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PROFITABILITY ESTIMATE OF QUALITY PROTEIN MAIZE VARIETY (QPMV) AMONG MAIZE FARMERS IN SELECTED VILLAGES OF SOUTHERN KATSINA STATE, NIGERIA

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ABSTRACT

This study was conducted to estimate the profitability among farmers who adopted quality protein maize variety (QPMV) in southern Katsina State, Nigeria. During the study, a structured questionnaire complemented with interview schedule was administered on 75 maize farmers selected from three villages namely; Kurami, Rugoji and Tudu using multi-stage sampling technique. The data collected were analysed using descriptive statistics and farm budgeting technique. The results of the study revealed that all the sampled farmers were male, 40% were within the age of 41-50 which is consider to be active and productive age and majority 89.33% were married. Furthermore, the findings showed that most of the farmers are literate with majority cultivating QPMV on small-scale basis. However, the study indicates that quite a sizeable number of the respondents (48%) who adopted QPM purely for economic benefits (45.33%) find it difficult to identify QPM variety. Evidence showed that the production of QPM variety is profitable when compared with other varieties as indicated by the gross margin values of ₦ 179, 839/ha, ₦ 178, 462/ha, and ₦ 162, 503/ha for Tudu, Rugoji and Kurami, respectively. It is therefore, recommended that production of QPM variety is very profitable in comparison to the local maize varieties used in the study area. Policy makers should therefore encourage the adoption of the variety by providing all necessary inputs and other institutional support.

Keywords: Profitability estimate; QPMV; maize farmers

INTRODUCTION

Maize (*Zea mays*) play a vital role in human and animal nutrition in many parts of the world. It ranks second to wheat in the world of cereal production. It is the most important cereal in the sub-Saharan Africa. Maize is also a major cereal crop in Nigeria and the yield

potential of maize is particularly high in the savanna belt of wet climate of the coast to the dry Sudan savannas of west and central Africa (Bello *et al.*, 2017). Nigeria, which is a maize consuming nation, has a total maize production of 5.33 million tons from an area of 4.1 million hectares in 1999, production rose to 8.6 million tons in 2013 with average yield of 5.6 tons per hectare (FAO, 2014). The output of maize in Nigeria covers 45% of all maize grown in west and central Africa (RMRDC, 2004).Unlike in other west African countries such as Ghana, the adoption and cultivation of quality protein maize variety is rather low in Nigeria, and consumption is mainly on other local varieties (Akande and Lamidi, 2006). According to UNDP, almost one billion people living in developing countries are malnourished and do not consume enough protein for good health (Future Harvest, 2004). Malnutrition is widespread in Nigeria especially among children, pregnant women and nursing mothers, at least 40% of the children under five are stunted despite the country's huge agricultural potential.

The aim of developing and introducing Quality Protein Maize is to help the poor reduce malnutrition though direct consumption. It was also observed that, Quality Protein Maize (QPMV) fed to animals performed better than the animals fed with normal maize (Onimisi, 2009). Janet (2001) to analyze the possible economic benefit of quality protein maize for commercial feed industries in Brazil and El-Salvador, it is revealed that, by using quality protein maize variety, Soya-beans meals could be reduced by approximately 50% and imports of synthetic lysine eliminated or substantially reduced. Furthermore, the saving in the cost of producing feed from using QPMV would be 4-5% for pig feeds and 3-4% for poultry feeds in Brazil and 3-4% for both pig and poultry feeds in EL-Salvador. Similarly, nutritional officer with Ghana Health Service conducted a series of village level infant feeding trials, comparing QPMV to normal maize and the result shows that QPMV significantly increases infant growth and reduces stunting. The researcher also suggested that, general health, measured by the number of days a child is ill by month, is also significantly improved and there is a strong tendency toward reduced mortality. This evidence validates the objective now shared by many stakeholders, of substituting QPM for normal maize. (Sasakawa, 2005)

In Katsina State, QPMV production stood at 60 tonnes, 208 tonnes and 525 tonnes in 2005, 2006, and 2007 respectively. While the total area put under cultivation were 20 hectares, 80 hectares and 150 hectares in the respective years mentioned (KTARDA, 2007).

