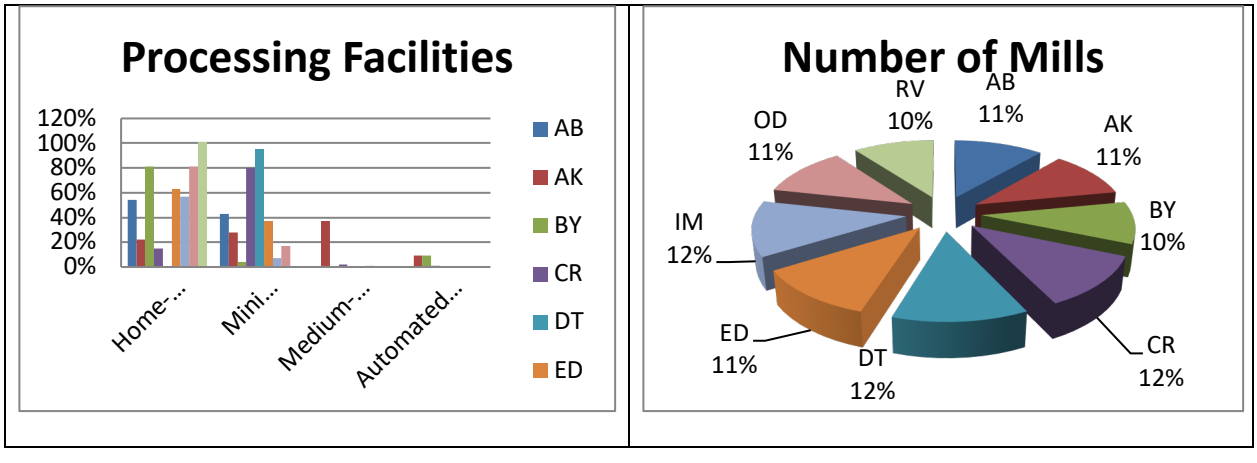
4.3 Major Cassava Processing Facilities for Intermediate Products

A key factor influencing the interest of an entrepreneur or group of entrepreneurs to establish a processing facility is the level of market demand for a product. The cassava value chain is no exception to this approach to investment decision.

4.3.1 Processing Facilities Available

The long-existing status of cassava as a staple supplying essential carbohydrates to families in the Niger Delta in particular and Nigeria at large, apparently boosted the market demand for cassava-related foodstuff; this in turn stimulated the emergence of many small-scale processing facilities and a simultaneous lower emphasis on intermediate products such as starch, grits, tapioca and high quality cassava flour (HQCF).

Fig. 6: Kinds of Processing Facilities Available



As revealed by the above Fig., the home-based mills (less than 1mt/day) and mini-mechanized mills (up to 2mt/day), which are dedicated to the processing of foodstuff products, accounted for the bulk of facilities in the states. This was occasioned by the fact that processors along the cassava value chain continue to be attracted by the demand for foodstuff.

There are abundant opportunities for investment in processing facilities in the Niger Delta due to situations highlighted below:

a) High Demand for Cassava Products: for instance, garri alone is estimated to have a weekly demand of at least N1.8billion[9] and this in itself is a huge opportunity for more actors to invest in the value chain

b) Recurring Incidence of Diseases Spread by Rodents: with this development, there is a continuous call for cleaner and more hygienic processing techniques, which most small-scale entrepreneurs

[9] USADF/DDI, 2012: Business Expansion Plan for Umu-Oma Idu-Obosiukwu Young Farmers' Cooperative Society, Onelga LGA, Rivers State, Nigeria, Under the Grant from the United States African Development Foundation (USADF)

adhering to traditional methods are lacking. Investors can therefore make these improved units available to interested persons or groups under mutually agreed terms and conditions

c) Few Large Scale Mills: With detailed studies, this gap could be filled when more investors enter the cassava processing business by establishing mills with installed capacity in excess of 10mt/day

d) Insufficiency of Raw Materials for Large Scale Processors: There are opportunities for direct participation in cultivation (to meet the needs of existing and new processors), organizing and buying from farmers for sale to large scale processors and a processor (new or existing), entering into major outgrower contracts with organized farmers who are provided with all the required modern items and practices for increased output.

4.3.2 Ownership & Locations of Processing Facilities

The capital required to establish a processing mill is a direct function of its size and extent of sophistication. Most processing facilities were owned by private investors because of small size and being manually operated. Fig. 7 below, shows that nearly all facilities in Edo, Delta, Akwa Ibom and Ondo states were private; in addition, farmers in Rivers and Bayelsa clusters, though unaware of the ownership of processing facilities, the fact that 100% and 81% of the facilities were home-based (See Fig. 6) is consistent with the deduction that the assets were private-owned.

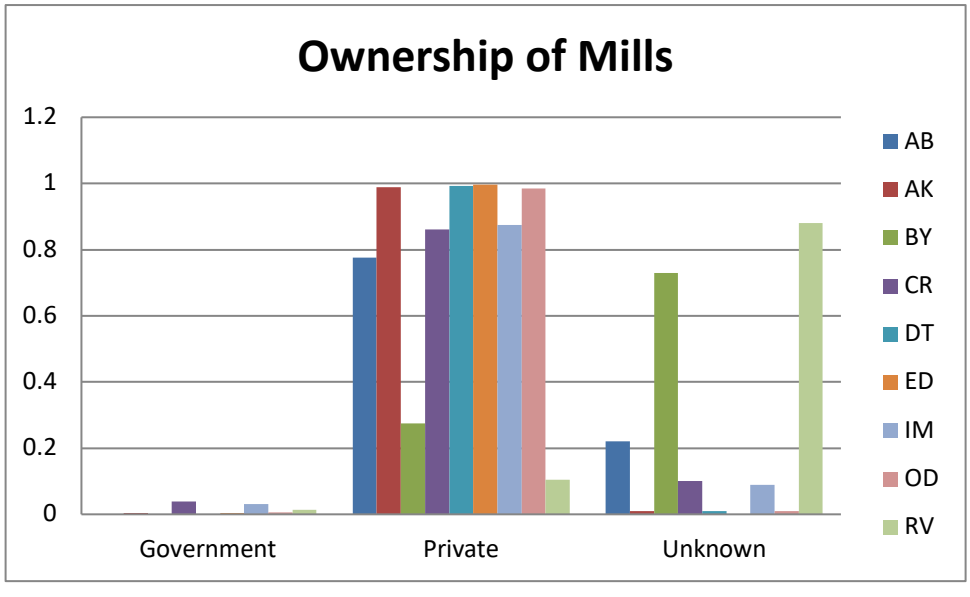


Fig. 7: Ownership of Processing Facilities

Most processing facilities were manual and typically located near or within the homestead to allow for effective monitoring of the procedure of adding form utility to cassava. Accordingly, as indicated in Fig. 7 below, processing facilities in Delta, Edo and Ondo states were closest to the farmers; in the peculiar case of Rivers State, the farmers' apparent ignorance about where processing plants were located could imply that they delegate others to convey raw cassava to the processing centres. Lastly, Bayelsa farmers' patronage of processing facilities in the neighbouring Delta State presents an opportunity, no matter how little, for inter-state mobility of resources and technological knowledge. At this juncture, it must be emphasized that a producer's decision to relate with a specific processor would depend on the extent to which it is economically justifiable to do so.

