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Comparative Analysis of the Mean Output of Rice and Profit by Men and Women in Rice Production Systems in Abia State of Nigeria

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Abstract: This study was designed to analyze comparatively the mean output of rice and profit by men and women rice production systems in Abia State of Nigeria. Primary data collected from a random sample of 142 rice farmers from 2 Local Government Areas, purposively selected based on their performance in rice production were used for the study. This total sample was disaggregated on the basis of production systems to yield 46 inland valleys, 41 upland and 55 swamp rice farmers and on the basis of gender into 71 men and 71 women rice farmers. The cost route technique was adopted in data collection. Data analysis consisted of the use of such statistical tools as averages, Chi square test statistic and net profit analysis. Results of the data analysis show the mean output of the men rice farmers was significantly higher than that of their women counterpart and that the mean output from the inland valley was significantly higher than that from the two other production systems. It equally revealed that rice production is profitable for all the farmer groups. The net profit for men and women rice farmers were ₦ 77605.11 and ₦ 70126.14 ha^{-1} respectively and the inland valley, upland and swamp farms were ₦ 98811.86, ₦ 59016.32 and ₦73020.72 $^{-1}$, respectively.

Key words: Men, women, rice production systems, farmers, Nigeria

INTRODUCTION

FAO (2004) identified rice as a very important primary food source and that rice-based systems are essential for food security, poverty alleviation and improved livelihoods. It noted that rice is a staple food for over half of the world's population. In Asia alone for instance, more than 2 billion people obtain 60-70% of their energy intake from rice and its derivatives. It is the most rapidly growing food source in Africa and is of significant importance to food security in an increasing number of low-income food-deficit countries. Thus there has been an increased demand for rice.

High population growth rate, natural and human disasters such as drought, flood and land degradation as well as civil conflicts in some parts of Africa had contributed to this alarming increase in demand for agricultural products and the hunger situation. They account for high imports and dependence on food aid by most African countries thereby posing a huge problem of food insecurity. WARDA (2003) noted that Nigeria is the world's second largest importer of rice, spending over US $300 million annually on rice imports alone. It stated that the country imported 1.7 million tones of rice in 2001 and 1.5 million tones in 2002. Imports of these magnitudes represent a major brake/hindrance on broader development efforts because of their foreign exchange implications. Yet, Nigeria has the potential to greatly increase its own rice production. The Nigerian rice sector has a lot of potentials for increased rice productivity as the country is blessed with rich and abundant rice growing environment.

Once reserved for ceremonial occasions, rice has grown in importance as a component of Nigerian diets. The average Nigerian now consumes 21Kg of rice per year, representing 9% of total calorie intake and 23% of total cereal consumption (FAO, 2003). Since the mid 1980s, rice consumption has increased at an average annual rate of 11% of which only 3% can be explained by population growth; the remainder represents a shift in diet towards rice at the expense of the coarse grains (millet and sorghum) and wheat (WARDA, 2003). It noted that an estimated 2.1 million tones of rice are consumed annually. This has equally accounted for the increased demand for rice.

Erenstein and Lancon (2002) noted that the most important factor contributing to the shift being consumers' preferences away from the traditional staples towards rice is rapid urbanization and associated changes in family occupational structures. They noted that as

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women enter the work force, the opportunity cost of their time increases and convenience foods such as rice, which can be prepared quickly, rise in importance. Similarly, as men work at greater distances from their homes in the urban settlements, more meals are consumed from the market, where the ease of rice preparation has given a distinct advantage, the trend meaning that rice is no longer a luxury food but has become a major source of caloric intake for even the urban poor.

There has been gradual dismantling of the biased assumptions and underlying misconceptions in agrarian economics of developing world about gender and agriculture as a result of increasing gender sensitivity in research. World Bank/Widline (1992) and Nwaru (2003) noted that the African rural household is changing its orientation towards gender and agricultural production in response to liberalization policies and traditional gender patterns of farming are breaking down. Mamman (1994) therefore posited that effective and sustainable agriculture agricultural transformation in Nigeria would require the recognition and understanding of the intricate phenomenon of gender issues to determine and enhance the role, status and participation of women in this process. Women are increasingly growing cash crops, doing tasks traditionally performed by men and making decisions on management of farms and households. Akanji (1999) noted that many women like their men counterpart engage in both subsistence and cash crop farming.

It has however, been identified that the differences in gender performance and participation is derived more from differences in productivity. These observed differences in productivity are based on physical factor, distributional imbalance and skill and input imbalances (Goody and Buckley, 1973; Adeyeye, 1988; Akanji, 1991, 1997). Technological innovations for agricultural improvement has left women's farm roles at a disadvantage whereas it has been shown that women in farming households can be as productive as their male counterparts when given access to appropriate resources (Feldstein and Poats, 1990; World Bank, 1998; Quisumbing *et al*., 1988).

