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ECONOMIC ANALYSIS OF MILLET PRODUCTION IN JERE LOCAL GOVERNMENT AREA, BORNO STATE, NIGERIA.

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ABSTRACT

This research was carried out to determine the profitability of millet production in Jere local Government area of Borno state. Random sampling technique was adopted in this research through which data was collected from ninety (90) farms with the aid of a well-structured questionnaire. Data was analysed using descriptive statistics, gross margin analysis and production functions. Result indicated that 58.9% of respondents were in their economically active age group, majority (76.7%) of the farmers were male, 66.7% were married, while 42.2% had farming experience of between 21 – 30 years in millet production and it was revealed that farms were on a small-scale basis. Result further showed that millet production was profitable with gross margin and net farm income of ₦29,743.18 and ₦12,868.00 per hectare respectively. Regression model estimated revealed that double-log was the lead equation with R^2 of 68.5%. Also, land, labour and agrochemical had significant impact on the level of millet output at P<0.01 level of probability and F-ratio 35.212. Estimated efficiency ratios showed that land; labour and fertilizer were under-utilised, while agrochemical was over utilised. Return to scale gave a value of 1.27 which implies that millet production was in stage 1 of the production region. It can be concluded that millet production in the study area is profitably. The study recommends that farmers should employ more land; labour and fertilizer, while the use of agrochemical should be cut down in order to improved millet production output for profit maximization.

Key Words: Economic, millet, production, efficiency, utilised**.**

INTRODUCTION

Meaningful economic and political development of any country is highly dependent on adequate food supply. Agricultural sector plays strategic role in the process of economic development of a country. Increased agricultural output and productivity contributes substantially to an overall economic development of a country and therefore, it will be appropriate to place greater emphasis on further development of the agricultural sector through adequate assessment of the performance of individual crops produced. According to Ajeigbe's report, renewed focus on boosting the production of millet and highlighting its benefits was critical to reducing over-reliance on more-commonly grown crops, boosting diverse diets and food security (The Nation Newspaper, 2021). Millet is grown in the large savanna region of Nigeria commonly in a system of intercropping with other crops. In Nigeria, the increase in food production has not matched with the rapid population growth. The population is growing in double-digit, geometrically by nearly four percent annually but food production is increasing single digit, arithmetically at only partial of that rate. Yield for the crop has fallen like many other food crops. The actual average yield of millet under local conditions in Nigeria is 1.6 tonnes per ha compared with a potential yield of 5.4 tonnes per ha indicating a yield gap of 238% (Etonihu *et al.,* (2013; Food and Agriculture Organization Statistical Database (FAOSTAT, 2018) opined that the main objectives of a country are the accomplishment of an ideally high level of living with a certain amount of effort, any increase in the productivity of resources employed in agricultural activities amounts to development. Without access to good food, the citizenry remains malnourished and their contribution to national development stagnates or declines. Therefore, acknowledging the role of millet in responding to nutritional challenges, Ajeigbe (The Nation Newspaper, 2021) stressed the need to increase the cultivation of climate-resilient millet for sbalanced and healthy diets. The non-food use of millet has increased significantly, especially as animal feed ingredient and as raw material in breweries and starch industries. According to estimates, about 60 per cent of the millet production is for non-human consumption. However, in recent years, there is a renewed demand for millet as food for health-conscious urban consumers. Jeffrey, *et al.,* (2022) stated that average farm size for subsistence farmers in Nigeria ranges from 1 to 3 ha,

On the other hand, most farming households cultivate 2 to 3 hectares of farm land in Africa, whereas their counterparts in

developed economies like USA cultivate hundreds of hectares of land. In Africa, the use of primitive farm tools is still very much prevalent which substantially accounts for low yield recorded in many of the crops that are grown, which includes millet. Millet is one of the important cereals grown in Jere Local Government Area of Borno state in North East Nigeria. Millet is a monocotyledonous crop that contains about 30% starch and 12% protein. This crop has short gestation period which makes it very suitable for cultivation especially in the north east Nigeria which has very short raining period in the year. This therefore has given millet an important position among cereals grown in the region where it is used for food and different types of drinks such as kunu, fura etc. According to the International Crop Research Institute for the Semi-Arid Tropics (The Nation Newspaper, (2021), more than 90 million people in Africa and Asia depend on millet as a staple food.