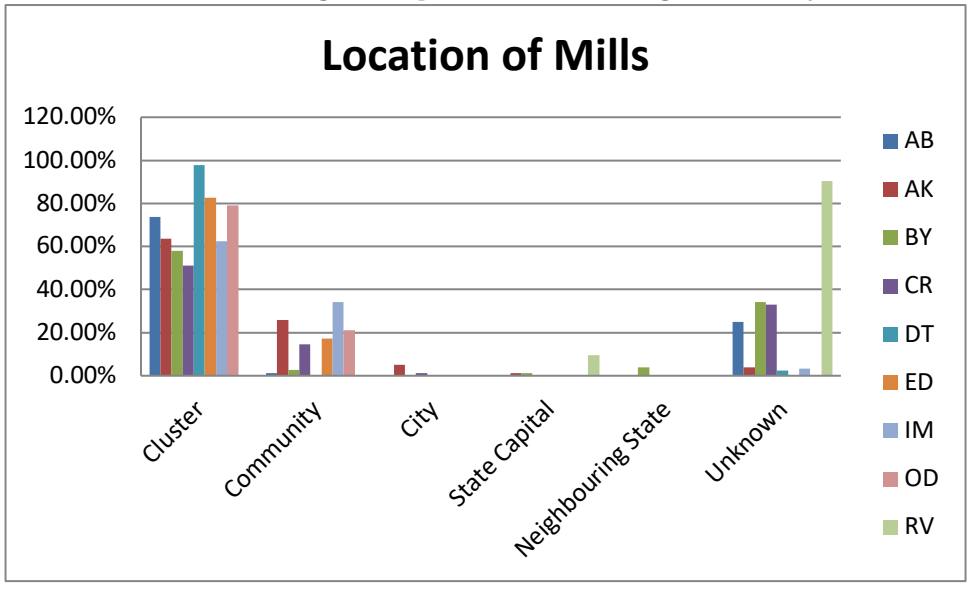


Fig. 8: Locations of Processing Facilities

4.3.3 Output of Processing Plants

From the Figure above, garri is the most recurring output from processing centres in every state, obviously in response to the nature of demand in the cassava value chain, wherein garri is the most sought after product.

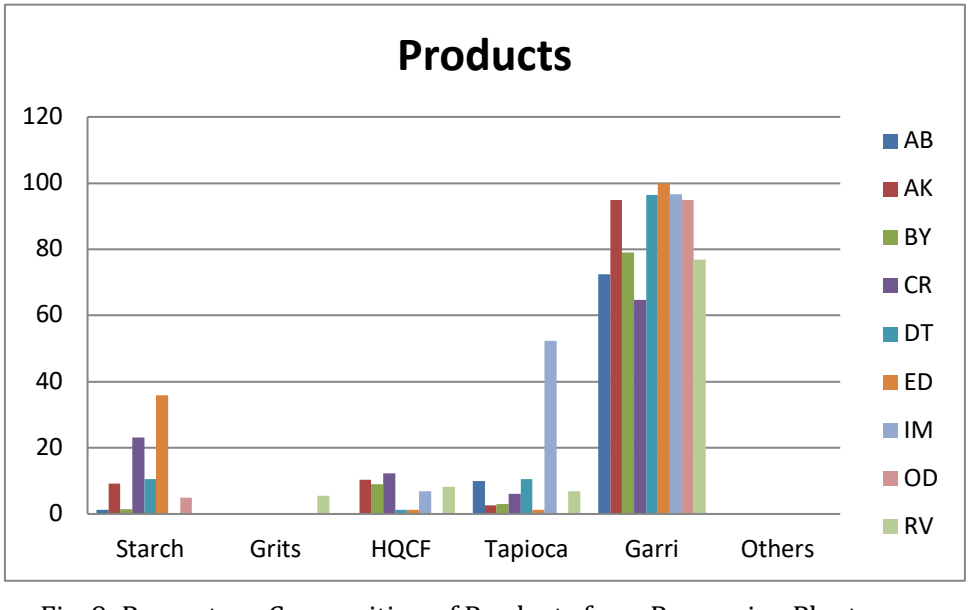


Fig. 9: Percentage Composition of Products from Processing Plants

In Edo, virtually every notable processing centre produces garri; this implies that some centres have multiple products. Other states in which processors also simultaneously have more than one kind of product include Akwa Ibom, Cross River, Delta and Imo. However, in Abia, Bayelsa, Ondo and Rivers states there does not seem to be multiplicity of products from processing centres.

High Quality Cassava Flour Ready for the Market

In the Niger Delta, there are only a few cassava processing facilities dedicated to the intermediate cassava products including starch, grits, tapioca and HQCF.

4.4 Industrial End-Users of Cassava Roots & Derivative Products

In addition to its processing into food stuff, cassava also has many uses in industry; the most promising conversion outlets identified include high quality cassava flour (HQCF) for use in bread, biscuits, snacks and paperboard, dried cassava for use in floating fish feed pellets for the aquaculture industry, starch for food and industrial applications and ethanol, both for industrial use and for fuelling domestic cooking stoves. There is also potential for cassava to be used as a partial substitute for barley in the production of clear beers[10].

For purposes of clarity, cassava, when dried and ground, is known as cassava flour; however, the high quality type (HQCF), which is white and fine in texture, is the grade specifically required by industries; it is different from the typical traditional cassava flours that are coarse, off-white in colour and have a characteristic fermented smell and taste.

The level of industrial demand for cassava derivatives is very high and broad-based; starting with a potential requirement of 250,000 ton/year in the High Quality Cassava Flour (HQCF), primarily from 10% replacement in bread flour and for use in bouillon, noodles, and the adhesive industry (dextrins); a demand equivalent of 1.15 million tons of fresh roots. Similarly, demand for native and modified starches

[10]Graffham, A., Naziri, D., Sergeant A., Sanni L., Abayomi, L., and Siwoku, B (2013): Market Opportunities for Cassava in Nigeria; in C:AVA (Cassava: Adding Value for Africa)

exceeds 230,000 tons/year in the food, paint, and pharmaceutical industries, another million tons of fresh roots.

