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GENDER FACTORS INFLUENCING TECHNICAL EFFICIENCY OF CASSAVA FARMERS IN AKWA IBOM STATE, NIGERIA

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ABSTRACT

It is seldom recognized that men and women have different interests in production, access to and use of resources for agricultural production. The resources they use in their production processes are very vital, due to their limited supply and stiff competition for them by many other enterprises, and as such needed to be properly utilized to increase production in a sustainable manner. This work was therefore conducted in Akwa Ibom state to examine factors influencing the technical efficiency of farmer groups in cassava production. In carrying out the study, 120 respondents were randomly selected from two agricultural zones in the State and interviewed with interview schedule. Data were analyzed using descriptive and inferential statistics. The results showed that more of the female farmers than the male were in their active and productive ages, had more farming experience while the males were more educated. Labour, fertilizer and capital input had positive and significant effects on the output of the male farmers while farm size, cassava cutting, fertilizer, capital input and other input (such as herbicides, poultry manure, depreciated cost of fixed farming equipment such as hoe, knife etc.) had positive and significant effects on that of the females. Membership of cooperative, extension contact, age, and farm size significantly influenced the technical efficiency of the male farmers while land ownership, house hold size, education, farming experience and farm size had significant and positive influence on that of the females. The results further revealed that the farmer groups were not technically efficient in cassava production even though the males were found to be more technically efficient than their female counterparts.

Key words: gender, factors, technical efficiency, cassava farmers
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INTRODUCTION

Cassava is one of the most important root crops grown by both male and female farmers in Nigeria. It is the chief source of dietary food energy for majority of the people living in the lowland tropic (Rosegrant, 2002). The root can be processed for human food and livestock feed. The leaves are consumed as vegetable while some of its cultivars that have low

cyanogenic glucocides can be eaten as salad or snacks (Osundare and Igbalajobi, 2012). Recently, cassava has also been of more importance to the economy as a result of ethanol derived from it which is being used by some industries. Hence, in Nigeria cassava can now be transformed into a number of products for domestic and industrial uses. According Emokaro and Erhabor (2006), there is a high need for increasing the production of cassava as it is clearly a viable option as a mitigation measure against food crisis in Nigeria and as a poverty reduction strategy.

Presently in Nigeria, cassava production is in the hands of smallholder farmers (males and females) (Asumugha and Nwosu, 2006). These farmers carry out different but complementary roles in the production and processing of the crop. These roles could vary widely and are in many instances determined by culture and tradition (Munguti *et al.,* 2002). Male and female farmers could have unequal decision power, differences in efficiency in resource management (Nwaru, 2003) and crop varietals preferences can differ by gender (Doss and Morris, 2001). Because of these differences, men and women's views and needs or priorities to improve their situations differ strongly and could affect their productivity even in cassava production. This situation calls for gender disaggregated data which could help in understanding gender differences, contributions and problems of different gender groups in production processes (Iwunor, 1999).

At present, Nigeria produces about 49 million metric tones of cassava annually (FMA and WR, 2008). Irrespective of the current glut in the local market, the present level of cassava output may not sustain the economy for too long, based on emerging trends in the global market for commodity trade. Therefore there is need for constantly increasing the production of the crop to meet up the high demand for the crop. To increase cassava production of the farmers in the zone, the efficiency at which the various categories of farmers use their resources in agricultural production should be examined in order to create room for improvement so as to enhance production on sustainable manner.

Since productive efficiency means the attainment of a production goal without waste (Ajibefun and Daramola, 2003), efficiency is then an important factor of productivity, growth as well as stability of production especially in developing agricultural economies (Hazhrika and Subramanian, 1990). The need for resource use efficiency in cassava production becomes imperative because most farmers who constitute 75% of the population are faced with the problem of resource scarcity and non-effective utilization of the available ones (Adeniyi and Fobrunso, 1997). As a result of this, their productivity in terms of individual resources inputs or in terms of a combination of them is low. Productivity of farmers could be improved by increasing their technical and allocative efficiency in response to better information and education (Ironkwe *et al*., 2012).

