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ANALYSIS OF GENDER DYNAMICS AND ALLOCATIVE EFFICIENCY IN CASSAVA PRODUCTION AMONG FARMERS IN OYO STATE, NIGERIA

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ABSTRACT

This study examined the gender dynamics and allocative efficiency (AE) in cassava production among farmers in Oyo State, Nigeria. Primary data were obtained through a multistage sampling procedure from 245 cassava farmers made up of 68 adult male (AM), 58 adult female (AF), 61 youth male (YM) and 58 youth female (YF) farmers. This was achieved with the aid of structured questionnaire and analyzed by stochastic frontier cost function. The results revealed that the coefficient of cost of labour influences AE of the cassava gender based groups at 1% level of probability. The mean AE were 0.74, 0.47, 0.77 and 0.90 for AM, AF, YM and YF cassava farmers, respectively. Costs of stem cuttings (0.822), fertilizer (0.022) and farm size (0.050) were significant variables influencing allocative efficiency of adult farmers. The coefficients of education (1.81), farming experience (-2.53), farmland (2.11), credit (-3.73) and non-farm income (-6.67) were significant inefficiency variables affecting allocative efficiency among young farmers. Inadequate credit was the most critical constraint indicated by all the categories of farmers. Farmers should collaborate with relevant agricultural institutions through their cooperative societies to organize training on management practices that could enhance optimizing application of inputs.

Key words: Resource allocation, cassava, gender, production, dynamics,

INTRODUCTION

Cassava (*Manihot esculenta* Crantz) is a perennial root crop that grows in non-ideal conditions and represents a major staple food crop in Africa, particularly in Nigeria. It is a tuber crop which originated in South America and was brought into central Africa from South America in the 16th century by the early Portuguese exporters. It was presumably the incapacitated slaves who brought the cassava crop into southern Nigeria as they came back to the country from South America through the island of Sao Tome and Fernanada Po (Odoemenem and Otanwa, 2011; Omotayo and Oladejo, 2016). Improved cassava varieties became available in Nigeria from mid-1970's and was disseminated for planting materials by the National Seed Services (NSS) through the Agricultural Development Project that began in 1986 (IITA, 1994; NRCRI, 2006). It performed well in Nigeria that the country has become the largest producer, having surpassed Brazil and Thailand, with global production of 21% in 2018 (FAOSTAT, 2019).

Oyo State is among the major producers of cassava in South- west Nigeria. In 2011, about 1.630 million metric tons (MT) of cassava was produced in Oyo State. Of this, 15.40% was produced in 4 communities; Saki, 83,729.69 MT (5.14%), Iwere-ile, 78,344.31 MT (4.81%), Eruwa, 49,659.18 MT (3.05%) and Igbeti, 39,293.55 MT (2.41%). Recently, out of 3.055 million MT produced in Oyo State in 2018, Saki accounted for about 146,832 MT (4.81%) of the state production of cassava; Iwerele, 100,000 MT (3.27%), and Igbeti, 73,594 MT, 2.41% (OYSADEP, 2019).

Various gender actors are involved in the production of cassava in Oyo State. Ogundumi (2015) defined gender as the socio-cultural construction of roles and relationship between adult male, adult female and youth that often change overtime and are content specific. There is a difference between gender and sex. According to Ogundumi (2015), gender identities and roles are constructed in society but not fixed, not universal and do change over time, while sex is biological and sex roles are fixed and universally similar.

The rationale for considering gender in agricultural research identifies with agricultural resource allocation, productivity, poverty reduction, and empowerment. Gender analysis is a systematic analytical process used to identify, comprehend, and portray gender differences. It is also the relevance of gender roles and power dynamics in a specific context. It centres on the different roles and responsibilities of women and men and how these influence society, culture, the economy and politics. In agriculture, it also identifies disparities such as differences in access to resources such as gender gap in access and use of productive resources and services that can improve agricultural productivity and efficiency. It also examines disparity in inputs, production pattern, resources allocation analyzes and why such disparities exist; decide if they are potential obstacles to accomplishing results, and looks at how they can be addressed. This will create important additional benefits through raising the incomes of gender based farmers such as adult male, adult female and youth farmers, increasing the availability of food, thus increasing profit which would thus reduce the number of the poor below the poverty line.