In the sweetener industry, an annual demand of 150,000 tons exists for high fructose syrup, as part replacement for imported sugar, and 40,000 tons/year for glucose (40,000ton/year); this requires an additional 950,000 tons of fresh roots. The dried cassava chips business is a value chain on its own; it has a potential demand of 900,000 tons per annum with 300,000 tons going to the regional food market, an estimated 80,000 tons/year to the local animal feed market, and 520,000 tons destined for the China export market. The dried chips market requires 3.4 million tons of fresh roots. Lastly, Nigeria, with its adoption of the policy of blending premium motor spirit (petrol) with 10% ethanol under the E-10 policy, needs a potential one billion litres of fuel ethanol per year and a potential demand of 2.3 million tons of fresh roots, assuming 50% of feedstock of E-10 comes from cassava[11].

Industrial end-users of cassava and its derivative products fall under the following categories:

a) Flour millers and bakers who require HQCF as a partial substitute for wheat in line with the Federal Government of Nigeria's Cassava Transformation Agenda Project (CTAP), whereby millers and bakers have been persuaded to adopt (initially 20% and later 10%) HQCF in bread and other bakery products.
b) Producers of fish feed; attempts have been made to demonstrate that cassava-based floating fish feed pellets are almost as palatable, digestible and nutritive as top-grade fish feeds in the market
c) Producers of glucose and other soluble sugars
d) Small-medium scale enterprises producing ethanol and
e) Small-medium scale industries manufacturing industrial starch

There are only a few end-users which are still in production; in many instances, the projects that were established by state governments have ceased to function due to reasons of inefficiency and poor cost control. Notable firms that are end-users:

a) Godilogo Farms Limited in Cross River State
b) Winosa Farms
c) Philajoms (Nigeria) Limited, Umuahia, Abia State
d) Ego Farms
e) Josy Integrated Services Limited, Bayelsa State
f) Gon Chuks Agro Products Limited, Mbiri, Ika North LGA, Delta State
g) MATNA Nigeria Limited, starch millers in Ondo State

4.5 Elements of the Local Cassava Supply Market

4.5.1 Products

Within the Niger Delta Region, the cassava value chain consists of input suppliers, farmers/farmers cooperatives, processors, aggregators and traders and intermediary and final consumers.

[11]FGN (2011): Action Plan for a Cassava Transformation in Nigeria page 7

Different products emanate from cassava as the raw roots undergo a various transformations into predominantly, foodstuff; the crop is also used in the manufacture of animal feeds as well as industrial raw material for the production of adhesives, bakery products, dextrin, dextrose glucose, lactose and sucrose. Food and beverage industries use cassava products in the production of jelly caramel and chewing-gum, pharmaceutical and chemical industries also use cassava ethanol in cosmetic and drug production.. Thus there is a very high demand for cassava products both in local and foreign markets[12].

The end markets for cassava in the Niger Delta region come under two broad categories – a) the traditional food oriented segment (which is the dominant segment as it accounts for about 90% of cassava produced) and b) the industrial product segment (including starch and HQCF) which accounts for less than 10%[13].

It is noteworthy that the foodstuff supply chain extends well beyond the Niger Delta Region because many markets across the region are depots from which garri and fufu are evacuated to other parts of Nigeria, typically the north. Transactions and other business activities along this expanded network continue to be smooth, owing to modern communication linkages and the highly efficient payment systems that now characterize Nigeria's financial landscape.

The market for HQCF is as a partial substitute for wheat flour in bakery products; the boost in this market was occasioned by Cassava Transformation Agenda Project (CTAP) of the Federal Government of Nigeria, which persuaded millers and bakers to adopt 10% HQCF in bread and other bakery products. Therefore substitution of wheat flour is potentially a very large market, as Nigeria only produces about 8,000 tons of wheat per annum while importing 4 million tons annually (ie 3% of the global supply of wheat) to be milled in country[14].

[12]PIND (2011): A Report on Cassava Value Chain Analysis in the Niger Delta, page 12; Foundation for Partnership Initiatives in the Niger Delta

[13]Joyce Ahmadu and P.O. Idisi (2014): Gendered participation in cassava value chain in Nigeria; Merit Research Journal of Agricultural Science and Soil Sciences (ISSN: 2350-2274) Vol. 2(11) pp. 147-153, November, 2014; http://meritresearchjournals.org/asss/index.htm

[14]Graffham, A., Naziri, D., Sergeant A., Sanni L., Abayomi, L., and Siwoku, B (2013): Market Opportunities for Cassava in Nigeria; in C:AVA (Cassava: Adding Value for Africa) page 3

Interview at Uzi Okpala Cluster, Ohaji Egbema LGA, Imo State

4.5.2 Channels of Cassava Sale

Farmers in Abia, Cross River, Imo, Ondo and Rivers relied substantially on open market sale for disposal of their output. This channel seemed predominant all through the Niger Delta, in spite of its weaknesses of not having dedicated buyers with whom pricing, quantities and other sale terms and conditions could have been agreed *ab initio*. This is also consistent with the predominance of the garri as the major product and source of food consumption. Direct sale to processors was generally low with the highest at 12% in Bayelsa.

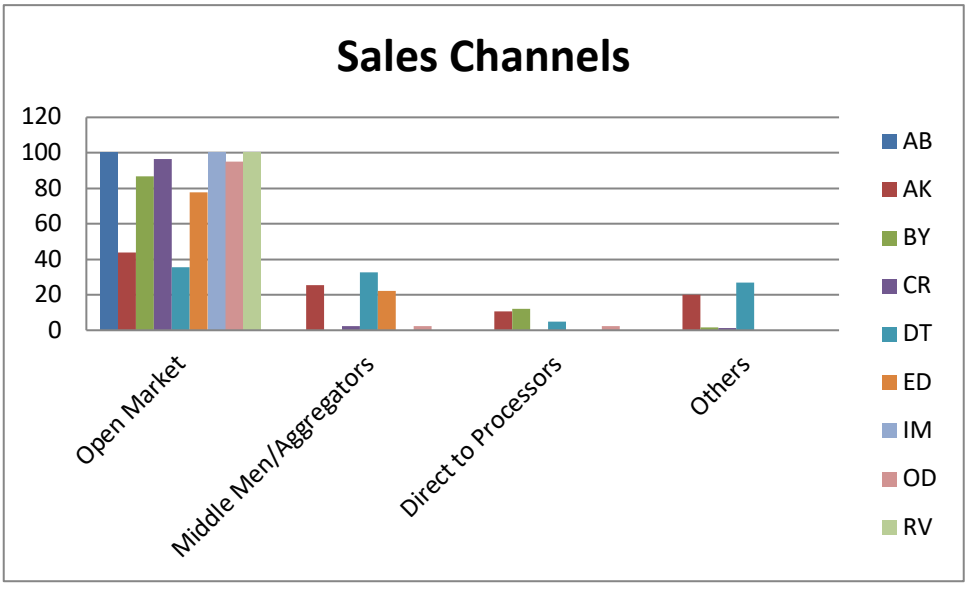


Fig. 10: Percentage Summary of Avenues of Selling Cassava

4.5.3 Conveying Output

Cassava tubers have three important features – bulkiness, tendency to deteriorate and lose quality due to rapid drying and lastly, the need for some form of processing before use. Therefore unlike other tubers such as sweet potato, Irish potato, yam and cocoyam, cassava must not be left in its raw form if the commodity is to travel very long distances along the supply chain.