Low productivity of the agricultural sector is largely due to farmers' reluctance to embrace improved farm practices. According to Etonihu *et al.*, (2013); Federal Office of Statistics (FAOSTAT, 2018), yield for millet has fallen like many other food crops. The actual average yield of millet under local conditions in Nigeria is 1.6 tonnes per ha compared with a potential yield of 5.4 tonnes per ha, indicating a yield gap of 238%. In an attempt to combat the inherent cause(s) of low millet productivity despite its strategic position among the cereals cultivated in Jere LGA of Borno State, research was conceived to embark on the assessment of economics of millet production in the study area. The research therefore focused on: Socio-economic attributes of millet farmers; determination of gross margin of millet production; determination of economic of scale of millet production and resources use efficiency in millet production in the study area.

METHODOLOGY

Area of study

The study area is Jere Local Government Area, one of the twenty-seven Local Government Areas of Borno State. The Local Government Area was carved out of Maiduguri Metropolitan Council (M.M.C) in 1996, Borno State Government (BSG, 2007). It lies within latitudes 11° 401 and 120 05 N and longitudes 13°501 and 120 201 E, it occupies a total landmass of 160 square kilometer, Ministry of Land and Survey (MLS, 2008). Within the state, it shares boundaries with Mafa Local Government Area to the east, Maiduguri Metropolitan Council to the north and Konduga Local Government Area to the south. The climate of the area is characterized by dry and hot seasons, minimum temperature ranging from 15-20°C, while the maximum temperature ranges from 37-45°C. The annual rainfall ranges from 500mm to 700mm per annum, Nigerian Metrological Agency (NMA, 2008). The rainy season is usually from May to October with low relative humidity and short wet seasons. The topography is generally low land plain, and the soil is generally sandy with short grasses and thorny shrubs. Jere Local Government Area has a projected population of 211,204 persons with annual growth rate of 2.8%, National Population Census (NPC, 2006). Majority of the inhabitants are farmers, traders and civil servants. The major ethnic groups are Kanuri and Shuwa-Arab. Others include Hausa, Bura and Fulani and many immigrant settlers from within and outside Nigeria, Borno State Agricultural Development Programme (B0SADP, 2008). Farmers in this area are engaged in production of millet and other food crops such as ground nut, water melon, cucumber, rice etc. They also rear livestock like cattle, sheep, goats, camel. The choice of this LGA was based on the high priority accorded production of millet in the area.

Sampling Technique and Sample size.

Multistage sampling procedure was used to arrive at the sample population used in this research. Three (3) wards were purposively selected out of the twelve (12) wards in the area due to their prominence in millet production and the wards are; Zabbarmari, Gongulong, and Lawanti. Two (2) villages were randomly selected from each the three wards as the second sampling stage. The third stage involved the random selection of fifteen (15) millet farmers from each village making a total of ninety (90) respondents for the study. Data for the study were obtained from both primary and secondary sources. The primary data was obtained with the aid of a structured questionnaire and personal interview was also conducted for farmers who cannot read and write; and the results of the interview were interpreted in the questionnaire. While the secondary sources of information include textbooks, journals, past project, internet, etc. Data were collected on socio-economic variables such as gender, farming experience, age, educational level, household size and farm size of respondents. Also, data were obtained on costs and returns and problem associated with millet production in the study area.

Method of Data Collection and Data Analysis.

The analytical tools employed for this study include, descriptive statistics and production function. The descriptive statistics that were used include percentage and frequency. These were used to analyze the socio-economic characteristics of the respondents. Production function model was adopted to determine input-output relationship and resource use efficiency.

