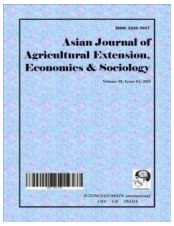

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Resource Use Efficiency among Cassava Farmers in Ilesa West Local Government Area of Osun State, Nigeria

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Authors' contributions

This article was a collaborative work among all the authors. Author EOO designed the study and wrote the methodology. Authors EOO, MAM and ALA designed the research instrument. Author EOO collected the data. Authors EOO, MAM and ALA analysed the data collected while authors EOO and AA interpreted the results. All the authors read and approved the final draft of the manuscript.

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ABSTRACT

The study determined the level of resource used efficiency among Cassava farmers in Ilesa West Local Government Area of Osun State, Nigeria. Simple random sampling technique was used to collect data from 50 respondents from four selected wards in the Local Government Area. The data collected were analysed using a descriptive statistics and a production functional analysis. The result shows that 60% of the farmer's age was between 31 and 50 years. Out of which (70%) of the farmers were males while the 60% of the farmers were married with 62% having family sizes ranging from 6 to 10 individuals. Farmers with primary and secondary school education dominated the cassava production activities. The result further shows that 52% of the farmers source their

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capitals from their savings to finance their activities, while 58% of cassava farmers consider their engagements in cassava production activities as a primary occupation. Most of the cassava farmers (82%) have at least 10 years of experience in cassava production activities. Resource use analysis shows that fertiliser, labour and herbicide were under-utilised while cassava cuttings were over-utilised. It was concluded that cassava producers in the study area were not efficient in their resource utilisation. Thus, the study recommended that cassava farmers in the study area should increase the level of fertiliser, labour and chemical but reduce the quantities of cassava cutting in cassava production.

Keywords: Resources; efficiency; cassava; farmer; producers; utilization; Ilesa West; Osun State.

1. INTRODUCTION

Agricultural production is the primary source of livelihood and a driver of Nigeria's economic growth [1]. Cassava (*Manihot esculenta*) is one of the essential agricultural food crops in West Africa according to Mehari, Amsalu and Tewedros [2]. Cassava (*Manihot esculenta*) is an important root crop in Nigeria. It plays an essential dietary role in many parts of tropical Africa. The importance of cassava as an efficient and economical source of energy in intensive cropping system and its reliability under adverse conditions and adaptability to a broad ecological range, make cassava an attractive crop to farmers [3]. Cassava is an important staple crop in the tropical world; it ranks third according to its importance after rice and maize [4]. The crop originated from tropical Brazil, from where it spread to other parts of the Latin America in post-Columbia times before it was introduced into East Africa via reunion by the end of the 1800s. It has been grown in Africa especially Nigeria since the 1850s [5]. A staple food for about 700 million people, cassava is an excellent commercial cash crop but needs a competitive edge to thrive in the global market.

The UNFAO [6] stressed the importance of cassava to the livelihoods of many millions of poor people and had made the commodity a target for interventions. Nigerians agriculture is dominated by the small-scale farmers who produce the bulk of food requirement in the country. Despite their unique and pivotal position, the small farmers belong to the poorest segment of the population and therefore, cannot invest much on their farms. The vicious circle of poverty among these farmers has led to the unimpressive performance of the agricultural sector [7].

According to Ajibefun and Daramola [7], resources must be used much more efficiently, with more attention paid to an increase in productivity and income. Cassava proves more egalitarian than the other significant staples because of its low cash input cost compared with other significant staples [8]. Cassava performs well across a broad ecological spectrum. It, therefore, benefits farmers across a broader swath of ecological zones. Cassava is less expensive to produce as it tolerates poor soil, adverse weather and pest and diseases more than other significant staples [8]. The crop puts ready money and foods in the very vulnerable segments of the society. Cassava stores its harvestable portion underground; therefore, it is,a classic food security crop. The current policy direction of the federal government of Nigeria has encouraged cassava development leading to a new orientation. Asogwa, Umeh and Penda [9] observed that the input expansion policy of the government in the cassava industry through the provision of improved cassava varieties and enhanced processing technology lead to efficient use of resources in cassava production in Nigeria. Given the various cassava programs and policies implemented over the years to raise farmers' efficiency and productivity in cassava production.