The Fig. below shows that farmers typically used a combination of methods to convey their harvested cassava; the use of head carriage was highest in Rivers (98.63%) and lowest in Ondo and Akwa Ibom (zero and 7.8% respectively). Furthermore, the use of wheel barrows was very common in Rivers and Imo while motorcycles/tricycles were highly in use as means of transporting cassava in Rivers, Delta, Bayelsa and Ondo states.

The closer a feeder road is to the point of harvest or aggregation, the higher the use of four-wheel vehicles in transporting harvested produce. Accordingly, Edo and Ondo, appeared to rely most on pick-up trucks to convey cassava. Animal-drawn carts are not used for transporting farm produce in the Niger Delta due to the challenges of rearing draft animals in consistently humid environments coupled with the threat of trypanosomiasis in cattle. Therefore in making investment decisions, cognizance must be taken of vehicles that are fit for the peculiar terrain of the selected area, for reasons of efficiency and durability of vehicles.

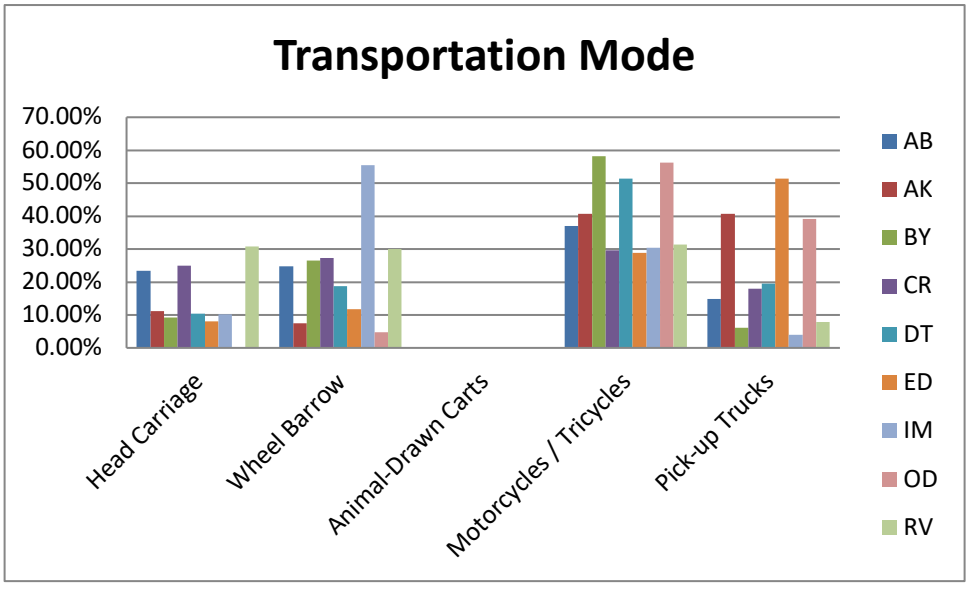


Fig. 11: Percentage of Farmers Using Various Means to Convey Harvested Cassava

4.5.4 Estimated Profitability of Cassava Farming

Profitability of primary producers (or for that matter, any other participant) is a necessary feature for enterprise sustainability. Data obtained from the mapping exercise were used to ascertain the profitability of cassava cultivation.

The total cost of production per metric ton was computed as the sum of all costs incurred in planting, harvesting and selling each ton of fresh cassava roots while the price at which the farmer sold each ton was assumed as the revenue realized per ton, irrespective of the prevailing market price at the time of sale. Net margin was calculated as the difference between price and total cost, taken as a proportion of total cost. The state-by-state results are summarized below:

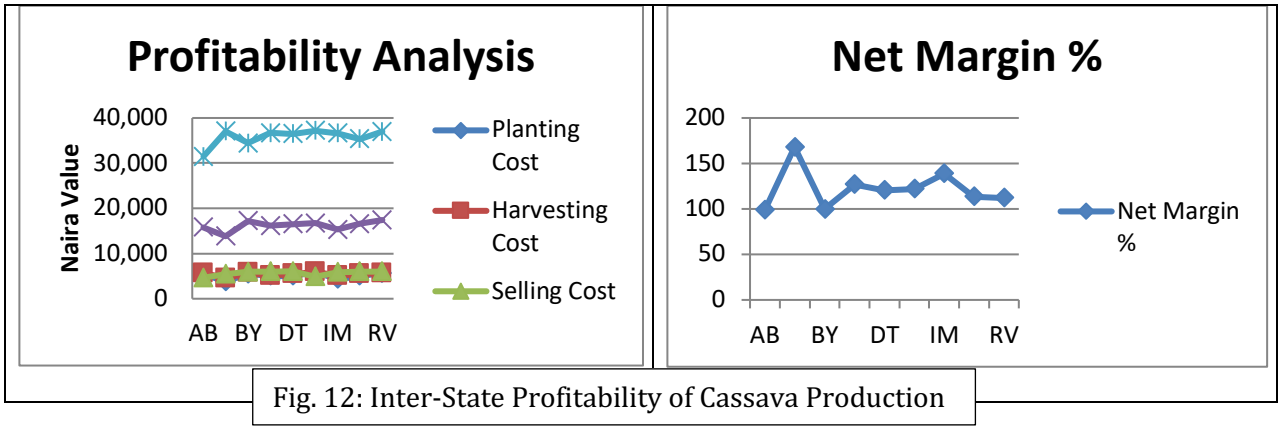


Fig. 12: Inter-State Profitability of Cassava Production

The net margin, which is the index of profitability, ranged from 98.97% and 99.92% in Abia and Bayelsa respectively to 139.02% and 168.14% in Imo and Akwa-Ibom respectively. In simple language, the net margin of 113.55% in Ondo State for example, implies that every N100 expended in producing 1mt of cassava roots translates into a net income of N113.55. Accordingly, in working towards decision making, investors should realize that profitability depends on factors including:

a) The variety of cassava planted; for the same amount of investment, some varieties would produce higher than others
b) For the same variety, the extent of adherence to recommended agronomic practices in terms of methods, quantities and timing affect yield
c) Impact of factors such as dry spells and the incidence of pests and diseases
d) Pricing per ton at the time of sale, coupled with the farmers' ability to sell at the best prices
e) The kinds of mechanized technologies to be used, the length of useful life and the impact of these on depreciation charges and maintenance costs

4.5.5 Seasonality in Cassava Production

Notwithstanding the lengthy gestation period of cassava (typically up to eight months and above), cassava production remains seasonal, in response to the annual pattern of wet and dry seasons in producing areas. For most farmers, agronomic activities commence just before the on-set of the rainy season, by which period many farmers also have cassava ready for harvest.