Allocative efficiency analysis is an issue of interest among economists in recent times. According to Izekor and Alufohai, (2014), optimization can be obtained by either minimizing the cost of producing a given level of output (allocative efficiency), or maximizing the output attainable with a given level of cost. Both optimization problems require proper allocation of inputs for the goal to be achieved. Maximum resource productivity means obtaining the maximum possible output from minimum possible set of inputs. Therefore, optimal productivity of resources involves an efficient utilization of resources in the production process. To achieve optimum output, resources have to be optimally and efficiently utilized.

Most efficiency studies on cassava production in Nigeria were on technical efficiency measurement (Michael, 2011; Eze and Nwibo, 2014; Girei *et al.,* 2014; Simpa *et al.,* 2014; Makinde *et al.,* 2015; Isitor *et al.,* 2017; Akerele *et al.* 2019) with little attention given to allocative efficiency measurement and mostly gender biased. This study is necessary so as to contribute to literature on allocative efficiency studies on cassava production, with the aim of disaggregating cassava farmers based on gender which is rare in literature, especially in the study area: Oyo State. The objective of this study was to assess gender dynamics and allocative efficiency towards cost minimization in cassava production among farmers in Oyo State, Nigeria.

METHODOLOGY

Study area

The study was carried out in Oyo State, one of the six states in Southwest, Nigeria. The state is among the major cassava producing states in the country and the region in particular. It is geographically located within Latitudes 5^{o} 15' N and 9^{o} 10' N, and Longitudes 2^{o} 50' E. Annual temperature varies from 25^{o}C – 35^{o}C. The vegetation has a rainfall pattern of about 1,300 mm to 1,500 mm per annum, and ranges from rain forest to derived savannah. The climate is equatorial, with notable dry and wet seasons with high relative humidity. The state had a projected population of 9.472,009 persons in 2020 with an estimated growth rate of 3.2 percent (NPC, 2006). The state covers an area of about 28,454 square km. The state comprises of 33 Local Government Areas (LGAs) and 4 agricultural zones namely, Ibadan / Ibarapa, Oyo, Ogbomosho, and Saki.

Method of data collection and sampling technique

The data used for this study were essentially from primary source, which were obtained from 245 cassava farmers. A multi-stage sampling procedure was used to obtain the sample size. The first stage involved selection of the four agricultural zones in the state because of their involvement in extensive cassava farming. Thereafter, two LGAs were randomly selected from each of the four agricultural zones, making 8 LGAs. The third stage involved a random selection of two villages from each of the zones to make a total of 16 villages. The last stage involved using Yamane formula to calculate the minimum sample size based on the assumption of 5% expected margin of error, 95% confidence interval and applying the finite population correction factor. The formula is expressed as follows:

$$n = \frac{N}{1+N(e)^2} \qquad (1)$$

Where: N = the population under study, n = the desire sample, e = the level of tolerable error assumed to be 0.05, while 1 is a constant value.

$$n = \frac{634}{1+634(0.05)^2} \; ; \quad n = \frac{634}{2.59} \; n = 245 \; ; \qquad \frac{245}{634} x \; 100 = 38\%$$

The sample size of 245 cassava farmers was sorted by gender for the purpose of this study. Hence, the sample size was made up of 68 adult male, 58 adult female, 61 youth male and 58 youth female cassava farmers.

Techniques of data analysis

Conceptual framework and analytical technique

Descriptive statistics and stochastic cost (allocative) frontier production function were used to analyze the data collection for this study. Descriptive statistics employed include frequency, percentage, mean, standard deviation and coefficient of variation. The efficient production is represented by an index value of 1.0 while lower values indicate a greater degree of inefficiency. The stochastic frontier cost function or allocative efficiency is defined by:

$$C = F(W_i, Y_i; \alpha) \exp e_i \qquad i = 1,2,3 \ldots 5 \qquad (1)$$

Where: C = the minimum cost associated with cassava production based on gender, W = vector of input prices, Y = cassava based output, α = vector of parameters, e_i = composite error term. Assuming that equation 1 is of a Cobb-Douglas form, the dual cost frontier can be expressed in equation 2:

$$C_i = g(P_i; \alpha)e^{(v+\mu)} \qquad (2)$$

Where C_i is the minimum cost incurred by the i^{th} cassava farmer to produce output *Y*; *g* is a suitable function; P_i represents a vector of input prices employed by the i^{th} farm in cassava production; α is the parameter to be estimated; e_i = composite error term comprising of V_i and U_i. The term U is non-negative random variable representing inefficiency in production relative to the stochastic frontier. The random error V_i is assumed to be independently and identically distributed as $N(o, \sigma_v{}^2)$ random variables independent of the U which are assumed to be non-negative truncation of the $N(o, \sigma_u{}^2)$ distribution (i.e. half-normal distribution) or have exponential distribution.

Shepherd's Lemma can be applied in partially differentiating the cost frontier with respect to each input price to obtain the system of minimum cost input demand relationship in equation 3 (Bravo- Ureta and Pinheiro, 1997).

$$\frac{\partial c}{\partial p_i} = X_{di} = f(P_i, Y_i; \varphi) \qquad (3)$$

Where: *φ* is a vector of parameters to be estimated. The economically efficient input quantities (X_{ie}) from input demand equations can be obtained by substituting the cassava farmers' input prices P and output quantity Y* into equation 3. The costs of technically (technical efficiency) and economically efficient (economic efficiency) input combinations associated with the farmers' observed output were given by $\Sigma(X_{it} * P_i)$ and $\Sigma(X_{ie} * P_i)$ respectively. Therefore, allocative efficiency estimates can be calculated based on these cost measures as depicted in equation 4:

$$AE_i = \sum(X_{ie} * P_i) / \sum(X_{it} * P_i) \quad (4)$$

However, it was further assumed that the average level of allocative efficiency, predicted as AE_i in equation (4) was a function of demographic, socio-economic and institutional factors. In this study, the stochastic cost frontier production function also incorporated a model of inefficiency effect.

The explicit form of the stochastic frontier cost function was specified as:

$$lnC = \beta_0 o + \beta_1 lnX_1 i + \beta_2 lnX_2 i + \beta_3 lnX_3 i + \beta_4 lnX_4 i + \beta_5 lnX_5 i + (V_i + U_i) \quad (5)$$

Where: ln = the natural logarithm, C = cost of production of cassava (₦), β_0 = constant term

$\beta_1 - \beta_5$ = regression coefficients, X_1 = cost of farm size (₦), X_2 = cost of stem cuttings (₦)

X_3 =cost of fertilizer (₦), X_4 = cost of labour (₦), X_5 = cost of herbicide (₦), V_i = random variability in the production that cannot be influenced by the farmer and

U_i = deviation from the production cost frontier attributable to technical inefficiency stated as:

$$U_i = \delta_0 + \delta_1 lnZ_1 + \delta_2 lnZ_2 + \delta_3 lnZ_3 + \delta_4 lnZ_4 + \delta_5 lnZ_5 + \delta_6 lnZ_6 \quad (6)$$

Where: U_i = inefficiency effects, Z_1 = age of farmer (years), Z_1 = educational level (0 for not attended, 1 for primary, 2 for secondary, 3 for tertiary, and 4 for others), Z_1 = household size (number), Z_2 = farming Experience (years), Z_3 = access to extension services (number of contact), Z_4 = access to credit (₦), Z_5 = membership of association (years), Z_6 = non-farm income (₦), δ_0 = constant, δ_1 - δ_6 = coefficients to be estimated.

The maximum likelihood estimates (MLE) of the parameters of the stochastic frontier cost function and the inefficiency model were simultaneously obtained using FRONTIER 4.1.

RESULTS

Description of variables used in efficiency and inefficiency model of the cassava farmers

The production variables were: labour, cassava stem cuttings, fertilizer and herbicide (Table 1). The AM farmers utilized 58.12 man-days per ha of labour compared to

28.51 (AF), 37.12 (YM) and 29.14 (YF) man -days. A large number of AM (88.2%) and AF (82.8%) farmers were exposed to extension contact compared to YM (42.6%) and YF (39.7%) farmers. About 97.1% of AM were married and 85.9% had access to one form of credit or the others. With education level, preponderance of 70.6% AM, 51.7% AF, 91.8% YM, and 86.2% YF cassava farmers had at least secondary education (Table 1).

