NJRS VOL. 12, NO 2, DECEMBER, 2011
ISSN 0189 - 7543

GENDER ROLES AND TECHNICAL EFFICIENCY OF FARMERS FOR SUSTAINABLE CASSAVA PRODUCTION IN ABIA STATE, NIGERIA

Ironkwe, A.G., Mbanaso, E.O. & Ezebuiro, N.C.
National Root Crops Research Institute, Umudike
P.M.B. 7006, Umuahia, Abia State, Nigeria
E-mail: adanmaglory @ yahoo.co.uk; 08038449503

Abstract

This study was conducted to determine the gender roles and technical efficiency of cassava farmers in Abia State. Multi-stage sampling technique was employed in selecting 180 cassava farmers. Data were collected with the aid of interview schedule. Analysis was carried out using frequencies, percentages and Cobb-Douglas functional forms of the Stochastic Frontier Production Function. Results revealed that more of younger females than the males were in cassava production. Greater number of the males than females cultivated more farmland, belonged to cooperative societies, had more years of farming experience and education. However, more of the females than the males participated in almost all the production activities. The results further revealed that farm size, labour, planting materials and capital input positively affected the cassava output of the male farmers while fertilizer, capital input, farm land and labour affected that of the females. Meanwhile, access to credit, farm size, house-hold size farming experience and extension contact had positive effect on the technical efficiency of the male farmers. On the other hand, farm size, education, household size, farming experience, access to credit and membership of cooperative society had positive effect on the technical efficiency of the female farmers. However, the male farmers were found to be more technically efficient than their female counterparts even though both farmer genders were not fully technically efficient in their use of resources in cassava production. Hence it was recommended that efforts to improve production of cassava and the technical efficiency of the farmer gender should consider those variables that had positive effects on technical efficiency of both farmer genders. This would enhance production, ensure sustainability, alleviate poverty among the farmers and make room for sustainable rural development in the state.

Key words: Gender, cassava production, technical efficiency, farmers

Introduction

Gender refers to many social or cultural constructed characteristics, qualities, behaviour and roles which different societies ascribe to males and females (Okeke, 2000; and Obasi, 2004). It denotes a refusal to focus on men or women alone, but on the social relationship between the two and how those relationships are negotiated even in production processes (Sigot, 1995). It is the society that stipulates the gender expectations, roles and characteristics of its members as made evident in the approved process of socialization. (Obasi, 2006). The gender roles vary widely depending on culture, society, class and age. Such gender roles are eminent in agricultural production in our rural setting even in cassava production.

In fact, gender is the most important determinant of the distribution of rights, resources and responsibilities among individual families and communities (Ironkwe *et al*., 2009).

It determines the access and ownership of production resources, even the extent these resources are used efficiently to increase and sustain production (Ironkwe, 2011). With the rapidly growing population, more pressure is being exerted on the increasing demand for food. According to Tanko (2003), the yields of the agricultural crops are low as a result of inefficient production techniques manifested in technical and allocative inefficiencies, over reliance on household resources, labour intensive agricultural technology and rapidly declining soil productivity. To increase production under such prevailing condition requires improving the efficiency of farmers in food production as to increase output to meet the increasing demand for food that has become imperative. In line with this issue, Aye *et al*., (2006) posited that one of the probable ways of increasing food availability in the country is by increasing the yield per unit of production resource (land, capital and labour). This according to them has to do with efficiency of resources used. In the same vein, Tanko and Opara (2010) affirmed that productivity can be enhanced by adopting improved technology and improved efficiency in resources used by smallholder farmers who produce 70% of the food consumed in the country.

Determining the technical efficiency of the farmer gender becomes imperative in the production process to increase and sustain production even now that the production resources are scarce and expensive. Technical efficiency in production is defined as the ability of the farmer to produce at the maximum output (frontier production), given quantities of inputs and production technology (Onyenweaku and Nwaru 2005). According to Tanko and Opara (2010), technical efficiency in production context, relates to the degree to which a farmer produces the maximum feasible output from a given bundle of inputs. Efficiency of resource use is defined as the ability to derive maximum output per unit of resources. This is important for sustainable cassava production in our country.