Cassava is planted at least twice a year, implying that there are at least two seasons (peak and off-peak) when the major activities of planting and harvesting take place. The activity charts below, show the months in which both activities are carried out:

Chart 1: Period for Low Season Planting

AB	J	F	M	A	M	J	J	A	S	O	N	D
AK	J	F	M	A	M	J	J	A	S	O	N	D
BY	J	F	M	A	M	J	J	A	S	O	N	D
CR	J	F	M	A	M	J	J	A	S	O	N	D
DT	J	F	M	A	M	J	J	A	S	O	N	D

ED	J	F	M	A	M	J	J	A	S	O	N	D
IM	J	F	M	A	M	J	J	A	S	O	N	D
OD	J	F	M	A	M	J	J	A	S	O	N	D
RV	J	F	M	A	M	J	J	A	S	O	N	D

Chart 2: Period for Low Season Harvest

AB	J	F	M	A	M	J	J	A	S	O	N	D
AK	J	F	M	A	M	J	J	A	S	O	N	D
BY	J	F	M	A	M	J	J	A	S	O	N	D
CR	J	F	M	A	M	J	J	A	S	O	N	D
DT	J	F	M	A	M	J	J	A	S	O	N	D
ED	J	F	M	A	M	J	J	A	S	O	N	D
IM	J	F	M	A	M	J	J	A	S	O	N	D
OD	J	F	M	A	M	J	J	A	S	O	N	D
RV	J	F	M	A	M	J	J	A	S	O	N	D

Chart 3: Period for Peak Season Planting

AB	J	F	M	A	M	J	J	A	S	O	N	D
AK	J	F	M	A	M	J	J	A	S	O	N	D
BY	J	F	M	A	M	J	J	A	S	O	N	D
CR	J	F	M	A	M	J	J	A	S	O	N	D

DT	J	F	M	A	M	J	J	A	S	O	N	D
ED	J	F	M	A	M	J	J	A	S	O	N	D
IM	J	F	M	A	M	J	J	A	S	O	N	D
OD	J	F	M	A	M	J	J	A	S	O	N	D
RV	J	F	M	A	M	J	J	A	S	O	N	D

Chart 4: Period for Peak Season Harvest

AB	J	F	M	A	M	J	J	A	S	O	N	D
AK	J	F	M	A	M	J	J	A	S	O	N	D
BY	J	F	M	A	M	J	J	A	S	O	N	D
CR	J	F	M	A	M	J	J	A	S	O	N	D
DT	J	F	M	A	M	J	J	A	S	O	N	D
ED	J	F	M	A	M	J	J	A	S	O	N	D
IM	J	F	M	A	M	J	J	A	S	O	N	D
OD	J	F	M	A	M	J	J	A	S	O	N	D
RV	J	F	M	A	M	J	J	A	S	O	N	D

In regards to the above activity charts, investment promoters should note the following facts:

a) The basic requirements of suitable variety, well-handled planting material, appropriate soil type and optimum number of planting material must be attained
b) There should be provision for the recommended inputs in optimum quantities
c) Planting could commence whenever the environmental conditions of relative humidity and precipitation are okay
d) Good agronomic practices and proper field maintenance should be adhered to
e) Improper carrying-out of practices results in increased costs
f) The timing of harvests in many states does not necessarily imply that all harvest is done in that period, because many farmers also leave matured roots below the ground and do the harvesting on a need basis and
g) Cost of harvesting could be high when the soil is very dry and during such periods, roots are undersupplied in the market, leading to very high prices. Therefore mechanized harvesting

equipment, where available, could enable the farmer and/or investor benefit immensely from such attractive pricing regimes

4.5.6 Length of the Supply Chain

The cassava market is not localized; that is, market exchange activities are not just restricted to other towns and states beyond the Niger Delta. Products also get to markets outside the shores of Nigeria. For instance, the main countries that import dried cassava from Nigeria are the USA, China and Niger Republic while the main importers of starch from Nigeria are Togo, the USA, Netherlands and South Africa. Furthermore, starch is exported to Côte d'Ivoire, while cassava flour and instant fufu flour are shipped to the USA, UK, Ireland and Italy. Formal exports to European and Asian countries such as the Netherlands, Belgium and China are also on-going cassava products are also involved in the cross border trade from Nigeria to the West African countries of Niger, Mali, and Burkina Faso[15].

Even in the face of international trade opportunities, the local farmers in the communities and the traders in the nearby markets are neither aware that their products eventually reach international markets, nor do they reap significant direct benefits from the lengthy supply chain.

The length of the supply chain portends immense investment opportunities to entrepreneurs who are willing to expand trading activities within and beyond the length currently recognized, by investing into various points of the value chain, both locally and internationally.

4.6 Capacity Building for Primary Producers

Effective capacity building serves as the driving force behind farmers' continued understanding and subsequent acceptance of technological innovations, thereby creating room for adoption.

4.6.1 Are Farmers Being Trained?

In the 718 clusters mapped, when interviewees were asked if they had been receiving training, 523 (72.84%) affirmed while the rest 195 or 27.16% said they were not being trained. To an investor, the implications of these statistics are follows:

a) Most farmers are already aware that formal training exists as an activity in farming
b) The fact that some modules have been previously treated eases the decision on what next to treat going-forward, and if there is need to re-visit past modules
c) Past activities in capacity building would enable investors determine the minimum level of value for money in training and set the standards they intend to attain
d) The farmers' existing practices would enable investors physically match the farmers' practices against what they were taught, and any gaps could be bridged to enable the investors attain whatever objectives they had set.

4.6.2 Sources From Which the Farmers Received Training

[15]Asante-Pok A., (2013): Analysis of Incentives and Disincentives for Cassava in Nigeria. Technical Notes Series, MAFAP (Monitoring and Analysing African Food and Agricultural Policies), FAO, Rome page 15; www.fao.org/docrep

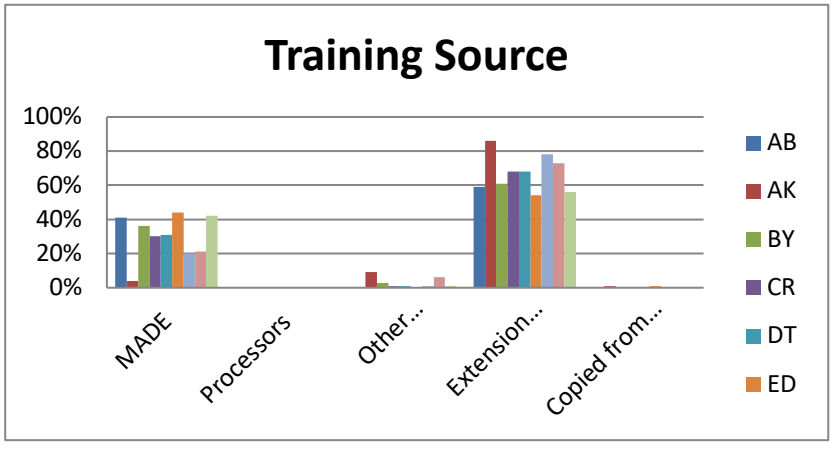


Fig. 13: Sources of Training for Farmers

The reasonable availability of targeted farmers to have met with government extension agents implies that there were already structures on ground, which would enable an investor to always reach-out to many farmers in an effective manner (whether in commercial extension services or in an activity such as out-grower contracts).