New Partnership for Africa's Development has adopted the slogan "Cassava: A Powerful Poverty Fighter in Africa" for its Pan African Cassava Initiative [10]. The potential of the crop is significant because it offers a cheap source of food calories and the highest yield per unit area. It also has multiple roles as famine reserve, food and cash crop, industrial raw material and livestock feed. There are too many agronomic (relative resistance to pests and diseases, flexibility in planting and harvesting, etc.) and social (income earner for women, flexible labour requirements) reasons why cassava has become such an important crop [11]. A critical review of current diversification of cassava to value-added products is reported. Research to investigate

'modified starch quality for better marketability' is proposed. The food industry must be alert to the findings from this science network as it could well open the door to viable alternatives to current sources rooted in high-price of raw materials. Cassava is the chief source of dietary food energy for the majority of the people living in the lowland tropics, and much of the sub-humid tropics of West and Central Africa [12]. Cassava is used in both human and animal food, in many industrial sectors, particularly in the form of starch, and more recently to produce ethanol. Cassava is primarily grown for its roots, but all of the plants can be used: the wood as a fuel, the leaves and peelings for animal feed and even the stem as dietary salt. In other to address the issue of resource use efficiency among cassava farmers in the study area, the study has been conducted based on these objectives. The broad objective is to examine the resource use efficiency among cassava farmers in Ilesa West Local Government Area of Osun State. The specific objectives are to: describes the socioeconomic characteristic of cassava farmers and determine the resources use efficiency in cassava production in the study area.

2. METHODOLOGY

This research was conducted in Ilesa West Local Government Area in Osun State, Nigeria. The area lies between latitudes 7°39'N and 7°617'N and longitudes 4°43'E and 7°767'E. It covers an estimated land mass of about 75 square kilometres with rivers like Adeti, Oora and Oromu traversing the Local Government Area. Its headquarters is located at Ereja square (now at Omi-Aladiye, Osogbo Road) and it is purely an urban area. The projected human population for year 2018 according to National Population Commission [13] is 213,684 people. The annual mean temperature is about 85^0F (29.44℃) and annual mean rainfall measures about 60 inches (1,524 mm). The area is relatively flat with elevation ranging between 800 and 950 feet above sea level. The area has a good rich climate, flat land and fertile soils that are supportive of agricultural activities especially crop production (Cassava, Maize, Soybeans, Potatoes, Cotton, etc.). A handful of the farmers are engaged in cash and food crop production; they are also involved in livestock farming (Poultry, Cattle, Sheep and Goat, etc).

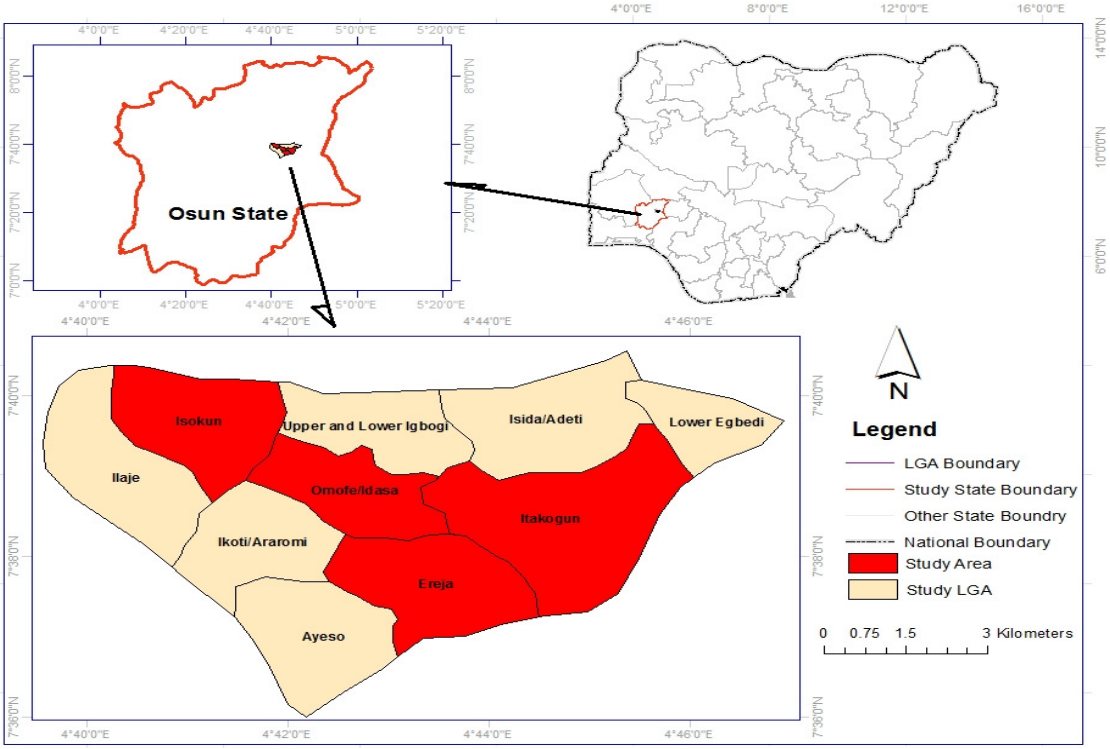

Fig. 1. Location map of the study area
Source: Adopted from Osun State Ministry of Lands and Physical Planning [14]