There is therefore, the need to access the performance of men and women in rice production systems in terms of their productivity and profit accruing from rice production in the study area, Abia state of Nigeria. This would lead to the formulation and implementation of policies that would eliminate their constraints and enable them to improve on their performance.

MATERIALS AND METHODS

Study area and sample selection: The study was carried out in Abia State of Nigeria. The State lies between latitude 5° 25/ North and Longitude 7°30/ East. Abia State is divided into three agricultural zones namely: Ohafia, Umuahia and Aba Agricultural Zones. Ohafia Agricultural Zone was purposively selected being the major area of rice production in the State. A multi-stage random sampling technique was used in choosing the sample.. Two Local Government Areas in the zone, based on performance in rice production, were purposively selected for the study. From each of the chosen LGA, 3 blocks were randomly selected from which 6 ADP cycles were chosen by simple random sampling. Five villages in each cycle were selected by simple random sampling. The lists of men and women rice farmers in each chosen village formed the sampling frames from which samples of rice farmers were selected using simple random sampling procedure. In all, 142 rice farmers were chosen. This total sample was disaggregated on the basis of production system to yield 46 inland valleys, 41 upland and 55 swamp rice farmers and on the basis of gender into 71 men and 71 women rice farmers.

Data collection and analysis: The cost route approach was used in data collection. Data collection was by the use of well structured questionnaire and interview schedules. Data collected were those on farm inputs like fertilizer, labour use; farm size, capital assets, paddy prices and farm output.

Data analysis was by the use of simple statistical tools like averages and derivation of net profit. The test of significance between the mean output of the men and women rice farmers and net profit from the production systems was realized by the chi-square test statistic employing the contingency table procedure. The production systems are inland valley, upland and swamp. The chi square test is given by:

$$\chi^2 = \Sigma[(O_i - E_i)^2 / \overset{n}{\underset{i=1}{E_i}}] \quad (1)$$

with (r-1)(c-1) degrees of freedom

Where χ^2 = Chi square, O_i = observed ith value, E_i=expected ith value, r = number of rows and c = number of columns.

In this case, we have a 2 by 3 contingency table, 2 rows and 3 columns and so the degree of freedom is 2. We reject the null hypothesis if the χ^2 computed is greater than the χ^2 table value ($\chi^2\alpha$ =0.05, 2df) and conclude that there is a significant difference between the mean output of the men and women rice farmers and in the production systems. The next step is to is to proceed to multiple comparism for the production systems by computing the Least Significant Difference (LSD) and comparing it with the pay-wise differences between the means.

$$LSD\alpha = \chi^2_{\alpha,2df}(SD) \quad (2)$$

Where LSDα is the least significant difference; SD is the standard error of the difference between the means, given by:

$$SD = (2S^2/r)\hat{}2 \quad (3)$$

S^2= variance of the samples pooled, r = number of production systems, $\chi^2_{\alpha,2df}$ = tabulated value of χ^2 statistic.

The decision rule is that if $(\bar{x}_i - \bar{x}_j) > LSD\alpha$, there is significant different between the two means being compared and if otherwise, the two means being compared are equal.

Estimation of the net profit involves the determination of the total revenue and total cost of production which is made up of total variable cost and total fixed cost. The net farm income was derived by evaluating the formula,

$$NFI = TR - TC = \sum_{i=1}^{n} PQ - \sum_{j=1}^{m} TFC + TVC \quad (4)$$

Where NFI is the Net Farm Income, TR is the Total Revenue; TC is the Total Cost; P is the unit price of output; Q is the quantity of output. TFC is the Total Fixed Cost and TVC is the Total Variable Cost.

RESULTS AND DISCUSSION

Output of rice: The mean output of the men and women rice farmers were derived and presented in Table 1. In all the production systems, men had higher kilogrammes of rice output. However, the test of hypothesis that the mean output of the men rice farmers is not significantly different from that of the women rice farmers would reveal the expected values.

Since the calculated value is greater than the table value, we reject the null hypothesis. Hence there is significant different in the mean output of the men and women rice farmers in the production systems. The mean output of the men is significantly higher than that of their women counterpart. This could be that they are more efficient in farm resource utilization, are more experienced and have higher entrepreneurial capabilities.

For the production systems, the pay-wise differences between the means were computed and presented in Table 3:

Therefore since $(\bar{x}_i - \bar{x}_j) > LSD\alpha$ in all cases, it implies that the mean output of rice in inland valleys is the greatest, followed by the swamp farms ($p<0.05$). This could be as a result of better water availability, slightly higher soil fertility and lower erosion risks as noted by IITA (1988) and Windmeijer and Andriesse(1993). Thus the inland valley represents a boost in rice production if fully exploited.