Table 1: Description of variables used in efficiency model of the cassava based farmers

	AM		**AF**		**YM**		**YF**	
	mean	**stdev**	**mean**	**Stdev**	**Mean**	**stdev**	**mean**	**stdev**
Production variable		**±**		**±**		**±**		**±**
Labour (man-day)	58.12	13.71	28.51	3.67	37.12	15.89	29.14	16.00
Cassava stem (cutting)	22.34	4.18	12.05	4.78	10.23	4.26	7.39	4.72
Fertilizer (kg)	36.51	16.03	14.18	4.40	14.56	5.75	9.77	5.28
Herbicide (litre)	7.29	1.74	3.62	0.71	2.57	1.11	1.99	1.34
Socio-economic variable								
Household size	6.8	1.05	5.8	1.40	1.7	1.10	1.80	1.29
Farming experience	22.3	8.09	19.9	9.49	4.18	2.1	4.00	2.10
Farm size (ha)	1.9	0.79	0.93	0.54	0.71	0.23	0.42	0.26
Credit: only access (‘000)	85.9	27.06	11.5	7.76	15.7	11.31	0.95	0.72
Cooperative membership	11.95	1.79	14.5	7.60	1.5	2.0	1.1	2.00
	F	%	F	%	F	%	F	%
Marital status (married)	97.1	2.9	87.9	12.1	18.0	82.0	19.0	81.0
Extension (Contact)	60	88.2	48	82.8	26	42.6	23	39.7
Education level	52	70.6	30	51.7	56	91.8	50	86.2
Main occupation (farming)	50	73.5	38	65.5	44	72.1	39	67.2
Farm land (dominance)	41	70.6	41	60.3	30	49.1	38	65.5
Total	**68**	**100**	**58**	**100**	**61**	**100**	**58**	**100**

AM= Adult male; AF= Adult female; YM= Youth male; YF= Youth female; CV= coefficient of variation; Stdev= Standard deviation

Maximum likelihood estimate (MLE) of cost frontier function

The allocative efficiency analysis of cassava production revealed that the gamma values of about 0.99 for AM, AF and YM and (0.97) YF cassava farmers that were significantly at 1% level of probability across the gender groups (Table 2). The gamma (γ) value of 0.99 for AM, AF and YM implies that about 99% variation in the output of cassava farmers was due to differences in their allocative efficiencies. The coefficients of the constant term were positive and statistically significant for AM, YM and YF cassava farmers. Cost of farm size was positive and statistically significant for AF, YM and YF farmers. The coefficient of fertilizer was positive and statistically significant for AF, YM and YF cassava farmers. Cost of stem cutting was also positive and statistically significant for only AF and YM. The coefficient of labour was positive and statistically significant at 1% level of probability across the various gender groups (Table 2).

Table 2: MLE results of stochastic frontier cost function of cassava-based farmers

Variables (cost of ….)	**Adult male β (t-value)**	**Adult female β (t-value)**	**Youth male β (t-value)**	**Youth female β (t-value)**
Constant	3.697*** (6.376)	1.717 (1.197)	2.526*** (3.611)	9.216*** (17.867)
Farm size	0.004 (0.709)	0.050*** (7.304)	0.014*** (4.610)	0.006* (1.519)
Stem cutting	0.369 (0.957)	0.822*** (4.088)	0.358* (1.766)	0.010 (1.362)
Fertilizer	0.025 (1.1670	0.022*** (4.886)	0.007* (1.910)	0.020*** (5.793)
Labour	0.034*** (10.734)	0.042*** (5.770)	0.110*** (12.663)	0.138*** (11.154)
Herbicides	0.012 (0.538)	-0.009 (-0.490)	0.001 (0.159)	0.001 (0.190)
Output	0.370 (0.990)	0.106 (0.893)	0.436* (1.928)	0.004 (0.059)
Diagnostic	**statistic**			
Sigma square	0.279*** (7.990)	0.103*** (5.880)	1.424*** (6.152)	0.386*** (3.760)
Gamma	0.99*** (19157.516)	0.99*** (31492.824)	0.994*** (310.174)	0.968*** (66.107)