2.1 Sampling Procedures and Sampling Size

Cassava farmers in the study area constitute the sampling frame for this study, Four out of ten Wards in the Local Government Area (Itakogun, Idasa, Isokun, and Ereja) were selected at random (Fig. 1) and fifty cassava farmers were selected from the four Wards using simple random techniques. The selection process was based on assigning a number to all the cassava farmers in the Wards and the numbers were placed in a bowl and mixed up in selecting the respondents. The number of respondents drawn from each Ward was determined by the proportion of cassava producers within the Wards and these were based on the total list of cassava farmers obtained from the union.

2.2 Source and Method of Data Analysis

Primary data was collected for the study, using only structured questionnaire, containing information on the socioeconomic characteristic of the cassava farmers, farm size, type of cassava produced, cassava cutting, labour, fertilisers and herbicides used. The tools used to analyse the data generated from the study were descriptive statistics used to analyse the socioeconomic character of the cassava farmers. Production function analysis used to estimate the resource use efficiency in cassava production.

2.2.1 Production function analysis

Production function according to Olukosi and Erhabor [15] stipulates the physical and technical relationship between the inputs and output in any production process. Such relationship could be represented in the implicit form of production function as follows:

$$Y = f(X_1, X_2, X_3, X_4, X_5, e) \quad (1)$$

Where:

- Y = Output (kg)
- X_1 = Farm size (ha)
- X_2 = Cassava cuttings (kg)
- X_3 = Fertilizer (kg)
- X_4 = Labour (mandays)
- X_5 = Herbicide (liter)
- F = Functional notation
- e = Error term

The explicit form of production function can be presented using Semi-log functional form stated as follows:

$$Y = b_0 + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + b_5 \log X_5 + e \quad (2)$$

Where:

- Y = Dependent variable
- b_0 = Constant term
- $b_1 - b_5$ = Parameters to be estimated (coefficients)
- $X_1 - X_5$ = Independent variables.
- Log = Natural logarithm

2.2.2 Estimation of resource use efficiency

Resource use efficiency (r) was determined from the ratio of marginal value production (MVP) to marginal factors costs (MFC) as used by Olukosi and Ogungbile [16].

$$r = \frac{MVP}{MFC} \quad (3)$$

Where:

$$MVP = \frac{\Delta TVP}{\Delta X} \quad (4)$$

$$= \frac{biPy}{Xi} \quad (5)$$

$$MFC = \frac{\Delta FC}{\Delta X} \quad (6)$$

- r = Resource use efficiency
- MVP = Marginal value product (₦)
- MFC = Marginal factor cost (₦)
- TVP = Total value product (₦)
- b_i = Regression coefficient
- P_y = Unit price of output (₦)
- x_i = Unit quantity of input (₦)
- Δ = Unit change

2.2.3 Decision rule

The decision rule for the value of r that was obtained for each input utilized is as follows:

if r > 1, resource is underutilized
if r < 1, resource is over utilized
if r = 1, resource is efficiently utilized as used by Olukosi and Ogungbile [16].

3. RESULTS AND DISCUSSION

3.1 Socio-Economic Characteristic of Cassava Farmers

The socio-economic characteristics of cassava farmers have direct or indirect influence on resource use efficiency in cassava production. The socio-economic characteristics of the respondents in the study area are presented in Table 1. The age of the respondents determines the effort and quality of labour he/she employs in any given area [17]. The results show that majority, 60% of the cassava farmers are between the age group of 31 – 50 years old. This indicates that most of the cassava farmers are in their active age years. This implies that most of the actors involved are likely to be physically fit to perform cassava production activities. The mean age of cassava actors was 47.96 years. Rathman and Ogungbile [18] showed that 47.96 years is within the economically active age and as such will respond positively to any intervention aimed at improving productive capacity. Gender is state of being a male or a female, which in turn, leads to defining the necessary function of each individual in the society Baker and Silverton [19]. The result of gender distribution of the respondents (Table 1) in the study area shows that males are more involved in cassava production than female. The distribution shows that 70% of the farmers are males while the remaining 30% are females. The results are in agreement with the findings of Ofuoku, FAO [20,21] which stated that male respondents were fully in cassava production.