However, despite the nutritional importance of quality protein maize in providing the essential amino acids in sufficient quantity for healthy diet for human and animal consumption little research was conducted on it. Study on profitability could accelerate the cultivation of this maize variety and enhance sustainable development, especially among rural farmers. It is in line with this that, this study was conceived to determine the economic implications of producing the variety and comparing it with other varieties. Socioeconomic characteristics of the farmers and major constraints associated with production in the study area were also captured.

MATERIALS AND METHOD

Study Area

The study area is southern Katsina, Katsina State. The state has a total area of 24,192 Km^2 out of which about 2.8 million hectares is devoted to cultivation of crops. The state lies

entirely within the tropics (latitude 11^0 07"N to 13^0 22"N and 6^0 45'E to 9^0 05'E) with distinct rainy season between May and October, and dry season between the months of November and April. The state climate varies considerably according to months and season. The state is located within three agro ecological zones, the Sahel at the extreme north, the Sudan savanna at the centre and the northern guinea savannah in the south. Farming is the main occupation of its people, with over 800,000 farming families agriculture pursuit must surely be on its list of priorities (KTSG, 2006)

Sampling Procedure and Data Collection

Multi-stage sampling technique was used to select QPMV and other maize varieties farmers in the study area. Of the three Agricultural zones in the state, Funtua Agricultural zone (Zone II) was purposively selected due to its high number of QPM farmer's maize. The next stage was the purposive selection of three villages noted for high production of QPM; i.e. Kurami, Rugoji and Tudu in Bakori, Kafur and Kankara Local Government Areas respectively. Simple random sampling was employed to select a total of 75 maize farmers from a sampling frame of 300 using Yamane's (1967) sample size determination method (equation 1). Respondents were interviewed though structured questionnaires. Variables captured include; age of respondents, farm size, experience in farming, size of family etc. Revenues and costs components from production were also elicited from each respondent to determine profitability of the farm business.

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

Where, n is the sample, N = total population of QPM farmers, e = level of precision or sampling error, which assumed to be 10% (0.1)

Analytical Tools and Models Specification

Data collected were analyzed using descriptive statistics in describing the socioeconomic characteristics of respondents. Production cost was estimated based on average production cost per hectare. Revenue was estimated as a product of output prices and quantity per hectare. Gross margin and net returns analysis were used as a measure of profitability. Olukosi and Erhabor (2008), Adegey and Dittoh (1982) and Abbott and Makeham, (1979) who stated that gross margin was a good measure of profitability when fixed cost component is negligible and is widely used for comparative analysis of activities in one farm, and between farms in similar environment. Gross margin was estimated as:

$$\mathrm{GM} = \mathrm{TR} - \mathrm{TVC} \qquad (2)$$

$$\mathrm{NFI} = \mathrm{GM} - \mathrm{TFC} \qquad (3)$$

Other measures of financial success employed were, efficiency ratios and return on naira invested as follows;

$$\text{Operating ratio} = {}^{TOC}/_{GI} \qquad (4)$$

Where; TOC is total operating cost, GI = gross income

Return on Naira Invested = TR/TC (5)

Where; TR= Total revenue, TC = Total cost

Multiple linear regression model was also used to determine key variables influencing profits, thus using Ordinary Least Square method (OLS), gross margin was regressed against socioeconomic characteristics, some costs components and production output as follows;

$$y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + ui \quad (6)$$

Where; Y = Gross margin, X_1 = yield/output, X_2 = Total cost X_3 = Variable cost X_4 = House hold size X_5= Farm size, U = Error term