Cassava is an important root crop widely grown by both male and female farmers in Nigeria. It has a high yield potential, performs better than other crops under sub-optimal condition and can be cultivated all year round (Alabi and Oviasogie,2005). The crop, according to Aye *et al*., (2006), has a great potential and can play a crucial role in contributing to food and nutritional security, income generation, poverty alleviation and socio-economic growth of Nigeria. At present, Nigeria is the world's largest producer of cassava (Philips *et al*., 2004) and produces approximately 45.75 million metric tonnes of the crop annually (FAO, 2007). Because of the significant contribution of cassava to food security and economic development of the country, the Federal Government embarked upon a number of programmes to boost its production in the country. Considering the importance of cassava as a traditional staple food in Nigeria, its productivity can be increased and sustained through adoption of relevant technologies and efficient utilization of existing resources. However, it has been observed that smallholder farmers generally operate optimally along their production function but find it difficult to move from a lower to higher production function given their poor reliance on household resources (Tanko and Opara, 2010). This problem may vary depending on the gender of the farmer. For instance, Ironkwe *et al.,* (2009) and Okoye *et al*, (2009) reported inefficient allocation of resources along gender lines and to the detriment of the female farmers. On the other hand Nwaru (2007) indicated that the mean technical efficiency for the female farmers was significantly higher than that of the male farmers in arable crop production in Abia State Nigeria. Hence, the challenge facing farmer gender is how to improve upon their various allocation and technical efficiencies in production to increase profit through increased output. However, improving the resource use efficiency of cassava farmers for increased and sustainable

cassava production will require the knowledge of their current efficiency level as well as identification of its determinants. This study was therefore designed to determine the technical efficiency and its determinants in cassava production among farmer gender, and their implications for sustainable cassava production in Abia State of Nigeria.

Methodology

Study area

The study was carried out in Abia State in South-east agro-ecological zone of Nigeria. The state lies between latitudes 6^0 17" and 4^0 45" North and longitudes 7^0 00" and $8^0$10" East. (Nwaru, 2007). It is bounded in the North by Ebonyi State, North-east by Cross River State, North-west by Anambra State, South by Rivers State, South-east by Akwa-Ibom State and South-west by Imo State. The State is one of the major food crops producing area in South-eastern Nigeria and where gender roles in food production have been conspicuous.

Sampling and Data Collection

Multi-stage sampling technique was used in selecting the communities and the respondents. The target population was the cassava farmers in the state. The three agricultural zones (Aba, Umuahia and Ohafia) were covered during the study. In each of the agricultural zones, two blocks were randomly selected. From each of the selected blocks, one circle was randomly selected. Finally, from the selected circle, 30 farmers were randomly selected from a sample frame collected from the zonal ADP offices in each agricultural zone. A total of 180 cassava farmers were selected and interviewed with the aid of interview schedule. Major variables on which data were collected include farm size, labour, planting materials, fertilizer, capital input and output. Others were farmer's age, educational level, household size, farming experience as well as access to credit, membership of cooperative/association and extension contact.

Analytics Procedure

The data collected were analyzed using descriptive and inferential statistics. The Cobb-Douglas functional forms of the Stochastic Frontier Production Function was used to determine the factors influencing their output and efficiency in cassava production. The production function was specified as follows:

$$\text{Ln } Y = X_0 + X_1 \text{In } A_1 + X_2 \text{ In } A_2 + X_5 \text{ In } A_5 \ldots\ldots V_i U_i) \ldots \ldots\ldots\ldots (1)$$

Where: Ln = Logarithm to base

Y_1 = output from cassava in kg

A_1 A_5 = the production variables

X_0 X_5 = regression parameters to be estimated by the maximum likelihood estimation (MLE)

V_i = a symmetric error term which accounts for random variations in output due to factors beyond the control of the farmer e.g weather, disease outbreak government policies e.g.