Note: Figures in parenthesis are t-values; ***; **; * denote significant at 5%, 1%, 0.1% respectively

Estimation of technical inefficiency model

Age (1.18) was positive and statistically significant at 1% level of probability for AF farmers (Table 2). Educational level was also positive and statistically significant for AF, YM and YF farmers. Household size was negative and significant at 5% level of probability for YF farmers. The estimated coefficient of farming experience was positive for AM (0.76) and negative (2.53) for YM and statistically significant at 1% level of probability. Extension contact had a negative relationship (-2.490) for AM farmers and statistically significant at 1% level of probability. The coefficient of membership of association was also positive for AM farmers and negative for YF farmers and significant at 1% level of probability. The coefficient of non-farm income for youth (-6.67) was negative and statistically significant (Table 3).

Table 3: Determinants of cassava-based farmers' allocative inefficiency based on gender

Variables	Adult male β (t-value)	Adult female β (t-value)	Youth male β (t-value)	Youth female β (t-value)
Constant	-4.54***	-3.96***	1.23	-2.41
Age	0.57	1.18***	-0.76	0.19
Educational level	-0.14	0.14*	1.81***	0.64*
Household size	-0.40	0.07	0.19	-1.54**
Farming experience	0.76***	-0.08	-2.53***	0.83
Land acquisition	2.91***	-0.08	2.11***	0.73
Access to extension	-2.49***	-0.11	-1.11	-1.31
Access to credit	-0.27	0.18	-3.73***	-0.22
Membership of association	2.65***	-0.16	-0.72	-2.25***
Non-farm income	0.71	0.06	-6.67***	0.28

Note: The values are the coefficients; ***; **;

* denote significant at 5%, 1%, 0.1% respectively

Decile range of allocative efficiency of cassava farmers based on gender

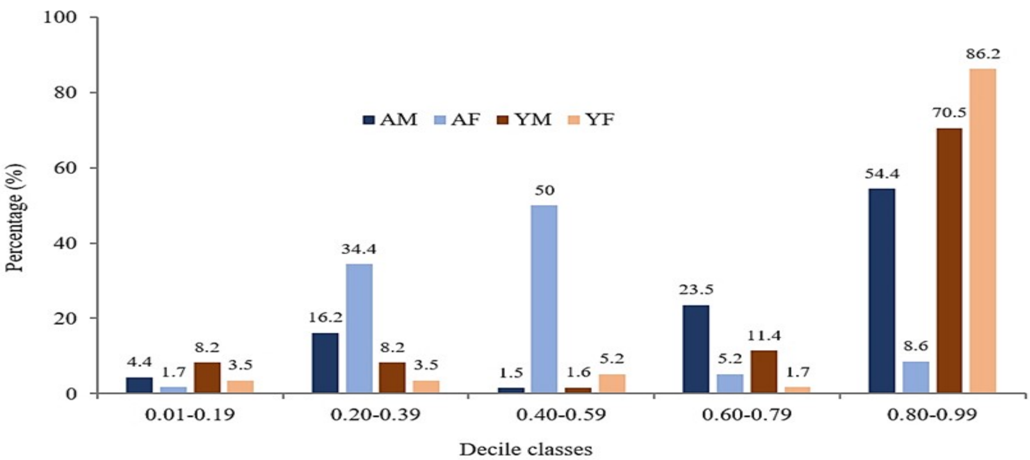

Figure 1: Frequency distribution of allocative efficiencies of cassava farmers based on gender

About 54% AM, 71% YM and 86% YF cassava farmers were skewed towards efficiency levels of 80% and above compared to 64% of AF cassava farmers that were skewed towards efficiency level of 40% and above (Fig. 1). The mean allocative efficiency were 0.74, 0.47, 0.77 and 0.90 for AM, AF, YM and YF for cassava farmers respectively (Fig. 1).

