

Rural Women Participation in Nutrition and Agri-Entrepreneurial Development: Empirical Evidence from Yobe State, Nigeria

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ABSTRACT

The study was designed to investigate rural women's involvement in food and agriculture businesses in Yobe State, Nigeria. Specifically, the research identified key agricultural interventions involving women, the viability of agribusiness, and constraints faced by rural women in the study area. Descriptive statistics, household and financial analysis, and principal component analysis (PCA) were used for data analysis. The study found that the Fadama Development Programme was the most frequently reported (29%) and most effective intervention. Agribusinesses run by women were not only viable but also profitable. It recorded an average gross margin ratio (GMR) and return on investment (ROI) of 0.67 and 1.40, respectively. However, the achievements have met critical challenges such as a lack of women's inclusion, security threats in the region, cultural barriers, and a lack of awareness. To this end, the study recommends maintaining women's inclusion from program and intervention design to implementation. In addition, the security architecture of the region should be improved through local whistleblowers and cooperation. Finally, counselors should train and build the capacity of the local community, especially the women's group.

Keywords: Women, Nutrition, Agri-entrepreneu, Development, Nigeria.

INTRODUCTION

Improvement in agriculture is critical and necessary for the development of human nutrition. Good nutrition is not only a determinant for physical and mental development for individuals, but also has a major implication for the health and human capital productivity of the entire country. It is to this end that policy makers and the international community has identified the role of agriculture in improving human nutrition and health. Good nutrition starts in the household and has a spill-over effect on the community, as malnutrition created a negative effect at the various stages of human development. Malnutrition during pregnancy and the first two years of childhood can lead to a permanent deformation in the physical structure, cognitive capacity, immune system and mental capacity of the child (Houston and Huguley, 2014). According to Haruna (2022), insurgency over the years has displaced about 2.2 million people mostly women in the Northeastern, Nigeria. This development has exacerbated the problem of food insecurity, limits farmers' income; increase prices of foods and may hinder utilization of nutritious food. Therefore, the role of women in nutritional development prior to pregnancy, during pregnancy, breast feeding and parenting cannot be over emphasized. Hence, women are important factor in the human capital development of their children and the entire country.

Over the years' women around the world have identified the opportunities offered by integrated agriculture system in enhancing the development of human nutrition and health. Thus, African women who were traditionally regarded as home makers to oversee the activities at home and coordinate the affairs have extended their activities to customary agriculture in a bit to improve the nutritional output of their children. In sub-Saharan Africa women are at the pivot and backbone of the agricultural sector (Assan, 2021). Women in agriculture accounted for 60% of agricultural production, 70% of agricultural labour, and 80% of food production (Subathra, 2020). The roles of women, the major player in sub-Saharan African agriculture have not been recognized. The lack of appropriate policy recommendations and program strategies made the contributions of women to agriculture imperceptible.

Women play a very significant role in agriculture production in Nigeria ranging from food production, food processing, transportation and distribution, threshing, milling, marketing and livestock management (Ejikeet *al.*, 2018). Women in the North Eastern Region of Nigeria are saddled with the task of agriculture production that are meant to be undertaken by the male counterparts, but the accrued benefits gained from the activity is not commensurate to the amount of time spent in the agricultural activities. Poor agricultural production has affected the household consumption and nutritional development in children. This can be attributed to poor policies formulation and implementation towards (1) inadequate improvement in women's human capital and empowerment (2) capital or loan acquisition for financing Agriculture Extension (3) training of Women participating in agriculture on the use of modern techniques for integrated system of Agriculture by Extension Agents (4) lack of fertilizers and farm input for crop and livestock production. Despite the fact that women contribute significantly to food production in the North Eastern Region of Nigeria, the majority of them are still food insecure, being small – scale farmers

whose farm sizes fall below the threshold level for adequate commercial food production (Akpan, 2015). Those affected are usually pregnant and lactating women whose protein and energy intake falls below the recommended daily allowance (RDA) or recommended nutrient intake (RNI) (Rothet *al.*,2018). Existing studies have proven that the involvement of women in agriculture in both urban and rural centres of Nigeria will improve agriculture output and food security in the country (Ogunniyet *al.*, 2021; Adebisi and Monisola, 2012). The authors recommended that urban agriculture should be given official recognition by advocating for its support while women should be provided with financial resources by the private and public Sector to expand their farm plots. According to Agarwal (2018) women's participation in food production for enhancing nutrition outcome are determined by certain key factors which include: income, food security and accessibility to Credit, agriculture extension services, among others.