Table 1: Observed mean values of output (kg ha^{-1})

Gender	Inland valley	Upland	Swamp	Row total
Men	3467	2562	3228	9257
Women	1800	1526	1781	5107
Column total	5267	4088	5009	14364

Source: Computed from survey data (2005)

Table 2: Expected values of mean output (kg ha^{-1})

Gender	Inland valley	Upland	Swamp
Men	3394	2635	3228
Women	1873	1453	1781

Source: Computed from Table 2, $\chi 2$ cal = 10.105, $\chi 2\ \alpha = 0.05$, 2df=5.991

Table 3: Computed pay-wise differences between the means

Production systems	Mean output	Ranking in increasing order	Pay-wise differences
Inland valley (X_1)	2706	X_2	$(\bar{x}_1 - \bar{x}_3) = 649$
Upland (X_2)	2057	X_3	$(\bar{x}_1 - \bar{x}_2) = 267$
Swamp (X_3)	2439	X_1	$(\bar{x}_3 - \bar{x}_2) = 382$

Source: Computed from survey data (2005), SD = 39.79; $\chi 2\ \alpha = 0.05$, 2df=5.991, LSDα = 5.991*39.79 = 239.58

Table 4: Observed net profit values

Gender	Inland valley	Upland	Swamp	Row total
Men	110387.8	102522.8	97666.76	310577.36
Women	97767.89	131390.3	95454.43	324612.62
Column total	208155.69	233913.1	193121.19	635189.98

Table 5: Expected net profit values

Gender	Inland valley	Upland	Swamp
Men	101778.12	114372.26	94426.98
Women	106377.57	119540.84	98694.21

$\chi 2$ cal = 4044.88, $\chi 2\ \alpha = 0.05$, 2df = 5.991

Table 6: Computed pay-wise differences between the means for the significance in the production systems

Production systems	Mean output	Ranking in increasing order	Pay-wise differences
Inland valley (X_1)	208155.69	X_2	$(\bar{x}_2 - \bar{x}_1) = 25757.41$
Upland (X_2)	233913.1	X_1	$(\bar{x}_2 - \bar{x}_3) = 40791.91$
Swamp (X_3)	193121.19	X_3	$(\bar{x}_1 - \bar{x}_3) = 15034.5$

SD = 4044.88; $\chi 2\ \alpha = 0.05$, 2df = 5.991, LSDα = 5.991*4044.88 = 24232.88

The test of hypothesis that the net profit of the men rice farmers is not significantly different from that of the women rice farmers is presented above.

Since the calculated value is greater than the table value, we reject the null hypothesis. Hence there is significant different in the net profit of the men and women rice farmers in the production systems. The net profit of the men is significantly higher than that of their women counterpart (Table 4 and 5).

Comparing the $(\bar{x}_i - \bar{x}_j)$ with the LDSα, shows that the net profit in upland system is significantly higher than that from inland valley. Also the net profit from upland is significantly higher than that from swamp farms while there is no significant different between the net profit from inland valley and swamp farms. The profit differential may have resulted from different marketing strategies adopted and the time of sale of the produce (Table 6).

Table 7: Net profit of the men and women rice farmers

Item	Men	Women
(A) Variable cost		
Family labour	12429.88	18538.34
Hired labour	13419.51	12411.43
Other inputs (fertilizer, seeds, transportation)	4375.90	5613.61
Milling of rice	5520.98	4990.30
Total variable cost	35746.28	41553.68
(B) Fixed cost		
Land	2739.15	2768.65
Depreciated farm tools	663.33	710.89
Interest on loans	380.08	281.76
Total Fixed cost	3782.56	3761.30
(C) Total cost	39528.84	45314.98
(D) Revenue	117133.94	115441.12
E) Net profit	77, 605.11	70, 126.14

Source: Computed from survey data (2005)

Table 8: Net profit of the farmers based on production system

Item	Inland	Upland	Swamp
A) Variable cost			
Family labour	11024.14	15231.17	16494.31
Hired labour	11149.53	13308.44	14085.16
Other inputs (fertilizer, seeds, transportation)	4690.63	5422.03	4209.33
Milling of rice	5714.06	4343.29	5288.17
Total variable cost	22578.36	38304.93	40076.97
B) Fixed cost			
Land	2882.7	2413.1	2672.9
Depreciated farm tools	483.14	1008	581.74
Interest on loans	390.22	393.33	244.75
Total fixed cost	3756.06	3814.43	3499.39
C)Total cost	26334.46	42119.36	43576.63
D) Revenue	125146.3	101135.7	116597.1
E) Net profit	98811.86	59016.32	73020.72

Source: Computed from Survey data (2005)

Net profit for the men and women rice farmers: The net profit per hectare associated with rice production for the men and women rice farmers were derived, summarized and presented in Table 7. This table reveals that the net profit for the two groups were ₦ 77605.11 ha^{-1} for the men rice farmers and ₦ 70126.14 ha^{-1} for the women rice farmers. This result shows that rice production is profitable and holds great potentials for the men and women farmers in Nigeria and in the national match against unemployment, poverty and hunger and food insecurity. The men farmers made higher profit than their women counterparts. Therefore, men and women should be amply empowered to take up rice farming confidently as a means of livelihood. Improving the quality of locally produced rice through good processing, de-stoning and polishing will help increase the market share of the commodity and for it to compete favourably with the imported rice.