Regression model was used to evaluate input-output relationship and the implicit form of the model is expressed as;

$Y = f(X_1, X_2, X_3, X_4, X_5, \mu)$ ---------- (1)

Where;

Y = Output from millet production (kg)

X_1 = Farm size (ha)

X_2 = Quantity of seed (kg)
X_3 = Quantity of fertilizer (kg)
X_4 = Labour input (man day)
X_5 = Agrochemicals (liters)
μ = Error term

However, the explicit form of this function is as follows;

$Y = a+\beta_1 InX_1 + \beta_2 InX_2 +\beta_3 InX_3 + \beta_4 InX_4+\beta_5 InX_5+\mu$. (Semi-log) -------- (2)

$InY = a+ \beta_1 InX_1 + \beta_2 InX_2 + \beta_3 InX_3 + \beta_4 InX_4+ \beta_5 InX_5+ \mu$. (Double-log) ------ (3)

$Y = a+ \beta X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4+ \beta_5 X_5 + \mu$. (Linear) ---------- (4)

$InY = a+ \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4+ \beta_5 X_5+ \mu$. (Exponential) ------ (5)

Resource use efficiency in millet production was computed using the following formula;

$$R = \frac{MVP}{MFC} \quad \text{----- (6)}$$

Where;
r = efficiency ratio
MVP = Marginal value product of variable
MMFC = Marginal factor cost

Then, MVP was estimated as; MVP = MPP.Py ----------(7)

Where;
MPP = Marginal physical product
P_y = Price input

While the decision rule is;
If, r = I, resources are efficiently used
If, r > I, resources are under utilized
If, r < I, resources are over utilized

Also employed in the data analysis was gross margin (GM), which is the difference between the gross farm income (GFI) and the total variable cost (TVC) as a useful planning tool in situations where fixed capital is a negligible portion of the farming enterprises as in the case of small scale and subsistence agriculture. This was therefore used in this study to estimate the returns to the investment by the farmers it is expressed as:

GM = GFI - TVC ---------- (8)
Where;
GM = Gross margin
GFI = Gross farm income
TVC = Total Variable lost

Economics of scale was also determined. Economics of scale measures a firm's success in producing maximum possible output from a given set of inputs. In addition, elasticity of production (E_p) and returns to scale (RTS) were estimated using the formula;

$\Sigma E_p = RTS$ ---------- (9)
Where;
E_p = Elasticity of production
RST = Return of scale
Σ = Summation sign.

RESULTS AND DISCUSSION

Socio-economic Characteristics of Respondents

Some socio-economic characteristics of farmers may exact influence on production of millet in the study area. The socio-economic variables captured in this research include age, sex, marital status, educational attainment, membership of association and years of farming experience by the respondents.

TABLE 1: Socio-economic Characteristics of Respondents (n = 90)

Variables	Frequency	Percentage
Age		
21 - 30	21	23.0

31 - 40	37	35.0
41 - 50	20	27.2
51 - 60	17	18.9
Total	**90**	**100**
Sex		
Male	69	76.7
Female	21	23.3
Total	**90**	**100**
Marital status		
Married	60	66.7
Single	10	11.0
Divorce	5	5.6
Widowed	15	16.7
Education level attained		
Primary	25	27.8
Secondary	20	22.2
Tertiary	5	5.6
Quaranic	30	33.3
None of the above	10	11.1
Total	**90**	**100**
Year of farming experience		
< 10	10	11.1
11 – 20	25	27.8
21 – 30	38	42.2
31 – 40	15	16.7
≥ 41	2	2.2
Total	**90**	**100**
Farm size (ha)		
0.1 - 1.0	64	71.1
1.1 - 2.0	15	16.7
2.1 - 3.0	5	5.7
3.1 - 3.0	4	4.4
4.1 - 5.0	2	2.2
Total	**90**	**100**

Field survey: 2023

Table 1 indicates that about 58.9% of the respondents were in their active economic year i.e 21-40 years. This is in line with the finding of (Tikon *et al*., 2021) sin a similar study where it was discovered that about 45.0% of the millet farmers were within the ages of 30 and 40 years in their active and productive age bracket. This finding conforms to Anang *et al*. (2013) which showed that majority (80%) of millet farmers were in their youthful age. The reason is obvious; the age of a farmer has effect on the type of agricultural activities he may engage in. This aligns with the outcome of the study by Coker *et al*. (2018), who pointed out that younger farmers are more at risk to use new technologies than older farmers. Hence, they are expected to approve innovations more readily than older farmers. This is an added advantage to increase millet production all things being equal.