Another important socio-economic characteristic is marital status. This determines the family size of the cassava farmers and consequently determines the number of people expected to work on the farm. The marital status of the respondents is presented in Table 1. The result reveals that majority of the cassava farmers (60%) are married while 30% are divorced. This result agrees with the work of Ofuoku; Fakoya, Banmek, Ashinmolowo and Fapojuwo [20,22] who noted that married people have the responsibilities of catering for the needs of their families and therefore engage in various economic activities that would serve as sources of income. The household size of cassava farmers determines the contribution of the family members in cassava production. This determines the number of family members in a household that could contribute to family labour. Table 1 reveals that majority of the farmers (62%) have family sizes ranging from 6 to 10 individuals.

Table 1. Distribution of cassava farmers according to age, gender, marital status and family size

Items	Frequency	Percentage
Age range (years)		
≤ 30	2	4
31 – 40	10	20
41 – 50	20	40
51 – 60	11	22
≥ 61	7	14
Mean	**47.96**	
Gender		
Male	35	70
Female	15	30
Marital status		
Single	1	2
Married	30	60
Divorced	15	30
Widowed	4	8
Family size		
1 - 5	19	38
6 - 10	31	62
Total	**50**	**100**

Source: Field survey, 2014

Education plays a vital role in the adoption of innovative practices among the traders, producers, processor and marketers. Education is seen as a means of acquiring knowledge on new technology to add value and increase efficiency. With high level of education, adoption of new technology becomes easy. Table 2 reveals that 42% of the cassava farmers obtained primary school certificate, while 30% attended secondary school. Farmers with primary and secondary school education dominate the cassava production activities. William; Adesoji and Farinde [23,24] noted that secondary education can equip farmers with some managerial skills in agri-business and help in understanding innovations.

Capital, as used here, refers to money for financing cassava input in the study area. Capital is one of the factors of production, without which the production will not be possible. Incidentally, most farmers have little or no money to carry out essential farm operations or purchase modern yield exchanging input in production. Capital also is essential because it helps the farmers to expand their activities. Sources of capital for

cassava farmers are presented in Table 2. The result shows that 52% of producers used their personal savings to finance their activities, while 42% borrows from friends and relatives. This result indicates that farmers do not have much access to capital from banks in the study area. This is because either the actors do not know the procedure to get loans from banks or they are smallholders who lack collateral which could be used to obtain bank loans. The result agrees with that of Alimi [25] who observed that food crop farmers' significant sources of capital (working capital) are personal savings which are inadequate.

Occupation involves activity that is carried out by an individual to derive a particular benefit or to enable the individual sustain a living. The distribution of the cassava farmers based on occupation is shown in Table 2. The Table shows that 58% of cassava farmers are engaged in cassava production activities as their primary occupation; for the remaining 42%, cassava production is a secondary activity.

The years of experience refers to the number of years over which a cassava farmer has been engaged in cassava production activities. The more experienced one is, the higher the profit margin. Also, the more the period a farmer spends in the practice, the more he/she will improve in managerial capability and overall efficiency. The years of experience of the cassava farmers are presented in Table 3. The result indicates that most of the cassava farmers (82%) have at least 10 years of experience in their engagements in cassava production activities. It is expected that the farmers are aware of new production technologies and methods of production and would likely achieve higher level of productivity. This supports the findings of Maurice [26] who reported a positive and significant relationship between farming experience and technical efficiency in cassava production.

Farm size refers to the total land area that the farmers cultivate [27]. The distribution of cassava farmers according to the farm size is presented in Table 3. The result shows that majority (52%) have farm sizes ranging from 1.1 hectares and above. The small farm size holding is in line with the finding of Ofuoku [28] which revealed that the average farm size for cassava production was 3 hectares, an indication of small-scale nature of cassava production in the study area.