Unfavorable policies towards women empowerment by policy makers have discourage and decrease the level of women participation in agriculture production. Policies Makers have failed to the unpleasant and deploring condition under which women in the country contribute to agricultural production. This can be attributed to the perception of female policy makers that assume that women to play the role of a second fiddle in the economy (Inmpeyet *al.*, 2019). Most policy created did not incorporate the contribution of women to food production that will enhance nutritional development in the North Eastern Nigeria and the entire country. There is a great need for policy makers to correct this abnormality, as a great segment of women in the rural population rely majorly on the consumption of their agricultural product. Inadequate information on the level of women participation in agriculture for enhancing human nutrition and health has not only underestimated their productive capacity but caused a reduction in nutrition output causing malnutrition and other related disease. An investigation into the available policies created for empower women in agriculture extension for enhancing human nutrition and health in the North Eastern Region of Nigeria is therefore necessary. Information gotten will assist policy makers in policy formulation that can strengthen women's participation in integrated farming system to enhance nutritional output in North East Communities and the entire country.

The Problem of this Study stems out of the fact that there exists a gap between supported government agricultural interventions on women empowerment in agricultural development and its actualization in Nigeria. The lack of political will by the government of Nigeria, the prevailing cultural believe, land tenure system, un-actualized awareness programmes on agriculture extension has discourage women from participating in agriculture to enhance nutritional output. Agriculture is the main occupation in most of the communities in the study area, about 70% of the entire female populations are predominantly subsistent farmers, cultivating millet, guinea corm and livestock management and Fish farming are great source of commercial farming. Related to animal production and in line with the nutritional contribution of women farmers is the area of fish production. Women participation in agriculture for enhancing food security has decrease over the years due to the rising state of insecurity in the North East region of the country. In recent times, the issues of conflict and instability in the northern region particularly North East has become a major course of the decrease in food production, increase prices, and poor nutrition in the entire country. This issue seemed to dominate the focus of the Nigerian Government, International and National or indigenous development organizations.

The research was underscored by the fact that there are little or no research work that has been able to link women empowerment, nutrition and health to agriculture particularly in Yobe State. Two-third of the human labourers are working in agricultural sector and they operate on small scale, subsistence rural farmers using crude implements such as hand hoes, and most importantly the female farmers are the poorest among them(Adeyemi *et al.*, 2019). Hence, the research is undertaken to bridge the knowledge gap and add to the existing literature on the subject.The main objective of this study was to examine the role of women in nutrition and agricultural development in Yobe State, Nigeria. The specific objectives are to.

1. Identify and examine government agricultural interventions that encourage women's involvement in agricultural development and Nutrition output in Yobe State.
2. Analyze the costs and returns of women's agri-entrepreneurial activities in the study area.
3. To identify the major constraints faced by women participating in Agriculture in Yobe State.

MATERIAL AND METHODS

Yobe State is geographically located on latitude 11°42'50N and longitude 11°4'52E in North Eastern part of Nigeria. It is mainly an agrarian State. It was created on August 27th, 1991. The State was carved out from the present day Borno State. The State shared boundaries with Bauchi State to the West, Gombe to the South and Borno to the East. The State comprises of seventeen local government areas (LGA's) and geographically divided into three part namely; Eastern, southern and Northern. The Eastern part is made up of four local government areas including the State capital, four LGA's from southern part of the State and nine LGA's from Northern part of the State. The research was conducted in the Northern part of the State because it comprises of more LGA's and relatively peaceful compared to other parts of the State. To this end, it was therefore considered to serve as a better representation of the State. The Northern parts of Yobe State lies on the longitude 12°87'N and along river Yobe. The area is within the dry savannah belt and is therefore mostly hot and dry for most part of the year. The main occupation of the people was farming cultivating crops such as millet, sorghum, wheat and rice. They are also involved in domestication of animals such as goats, sheep, and cattle. Other engaged in fishing, trading while few numbers of the populace were civil