Return to scale in cassava production based on gender

The elasticity of the mean value of cassava based on gender allocating of resources were estimated to be 0.444, 0.927, 0.490 and 0.175 for AM, AF, YM and YF, respectively (Figure 2).

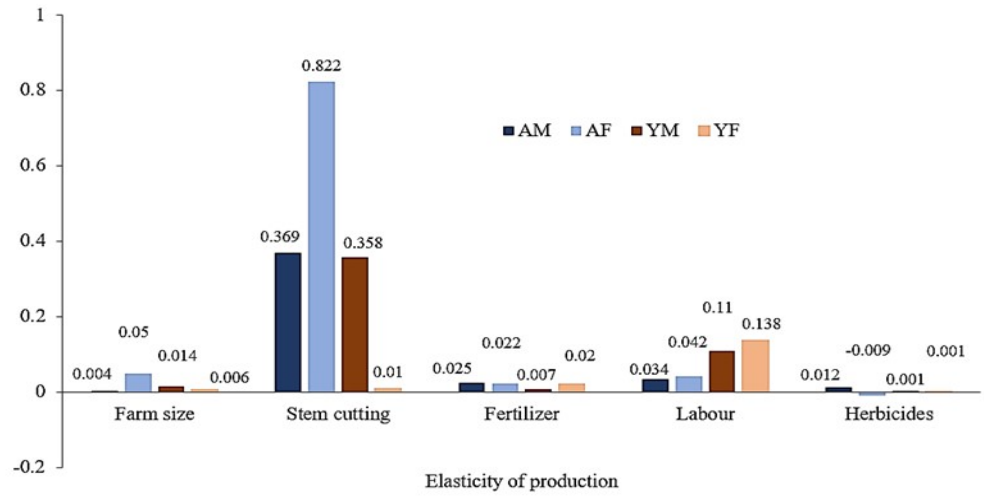

Figure 2: Elasticity of production and return to scale in cassava production based on gender

Constraints confronting farmers in cassava production

Cassava farmers based on gender encountered various constraints which includes inadequate of farm credit, lack and scarcity of improved planting materials and lack of technical know.

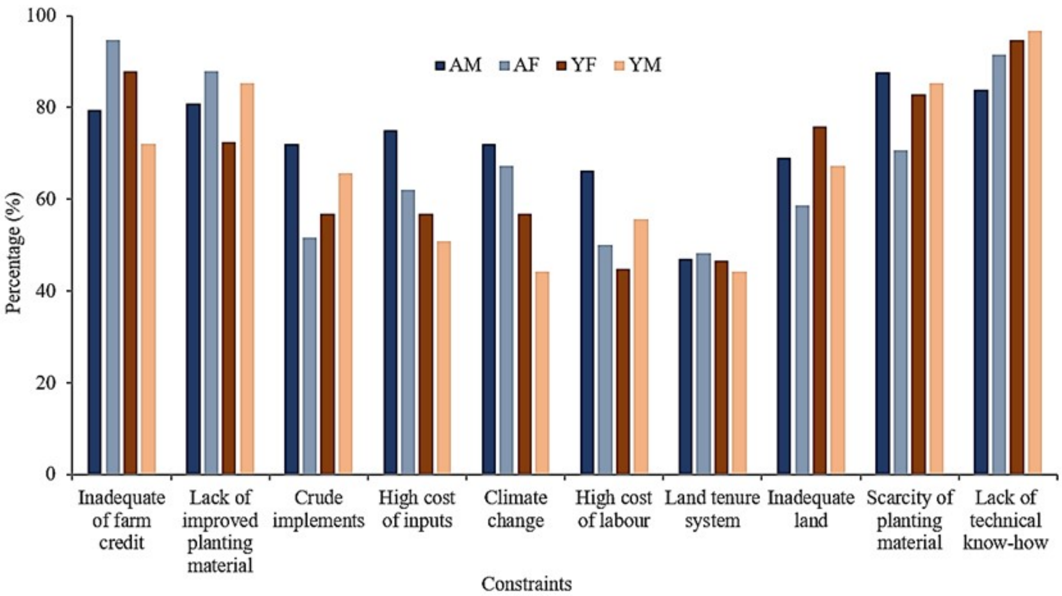

Figure 3: Constraints faced by cassava farmers based on gender
***multiple responses are allowed**

