

Economic Analysis of Cassava Production in Benue State, Nigeria

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Abstract: The study was undertaken to analyze the economics of cassava production in Benue State. Data for this study were collected from a sample of one hundred and sixteen small-scale cassava farmers randomly selected. The objectives of the study were to determine and rank the cost elements of cassava production in the study area; determine the returns to cassava production; and evaluate the profitability of cassava production in the study area. Socio-economic factors include age, educational background, marital status, sex, sources of labour, awareness of extension services, method of weed control, and method of farm land acquisition were identified. Data collected for the study were analyzed using descriptive and inferential statistics. The coefficient of determination (R^2) is 0.616, suggesting that the used model has a high goodness of fit. Furthermore, the result of the statistical analysis shows that investing in cassava production enterprise is profitable.

Key words: Acquisition, awareness, Cassava, farmers, small-scale

INTRODUCTION

Cassava (*Manihot esculenta crantz*) is grown in many tropical countries of Africa, Asia and Latin America. Most statistics do not usually distinguish between sweet and bitter varieties. In some sweet varieties are not included as they are commonly grown as a secondary crop for home consumption. Brazil is the largest producer, but most of the crop is consumed locally and exports are only a small portion of the total output. The same pattern applies to other important producers, such as Nigeria, Indonesia, Zaire, India and Colombia. Cassava does not form an important part of the staple diet in Thailand, and that country is now the world's largest exporter of cassava products. In the last few years, most of the important producers have greatly increased their production. Cassava roots are very rich in starch and contain significant amount of calcium (50 mg/ 100 g), phosphorus (40 mg/100 g) and vitamins (25 mg/100 g). However, they are poor protein and other nutrients. In contrast, cassava leaves are a good source of proteins if supplemented with the amino acid methionine despite containing cyanide (FAO, 2003).

Surplus production of cassava products enters international trade in different forms such as chips, broken dried roots, meal, flour and tapioca starch. Dried cassava roots and meal are used as raw materials for compounding animal feeds, while cassava starch is used for industrial purposes; grocery tapioca is used solely for human consumption.

Cassava was introduced into Central Africa from South America in the 16th century by the early Portuguese exporters (Ohadike, 2007). It was probably the

incapacitated slaves who introduced the cassava crop into southern Nigeria as they returned to the country from South America through the Island of Sao Tome and Fernanda Po. At that time, there were Portuguese colonies off Nigeria shores. Cassava however, did not become important in the country until the end of the nineteenth century when processing techniques were introduced as many slaves returned home.

In Nigeria, cassava is grown in all the ecological zones; the crop is planted all year round depending on the availability of moisture. The peak of planting period is April to May. Mixed cropping system is the most practiced method of cassava production .Cassava is important not as a food crop but even more so as a major source of income for rural households. The world production of cassava root was estimated to be 184 million tones in 2002. The majority of production is in Africa where 99.1million tones were grown 51.5 million tones were grown in Asia and 33.2 million tones in Latin America and the Caribbean, (FAO, 2005). Nigeria is the world's largest exporting country of dried cassava with a total of 77% of world export in 2005. The second largest exporting country is Vietnam, with 13.6% followed by Indonesia 5.8% and Costa Rica 2.1% world wide cassava production increased by 12.5% between 1900 and 1988 (FAO, 2005). Its wide harvesting window allows it to act as a famine reserve and it is available in managing labour schedules. It also offers flexibility to resource poor farmers because it serves as either subsistence or as cash crop. Nweke (1992) and FAO (2003), revealed that about 42% of harvested cassava roots in West and East Africa are processed into dried chips and flour. As a cash crop, cassava generates cash income for the largest number of

households in companion with other staples Nweke (1997). Thus, many Nigerians derive much of their food and employment from cassava production, processing, marketing and cassava based agro-industrial schemes. Although, yam is traditionally the most important food among the indigenous ethnic groups in Benue state, cassava has gained widespread acceptance as a "Saviour" crop being cropped by almost all households State-wide (BNARDA, 1997). The farm sizes of 78% of cassava producers range between 0.1 to 0.2 ha (BNARDA, 1995)

The four most important reasons farmers give as motivation for the production of cassava and other tuber crops in the State include food security, extra income, tradition and industrial raw materials (BNARDA, 1997). As a food crop, cassava fits well with farming patterns of the small holder farmers in Nigeria, because it gives some yield of carbohydrates and is available all year round thus producing household food security . Compared to grains; cassava is more tolerant to low soil fertility and more resistant to drought, pests and diseases.