It is when resources are allocated to their best uses and in the right proportion that productivity and output rise to their highest possible levels. (Njoku, 1995). According to Kebede (2001), efficiency in resource management is how effective a production unit or firm uses variable resources for the purpose of profit maximization given the best production technology available. Efficiency therefore becomes a very significant factor in increasing productivity through technology adoption in view of the difficulties encountered by farmers in adopting improved technologies due to shortage of farm resources. This study therefore was carried to determine the factors influencing technical efficiency of the farmers on gender basis.

The specific objectives of the study are to:

i. Examine the gender-based characteristics of the cassava farmers,

ii. Determine the factors affecting the technical efficiency of the cassava farmers in the study area.

METHODOLOGY

This work was done in Akwa Ibom in South east agro-ecological zone of Nigeria. The Agricultural Development Programme (ADP) blocking system was used in carrying out the study. Two agricultural zones out of the three zones in the state were randomly selected. Multi-stage random sampling procedure was used in getting to the respondents. A total of 120 respondents (60 male, 60 female) were interviewed. Interview schedule was used to elicit information from the respondents. The data collected were analyzed using descriptive and inferential statistics. The Cobb-Douglas production functional forms of the stochastic frontier production function was employed in determining factors influencing the technical efficiency of the farmer groups. The model is defined as follows:

$$InY_1 = b_o + b_1\, InX_1 + b_2\, InX_2 + b_3\, InX_3 + b_4\, InX_4 + b_5\, InX_5 + b_6\, InX_6 + Vi\ Ui \ldots (1)$$

Where: In = Logarithm to base e , Y_1 is the output of cassava in kg of the ith farmer , X_1 = Farm size in hectare, X_2 = Cassava stems in kg, X_3 = Labour in Mandays, X_4 = Fertilizer in kg, X_5 = Capital input in Naira, X_6 = other input in kg (such as herbicides, poultry manure, depreciated cost of fixed farming equipment such as hoe and knife), V_1 is a symmetric error, which accounts for random variations in output due to factors beyond the control of the farmer. U_I is a non negative random variable representing inefficiency in production relative to the stochastic frontier. b_0, b_1, b_2, b_3, b_4, b_5, and b_6 are parameters estimated. In order to determine the factors contributing to the observed technical efficiency, the following model

was formulated and estimated jointly with equation (1) in a single stage by the methods of maximum likelihood using the computer programme frontier 4.1 (Coelli, 1996).

$TE1 = 0_1 + {}_1Z_1 + {}_2Z_2 + {}_3Z_3 + {}_4Z_4 \ldots\ldots\ldots\ldots\ldots\ldots + {}_{10}Z_{10} \ldots\ldots\ldots\ldots\ldots\ldots(2)$

Where: TE_1 = the technical efficiency of the farmer, Z_1 = ownership of land (ha), Z_2 = household size (number), Z_3 = membership of cooperative/farmers association (member), Z_4 = contact with extension agent (member), Z_5 = age (years), Z_6 = marital status, Z_7 = educational status, Z_8 = access to credit, Z_9 = farming experience (years), Z_{10} = farm size (ha), 0 = the intercept, 1, 2, 3, 4, 5 … 10 are parameters estimated. All the variables are expected to be positive except age.

RESULTS AND DISCUSSION

Gender-based characteristics of the cassava farmers

Table 1 revealed that more of the younger female farmers than males were in cassava production in this state. This means that majority of the female farmers in the State were in their productive and economic ages. Since the farmer's age is an important factor in determining the productivity and adoption of an innovation (Kebede, 2001; and Nwaru, 2004), this result implies that there is great prospect for increased and sustainable cassava production among the female farmers and is in consistent with the findings of Ironkwe, *et al*., (2007) and Ironkwe *et al*., (2012). The result in the Table further showed that greater proportion of the farmer groups had one form of education or the other even though more than half of the males than the females had both secondary and tertiary education. Since education increases productivity, improves access to agricultural information and as well as enhances farmers' ability to understand and evaluate new production techniques (Onyenweaku and Nwaru, 2005), it implies that the female farmers were disadvantaged more than their male counterparts in the process of production. Majority of both the male and female farmers had the same household size (6 – 10). However, greater proportion of the male farmers had more years of farming experience than their female counterparts. This means that the males are more experienced than the females. The more experienced a farmer is, the more efficient his decision making processes are, and the more he will be willing to take risks associated with the adoption of innovation (Okoye *et al*., 2009). In addition, greater percentage of the male than the female farmers had contact with extension.