Gender is a significant factor in agriculture because of its vital role in determining the farmer's agricultural activities. Analysis result on gender shows that majority (76.7%) were male while 23.3% were female meaning that the millet production in the study area is dominated by male folk. This is in agreement with the finding of Tikon *et al*., (2021) majority (80%) of the millet farmers were males, which implies that men constitute a greater percentage of those involved in millet farming. This implies that in the study area, males engaged more in agricultural activities than female due to the drudgery involved in agriculture. In addition, the purdah system (seclusion of women) limits women's active participation in agriculture.

Furthermore, Table 1 shows that majority (66.7%) of the respondents were married, 11.0% represents the proportion of the single as the least proportion of respondents on this variable. This is in line with the submission of Tikon *et al.*, (2021) that greater proportions (63.3%) of the millet farmers were married. This is an indication that majority of the respondents have the responsibility of providing food for the family. The marital status of the millet farmers is

expected to influence the value placed on profitable business management (Umar *et al*., 2018).

Education is important to the timing of adoption of new technology which improves the chances of the business being more profitable. Formal educational and training experience could expose the farmers to business management and processing operations skills. In addition, respondents' level of literacy can have positive effects in their involvement in the use of agricultural technology operations, which could enhance the profitability of their farming (Tikon *et al*., 2021). About 33.3% of the respondents had Quaranic education. This shows that Qur'anic education hold sway among the farming population in the study area. This was closely followed by those who had primary and secondary education accounting for 27.8% and 22.2% of the total respondents respectively. Result also has it that those with tertiary education accounted for 5.6% as the least. The finding of this research is tandem with the result of Tikon *et al.,* (2021) that 30.0% and 20.9% of millet farmers had both secondary and tertiary education, respectively, while a larger proportion (40.8%) had primary education. Formal educational and training experience could expose the farmers to business management and processing operations skills. In addition, respondents' level of literacy can have positive effects in their involvement in the use of agricultural technology operations, which could enhance the profitability of their farming.

On years of farming experience, 42.2% of the total respondents had 21-30 years farming experience. This group is following by those with 11-20 years of experience accounting for 27.8%, while the least (2.2%) represented farmers with 41years and above of farming experience. This agrees with position of Tikon *et al*., (2021) that 38.3% of the millet farmers had between 21 and 30 years of millet farming experience. Very few (17.5%) had experience of between 31 and 40 years, while 16.7% had between 41 and 50 years. From the result of this study, the percentage of farmers in the age class of 21 – 30 years of farming experience is a reasonable proportion that should enhance better agronomic practices given the availability of other favourable factors. This implies that the higher the number of years spent in farming by a farmer, the more he becomes aware of new production techniques.

Considering farm size, result shows that majority (71.1%) of the respondents were farm holders of between 0.1-1.0 hectares of millet farm. This is followed from a far distance by 16.7% of the farmers with millet farm holding of between 1.1 -2.0 hectares the least 2.2% of the respondents were those with millet farm size of 4.1 5.0 ha. This implies that majority of the respondents can be classified as Medium-scale farmers. This is in agreement with the submission from Pro-poor intervention strategies in irrigated agriculture publication Intizar (2004; retrieved 6th January, 2023) in which holders of farm between 1.01 – 3.00 were classified as medium farms.

Gross Margin Analysis

Estimated gross margin analysis was used to determine the profitability of millet production and the result is as sshown in table 2.

Table 2: Estimated Gross Margin Analysis for Millet Production.