Furthermore, its root store well in the ground for months after they mature, these attributes combined with other socio-economic considerations are therefore what IFAD has recognized in the crop lending itself to a community based approach to poverty alleviation (FAO, 1995).

The production of cassava in villages was increasing initially. These were areas where cassava, yam, rice, beans or peas were the most important crops (based on farmers ranking) in the cropping system (Olayide, 1982). But it's certain factors such as losses from livestock, mainly from cattle, pests and diseases and or declining soil fertility. Unless fenced round, the cassava fields could be destroyed by cattle, especially during the dry season when pasture is scarce. The villages with declining production trend were mostly located in the non-humid climate zone, where soil fertility is low with short rainfall duration, farmers with a limited supply of fertilizer prefer to cultivate short duration crops (Annual crops) such as millet and sorghum. As a result of the above problems, improved cassava varieties were bred for high yield (high dry matter content) pest-disease resistance, good product quality and early maturity among other desired qualities. Cassava root yield is significantly higher for improved variety than for local varieties (Nweke, 2004). Higher root yield will result in larger total production per unit area.

The socio-economic importance of cassava and the accidental introduction of cassava mealy bug which ravaged most cassava fields in the major producing areas led to the government's direct intervention in the subsector in the implementation of the IFAD-assisted Cassava Multiplication Project (CMP) between 1996 in response to the above problem the IFAD initiated the (CMP) as a parallel-financial part of the world Bank-assisted MSADP-L the overall objective of the CMP was

to multiply, promote and distribute improved varieties to farmers so as to improve productivity and income of cassava farmers.

In Benue State, the record of cassava production shows that the total number of farm families involved in the production were 413159. The area of land devoted to this production was 268.11 ('000 Ha) and the total output was 3533.69 ('000 metric tones) BNARDA (2007). The main objective of the study was to analyze the costs and returns to cassava production in Benue state with emphasis on Ohimini Local Government Area. Specifically, the study sought to determine and rank the cost elements of cassava production in the study area; determine the returns to cassava production; evaluate the profitability of cassava production using gross margin and return per naira analysis.

MATERIALS AND METHODS

The study area: The middle belt agro-ecological zones in Nigeria which include Benue typify the tropical environment that favours a wide spectrum of crops, especially roots and tubers Kalu (2003), popularly referred to as the "Food Basket of the Nation" on the basis that agriculture is the main economic activity, Benue state has an estimated population of 2.8 million people made up of 413159 farm families, majority of whom are ruralites and are directly involved in subsistence agriculture characterized by small farm holdings with an average farm size of 1.5-2.0 ha NPC (1996).

Ohimini Local Government was created out of Otukpo Local government in the year 1996. The name "Ohimini" was derived from the famous Ohimini River that flows through the local government area. This river is located at Agadagba council ward.

There are 3 districts in Ohimini Local Government area namely: Oglewu/Ochobo, Onyegede/Awume and Okpiko/Agadagba which together have ten (10) council wards.

The local government area is located at the southern part of Benue state capital . It shares borders with Otukpo local government in the South East and Okpokwu local government in the south west.

According to the census conducted in the year 2005, Ohimini Local Government is known to have a population of 7 9,151 inhabitants. Vegetation existing in the area is grassland with two clearly identifiable seasons; the rainy season usually last from April to early November and is followed by the dry season which spans through November to March.

Ohimini Local Government has a fertile land mass covering about 121 km for large and small scale agricultural projects. Idoma is the predominantly spoken language with slight dialectical variation in some areas,

Christianity and African Traditional religions are the principal forms of faith practiced in the area.

The people are predominantly farmers growing foods crops in virtually all the parts of the local government, finished products like palm oil, palm wine, baskets, brooms, local mats clay pot, local chair local room divider in addition leafy vegetables as well as crops like guinea corn, maize, millet, benniseed, pepper, groundnut, rice and cassava usually exported to neighboring states are produced in the local government.

The study involved the use of both primary and secondary data in obtaining information necessary for analysis. Primary data was obtained by the use of structured questionnaires which was administered to the respondents. Secondary data relevant to this study were obtained from Journals, research reports, textbooks and Benue State Agricultural and Rural Development Authority (BNARDA) publications.