RESULTS AND DISCUSSION

Socio-Economic Characteristics of Respondents

The socio-economic characteristics of respondents are vital in this study, because they influence the decision making of the respondents. The most important socio-economic characteristics considered in this study include; age, sex, marital status, household size and level of education. The results indicated that majority of the respondents (40%) are within the age range 41-50 years. Those within the age of 51 years and above constitute 28%. The overall results indicate that majority of the respondents in the study area (86.67%) were in their middle age and above (31 years and above) the age of the farmers significantly affect agricultural production. It is believed that people within this age range 31-50 years fall within the productive sector of the economy, this finding is in consonance with Ahmed, Eugene and Abah (2015) who perceived that the nature of household in term of population age might be attributed to marital status, polygamous nature and other cultural heritage associated with households in the study area. Gender as a socio-economic variable that assist a researcher to analyse the role, responsibility, constrains and opportunity of both male and female. Rahman *et al.* (2013) noted that the low participation of female in farming may be attributed to gender inequality in terms of land holding. The study reveals that all the respondents were male and this could be due to the culture and tradition of the study area. The result also revealed that 89.33% were married and this was in agreement with the findings of who perceived that marriage make an individual more responsible and take more decision appropriately. From the result of the study, 76% of the respondents have formal education of different levels and this is encouraging since Maikasuwa and Ala (2013) reported that education is an important instrument that influences agricultural production decision of smallholder farmers. Land resources is very important factor of production, results revealed that majority 60 % of the respondents have 1-2 ha of land. Years of experience of a farmer to a large extent effects his/her managerial ability and decision in farm operation, and the findings of this study indicated that farmers have a range of experience in QPMV production with the majority (49.33%) having 1-2 years experience in the production of this variety.

Table 1: Socio economics characteristics of QPM farmers

Variable	Frequency	Percentage
Age		
21-30	10	13.33
31-40	14	18.67
41-50	30	40.00
51 and above	21	28.00
Total	75	100.00
Sex:		
Male	75	100
Female	-	-
Total	75	100
Marital Status		
Married	67	89.33
Single	8	10.67
Total	75	100
Educational Attainment		
Primary Education		
Secondary Education	13	17.33
Tertiary Education	20	26.67
Religious Education	24	32.00
Adult Education	14	18.67
Total	04	5.33
Household Size	75	100
1-5		
6-10	22	29.33
11-15	18	24.00
> 15	12	16.00
No. of response	13	17.33
Total	10	13.33
Experience in Maize Farming	75	100
1-5 years		
6-10 years	16	21.33
11-15 years	15	20.00
16-20 years	07	9.33
> 20 years	10	13.34
Total	27	36.33
Years Experiences in QPM Production	75	100
1-2 years		
3-4 years	37	49.33
> 4 years	31	41.33
Total	7	9.32
Farm Size (ha)	75	100
< 1	11	14.67
1-2	45	60.00
3-4	15	20.00
> 5	04	5.33

Source: Field survey, 2014

Results of Gross Margin Analysis

Result in Table 2 revealed that average yield of QPMV obtained by the sampled farmers in Kurami, Rugoji and Tudu were 3,836kg/ha, 4,032kg/ha and 3,987 kg/ha respectively. However, the total average yield of QPMV for the whole farmers in the sample villages was found to be 3952kg/ha. This is contrary to newsletter of the Sasakawa Africa Association (2005) findings, whose average yield per hectare was found to be 5.7 tones. This variation in yield could be due to some factors such as climate, management practices, soil etc. It was also observed that, there is a significant difference between yield of QPMV and that of other varieties, as yield of other grown maize varieties during the study period stood at 2,820 kg/ha, 3,216 kg/ha and 3,106.80 kg/ha for Kurami, Rugoji and Tudu respectively. This should be a reason why farmers should adopt the cultivation of quality protein maize variety.