In addition to the above, the fact that farmers have recognized interactions with MADE partners creates room for potential investors to cooperate with MADE (due to the effectiveness of the programme) and similar interventions or their structures, if they want to succeed.

4.6.3 Farmers' Willingness to Pay for Training Services

Training services cost money and require sustainability; therefore investors must encourage farmers to increase their stake in the training process by periodically paying fees. The extent to which farmers are willing to pay for training, especially if the knowledge transferred would eventually increase their income, is highlighted in the Fig. 14.

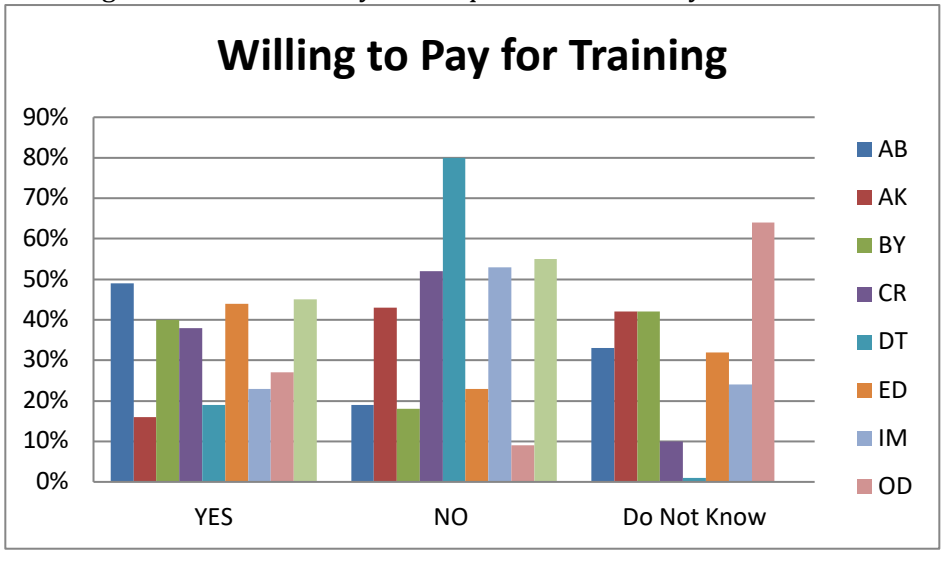


Fig. 14: Willingness to Pay for Training

Farmers in Abia, Bayelsa, Edo and Rivers were willing to bear the cost of training, as they had witnessed the benefits. Conversely, in Akwa-Ibom and Delta farmers were still unwilling, because they claimed not to be able to afford. This means that investors could start from a token per farmer and provided that critical mass is attained, the overall sum realized could still make the desired impact of defraying training expenses.

Quite interesting are 'do-not-know' statistics for Ondo, Akwa-Ibom, Bayelsa and Abia, where 64%, 42%, 42% and 33% of clusters respectively were unsure of whether or not they would pay for services. This group of farmers presented a significant opening for more producers to be convinced on the benefits of training and why they should increase their stake by shouldering some cost.

4.7 Critical Cassava Market Support Services in the Niger Delta

The need for services that act as catalyst to the development of an efficient and vibrant market cannot be overemphasized. All respondents under the mapping exercise listed the key support services required

for the cassava sector as mechanized tillage services that are affordable, adequate extension services, linkage to agro-dealers, access to finance and access to off-takers of fresh cassava roots.

An interesting revelation was that while most farmers used the terms 'affordable' and 'cheap or subsidized' interchangeably, everyone emphasized availability as an important feature of support services. In the following Fig., the extent to which services were available as at the time of the mapping, was measured as none (N), low (L), moderate (M) and high (H), while the percentage of interviewees who gave the responses are in the boxes:

Table 1: Availability of Support Services to Cassava Farmers in Niger Delta

	Land Preparation				Linkage to Agro-Dealers				Access to Finance				Access to Buyers				Extension Services			
	N	L	M	H	N	L	M	H	N	L	M	H	N	L	M	H	N	L	M	H
AB	42.5	3.3	3.7	19.8	50.9	14.6	19.7	9.8	34.6	24.8	0.9	37.8	54.7	30.9	2.5	9.8	42.7	22.6	24	9.8
AK	2.5	40.3	22.1	35.1	1.3	35.1	42	19.1	6.2	61.2	3.9	28.7	2.5	46.9	28.4	22.2	2.47	13.6	76.5	8.6
BY	83.6	10.4	4.5	1.5	82.1	10.4	4.5	1.5	61.2	97.1	0	3.0	77.1	4.7	6.1	12.1	31.3	20.9	46.3	0
CR	24.1	56.1	25.6	16.1	28.0	42.6	21.9	13.4	8.5	57.3	9.7	24.4	26.6	36.6	15.9	18.3	21.9	43.9	24.4	8.5
DT	59.3	22.1	16.3	2.32	52.3	31.4	13.9	1.16	60.5	34.8	3.5	0	60.4	9.4	9.3	20.9	58.1	36.1	5.8	0
ED	2.5	14.8	17.1	65.4	7.4	6.2	33.3	53.1	2.5	1.2	6.2	90.1	22.2	6.3	22.2	48.2	0	28.4	40.7	29.6
IM	55.7	39.8	0	2.3	55.7	25.0	18.2	0	23.9	57.9	17.1	1.1	59.1	20.5	19.3	1.1	40.9	55.7	2.1	1.1
OD	2.5	59.3	33.3	4.9	3.7	71.6	20.9	3.7	4.9	88.9	4.9	1.2	2.5	46.9	28.4	22.2	2.5	12.3	76.6	8.6
RV	0	5.5	0	94.5	0	5.5	0	94.5	0	5.5	0	94.5	0	5.5	0	94.5	0	5.5	0	94.5

Availability of mechanized land preparation services was highest in Edo and Rivers States and almost non-existent in Bayelsa. Linkage to agro-dealers was highest in Rivers and non-existent in Bayelsa, while it was low-moderate in Akwa Ibom, Cross River, Delta, Edo, Imo and Ondo states. Furthermore, access to institutional funding was generally low-moderate in all states except in Edo and Rivers where it was particularly high. Discerning investors always assess places where a need exists, even though slightly satisfied; if there is a possibility for providing that services more efficiently, the investor could do so (at competitive pricing) and earn high revenues. This is the case with mechanization and agro-dealer services.