Using multi-stage random sampling technique, a total of one hundred and twenty (120) small-scale farmers were selected for the study from 3 districts comprising of ten (10) council wards in the study area. A random selection of 12 farmers from each of the council ward in the study area, was adopted. This study was conducted between March and November of 2010 in ten council wards of Ohimini Local Government Area of Benue State.

Model specification:

Gross Margin Analysis was used as a tool of analysis for this study. The gross margin is a dependable analytical tool in determining the profitability of cassava production. It is very useful where fixed capital is a negligible portion of the farming enterprise and is defined as the difference between the gross farm income (GI) and the total variable cost (TVC). This is $GM = GI - TVC$. Olukosi and Erhabor (2005).

$$GM = GI - TVC(N/ha)$$

$$GI = TPP \cdot Py(N/ha)$$

$$GM = TPP \cdot Py - TVC(N/ha)$$

where,

Py is the price of a unit product

TVC is the total variable cost

TPP is the total value of production

GI is the Gross farm income

Some of the importance of gross margin analysis include; It serves as a guide to the selection of enterprises by comprising their margins; It is used to determine net farm income; It is used as a budgeting tool to compare the profitably of one enterprise with another; It is highly applicable to subsistence system of farming involving small fixed capital component; and It is easy to compute and interpret.

Table 1: Percentage distribution of respondents by source of labour

Index	Frequency	Percentage
Family	21	18.0
Hired	46	40.0
Both family and hired	49	42.0
Total	116	100

Field survey (2010)

Table 2: Percentage distribution of respondents by method of weed control and types of herbicide used

Index	Frequency	Percentage
Weed control method		
Manual weeding	28	24.1
Chemical control	80	68.9
Both manual and chemical	8	7.0
Total	116	100
Types of herbicide used		
Primextra	6	5.17
Dansate	11	9.48
Sarosate	50	43.10
Weed off	18	15.52
Propan	3	2.59
Select	2	1.72
Glycel	1	0.86
Force up	1	0.86
Did not use herbicide	24	20.69
Total	116	100

Field survey (2010)

RESULTS AND DISCUSSION

The result in Table 1 shows that 42.0% of the respondent farmers used both family and hired labour, 40.0% used hired labour and 18.0% used family labour in cassava production. This implies that most of the respondent farmers were involved in the labour in one way or the other.

Cassava is the major calorie in the diet of rural consumers. Yields are low, production, harvesting and processing task are done manually and from households who consume most of the output farmers equally rely on each other for transfer of varieties which are more or less not improved (Nweke, 2004).

Cassava is primarily produced and processed for sale as cash crop in urban areas and foreign markets. For a nation to move to this stage, the technological requirements are high yielding varieties as well as early bulking than can be harvested at 12 months and mechanized processing tasks (Nweke, 2004).

Production processing and marketing costs are reduced to enable Nigerian cassava to compete in the global starch markets and cassava pellets for livestock feeds. This help to generate income for farmers and industrialists. The fuels that drive the transformation include development and dissemination of high yielding. These varieties, increased demand for cassava and the favourable government policies (Nweke, 2004). The transformation however, introduced bottlenecks which were broken so as to transform cassava from rural and urban cash crop to play additional roles as livestock and industrial raw materials (Nweke, 2004).

Table 3: Percentage distribution of respondents by income obtained from sales of cassava

Index	Frequency	Percentage
Range of income (N)		
10,000 - 50,000	25	21.55
50,000 - 100,000	48	41.40
100,000 - 200,000	37	31.90
200,000 -300,000	4	3.45
300,000 - 400,000	1	0.86
400,000 - 500,000	1	0.86
Total	11	6100
Field survey (2010)		

The result in Table 2 indicates that 68.9% of the sampled farmers used chemical to control weeds on their cassava farm, 24.1% used manual weeding method and 7.0% of the respondents used both chemical and manual methods of weed control.

The result further shows that 43.10% of the farmers sampled, used sarosate herbicide to control weeds on their cassava farm, 15.52% used weed off, 9.48% used Dansate, 5.17% used primextra, 2.59% used Propan, 1.72% used Select, while 20.69% did not use any herbicide and 0.86% used Glycel and Force up respectively. This indicates that sarosate herbicide is less expensive compared to other herbicides used. Therefore, farmers prefer the use of sarosate since they can purchase it at a cheaper rate. It also has a high percentage of farmers who neither used any of the herbicides because of lack of capital and high cost of herbicides.