Net profit from the production systems: The net profit associated with rice farming from the three production systems are presented in Table 8. It depicts a net profit of ₦ 98811.86, ₦ 59016.32 and ₦ 73020.72 ha^{-1}, respectively for the inland, upland and swamp production systems. This result shows that although rice productions in the three systems were profitable, the inland valley system is the most profitable, followed by the swamp production system. Efforts should therefore, be made to develop appropriate technology to take up the opportunities offered by these environments especially the inland valleys since as noted by IITA (1988) and Windmeijer and Andriesse (1993) that the greatest increases in rice production in the region would come from the inland valleys bottoms which has the potential of enhancing the productivity of rice while protecting and conserving the environment and for sustainable land use because of better water availability, slightly high soil fertility and lower erosion risks.

CONCLUSION

This study revealed that the mean output of rice in inland valleys is significantly higher than that from the other production systems and that rice production is profitable for all the farmer groups. Inland valleys present the most profitable picture of the production systems. Therefore people should be encouraged to take up rice farming confidently as a means of livelihood and exploit the opportunities offered the production systems especially inland valleys. This would help in reducing the high import bill on rice, hunger, poverty and malnutrition and improve the quality of life, especially in the rural areas.

REFERENCES

Adeyeye, V.A., 1988. Nutrition, Health and Agricultural Productivity. NISER Research Report.

Akanji, B., 1991. Land Rights and Use of Women Cocoa Farmers. Ford Foundation/Social Service Research Council Network Research Studies.

Akanji, B., 1997. The Gender Implications of Structural Adjustment for Women Farmers And their Households, in Garba, P.K, b. Akanji and I. Isiugo (Eds.), Women and Economic Reforms in Nigeria. WORDOC, University of Ibadan.

Akanji, B., 1999. Differentials and patterns of Gender Responsibility in Tradable crop Agriculture in Nigeria, Paper Presented at a Conference on Women Farmers: Enhancing Rights and productivity by Centre for Development Research, (ZEF), Bonn, Germany; Tuffs University, Boston, USA and University of Hoheinheim, Stuttgart, Germany, pp: 2-6.

Erenstain, O. and F. Larcon, 2002. Potentials and Prospects for Rice Production in West Africa. Paper presented at the Sub-Regional Workshop on Harmonization of policies and coordination of programmes on Rice in the EOWAS Sub-Region, Accra, Ghana.

Food and Agricultural Organization, 2003. Rice Environments. FAO, Rome.

Food and Agricultural Organization, 2004. Concept Paper-The International year of Rice 2004., Rome, pp: 4.

Feldstein, H.S., B. Flora and S. Poats, 1990. The Gender Variable in Agricultural Research. Report No. MR225e. IDRC, Ottawa

Goody, J. and J. Buckley, 1973. Inheritance and Women's Labour in Africa", Africa, Vol.23.

IITA, 1988. Strategic Plan 1989-2002, Ibadan International Institute of Tropical Agriculture.

Mamman, M., 1994. Population and Women in Food Production, In Adetunbem, J.O. (Ed.), Food Crisis in Nigeria. Abstract of papers presented at the 7th Annual Conference of Nigerian Geographical Association held at Ondo State College of Education, Ikarre-Ekiti, pp: 109-113.

Nwaru, J.C., 2003. Gender and Relative Production Efficiency in Food Crop Farming in Abia State of Nigeria. The Nigerian Agric. J., 34: 1-10.

Quisumbing, A., L.R. Brown, L. Haddad and R. Meizen-Dick, 1988. The Importance of Gender Issues for Environmentally and Socially Sustainable Rural Development", In Ernst Lutz (Ed.). Agriculture and the Environment; Perspective for Sustainable Rural Development, pp: 186-1999.

West Africa Rice Development Association, 2003. Strategic Plan 2003-2012, Buoake, Cote d'Ivoire.

Windmeijer, P.A. and W. Andriesse, 1993. Inland Valleys in West Africa: An Ecological Characterization of Rice Growing Environment. Wageningen, The Netherlands, International Institute for Tropical Agriculture, pp: 160.

World Bank, 1998. Agriculture and the Environment: Perspective for Sustainable Rural Development, Ernst Lutz (Ed.) John Hopkins University Press for the World Bank

World Bank/Widline, 1992. Raising the Productivity of women farmers in Sub-Saharan Africa., pp: 6.