Ui = random error under the control of the farmers (non-negative random variables representing inefficiency in production relative to the stochastic frontier)

A_1 = Farm size (ha), A_2 = labour (Mandays)

A_3 = Cassava (kg), A_4 = fertilizer (kg)

A_5 = Capital input

Determinants of Technical Efficiency

In order to determine the factors contributing to the observed technical efficiency in cassava production, the following model was estimated jointly with the stochastic frontier model in single stage maximum likelihood estimation procedure using the computer software frontier version 4.1 (Coeli, 1996).

$$TEi = a_0 + a_1 + Z_{1+} a_2 Z_2 + a_3 Z_3 + a_4 Z_4 + a_5 Z_5 + a_6 Z_6 + a_7 Z_7 + a_8 Z_8 \ldots\ldots\ldots (2)$$

where TEi is the technical efficiency of the i-th farmers, Z_1 is farmer's age in years, Z_2 is farm size in hectares, Z_3 is farmer's level of education in years, Z_4 is household size, Z_5 is farming experience in years, Z_6 is credit access, a dummy variable which takes the value of unity if the farmer has access to credit and zero otherwise, Z_7 is membership of

cooperative association (member = 1, otherwise = 0), Z_8 is extension contact (contact = 1, otherwise = 01). The coefficient of age is expected to be negative and those for other variables positive.

Results and Discussion

Table 1 reveals that more of the younger female farmers than the males were involved in cassava production in the state. Majority of the respondents had one level of education or the other. More than half of the male and female farmers had between 5 to 10 persons in their families. Most of the respondents had between 10 to 30 years of farming experience. However, majority of the male farmers devoted between 2 to 6 hectares of land for cassava cultivation while majority of the women folks used between less than 0.5 to 2 hectares of land for same. Greater proportion of the males than the females indicated membership of cooperatives. Meanwhile, majority of both males and females were in regular contact with extension agents.

Table 1: Distribution according to the personal characteristics of the respondents on gender basis

	Males		Females	
	Frequency	Percentage	Frequency	Percentage
Age in years				
< 40	4	4.4	12	13.3
40-50	28	31.1	33	36.7
51-60	20	22.2	32	35.6
>60	38	42.2	13	14.4
Educational Status				
No formal education	1	1.1	14	15.6
Primary education	38	42.2	33	36.7
Secondary education	35	38.9	24	26 7
Tertiary education	16	17.8	19	21.1
Household Size				
<5	12	13.3	10	11.1
5-10	63	70.0	70	77.8
11-15	12	13.3	8	8.9
>15	3	3.3	1	1.1
Farming experience in years				
< 10	26	28.9	14	15.6
10-20	33	36.7	44	48.8
21-30	13	14.4	9	10.0
31-40	14	15.6	12	12.2
>40	4	4.4	11	12.2
Farm size (ha)				
< 0.5	3	3.3	29	32.2
0.5 – 2	52	57.8	55	61.1
2.01– 6	20	22.2	4	4.4
> 6	15	16.7	2	2.2
Membership of cooperative society				
Yes	52	57.8	41	45.6
No	38	42.2	49	54.4
Contact with extension				
Yes	75	83.3	65	72.2
No	15	16.7	25	27.8

Source: Field survey, 2009

Majority of the female farmers carried out almost all the production and activities more than their male folks as shown in Table 2, the male farmers functioned more than the females in land clearing and mounding activities.

Table 2: Distribution of respondents according to activities carried out in cassava production and processing

	Male		Female	
Activities	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Land clearing	85	94.4	40	44.4
Mounding	80	88.9	32	35.6
Cutting of planting materials	51	56.7	87	96.7
Planting	46	51.1	89	98.9
Weeding	25	27.8	83	92.2
Fertilizer application	65	72.2	78	86.7
Harvesting	30	33.3	85	94.4
Haulage / transportation	60	66.7	88	97.8

Source: Field Survey, 2009
Multiple response

The major constraints to cassava production as indicated by the farmer groups were presented in Table 3. The most serious among them were lack of fund/capital, scarcity/high cost of fertilizer, high cost of labour and unfavourable land tenure system.