With regard to access to off-takers, Rivers also stood out as a state where primary producers easily linked with buyers of their output; the converse was the case in Abia, Bayelsa, Delta and Imo states, where 54.7%, 77.1%, 60.4% and 59.1% of respondents respectively, rated the service as non-existent. Although farmers tend to conclude that off-takers are absent whenever they are unable to sell their output, it is imperative to note that any investor that provides the right type of linkage that enables farmers sell their produce would reap good benefits. Lastly, extension services were relatively most available in Akwa

Ibom, Ondo and Rivers states; in most of the states, the availability was low-moderate and the state with the highest score of non-existence was Delta with 58.1%.

States such as Cross River, Ondo, Akwa Ibom and Imo, which have a high availability of formal cooperatives, have yet to use that scenario to access support services. The next section of this report highlights key investment opportunities occasioned by gaps in the availability of services.

4.8 Gaps & Opportunities for Investment in Support Services

The supply chain begins from the end of primary production till the point of delivery of raw cassava and/or its intermediary products to the market. Wherever gaps evolve along the supply chain (whether in primary production or after harvest), there would be a negative impact on the quantity of raw cassava reaching the market.

The mapping exercise showed that there are at least five support services required for the cassava sector in the Niger Delta and which continued availability and effectiveness would engender development of the cassava supply chain. The services, (as stated by the farmers during the mapping exercise), are mechanized and affordable land preparation services, extension services, linkage to agro-dealers, access to finance and access to buyers of fresh cassava roots

Areas with low availability of support services may signify the inability of government to provide these services, partly due to the overwhelming number of farmers, *vis-à-vis* the lean resources available to government. Therefore given the importance of support services and their strong impact on value chain growth, investors have the chance to participate in the delivery of these services by injecting capital now, for future benefits. This is discussed in the next section, wherein the Fig. below gives a summary of perceived gaps, each with its opportunity for investment in a related support service(s) plus the expected benefit(s):

Table 2: Gaps, Opportunities and Benefits

Perceived Gap	**Perceived Opportunity**	**Likely Impact & Benefit(s)**
1. Group action still largely informal	Capacity building for farmers and nurturing of existing groups to make them formal	▪ Evolution of better-organized groups ▪ For all agencies, the farmers become easier to reach and interact with ▪ Increased adoption of innovations
2. Varied perception of farm size	▪ Measurement of farm size (provided as a service) ▪ Ascertain and enlighten farmers about the exact quantity of inputs required	▪ Applying inputs in line with recommendations ▪ Crop response becoming increasingly optimal ▪ Farmers control production costs ▪ Income for service providers
3. Paucity of mechanized land preparation services	Establish private mechanization services	▪ Accessibility and timely availability of service to the farmers ▪ Properly tilled plots for optimal crop growth & development ▪ Improved yields and higher supply ▪ Increased income for the farmers ▪ Income for the service providers
4. Poor extension out-reach	Establishment of commercialized and private extension services	▪ Regular contacts with the farmers ▪ Increased adoption of innovations

5. Poor knowledge on importance of effective pest and disease management	Establish demonstration farms so the farmers can see the efficacy of agrochemicals	▪ Farmers increasingly accept that agrochemicals are beneficial ▪ Increased demand for agrochemicals ▪ Better crop performance leading to increased yields ▪ Increased income for farmers ▪ Increased income for manufacturers and distributors of agrochemicals
6. Insignificant linkage to agro-dealers	▪ Creating distribution outlets and expand the customer base ▪ Training farmers on application of agrochemicals	▪ Increased demand for agrochemicals ▪ Farmers become more knowledgeable on the safe and effective use of pesticides ▪ Better crop performance leading to increased yields ▪ Increased income for farmers ▪ Increased income for manufacturers and distributors of agrochemicals ▪ A safer ecosystem.
7. Lack of access to finance	Provide financial services	▪ Enhanced financial inclusion of the farmers ▪ Increased yields and income for producers ▪ Increased raw materials for processing firms ▪ Increased income for institutional lenders
8. Farmers lack access to buyers of fresh cassava roots	Linkage to be created by agencies, private or public	▪ Ready and timely availability of cassava ▪ Increased availability of raw materials ▪ Increased income for farmers and processors
9. Unavailability of transport to evacuate roots from farms to the buyers	Investment in transportation services and equipment	▪ Timely evacuation of products ▪ Ready and timely availability of cassava ▪ Increased income for farmers, processors and service providers
10. Dearth of market information	Share data on demand & price Share data on quality specifics Share data on location of mills	▪ Increased demand & income ▪ Increased demand & income ▪ Increased value-adding activities

5.0 INPUTS FROM KEY INFORMANTS

5.1 Responses from Producers

The farmers considered cassava as a major crop for three principal reasons – its high yield, its status as a major staple and the fact that the crop performs well, even in soils without a boost in soil fertility. All interviewees strongly disagreed with the notion that cassava is a poor man's crop. Generally, farmers are busy on the fields all-year round because of multiple cropping involving plantain, maize, yams, vegetables, cocoyam, among others in addition to cassava.

Producers felt that female participation in primary production can be enhanced through disbursement of grants and loans and if husbands render support by providing farm labour to the women. In addition, the women's participation in training activities could be enhanced by organizing demonstration activities and plots and also encouraging them financially. Furthermore, where farmers received trainings through MADE partners, the most appreciated aspects of the trainings were the successful use of demo-plots to showcase the efficacy of improved technologies and their superiority over traditional practices and the safe and effective use of agrochemicals. On a related note, the farmers opined that capacity building in general and regular visits by extension agents are important vehicles for engendering or increasing farmers' participation in formal cooperative activities.

In regards to payment for training, there was divided opinion among informants; while about half were categorical that most farmers will not pay for training, others felt that with proper advocacy and practical proof that proper training could result in an increase in farmers' income, they would gladly pay for training.

The decision of farmers to sell their output to bulk buyers or processors is driven primarily by the income and profitability motive; in so doing, the major constraints facing farmers include low pricing, too few buyers and inadequate means of transportation.

All the entrepreneurs who consider cassava as a major crop, make a living through it and they do face a number challenges such as gender roles, time constraints, unavailability of institutional credit and paucity of information.

As a general comment, the farmers stated that they require funding, agro-chemicals, mechanization and good pricing for their output.

5.2 Responses from Processors

Processors typically get cassava supplies from their own farms, farmers' supply at the factory gate and cooperatives as out-growers (in a ratio of 20:60:20). They establish out-grower schemes because the arrangement enables them maintain a steady flow of raw material. Sometimes the processors' expectations are not met due to a shortfall in supply, forcing them to operate below installed capacity. Most operate at 50% - 60% of capacity due to shortage of raw material.