servants. Majority of the population were illiterate and semi illiterate and speak different languages such as Kanuri, Fulani, Ngzim, Bole and Kare-Kare.

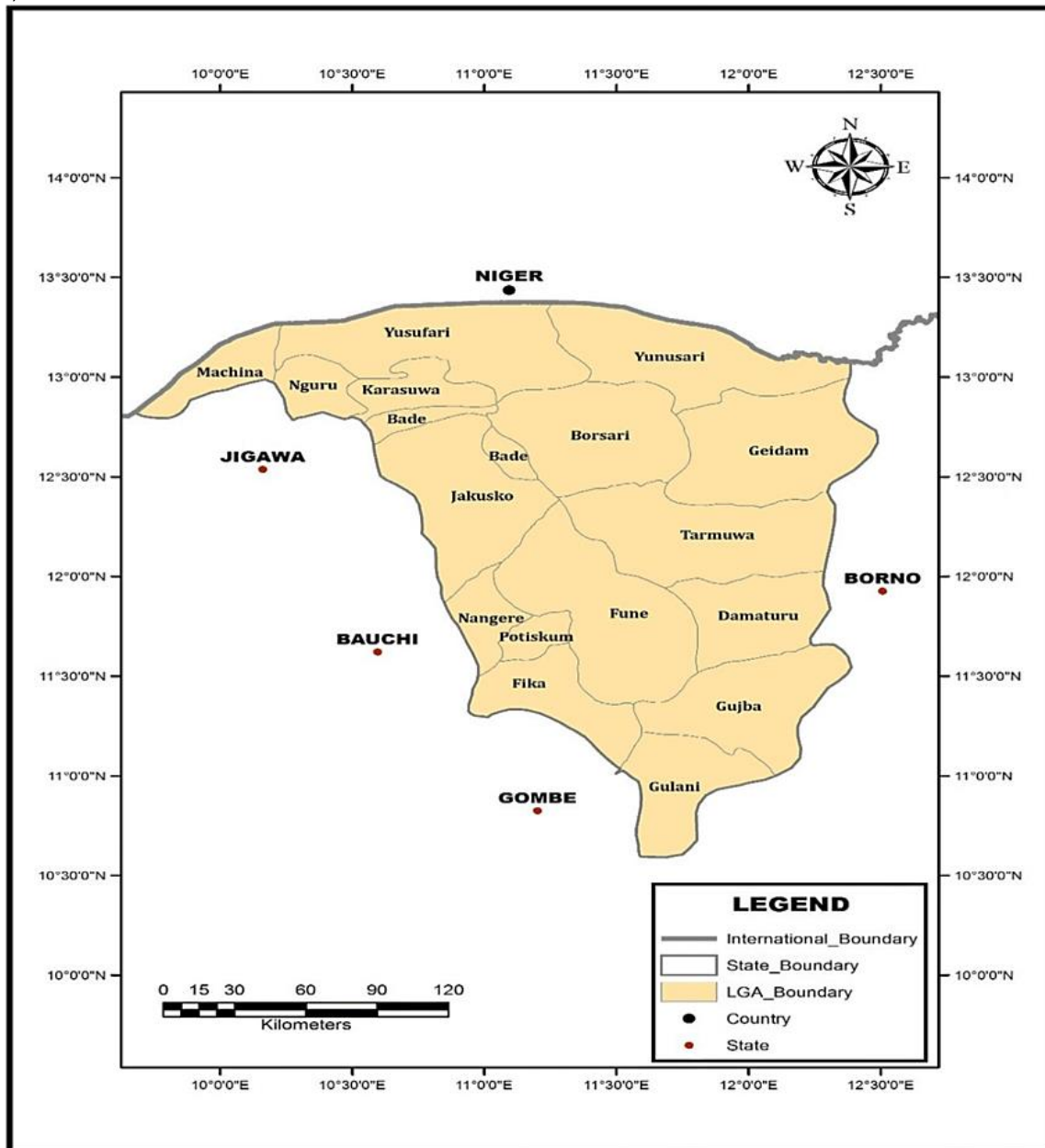


Fig. 1. Map of Yobe State showing the Local Government Areas of the State Source: www.researchgate.net

Sample size and sampling techniques

Multistage random sampling technique was employed in the study. Firstly, four (4) Local Government Areas (LGA’s) namely Nguru, Karasuwa, Gulani and Geidam were selected using random sampling technique. In the second stage, four (4) wards were randomly selected from each of the Local Government Area with the aid of raffle draw ballot box method of random sampling. In the third stage, two (2) villages were randomly selected from each of the sixteen (16) wards making a total of thirty-two (32) villages. The fourth and final stage involved proportionate determination of the sample size from equation (1) using the sampling frame as stated in Table 1. Hence, the respondents were drawn from a total of thirty-two villages. The estimated sample size is given thus;

$$n = \frac{N}{1 + N(e^2)} = 351 \dots \dots \dots (1)$$

Where,

- n = Sample Size (Units)
- N= Sample Frame/Population size (Units)

e = Level of Precision (5%)

Table 1: Sampling Matrix and Sample Size of Women in Agriculture in the Study Areas

S/N	Local Government Areas	Wards	Villages	Number of Farmers	Proportion	Sample Size		
1	Nguru	Bulabulin	Bulangua	81	0.028	9.865		
			Bulanguaram	99	0.034	12.057		
		Hausari	Jigamari	95	0.033	11.570		
			Kakori	91	0.032	11.083		
		Dogana	Dogon-Kuka	83	0.029	10.109		
			Dumasai	88	0.031	10.718		