Table 3: Distribution according to constraints faced by the respondents in cassava production and cassava processing

	Males		Females	
Constraints	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Lack of fund/capital	64	71.1	62	68.9
Scarcity/high cost of fertilizer	60	66.7	65	72.2
High cost of labour	58	64.4	59	65.6
Land tenure system	20	22.2	28	31.1
Rodent/disease attack	13	14.4	25	27.8
Lack of improved varieties	16	17.8	16	17.8
Transportation problems	21	23.3	15	16.7
Low prices	3	3.3	6	6.7
Weed problems	3	3.3	5	5.6

Source: Field Survey, 2009
Multiple response

Estimated Production Function: The results of fitting numerical data disaggregated on gender basis equation (2) were summarized and presented in Table 4. The estimated variance was significant at 1% for farmer groups, indicating goodness of fit and the correctness of the specified distribution assumptions of the composite error terms. The estimated values of gamma were also highly

significant, at 1% in both groups. The coefficients for variance were 0.9009 and 0.8723 for both male and female farmers respectively, implying that 90.10% and 87.23% of the total variation in cassava output for the male and female farmers, respectively, was due to technical inefficiency. Land, labour and entrepreneurship are the most important resources in traditional agriculture as practised in Nigeria because in them resides the decision-making power in the production process (Nwaru, 2007). For the male farmers, the coefficients of farm size (P = 0.1), labour input (P = 0.1), Cassava stem/planting material (P = 0.1) and capital inputs (P = 0.5) were significant and positive according to *a priori* expectations while fertilizer was not significant but positive. For the female farmers, farm size (P = 0.1), labour input (P = 0.5), fertilizer (P = 0.10) and capital inputs (P = 0.1) were significant and positive while cassava stem even though positive was not significant.

In Nigeria, arable land has posed the greatest constraint in arable crop production and farm operations have remained labour intensive (Nwaru, 2004). Therefore, the significant and positive coefficients for labour and land for both the male and female farmers are expected and agreed with Nwaru (2007). The use of more land is expected to lead to greater output of cassava production, *ceteris paribus*. However, it has been observed by some researchers that given the severe scarcity, unsustainability and insecurity of land and its fast deterioration (Nwaru and Nnadozie, 2002), increase in cassava output should be expected more from the application of relevant technologies rather than from land area expansion.

Sources of Technical Efficiency: Results also revealed that age had a negative and significant effect on technical efficiency of both male and female farmers at 5% and 1% levels respectively according to *a priori* expectations. This implies that increasing age would lead to decrease in technical efficiency. Ageing farmers would be less energetic to work, leading to low productivity as well as low technical efficiency (Ajibefun and Aderinola, 2003). This result was consistent with Onu *et al*., (2000) for cotton farmers in Nigeria and Onyenweaku and Nwaru (2005) for food crop farmers in Imo State of Nigeria. Farming experience was positive and significant at 5% level for both farmer groups in agreement with *a priori* expectation. This is expected because more experienced farmers are expected to have higher levels of technical efficiency following the findings of Okoye *et al.,* (2008) in Cocoyam in Anambra State. Experience enables the farmer to set realistic targets. This implies that farmers with more years of farming experience are more technically efficient in use of resources in cassava production in the study area (Nwaru, 2005). The number of years a farmer has been in the farming business may give an indication of the practical knowledge he or she has acquired on how to cope with the inherent farm production activities. The knowledge, if properly channeled, maylead to higher level of efficiency (Nwaru, 2005).

Membership of cooperatives was positive and significant at 5% level for the female farmers. This is in agreement with *a priori* expectations, because farmer associations have more access to agricultural information, credit and other inputs. As expected, the access to credit was positive and significant at 5% level for the female farmers. This implies that the female farmers who have access to credit tend to be more efficient in cassava production. This result is consistent with those of Okike (2000) and Onyenweaku and Nwaru (2005). Household size was positive and highly significant for the male farmers. This result agrees with *a prior* expectation that large household size eases labour constraints thereby leading to increases in productivity. This implies that the male farmers have easy access to cheap family labour which is an advantage to increased production. The study also found out that the male farmers were more technically efficient (52%) than their female (42%) counterparts in cassava production in the State. The mean technical efficiency of both male and female

farmers are 0.523 and 0.421 respectively implying that on the average, the respondents are able to obtain a little over 52.2% and 42.1% of potential output from a given mix of production inputs.This suggests a wider scope for the farmer gender to increase their levels of technical efficiency by allocating the existing resources more optimally.