In Benue State, the crop enjoyed a steady increase in importation both as a food and cash crop from 1960. It suffered attacks particularly by cassava mealybug in the last half of 1970s and early part of 1980s. This past attack problem was solved by the introduction of resistant varieties by Agricultural Development Agencies like Benue State Agricultural and Rural Development Agency (BNARDA). As such, solid foundation for steady expansion in has been laid and Benue has become the leading State in the production of cassava in Nigeria.

The crop accounts for over 50% of food intake in Nigeria and provides substantial percentage food energy in the daily diet. Its demand as livestock feed and industrial raw material for production of alcohol and acetones, starches for textiles and pharmaceutical industries have been on the increase over the years (Kalu, 2003).

The production of cassava within the context of farming system and trade flows offers varying forms of employment to over 60% of the rural population. It is relatively high prominence in production because of ability to grow on poor/marginal soils and good yield has given it attention as being able to provide basic food in regions where people might otherwise starve or perish (Kalu, 2003). It is thus a widely held belief that “there is no famine where cassava is grown” cassava is simply a “food security” crop.

Table 4: Percentage distribution of respondents by awareness of extension services, inputs obtained from government agents and technical information received on cassava production

Index	Frequency	Percentage
Awareness of extension services		
Yes	30	25.90
No	86	74.10
Total	116	100
Inputs obtained from government agents		
Planting Materials	10	8.62
Fertilizers	12	10.34
Herbicides	16	13.80
None	78	67.24
Technical information received		
Improved varieties	16	13.80
Labour	10	8.60
Source of fertilizer	30	25.9
None X	60	51.70
Total	116	100
Field survey (2010)		

The result in Table 3 shows that 41.40% of sampled farmers earned 50,000-100,000 naira per year, 31.90% earned 100,000-200,000 naira per year, 21.55% earned 10,000-50,000 naira per year, 3.45% earned 200,000-300,000 Naira/year, 0.86% earned 300,000-400,000 and 400,000-500,000 naira per year respectively. This implies that farmers in this area are generally low-income earners since their daily income is about N200.

The potential of cassava as a foreign exchange earner needs to be assessed carefully. Preliminary indications are that the average cost of production of pellets and chips may be too high to allow competition in the international market. For example, a survey of eleven cassava pellet producers in the South West Nigeria in 1996 showed that their mean production cost for dry pellet as N22, 500 per tonne. Only about 10% of the establishments produced at less than or equal to the monthly mean world market price of N13,000 per tonne for January and February 1966 (Nweke, 2004). A positive contributing factor to the development of these potentials in Nigeria is the provision of infrastructure in the form of roads, extension services and credit facilities.

In this regard, farmers should be encouraged to invest in this enterprise.

The result in Table 4 shows that 74.10% of the sampled farmers were not aware of extension services while only 25.90% of the sampled farmers were aware of extension services in the study area. This indicates that extension services were not effective in the area. The result in the table also shows that 67.24% of the sampled farmers did not have access to inputs from government agents, 13.80% obtained herbicides from government agents, 10.34% obtained fertilizer and 8.62% obtained planting materials. The percentage of farmers who could not gain access to inputs from government was observed to be high. This shows that most of the farmers did not benefit from services. Further, the result shows that

Table 5: Gross margin analysis for Cassava production in studied wards of Ohimini local government area of Benue State