		Kanuri	Karanbari	95	0.033	11.570		
			Kisogana	92	0.032	11.205		
		2	Karasuwa	Bukarti	Fajiganari	91	0.032	11.083
					GarinGawo	98	0.034	11.935
JajiMaji	Waro			95	0.033	11.570		
	Yajiri			83	0.029	10.109		
Wachakal	Kafetuwa			81	0.028	9.865		
	Dalari			97	0.034	11.814		
GarinJarma	Zango			86	0.030	10.474		
	Tabawa			97	0.034	11.814		
3	Gulani			Bara	Borno-Kiji	85	0.029	10.352
					Bularaba	88	0.031	10.718
		Bumsa	Burasari	92	0.032	11.205		
			Chandam	91	0.032	11.083		
		Gabai	Gagure	90	0.031	10.961		
			Gagari	91	0.032	11.083		
		GarinTuwo	Kukuwa	82	0.028	9.987		
			Kushimaga	98	0.034	11.935		
		4	Geidam	Abachari	Ashekli	93	0.032	11.327
					Badi	84	0.029	10.230
Gumsa	Gosora			95	0.033	11.570		
	Gallaba			91	0.032	11.083		
Kawuri	Karamti			88	0.031	10.718		
	Keleri			92	0.032	11.205		
Maannam	Magario			88	0.031	10.718		
	Maidari			82	0.028	9.987		
Total	4			16	32	2,882	1	351

Method of data Collection and analysis

Primary data was used for the study. Data were collected with the aid of well-structured questionnaires. This was complimented with focus group discussion (FGD's). Descriptive statistics such as averages, simple percentages, and frequency, budgetary (gross margin) analysis, financial analysis as well as Principal Component analysis complimented with four-pointlikert scale were used in the study. Gross margin model is expressed following Onogwuet *al.*, (2018) as: -

$$GM = TR - TVC \dots \dots \dots (2)$$

Where,

GM = Gross Margin (₦),

TR = Total Revenue (₦), and

TVC = Total Variable Cost (₦)

But,

$$TR = P.Q \dots \dots \dots (3)$$

Where: - P = Price of I product in Naira per Kilogram, Q = Output of I product in Kilogram.