Table 4: Estimated Cobb-Douglas Stochastic Frontier Production Function for Male and Female Cassava Farmers

Variable	Estimates	t-ratio	Estimates	t-ratio
	Males		Females	
Constant term	7.7099	14.7588***	- 0.1266	-0.2264
Farm size	0.0977	2.7400***	0.2470	4.7766***
Labour input	0.1949	5.9381***	0.6925	3.6496**
Cassava stems	0.5643	5.0861***	0.2826	1.0597
Fertilizer	0.0475	1.6022	0.1387	1.9538*
Capital inputs	0.0545	2.2601**	1.04536	4.7493***
Efficiency factors				
Constant term	-2.6843	-1.3649	-0.7676	-0.7993
Age	-0.1062	-2.2896**	- 0.0340	-3.3828***
Farm size	0.1344	1.0268	0.0296	0.4239
Education	-0.1918	-0.8127	0.0379	0.2741
Household size	0.2999	4.5476***	0.0295	0.6805
Farming experience	3.0876	2.5486**	0.6244	2.5858**
Credit Access	-1.1874	-1.0178	0.6535	2.7903**
Cooperative	-2.1140	-0.2049	1.5399	2.1390**
Extension contact	-0.3022	1.1653	0.0402	-0.2308
Log likelihood function	-66.3370		-64.6367	
Sigma squared	6.6169	4.0304***	1.9032	7.9434***
Gamma	0.9009	18.2826***	0.8723	147.2339***
Mean efficiency	0.52			0.42

Source:Field survey data analysis,2009

***, **, and * imply statistically significant at 1, 5, and 10% respectively.

Conclusion and Recommendation

The study revealed that more of the younger female than the male farmers were involved in cassava production. The female farmers were more involved in almost all the production activities than their male counterparts. Both male and female farmers encounter similar problems in cassava production and the same production factors affected their cassava output. The male were more technically efficient than the female in the use of production resources. However, both male and female farmers were not fully technically efficient in their use of resources, suggesting that there are substantial opportunities to increase productivity and income from cassava in the study area through more efficient utilization of productive resources.The need to increase the present level of technical efficiency in cassava production is imminent if production is to be increased and sustained. Policies should be designed to encourage the youths who are agile and stronger to go into cassava production as well as encourage the experienced farmers to remain in farming. Training programmes on farm management should also be organized for the farmers. Government and National Root Crops Research Institute (NRCRI), Umudike should embark upon provision of improved cassava varieties, fertilizers and agro-chemicals to the farmer groups at subsidized rates. Provision

of credit facilities to women farmers is also necessary, who in turn should belong to organized farmers' groups or cooperatives. All these would help to enhance the efficiency of the farmer groups for increased cassava production in a sustainable manner in the study area.

References

Alabi, R.A. and D.I. Oviasogie (2005). Cassava Production and processing in Nigeria: opportunities and challenges. Agricultural Rebirth for Improved Production in Nigeria. Proceedings of the 39th Annual Conference of the Agricultural Society of Nigeria held at the University of Benin, Benin City, Nigeria. Oct. 9th -13th pp 22-25.

Ajibefun, I. A. and Aderinola, E. A. (2003). Determinants of technical efficiency and policy implication in traditional agricultural production: Empirical study of Nigerian Food Crop Farmers' Work in Progress. Report presented at the Bi-Annual Research Workshop of AERC, Nairobi, Kenya. May 24th – 29th, 37p.

Aye, G.C., V.U. Oboh and C.K.Biam (2006). Resource use efficiency in cassava production among women farmers in Markurdi Local Government Area of Benue State. Proceedings of the 40th Annual Conference of the Agricultural Society of Nigeria (ASN) held at NRCRI, Umudike, Abia State, Nigeria October 16th –2006. pp 137 – 140.

Coelli T.J. (1996). A guide to frontier version 4.1: A Computer Programme for Stochastic Frontier production and Cost Function Estimation. working papers. Department of Economics.University of New England, Armidale, Australia.

FAO (2007). Food and Agricultural Organization Statistics Division, htp.//faostat.org.

Ironkwe, A.G., (2011). Gender Involvement in yam minisett technology development, transfer and utilization in Southeast Agro-ecological zone of Nigeria. An unpublished Ph.D Dissertation in the Department of Rural Sociology and Extension, Michael Okpara University of Agriculture, Umudike.