Table 2. Distribution of cassava farmers according to education status, source of capital, occupation

Items	Frequency	Percentage
Education status		
No Formal	11	22
Primary	21	42
Secondary	15	30
Tertiary	1	2
Islamic	1	2
Adult Education	1	2
Source off capital		
Personal saving	26	52
Friend & relative	21	42
Money lender	3	6
Bank	0	0
Occupation		
Primary	29	58
Secondary	21	42
Total	**50**	**100**

Source: Field survey, 2014

Table 3. Distribution of cassava farmers according to year of experience and farm size

Items	Frequency	Percentage
Year of experience		
1 - 10	9	18
11 - 20	31	62
21 - 30	7	14
> 30	3	6
Farm size		
0.1 - 1	24	48
1.1 - 2	22	44
2.1 – 3	2	4
> 3	2	4
Total	**50**	**100**

Source: Field survey, 2014

3.2 Result of Production Function on Cassava Production

The production function used for estimate the resource use efficiency in cassava production is shown in Table 4. The result reveals that the semi-log functional form gave the best fit on the basis of R^2 value and other econometric criteria such as sign and significance of the independent variables; thus, it was chosen as the lead equation. The result shows that semi-log has an R^2 value of 0.937 indicating that 93.7% of the variation in cassava production was accounted for by the independent variables considered in the model. The statistically significant F-value of 66.594 shows that variation in cassava enterprise is jointly influenced by the

Table 4. Semi-Log production function for cassava production in the study area

Variable	Coefficient	Standard error	T-value
Constant term	-33658.161	14285.171	-2.356**
Farm size (ha)	1647.609	4714.265	$0.349^{n.s}$
Cassava Cutting (kg)	-10714.091	4690.713	-2.384**
Fertilizer (kg)	14610.802	3561.951	4.102***
Labour (Man-days)	7099.175	2294.584	3.094***
Herbicide (litre)	277.964	53.498	5.196***
R^2 - value	0.937		
F - value	66.594***		

Source: Field survey, 2014.
**** - Significant at 1%*
*** - Significant at 5%*
n . s - Not significant

Table 5. Determination of resource use efficiency for cassava production

Variables	Coefficient	MVP (₦)	MFC (₦)	MVP/MFC	Decision
Cassava cutting (kg)	-10714.091	-8571.27	**200**	-42.86	over-utilized
Fertilizer (kg)	14610.802	730540.10	**5,000**	146.11	under-utilized
Labour (mandays)	7099.175	177479.38	**500**	354.96	under-utilized
Herbicide (litre)	277.764	26204.15	**1,000**	26.20	over-utilized

Source: Field survey, 2014

independent variables incorporated in the semi-log equation. The coefficient of cassava cutting (-10714.091) is negative and significant at 5%, implying that a unit increase in the cassava cutting will result in a decrease in cassava output by 10714.091. This means that there is an inverse relationship between cassava cutting and cassava output in the area. Such an inverse relationship may not be unconnected with over use of cassava cuttings on other inputs such as quantities of fertilizers, labours and herbicides utilized. On the contrary, the coefficients of fertilizers (14610.802), labour (7099.175) and herbicides (277.964) are positive and significant at 1% each implying that increasing the level of either fertilizers, labour and herbicides or all will result in a significant increase in the cassava output in the study area. This agrees with the work of Olayide and Heady [29] who stated that agricultural productivity can be increased through an increase in the quantity of a particular input. Falusi [30] also reported that farm size has a significant positive relationship with the dependent variable in an estimated regression equation.

3.3 Result of Resources Use Efficiency of Cassava Production

The result of the resource use efficiency is presented in Table 5. The result shows that the ratio of marginal value product to marginal factor product for cassava cutting is less than 1; this implies that the quantities of cassava cutting are overutilized. This may be as a result of getting the cassava cutting freely, and any reduction in the input usage will lead to an increase in the output. Fertilizer, labour and herbicide are under-utilised in cassava production activities in the study area. This may be as a result of scarcity and high prices of fertilisers, labour and herbicides especially during production periods, meaning that to increase the profitability of cassava production in the area, the level of such inputs utilised should be increased. This result is in agreement with the finding of Ebukiba [31] which stated that there is an inefficient utilisation of resource in cassava production in Nigeria. Other studies by Ohajianya & Onyenweaku [32,33], have shown that low resource productivity and inefficiency exist in Nigerian agriculture.

4. CONCLUSION AND RECOMMENDA-TION

Based on the findings of the study, the farmers engaged in cassava production in the study area were in their active ages. Males are more involved than females. It is therefore concluded that cassava producers in the study area are not efficient in their resource utilisation, as a result of high cost of farm input like fertilisers, labour and herbicides. Thus, for efficiency in cassava

production in the study area, farmers should increase the quantities of fertiliser, labour and herbicide inputs while the quantities of cassava cuttings utilised should be reduced. Also, extension agents should help in training the producers on improved production management to enable them to use the available resources efficiently.

CONSENT

As per international standard or university standard written consent has been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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