It is also worth noticing that the average gross income of QPMV (₦/ha) for Kurami, Rugoji and Tudu were N242,270. N268,908 and N265,164 respectively, while for other varieties, average gross income (N/ha) were N178,224, N170,448/ha and 201,890/ha for Kurami, Rugoji and Tudu respectively. This disparity may ostensibly be ascribed to differences in yield and operating cost as prices of output were similar across the selected villages.

Table 2: Average cost of producing one hectare of QPMV and other varieties in the sampled villages

Cost of Inputs (₦)	Kurami		Rugoji		Tudu	
	QPM	Others	QPM	Others	QPM	Others
Seeds	1808.60	748.80	1752.40	932.80	1750.00	902.40
Fertilizers	31.708.00	32700.00	37476.40	36324.00	37508.00	38228.00
Chemicals	2512.00	2352.00	2676.00	2476.00	3576.00	2616.00
Land Clearance	2204.00	2132.00	2268.00	2156.00	2148.00	2284.00
Ridging	3104.00	3076.00	3672.00	3316.00	2732.00	2724.00
Sowing	2972.00	2308.00	3192.00	3116.00	2232.00	2264.00
Weeding	6900.00	7552.00	8208.00	7700.00	6928.00	6936.00
Fertilizer Application	1838.00	1838.00	2440.00	2436.00	2004.00	1900.00
Chemical Application	872.00	872.00	708.00	724.00	924.00	836.00
Harvesting	4412.00	4404.00	4104.00	4236.00	3728.00	3668.00
Shelling	7076.40	5912.80	8654.40	5525.00	7258.00	5964.00
Transportation	3859.60	3061.80	3694.80	2575.20	3737.00	2937.40
Total Variable cost	69,266.6	66,957.4	78,866.0	71,517.0	74,525.0	71,259.8
Others cost (Fixed costs)	10,500.0	8700.00	11,600.00	8500.00	10,800.00	9000.00
Total Cost	79,766.60	75,657.40	90,446.00	80,017.00	85,325.00	80,259.80
Average Yield (kg/ha)	3,836.00	2,820.0	4,032.00	3,216.00	3,987.20	3,106.80
Average price (₦/kg)	63.17	63.20	66.69	53.0	66.50	64.98
Gross Income (₦/ha)	242,270.0	178,224.0	268,908.0	170,448.0	265,164.0	201,890.0

Source: Field survey, 2014

Table 3 presented the results of gross margin, net margin, operating ratio and return on naira invested. Gross margins per hectare from production of QPMV were generally higher than those obtained from production of other varieties in the sampled areas. Tudu village have the highest gross margin of N190,639, followed by Rugogi (N 190,042) and Kurami (N173, 003.4). For the non- protein varieties, the highest gross margin was also from Tudu village (N130,631) closely followed by Kurami farmers (N111, 266.6). This by

comparison indicated that, production of quality protein maize variety is more efficient than the other nonprotein varieties.

Similarly, other ratios also revealed that adoption of QPMV is financially healthier, for instance, the operating ratio which shows the proportion of gross income that goes to pay for the operating cost (variable input usage) are less than 1. This means that, the business can thrive/survive for a long period. The return on naira invested also indicated that, for every naira invested in the production of QPMV in tudu, rugogi and kurami villages, N210.77, N197.27 and N203, 74 would be obtained respectively. Therefore, based on the result of the analysis, it has been observed that QPMV variety yields higher and is more profitable than other varieties of maize grown in the areas studied.