Factors Affecting the Technical Efficiency of the Cassava Farmers in the Study Area

The Cobb-Douglas stochastic frontier production function for the male and female cassava farmers were estimated as presented in Table 2. The estimated variance (θ^2) was statistically

significant out 1% level of probability indicating a good fit and the correctness of the specified distribution assumptions of the composite error term.

(1) The result indicates that the male farmers were 77% (or .77) efficient implying that they require 23% (or .23) increase in efficiency to operate at the frontier level which is the optimum. In other words, the inability of the male farmers to operate at the frontier level is as a result of their inefficiency which is gratified to be 23%. Also, the female farmers were 74% efficient, meaning that they were 26% inefficient in their resource use, explaining why they could not operate at the frontier level.

(2) The mean technical efficiency was 0.77 for males and 0.74 for females. Thus implies that about 23% and 26% increase in cassava output could be achieved in the short-run without additional resources using the available technology for male and female farmers respectively. However, the technical efficiency of each farmer group was less than unity but greater than zero in conformity with theory. This indicates that the farmers in each group were producing below the frontier level although the male farmers achieved a higher mean farm level technical efficiency than their female counterparts in cassava production in the state. This shows that there are opportunities for increasing productivity and income of both male and female cassava farmers through increased technical efficiency given the existing technology.

The six production variables for the male farmers have direct relationship with their outputs which agree with *a prior* expectation. Labour inputs, fertilizer and capital inputs were significant at 10%, 5% and 1% levels respectively. Thus indicates that an increase in these variables would lead to increased cassava output of the male farmers in the State. Cassava stems and other inputs though positive, were not significant.

The coefficients of the six production factors for females were all positive, thus have direct relationship with cassava output and agree with *a prior* expectation. The coefficients for farm size and fertilizer were both significant at 10% level. Cassava stems and other inputs were significant at 5% level while capital inputs were highly significant at 1%. The coefficient for labour though positive, was not significant.

Sources of Technical Efficiency

The Table also shows the results of the factors influencing technical efficiency of male and female farmers in cassava production in Ebonyi State. All the coefficients for the male farmers had a direct relationship with technical efficiency. The coefficients for household size, membership of cooperatives societies, number of extension contacts, age, farming experience and farm size were all significant at 5% level. This result is in consonance with *a*

priori expectation and agrees with the report of Ironkwe *et al.,* 2012; Ironkwe *et al.,* 2009. This implies that ~~any~~ an increase in any of these variables would increase technical efficiency of the male farmers in cassava production in the state. Land ownership was also significant at 10% level. The coefficients for marital status, educational status and credit access were not significant.

The coefficients for the female farmers were all positive. Household sizes, age, farming experience and farm size were significant at 1% level which agrees with *a priori* expectation. The result is consistent with that of Onyenweaku and Nwaru (2005) and Nwaru (2009). Membership of cooperative societies and educational status were significant at 5% level while land ownership was significant at 10% level. This also implies that an increase in any of these variables would increase technical efficiency of women farmers in the State.

CONCLUSION AND RECOMMENDATIONS

The study revealed that more of the female farmers than the males were in their productive and active ages, had more farming experience, lesser household size and lesser numbers of extension contacts. However, the male farmers were more educated than the female ones. The factors that affected the outputs and technical efficiency of both farmer groups in cassava production were similar, but varied in their degree of influence in both cases. Even though the farmer groups were not technically efficient enough in cassava production in the State, the male farmers were more technical efficient than their female counterparts. This result suggests that there are substantial opportunities to increase cassava production in the study area through more efficient utilization of productive resources. Therefore, policies geared towards improvement of the farmers' access to those variables that positively affected their technical efficiency will be useful in enhancing technical efficiency for increased cassava production in the State.

REFERENCES

Ajibefun, I.A. and A.G. Daramola (2003). Efficiency of Micro-enterprises in Nigeria Economy, African Economic Research Consortium (AERC) Nairobi, Kenya 3-32.

Asumugha, G.N. and K.I. Nwosu (2006). The Cassava Sector and Backward Integration in Sustaining the Raw Material Requirement of Existing and Emerging Agro allied enterprises in Nigeria. Proceedings of the 40th Annual Conference of the Agricultural Society of Nigeria (ASN) held at NRCRI, Umudike, Abia State Nigeria. Pp 116 – 119.