Farmers' inability to meet up with factories' demand, continued preference of people for the flour from imported wheat and reneging by farmers with whom prior off-taker arrangements had been made.

Most mills are private-owned and produce HQCF and 'chin chop'; successful operation at/near installed capacity is facilitated by timely supply of fresh roots by farmers and good pricing of the raw material. The government-promoted mills (if any), are not really known. Peak period of purchasing raw cassava is May to August while processing is highest in June/July. In addition, sales are highest in June to August. Distance between one major mill and another is over 100 kilometres and many other mills are typically un-operational

Processors recommend for establishment, mills with installed capacities of 25mt – 40mt per day and the decision to site a plant in a particular location would be informed by two considerations - suitability of the location for cassava cultivation and reliability of the farmers to supply regularly.

The reasons adduced for farmers' tendency to sell cassava roots in the open include ignorance of the existence of a processing factory, inadequate arrangement for the off-takers, sometimes getting higher prices when compared to selling at the factory-gate, previous information that open market prices were higher on earlier market days, low transport costs on market days and more buyers converging at the market place from neighbouring towns and villages.

Farmers are attracted to processors that have arrangements to buy cassava roots from their farm-gate, those who bear all or a portion of the transport costs and processors who constantly demand for much.

Challenges facing farmers in selling their harvested cassava roots in general: people's preference for flour from imported wheat over local cassava flour, having to store and preserve unsold inventory of cassava roots at the end of a market day, ridiculous prices offered on surplus cassava roots by potential buyers and lastly, farmers' inability to negotiate when an interested buyer offers a very low price to cassava *in situ* (ie cassava still under the ground) before harvest.

To the farmers, the processors would recommend the following marketing strategies:
Take beneficial options such as collecting advance payments from off-takers prior to harvest, granting credit to buyers at the farm-gate, advertising their prices on market days, making prices subject to negotiation, agreeing with processors that they should bear the cost of transporting cassava roots to their factory.

How a processor could help in addressing the challenges faced by farmers:

a) Processor can help in notifying off-takers and other interested parties that specific farmers are ready for harvest

b) Processor can also pay for the cost of harvest at a price mutually agreed with the farmer

c) Processor and farmers could agree on strategic collection centres where the processor can come for evacuation using their (the processor's) truck.

Major challenges facing processors are slow sale of finished products, high cost of machine maintenance, insufficient funds to buy raw materials and modern drying equipment and high cost of fuel for electricity generators, farmers' ignorance about the existence and locations of processing plants and general lack of awareness that cassava flour can also be used as a confectionery ingredient.

6.0 SELECTED COMMENTS FROM INTERVIEWEES

6.1 Producers

1. *Our people are unwilling to release any information reasons because so many people have come to interview them without bringing any intervention or services to them in return, so they believe interview sessions are a waste of time;*

2. *Most entrepreneurs in Cross River have never heard about MADE...they are more familiar with Fadama Program;*

3. *There is no dry season cultivation of cassava in Elkins, Ekpoma because termites will attack the crop;*

4. *MADE is the intervention that has impressed me most; not only did they make us receive effective training, they also gave us processing equipment for which each recipient contributed 50% of the cost of equipment, unlike many other interventions that just train farmers and end there;*

5. *Inputs are available only in the open market; even with all the publicity about government support, the real farmer cannot get the inputs at subsidized prices;*

6. *A Chinese group came to Ekpoma farmers to grow cashew; many of the farmers are expanding cultivated land, but they will continue to plant cassava anyway;*

7. *Major problem with cassava is that there is no market after the farmer has produced.*

6.2 Processors

- *The real farmers not invisible farmers, portfolio or cooperative famers should be the end beneficiaries of any financial assistance;*

- *Efforts should be made to properly enlighten farmers about the process of bank documentation for access to finance;*

- *Cooperatives or their executive members should be encouraged to be actively involved in monitoring and evaluation of interventions.*

7.0 CONCLUDING REMARKS

MADE, having commissioned the cluster mapping exercise for cassava in the Niger Delta, has facilitated the identification of clusters of cassava farmers. Overall, there were more male than female farmers but at least four states recorded above 5% female composition in the clusters. The small size of most farms gives little room for the benefits of scale economies in mechanization.

As regards processing, small mills of less than 1MT/day were most common. Opportunities abound in processing due to high demand for foodstuff, need for more hygienic processes in value addition and paucity of raw materials. In the Niger Delta, only a few processing facilities had intermediate products such as grits, tapioca and HQCF. Companies established by government have ceased to function due to inefficiency and poor cost control.
Farmers used a combination of head carriage, wheel barrows and motorcycles/tricycles to convey raw cassava to the market. Edo and Ondo relied most on pick-up trucks for transportation while animal-drawn carts were not in use at all anywhere in the region. In at least five states, farmers sold cassava in the open markets. Therefore in making investment decisions, only the appropriate kind of vehicles (fit for the peculiar terrain of the selected area) should be considered.

Cassava production is seasonal and demand for its products is very high; the enterprise is also highly profitable, as reflected in the net margin of 98.97% and 99.92% in Abia and Bayelsa respectively to 139.02% and 168.14% in State to 139.02% in Imo and Akwa-Ibom respectively.

Most of the farmers in the mapped locations (72.84%) had received training from government extension agents, MADE partners and other interventions or their structures. Farmers' willingness to pay for

training was high in Abia, Bayelsa, Edo and Rivers but lower in Akwa-Ibom and Delta, both for the manageable reason of inability to afford the cost.

Key support services required for the cassava sector were mechanization, extension, linkage to agro-dealers, finance and access to off-takers. These were available at varying degrees in the states.

Investment opportunities resulting from gaps in the availability of services include capacity building for farmers, measurement of farm size, establishing private mechanization services, rendering of commercialized extension services, creating distribution outlets for agrochemicals, financial intermediation, linkage to off-takers, provision of transportation machinery and services and lastly, provision of timely market information to buyers and sellers.

The cassava value chain in the Niger Delta offers abundant investment opportunities waiting for discerning entrepreneurs.

8.0 ANNEX

Features of the Web Application

- Responsive design so as to look good on both big screens (such as desktop and laptop) and small screens (such as mobile phones and other hand-held devices)
- Existence of an admin section that enabled viewing of all data that had been transmitted from the mobile devices. There was also a provision for editing by the Administrator, whenever necessary.
- Could produce a map using the coordinates of retrieved data plotted;
- Sufficiently interactive to display information when a particular coordinate on the map is clicked

Features of the Mobile Application

- Ease of collecting information on such as name, LGA and all other items contained in the questionnaire;
- Possibility for the local storage of information retrieved so as to view all data collected by each worker (this means even under conditions of poor connectivity, the data would remain stored in the device for transmission to the server whenever/wherever there is connectivity).

Complements

On-line Web Hosting Server (A2 Hosting) and GPS-enabled mobile phone (Android), hand-held devices owned by the enumerators, for ease of handling.