Ward	Onyagede Ehaje	Agadagba	Oglewu Ehaje	Awume Ehaje	Onyagede Icho	Awume Icho	Ochobo	Idekpa	Oglewu Icho	Ehatokpe	Total
No. of hectares	5.75	12.4	15.70	14.45	5.70	12.4	9.55	16.77	8.8	11.1	112.62
Output per hectare (Tones)	15.80	16.62	14.72	15.41	15.72	15.07	15.55	17.09	15.56	10.16	151.70
Total output (Tones)	90.88	206.08	231.17	222.72	89.60	186.88	148.48	286.72	136.96	172.80	1,772.29
Variable cost (N) (I) Labour	247,700	433,950	561,100	378,800	210,600	347,650	326,700	560,550	218,000	331,600	3,616,650
(II) Transportation	46,400	69,800	93,150	49,600	50,400	53,850	52,300	102,300	34,800	66,900	619,500
(III) Fertilizer	12,300	49,300	66,000	138,600	78,000	110,100	32,200	28,600	16,500	59,400	591,000
(IV) Herbicide	55,300	20,400	45,700	97,800	60,100	95,800	48,000	96,700	19,000	62,500	601,300
Total variable Cost (N)	361,800	573,450	765,950	615,200	399,100	607,400	459,200	788,150	288,300	520,400	5,378,950
Revenue per Hectare (N)	119,304.3	125,000	141,719.7	124,567.5	133,333.3	122,177.4	118,848.2	136,911.2	120,454.5	131,531.5	1,273,847.6
Total revenue (N)	686,000	1,555,000	2,225,000	1,800,000	760,000	1,515,000	1,135,00	02,296,000	1,060,000	1,460,000	14,492,000
Gross margin per hectare	56,382.6	78,754.0	92,933.1	81,993.1	63,315.8	73,193.5	70,764.4	89,913.5	87,693.2	84,648.6	779,591.8
Total	1,585,399.3	2,900,889.1	3,991,814.4	3,991,814.4	1,754,960.1	2,243,186.2	4,099,445.3	1,844,909.0	2,717,174.2	27,349,976.1	

Gross margin (GM) = Total variable cost; GM = TR - TVC (TR = 14,492,000; TVC = 5,378,950) = 14,492,000 - 5,378,950 = 9,113,050

51.70% of the sampled farmers did not receive any technical information about source of fertilizer, 13.80% about improved varieties and 8.60% about labour. This indicates that technical information is not properly disseminated to the farmers since 51.70% of the farmers did not receive any information.

Cost and return analysis: This is done to determine the cost and returns to cassava farmers for effective comparative analysis of the costs and returns in cassava production in the study area.

The following were the variable costs viz: labour, fertilizer, herbicides and transportation. The respondents presented their output on the basis of the number of tones of cassava obtained. In this regard, in each ward, total output was calculated. Based on this study, Idekpa (286.72 tones) Oglewu Ehaje (231.168 tones) council wards showed higher records of cassava output in tones than other wards.

Furthermore, total number of hectares, total variable cost, total revenue and total gross margin for each ward was calculated. In addition, yield per hectare, variable costs, revenue per hectare and gross margin per hectare were also calculated as shown in the gross margin analysis in Table 5. From the analysis, it can be seen that cassava production yields profits to farmers.

The result in Table 6 shows that at 5% level of significance, hypothesis that the specified explanatory

variables have no significant influence on profit is rejected by F-test, suggesting that there is a significant cause-effect relationship between profit and the explanatory variables. Coefficient of determination (R^2) is 0.616, suggesting that the model has a high goodness of fit. This indicates that 61.6% variation in profit is accounted for by variations in the selected explanatory.

Furthermore, the result of the study showed that at 5% level of significant, output value has positive and significant influence on profit, suggesting that the higher the output value the higher the profit of the respondents. On the other hand, labour cost and seed cost have negative and significant influence on profit of the respondents, suggesting that as the cost of labour increases profit of the respondents decreases. Similarly, as the cost of seed increases, the profit of the respondents decreases.

CONCLUSION

Most of the farmers were relatively illiterate (no formal education) and land acquisition for cassava production in the study area are mainly through inheritance. In adequate capital, high cost of fertilizer and herbicides and high cost of transportation constitute the major production constraint of the sampled farmers. Variation in cassava output is explained by the variation in farm size, quality of cassava cultivars used, fertilizer applied and labour used. Data analysis showed that at 5% level of significance, output value has positive and significant influence on profit. It is however believed, that with time and policy changes, these small-scale farmers will improve on their performance and grow to become major producers of cassava in Benue State and in Nigeria in general.

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Table 6: Multiple linear regression result

Variable	Coefficient	SE	t-value
Constant	10.473	1.394	7.514
Ln output value	0.437	0.142	3.076**
Ln land cost	-0.004	0.008	-0.510
Ln labour cost	-0.271	0.079	-3.420**
Ln seed cost	-0.061	0.027	-2.272**
Ln fertilizer cost	-0.114	0.084	-1.359
Ln agrochemical cost	0.119	0.089	1.327
R^2	0.616		
F-value	4.789		
Durbin Watson	1.755		

Field survey (2010); **: t-value is significant at 1% level

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