Coelli, T.J. (1996). A guide to frontier 4.1: a computer programme for stochastic frontier production and cost function estimation. Working paper, Department of Econometrics, University of New England, Armidale, Australia.

Doss, C.R. and M.L. Morris (2001). How does gender affect the adoption of agricultural innovation. The case of improve maize technology in Ghana. *Journal of International Association of Agricultural Economics Vol. 1, No. 1. pp 27 -39.*

Emakoro, C.O. and Erhabor (2006). Efficiency of Resource use in cassava production in Edo State, Nigeria. *Journal of Agricultural Forestry and the Social Sciences. Vol.4 (1). Pp 22 – 29*.

Federal Ministry of Agriculture & Water Resources (2008). *The tropical Agriculture* MacmillanPublish Ltd. London

Ironkwe, A.G. (2005). Adoption of yam minisett technology by women farmers in Abia State, Nigeria. Unpublish MSc. Thesis in department of Rural Sociology and Extension, Michael Okpara University of Agriculture, Umudike, Umuahia, Abia State.

Ironkwe, A.G.; K.C. Ekwe, E.O. Mbanaso, G.N. Asumugha and B.C. Okoye (2007). Gender Role and Constraints in Cassava Production among women farmers in Ebonyi State, Nigeria. *Nigerian Journal of Rural Sociology Vol. 9(1): 63 – 68.*

Ironkwe, A.G.; Ewuziem, J.E. and Ezebuiro, N.C. (2012). Gender and resource use efficiency among small-holder cassava farmers in Ebonyi State, Nigeria. *Journal of Agricultural and Food Sciences Vol. 10(1): 56 – 68.*

Iwunor, C.O.C. (1999). Gender perspectives in the research process. In Nokoe, S. (ed). Biometry and quality of Life Proceeding of the 6th Scientific Workshop of the sub-Saharan Africa Network (SUSAN) of the International Biometrics Society (IBS),

Held at the International Institute of Tropical Agriculture (IITA), Ibadan, Nigeria.Pp 250 – 269.

Kebede, T.A. (2001). Farm household technical efficiency: A stochastic frontier analysis. A study of rice producers in Mardi – Watershed in the Western Development Region of Nepal. An Msc. Thesis in the Department of Economics and Social Sciences, Agricultural University of Norway. 56 pages.

Munguti, K.E.; Kabui. M. Isoilo and E. Kamaarus (2002). The Implication of Economic Reforms on Gender Relations. The case of poor households in Kisumsums. In: Diawarg, A. T. (ed). Gender Economic Integration Governance and Methods of Contraceptives. *A Journal of Association of Women for Research and Development (AAWARD) pp 13 – 43.*

Njoku, O.A. (1995). Gender planning and Development: A case study of Organizations in Swaziland, In: Nokoe, S. (ed). Biometry and Quality of life. Proceedings of the 6th Scientific Workshop of the Sub-Saharan African Network (SUSAN) of the International Biometric Society (IBS), held at the International Institute of Tropical Agriculture (IITA), Ibadan, Nigeria. 22nd – 27th August, Pp 247 – 256.

Nwaru, J.C. (2003). Gender and Relative production Efficiency in Crop farming in Abia State of Nigeria, *Nigeria Agricultural Journal vol. 34 pp 1 – 16.*

Nwaru, J.C. (2004). Rural credit markets and arable crop production in Imo State of Nigeria. Unpublished Ph.D. Dissertation, Department of Agricultural Economics, Michael Okpara University of Agriculture, Umudike, Umuahia, Abia State Nigeria. 123 pages

Nwaru, J.C. (2007). Gender and relative technical efficiency in smallholder arable crop production in Abia State of Nigeria. *International Journal of Agriculture and Rural Development (IJARD), 10 (2): 25 – 34.*

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

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, Nigeria. *The Nigerian Agricultural Journal* Vol. 36: 1 – 12.

Osundare, F.O. and Igbalajobi, O.A. (2012). Resource use efficiency in cassava production in Akure North Area of Ondo State – *Nigerian Journal of Farm Management formal FAMAN Journal Vol.* 13 (1): 107 – 112.

Rahman, S. A. (2005). Gender Based Analysis of Labour Productivity in Crop Production in Nasarawa State of Nigeria. Proceedings of the 39th Annual Conference of Agricultural Society of Nigeria, held at the University of Benin, Benin City, Nigeria, October 9 – 13 pp 388 – 390.