Cost item and Revenue	Cost (₦/Ha)	Percentage of Total Cost
Variables		
Labour cost	3,248.52	9.16
Fertilizer cost	9,050.00	25.51
Seed cost	2,800.00	7.90
Agrochemical's cost	3,500.00	9.87
Total variable cost	**18,598.52**	
Fixed cost		
Knapsack sprayer (Depreciation)	3,560.00	10.04
Farm tools (Depreciation)	4,808.00	13.55
Land rent	8,506.50	23.98
Total fixed cost (TFC)	**16,874.00**	
Total cost (TC)	**35,473.02**	
Returns		
Gross Income		**48,341.70**
Gross Margin		**29,743.18**
Net farm income		**12,868.00**

Field survey: 2023

The gross margin analysis for millet farmers is shown in table 2. The table revealed that cost of fertilizer accounted for 25.51% as the largest proportion of the variable cost in millet production. This was followed by the cost of agrochemicals (9.87%) and closely followed by 9.16% on the cost of labour, seed accounted for the least (7.90%) of

the variable costs respectively. Table 2 further shows the analysis of the fixed cost of production of millet farm in which land had 23.58%. This was followed by farm tools 13.55%, while Knapsack sprayer accounted for the least cost of ₦3,560. 00 representing 10.04% of the total production cost.

The total production cost analysis result shows that fertilizer accounted for the highest (25.51%) cost of production. This is closely followed by cost of land rent 28.98% while the least (9.90%) was that of seed. The profitability of millet production in this study has been confirmed with a net farm income of ₦12,868 ha. The farms generated a gross margin of ₦29,743.18 per ha and net farm income of ₦12,868.00 per ha during the production period.

Production Function Estimate

In the determination of inputs-output relationship, production functions were adopted and the functions are semi-log, double-log, linear and exponential.

Table 3: Estimated Double-log Production Function.

Variable	Regression Co-efficient	T-Value
Constant	7.105	4.595^{***}
Land (x_1)	1.087	6.483^{***}
Seed (x_1)	0.154	0.267^{ns}
Fertilizer (x_3)	-0.159	-1.941^{*}
Labour (x_4)	0.162	2.631
Agrochemical (x_5)	0.026	3.710^{x}
R^2	0.685	
F-Ratio		35.212^{***}

Field survey: 2023, *** = significant at 1% level of probability, * = not significant at 1% level of probability
ns = not significant.

In the determination of inputs-output relationship, different production functions were adopted and double-log production function was the lead equation. Table 3 shows the result of double-log production function and the result shows that it has R^2 value of 0.685 which simply means that about 68.5% of the variation in total value of output (Y) is explained by inputs indicated in the regression model. The regression co-efficient X_1, X_2 and X_5 (land size, labour and agrochemical) were positive. This means that an increase in these inputs, while holding others factor inputs constant will bring about an increase in the gross output of millet production. The F-ratio 35.212 is significant at ($P<0.01$) percent. This implies that the variables featured significantly explained variation obtained in the gross output of millet farm. The result further indicated that land (X_1), labour (X_4) and agrochemical (X_5) were significant at 1% probability level. On the other hand, fertilizer (X_3) was significant at 10% probability level.

Estimation of the efficiency of resources used in millet production

The efficiency indicator of the inputs in millet production is shown in table 4 showing extent of utilization of an input in millet production in the study area.

Table 4: Estimated Efficiency Ratio (R)

Variable inpts	MVP	MFC	Efficiency ratio
Land	1,5,247.5	5,700	2.675
Fertilizer	6,682.4	2,800	3.458
Labour	1,585.5	250	6.342
Agrochemical	172.9	950	0.182

Field survey: 2023

The result in the table shows that land, fertilizer and labour were underutilized, while agrochemical was over utilized. It implies that efficiency and productivity in millet production in the study area could be improved upon if farmers employ more of land, fertilizer and labour while cutting down on the level of agrochemical use and this will impact positively on the net farm income.

The Elasticity of Production

The test for input elasticity of production result is shown in table 5, which shows the stage at which a firm is operating at any given time in the production process.

Table 5: Elasticity of Productive Resources and Return to Scale.