DISCUSSION

The results of socio-economic and institutional characteristics showed that adult male (AM) cassava farmers allocated more resources per ha such as labour, cassava stem, fertilizer and herbicide compared to adult female, youth male and female. This may be as a result that adult female (women) and youth (male and female) assist their husbands or fathers in all farming activities. This supports the findings of Ajani (2008), and Elisha *et al.* (2020), that men and women have access to productive resources, but men have more control of production inputs. In addition, standard deviation of production inputs seems to be higher among youth male and female. This also implies that variations in inputs utilization among the youth exhibit high level of variability.

The significance of marital status on agricultural production is related with supply of agricultural labour. Based on these result, it is expected that adult male and female may have ample opportunity to agricultural labour for cassava production while youth farmers may have to outsource for labour or work on their farm themselves. The results exhibit wide variation and disparity in terms of access to production inputs and credit institutions among the gender based cassava farmers. Therefore, efforts must be made to assess the gender roles, differences and disparities between adult male, adult female and youths for the effectiveness of the agricultural development agenda. It has been argued in literature that most policies, programs, and projects that are targeted towards rural farming households have not made their intended impacts because the role and position of gender are not been considered. Therefore, formulation of policies, planning and preparation of projects / programmes by relevant agencies that would encourage gender sensitivity on cassava production is advocated.

The results of educational level suggests that majority of the farmers were literate and this is expected to enhance the degree of awareness, understanding, accepting and adoption of appropriate agricultural technologies or innovations relating to cassava production among farmers is expected to be high. Ameh *et al.* (2020), opined that education is an important socio-economic factor that influences farmer's decision making as it influences farmer's awareness, perception and adoption of innovations that can bring about increase in productivity. Findings also indicated that the bulk of cassava based farmers took farming as major occupation. Majority of gender based farmers acquired land for farming through inheritance.

The results of cost frontier function of gender based farmers showed that there was presence of allocative efficiency effects in cassava production in the study area as confirmed by the gamma values among cassava farmers that were statistically significant at 1% level of probability across the gender groups. The non-zero and positive variation in gamma (γ) values imply that variation in the output of cassava farmers was due to differences in their allocative efficiencies. The correctness of the specified assumption of the distribution of the component error terms is tested by the significant levels of the sigma square. The 1% level of statistical significance for all the groups' showed the appropriateness of the assumption for the distribution of the component error term. The result of the MLE of the production function showed diverse relationship among the 4 groups of cassava based farmers in the study area.

The coefficient of the constant term that was positive and statistically significant for AM, YM and YF was due to the fact that expenses on fixed factors of production such as land, farm machineries and tools, buildings and other permanent structures would keep running whether or not production takes place. Therefore, it is advisable for farmers to farm year round, i.e. engage in both rain-fed and dry season to reduce the cost of maintenance throughout the year.

The positive and statistically significance of cost of farm size among AF, YM and YF farmers implies that a unit increase in the cost of farm size will lead to a corresponding increase in the total cost of cassava output *ceteris paribus*. Farmers are encouraged to make better management of the available inheritance land to minimize cost of land rent and invariably reduce total cost. Similarly, cost of stem cutting was also positive and statistically significant for AF and YM which implies that a unit increase in cost of stem cutting will lead to a corresponding increase in the total cost of cassava production. Here, farmers can harness their cooperative to acquire improved stem cuttings through economy of scale by buying in bulk to reduce total cost of production.

The coefficient of labour that was positive and statistically significant across the various gender groups implied that a unit increase in cost of labour will lead to a corresponding increase in the total cost of cassava production *ceteris paribus*. The excessive uses of labour resource in rural areas tend to be a common occurrence due to rather low opportunity cost for the input (Oladimeji *et al.,* 2013)). Family labour cannot rationally be ignored in cassava production even when it is making a negative contribution because it still has to be catered for whether it is employed or not.