Rosegrant, M. (2002). Alternate Futures for food security. In: Sustainable food security fall all by 2000. International Food Policy Research Institute, Washington DC USA, Pp 44.

Journal of Agriculture and Food Sciences **A.G Ironkwe, J.E. Ewuziem, And K.C.Ekwe**
Volume 11 Number 2, October 2013 p. 26-36 .

APPENDIX

Table 1: Distribution according to the social- economic characteristics of the respondents (n =120)

Age range (yrs)	Male	Female
21 – 30	2 (3.33)	2 (3.33)
31 – 40	8 (13.33)	31 (51.67)
41 – 50	13 (21.67)	20 (33.33)
> 50	37 (61.67)	7 (11.67)
Total	**60(100.00)**	**60(100.00)**
Education Status		
No formal education	4 (6.67)	10 (16.67)
Primary education	15 (65.00)	24 (40.00)
Secondary education	30 (50.00)	20 (33.33)
Tertiary	11 (18.33)	6 (10.00)
Total	**60(100.00)**	**60 (100.00)**
Household Size		
1 – 5 members	15 (25.00)	20 (33.33)
6 – 10 members	35 (58.33)	36 (60.00)
11 – 15 members	5 (8.33)	4 (6.67)
> 15	5 (8.33)	0 (0.0)
Total	**60 (100.00)**	**60(100.00)**
Farming experience		
<10	6 (10.00)	9 (15.00)
10 – 20	25 (41.67)	18 (30.00)
21 – 30	21 (35.00)	25 (41.67)
> 30	8 (13.33)	8 (13.33)
Total	**60(100.00)**	**60 (100.00)**
Contact with extension		
Yes	53 (88.33)	41 (68.33)
No	7 (11.67)	19 (31.67)
Total	**60(100.00)**	**60 (100.00)**

Figures in parentheses are in percentages.

Source: Field Survey data, 2012.

Journal of Agriculture and Food Sciences **A.G Ironkwe, J.E. Ewuziem, And K.C.Ekwe**
Volume 11 Number 2, October 2013 p. 26-36 .

Table 2: Estimated Cobb-Douglas frontier Production Function for Male and Female Cassava Farmers in Akwa-Ibom State

Production Variables	Parameters	Estimates	T-ratios	Estimates	T-ratios
		Males		Females	
Constant term	B_0	3.4186	2.40738*	5.2596	2.3310**
Farm size (In X_1)	B_1	0.3326	2.0613	0.5289	1.7032*
Cassava stems (In X_2)	B_2	0.0242	0.2461	0.2484	2.2134**
Labour Input (In X_3)	B_3	0.3593	1.9430*	0.1050	0.8917
Fertilizer (In X_4)	B_4	0.2346	2.1194**	0.2743	1.9823*
Capital Input (In X_5)	B_5	0.6485	6.4172***	0.5585	11.2745***
Other Inputs (In X_6)	B_6	0.01232	0.1007	0.1778	2.5321**
Efficiency Variables					
Constant term	Z_0	3.700	2.2772**	1.8480	1.3149
Land Ownership	Z_1	0.0542	1.6797*	0.0413	1.9503*
Household Size	Z_2	0.1622	2.2374**	0.3056	2.9593***
Membership of Crop	Z_3	0.8480	2.4778**	0.2817	2.0259**
Extension Contacts	Z_4	0.0190	2.0825**	0.0710	0.9144
Age	Z_5	2.3606	2.0671**	0.9111	5.8198***
Marital Status	Z_6	0.0089	0.2724	0.0049	0.2289
Educational Status	Z_7	0.2153	0.4777	0.3183	2.4311**
Credit Access	Z_8	0.5681	0.6122	0.1190	0.2345
Farmer Experience	Z_9	2.2543	2.2324**	0.3334	3.0349***
Farm Size	Z_{10}	2.5140	2.0446**	0.3050	2.5203***
Log likelihood function	32.0945			14.90079	
Sigma Squared	O^2	0.6665	6.5929***	0.4472	2.5412***
Gamma	Y	0.9204	3.0861***	0.9613	27.1957***
Mean Efficiency		0.77		0.74	

Source: Field Survey data, 2012.