Ironkwe, A.G., Ekwe, K. C., Okoye, B. C. and Chukwu, L. I. (2009). Socio-economic determinants of cassava production among women farmers in Ebonyi State, Nigeria. *Nigerian Journal of Rural Sociology 9(1);63 - 68.*

Nwaru, J.C., (2005). Determinants of farm and off farm incomes and savings of food crop farmers in Imo State, Nigeria. Implications for poverty alleviation. *The Nigeria Agricultural Journal*. Vol. 36: 26 – 42.

Nwaru, J.C. (2007). Gender and Relative Technical Efficiency in small holder Arable Crop production in Abia State of Nigeria. *International Journal of Agriculture and Rural Development* (IJARD), 10 (2): 25 – 34.

Nwaru, J.C. and Nnadozie, B. C. (2002). Appropriate policies and institutions for sustainable environment in Nigeria. *Nigerian Journal of Rural Sociology 4(1): 211– 220.*

Obasi V.A. (2006). Gender: Education, Inequality and Women Empowerment. *Journal of Women Academics* (NAWACS). I (1): 11– 23.

Obasi, V.A. (2004). Curriculum for Gender Neutral Education. WOREC. *Journal of Gender Studies*, 1 (2): 65 – 73.

Okeke, E.A.C. (2000). Gender Equity/ Equality in Education. A lead paper presented at the 3rd Annual Conference of the World Council for Curriculum and Instruction (WCCI).

Okike, I. (2000). Crop – Livestock Interactions and Economic Efficiency of farmers in the Savannah Zones of Nigeria. Ph.D. Dissertation. Department of Agricultural Economics, University of Ibadan, Ibadan, Nigeria 155pp.

Okoye, B. C., Okoye, A. C., Dimehu, M. U., Asumugha, G. N., Agwu, A. E. and Agbaeze, C. C. (2009) Determinants of Gender Productivity among small holder cocoyam farmers in Nsukka Agricultural Zone of Enugu State, Nigeria. *Nigerian Journal of Rural Sociology, 9(1): 101 - 106.*

Okoye, B. C., Onyenweaku, C. E., and Asumugha, G. N. (2007). Allocative efficiency of small-holder cocoyam farmers in Anambra State, Nigeria. *The Nigerian Agricultural Journal, 38:70 – 81.*

Onu, J.K., Amaza, P.S. and Okunmadewa, F.Y. (2000). Determinants of cotton production and economic efficiency. *African Journal of Business and Economic Research 1 (1): 234 – 240.*

Onyenweaku, C.E and J.C. Nwaru (2005). Application of a Stochastic Frontier Production Function to the measurement of Technical Efficiency in Food Crop Production in Imo State of Nigeria. *The Nigerian Agricultural Journal 36: 1– 12.*

Philips, T.P., D.S. Taylor, L. Sanni and M.O. Akoroda (2004). A Cassava Industrial Revolution in Nigeria.The potential for a New Industrial Crop.http:\\ www.fao.org/docrep 1007 Y55 48E/4554807.htmc.

Sigot, A.J. (1995). Discourse on Gender and Natural Resource Management. In: Sigot, A.J., Thrupp, L.A. and Green, E (eds): *Towards Common Ground*: *Gender and Natural Mananagement in Africa.* African Centre for Technology Studies, Nairobi, Kenya. Pp 1– 4.

Tanko, L. (2003). Optimum combination of farm enterprise in Kebbi State, Nigeria. A linear programming approach. An unpublished Ph.D Dissertation presented to the Dept. of Agricultural Economics, MOUA, Umudike , Pp. 1– 5.

Tanko, L. and C. Opara (2010). Measurement of the Technical Efficiency in Maize Production in Bosso Local Government Area, Niger State, Nigeria: Restrategizing Nigerian Agriculture in Rapidly Changing Climatic Condition for Sustainable Food Security. Proceedings of 44th Annual Conference of ASN held at Ladoke Akintola University of Technology, Ogbomoso, Oyo State, Nigeria. 18th – 22nd October, 2010, Pp 25 – 28.