This was used to analyse the costs and returns of agribusiness as stated in specific objective two (ii).

The following financial ratios were also used determine the profitability of agri-entrepreneur by women in the study area:

Gross Margin Ratio (GMR) following Ben-Chendoet *al.*, (2015) is stated thus;

$$Gross\ Margin\ Ratio = \frac{Gross\ Margin}{Total\ Revenue} \dots \dots \dots (4)$$

Benefit – Cost ratio (BCR) following Adeniyi *et al.*, (2015) is stated thus;

$$Benefit - Cost\ Ratio\ (BCR) = \frac{Total\ Revenue}{Total\ Cost} \dots \dots \dots (5)$$

Return on Investment (ROI) following Adeniyi *et al.*,(2015) is stated thus;

$$\text{Return on Investment (ROI)} = \frac{\text{Net Farm Income}}{\text{Total Cost}} \dots \dots \dots (6)$$

The method of principal component analysis (PCA) is stated thus:

$$r = r_1, r_2, r_3, \dots, r_p \dots \dots \dots (7)$$

$$\partial_k = \partial_{1k1}, \partial_{2k}, \partial_{3k}, \dots, \alpha pk \dots \dots \dots (8)$$

$$\partial_k^T r = \sum_{j=1}^p \partial_{Kjrj} \dots \dots \dots (9)$$

$$\partial_k^T \text{Var} = [\partial_k^T R] \text{ is Maximum} \dots \dots \dots (10)$$

Subject to
 $\partial_k = 1 \dots \dots \dots (11)$

and $\text{Cov} = [\partial_1^T \partial - \partial_2^T \partial] = 0 \dots \dots \dots (12)$

The Variance of each of the Principal Component are:
 $\text{Var}[\partial_k R] = \lambda_k \dots \dots \dots (13)$

$$S = \frac{1}{n-1} (R - \bar{R})(R - \bar{R})^T \dots \dots \dots (14)$$

$$S_i = \frac{1}{n-1} \sum_{i=1}^n (R_i - \bar{R}_i)(R_i - \bar{R}_i) \dots \dots \dots (15)$$

Where,
 R = Vector of 'P' Random Variables,
 ∂_k = Vector of 'P' Constraints,
 λ_k = Eigen Value,
 T = Transpose, and
 S = Sample Covariance Matrix.

RESULTS

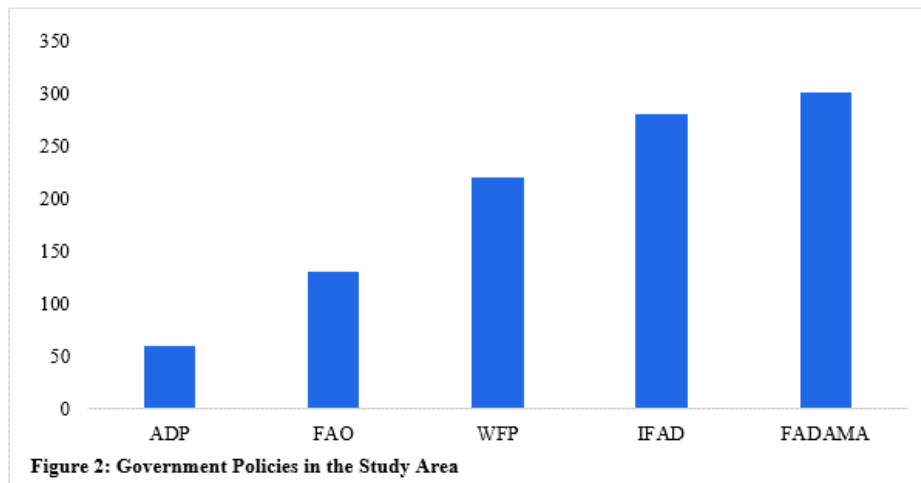
Agricultural programmes and interventions in the study area are presented in Table 2 and Figure 2 respectively. From the results FADAMA and IFAD were the major intervention programmes female farmers benefited from. About 29% and 27% of the women benefited from FADAMA and IFAD program respectively.