Inputs	Elasticity

Land	1.087
Seed	0.154
Fertilizer	-0159
Labour	0.162
Agrochemicals	0.026
Return to scale	1.27

Field survey: 2023

From the table, the sum total of the elasticities is 1.27. This implies an increasing return to scale in millet production and that production was at stage 1 of the production region. It means that millet production in the study area has the potentials of expanded production with efficient employment of resources.

CONCLUSION AND RECOMMENDATIONS

Given the empirical evidences on the assessment of economics of millet production in Jere LGA, it can be concluded that; millet production in the study area is profitable; that farm size, labour, fertilizer and agrochemical constituted the major important inputs in millet production; that the farms were operating at the region of increasing return to scale; that millet farmers were not operating at efficient level in the use of production resources. Therefore, the study submits that with efficient use of resources, the farms will increase their output to mitigate food insecurity and earn higher income. This study therefore recommends that there is the need for extension activities to be intensified to encourage and educate farmers to use improved millet seeds. Furthermore, it is recommended that farmers' access to fertilizer should be increased as well as labour while there should be a reduction in the level of agrochemical being used.

REFERENCES

Anang, B.T., Zakaria, A. and Yusuf, S. (2013). Production Constraints and Measures to Enhance the Competitiveness of the Tomato Industry in Wenchi Municipal District of Ghana. *American Journal of Experimental Agriculture, 3(4): 824- 838.*

Borno State Agricultural Development Programme (BOSADP) (2008). Office Memo File.

Borno State Government (BSG) (2007). Official Diary of Ministry of Information, Home Affairs, Maiduguri, Nigeria. Pp. 5 – 7.

Coker, A. A. A., Ibrahim, F. D., & Ibeziako, U. N. (2018). ''Effect of household demographics on the Technical Efficiency of Cowpea Farmers: Evidence from Stochastic Frontier Analysis in Nigeria''. Rjoas, 1(73), 179 – 186.

Etonihu, K. I., Rahman, S. A., and Usman, S. (2013). ''Determinants of access to agricultural credit among crop farmers in a farming community of Nasarawa state, Nigeria''. *Journal of Development & Agricultural Economics, 5(5), 192 – 196. FAOSTAT, (2018).*

Food and Agriculture Organization Statistical Database [http://faostat.fao.org/] site visited on 04/01/2023

Jeffrey chiwukem chiaka; Lin Zhen; Hu Yunfeng and Yu Xiao (2022): Smallholder Farmers Contribution to Food Production in Nigeria. Front. Nutr., 28 July 2022

Ministry of Land and Survey (MLS) (2008). Maiduguri, Borno State, Nigeria Office Memo File Vol. 4 Pp. 55 – 58.

Nigerian Metrological Agency (NMA) (2008). Annual Report. Office Memo File.

National Population Commission (NPC) (2006). Population Census Data Borno State, Nigeria Federal Republic of Nigeria Official Gazette, National and State Provisional Totals Census. Printed and Published in 2007 by the Federal Government Printer, Lagos, Nigeria. 94 (21): 175 – 198.

Intizar Hussain (2004). Pro-poor intervention strategies in irrigated agriculture in Asia: poverty in irrigated agriculture: issues and options: Vietnam. E-mail: i.hussain@cgiar.org Website: http://www.iwmi.org/propoor. Retrieved 6th January,2023

Tikon, F. U., Egbeadumah, M. O. and Hassan, C. K. (2021). Economics of Millet Production in Wukari Local Government Area, Taraba State, Nigeria. *Nigerian Agricultural Journal L* .52 (3):374-380

The Nation Newspaper (2021). The bid to revolutionise millet and bring it back to the plate is being driven by enhanced seeds all over the world, DANIEL ESSIET reports. Visited on 03/01/2023.

Umar, M., Zainalabidin, M., Mad, N. S. and Juwaidah, S. (2018). Impact of Inputs Costs on Farm Profitability: An Evaluation of Pearl Millet Production in Northwestern Nigeria. *Journal of Asian Scientific Research, 7(12): 471-482.*