Table 3: Results of gross margins and net margins for the sampled villages

Cost/Revenue	Kurmi Village		Rugogi Village		Tudu Village	
	QPMV	Others	QPMV	Others	QPMV	Others
Gross revenue (₦/ha)	242,270.0	178,224.0	268,908.0	170,448.0	265,164.	201,890
Total variable cost (₦/ha)	69,266.6	66,957.4	78,866.0	71,517	74,525	71,259.8
Gross margin (₦/ha)	173,003.4	111,266.6	190,042	98,923	190,639	130,631
Gross margin ratio (%)	19.34	12.44	21.24	11.06	21.31	14.16
Fixed cost (₦)	10,500.0	8700	11,600	8500	10,800	900
Total cost (₦)	79,766.60	75,657.4	90,466.0	80,017	85,325	80,259
Net margin (N/ha)	162,503	102,566.6	178,462	90,431	179,839	121,630
Net margin ratio (%)	19.45	12.28	21.36	10.82	21.52	14.56
Operating ratio	0.29	0.36	0.93	0.42	0.28	0.35
Return on Naira invested (₦)	203.74	135.57	197.27	487.93	210.77	151.55

Determinants of Profitability

Table 4 depicted the determinants of profit from equation 6. Yield was found to be positive and statistically significant ($p>0.1$). A unit increase in yield increase gross margin per hectare by N62.21, implying that QPMV farmer's profit was a function of yield obtained from the variety. Variable cost expenses and farm size also have positive relationship with gross margin. Farm size was significant at 10 % and increases gross margin by N1.59 The significant of farm size in QPM production was reported by Kehinde et al, (2015). As expected, total cost has negative impact on gross margin, increase in total cost decreases profit by N69.03 per hectare. Household size of respondents was also found to have negative relationship with gross margin, as household size increases by a unit, gross margin per hectare decrease by N2.53, this is contrary to the finding of Paul (2011) who reported that household size as one of the factors influencing profitability in agriculture. Result shows that the value of coefficient of multiple determinations R^2 was 0.69 indicated that 69% of the variation in the gross margin is explained by the explanatory variables included in the model. The significance of F statistics also indicated that the model could be validly accepted.

Table 4: Determinants of profitability

Variables	Coefficients	Standard error	T statistics	P value
Constant	-152.38	432.45	-0.352	0.7349 ns
Yield	62.21	30.87	2.014	0.0837*
Total cost	-69.03	40.46	-1.705	0.4088^{ns}
Variable cost	56.59	64.42	0.878	0.1317^{ns}
Age	-2.53	1.546	-1.637	0.1455^{ns}
Farm size	1.594	0.739	2.157	0.0678*
R^2	0.69			
Adjusted R^2	0.46			
F stat	3.074, 0.087			

*Significant at 10% level of probability; ns = Not Significant

Constraints facing QPMV Producers

It is evident from table 4 that the major constrains perceived by the farmers in the study area with QPMV production is the identification of QPMV seed (45.33%). Data presented also reveals that 14.67% of the respondents have problems in the acquisition of capital and credits. While 2.67% of the respondents were of the view that drought constrained production, while 13.33% had problem in the acquisition of inputs. Lack of market constitute 9.34% of the respondents.

Table 5: Problems associated with QPMV production

Problem	Frequency (N)	Percentage (%)	Ranking
Capital	11	14.67	2
Identification of QPMV seeds	34	45.33	1
Drought	2	2.67	5
Inputs	10	13.33	3
Marketing problems	7	9.33	4
Others	11	14.67	2
Total	75	100	

Source: Field survey, 2014

CONCLUSION

Based on the results obtained from the study, the adoption and production of QPMV is more profitable than other local maize varieties cultivated in the study area and that yield and farm size were influential variables that determines profit. It was also established that farmers encountered some challenges in the production of QPMV.

In view of the results obtained the study made the following recommendations so as to boost QPMV production in the study area; Proper and simpler way of identification of QPMV should be disseminated and explored by farmers by Extension workers in the area to increase rate of adoption. Issues related to the supply of farm inputs especially fertilizer needs to be addressed so that farmers can get inputs at their farm gates and at affordable prices. Farmers should be encouraged to identify more market outlets for the QPM variety especially as it relates to widespread consumption in household diet, this should be done with help of health worker which will solve the nutritional problem of rural poor as well as improve the marketability of QPM in the study area.

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