The analysis of inefficiency models showed that the signs and significance of the estimated coefficients in the inefficiency model have important implications on the allocative efficiency of the cassava farmer. In light of this, the positive and significance of age for AF farmers, implies that an increase in this variable will lead to a decrease in allocative efficiency. Educational level was also positive and statistically significant for AF, YM and YF farmers signified that low level of education may reduce allocative efficiency among these categories of cassava based farmers. The implication of household size is that increase in household size increases cost efficiency of youth female cassava farmers. This is comparable with the result of Aboki *et al.* (2013), Girei (2013), and Kamau (2019), who found that many farmers rely on household labour to increase production due to its availability, accessibility, inexpensiveness and ease and simplicity of timely allocation in different farm activities during planting, weeding and harvesting.

The estimated coefficient of farming experience that was positive for AM implies that a unit increase in farming experience will lead to increase in allocative inefficiency of adult male cassava farmers. This means that adult male cassava farmers must devise cost-saving strategies over years to reduce total cost.

Extension contact had a negative relationship with allocative efficiency of AM farmers. This was statistically significant and this is a pointer that a unit increase in extension contact will reduce allocative inefficiency by corresponding units. Consequently, efficiency in resource allocation increases as the frequency of extension contact increases. The coefficient of membership of association that was also positive for AM farmers and negative for YF farmers signified that for YM farmers were able to pooled resources together to acquired inputs to reduce inefficiency. This was in line with *a prior* expectation; membership of association was expected to have a negative influence on allocative efficiency. Farmers who are members of cooperatives societies are better informed on resources use and farm planning which empowers them to use resources more efficiently. Hence, farmers should collaborate and synergize with relevant agricultural institutions, extension personnel through their farmers' cooperative (associations) to organize or attend training, workshops and field demonstrations on management practices that could enhance optimizing application of inputs. Also, farmers should be encouraged to strengthen their cooperative associations to enjoy opportunity of economic of scale of bulk input purchase and various agricultural interventions from government and non-governmental organisations.

The coefficient of non-farm income was negative and statistically significant. This implied that youth male cassava farmers who engaged in activities that earned them non-farm income had opportunity to increase allocative efficiency. The results are comparable to findings of Elisha *et al.* (2020), on gender differential in accessibility to productive resources among strawberry farmers in Plateau state, Nigeria.

The distribution of allocative efficiency of cassava farmers based on gender revealed that all the categories of cassava based farmers could not reach frontier of 1.0 and the variation in efficiency of AM, YM and YF cassava farmers were skewed towards efficiency levels of 0.80 and above compared to AF cassava farmers that were skewed towards efficiency level of 0.41 and above. The study further revealed ample opportunity that exists for improving the level of allocative efficiency of cassava production in the study area in line with study of Kamau (2019), on allocative efficiency among maize and rice farmers under different land-use systems in east African wetlands.

The return to scale (RTS) analysis, which serves as a measure of total resource productivity in indicated that the elasticity of the mean value of cassava based on gender allocating of resources were all positive for all category of farmers. The positive coefficients for the price of these inputs showed that an increase in any or in all of these variables would increase the total cost of production, while the negative coefficient exhibited only in variable herbicide of AF farmers showed a decrease in the total cost level of production output. This indicated that, cassava production were in stage II of the production stage. This is also called the rational stage of production where resources and production could be efficient at this stage. Adjustments in the use of inputs can be made at this stage so that cassava farmers could produce at the point of economic optimum which enhances better resources allocation and guarantees profit maximization.

The constraints facing the cassava farmers based on gender in the area indicate that almost all the constraints cut across cassava farmers. However, inadequate credit or near absence of formal credit, lack of planting materials, high cost of inputs including labour were the most critical constraints indicated by all the categories of farmers. The constraints facing the cassava farmers based on gender in the area could also impede efficient allocation of resources among cassava based farmers.

CONCLUSION

Based on the findings of this study, it could be concluded that all the categories of cassava farmers based on gender were not able to achieve allocative efficiency frontier of one. Some production inputs were statistically significant at different level of probability, with variable labour significant in all the categories of gender based farmers. Farmers should collaborate with relevant agricultural institutions through their cooperative to organize training on management practices that could enhance optimizing application of inputs.

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