Table 2: Identified Agricultural Interventions in the Study Area

Government Programmes/Interventions	Frequency	Percentage
ADP	60	6
FAO	130	13
WFP	220	21
IFAD	280	27
FADAMA	300	29
Multiple Responses allowed	1040	100

Source: Field Survey (2021)

Source: Field Survey (2021) * Note: The full meaning of the acronyms used are ADP – Agricultural Development Programme



FADAMA- Farming on swampy area. FAO – Food and Agriculture Organization. IFAD- International Fund for Agricultural Development. WFP- Women Food Programme.

This analysis was incorporated to achieve objective (ii) of the research study, which was to examine the costs, and returns of average women in the study area. The cost and return on investment analysis of average woman that engaged in agribusiness ventures was presented in Table 3. The result revealed that the bulk of the total cost were on fertilizer and land (least/rent) representing 36.34% and 15.15% respectively. Furthermore, an average woman in agricultural enterprises incurred a total cost (TC) of ₦79, 534.09, and a net farm income of ₦111, 567.54. The gross margin ratio was 67%. The benefit-cost ratio (BCR) and return on investment (ROI) of agri-entrepreneurship engaged by women in the study area were 2.40 and 1.40 respectively.

Table 3: Average costs and return analysis of women agri-enterprises/ha in the Study Area

Items	Costs	% of Total Cost
Variable Costs (A)		
Cost of Inputs		
Seed Cost	5,738.91	
Fertilizer Cost	28,904.10	36.34
Agro chemical cost	8,760.50	
Feed Cost	5,138.66	
Vaccination cost	4,922.85	
Harvesting Cost	3,964.49	
Threshing/Bagging Cost	4,895.33	
Storage Cost	643.33	
Transport Cost	515.50	
Total Variable Cost (A)	63,483.67	
Fixed Costs (B)		
Rent/Lease on Land	12045.69	15.15
Depreciation		
Plough	577.38	
Water Pump	100.00	
Sprayers	920.60	
Hoe	505.50	
Cutlass	600.50	
Buildings/Stores	1,300.75	
Total Depreciation Cost	4,004.73	
Total Fixed Cost (B)	16,050.42	
Total Cost (C=A+B)	79,534.09	
Total produce Consumed	45,042.91	
Total produce Sold*	146,058.72	
Total Revenue (D)	191,101.63	
Gross Margin (D-A)	127,617.96	
Net Farm Income (D-C)	111,567.54	
GMR	0.67	
BCR	2.40	
ROI	1.40	
OR	0.33	

Source: Field Survey (2021)

Note: * Aggregate value of crop produce and livestock sold.

From the results presented on Table 4, the number of principal components retained using the Kaiser criterion, is four(4) that is, where the Eigen Values are 1 and above. At this component, 63.95% of the variations in the constraints have been explained by the components captured in the model. The Kaiser-Meyer-Olkin measures of sampling adequacy (KMO) of 0.627 and Bartlett test of sphericity of 753.335 was significant at 1% level of probability and demonstrated the feasibility of employing the data set for factor analysis (see data set as appendix I). The results revealed lack of inclusiveness was ranked 1st in the order of importance based on the perceptions of the women in agriculture with 18.30% proportion. Security threats and cultural and religious barriers were ranked 2nd and 3rd with 16.00% and 15.00% respectively in the order of importance based on the perceptions of the women farmer in the study area. The last identified constraints based on the PCA result was lack of awareness with 14.50% based on the insights of the respondents.

Table 4: Principal Component Analysis of Constraints Faced by Women in Agriculture in the Study Area

Component	Eigenvalue	Difference	Proportion	Cumulative
Lack of women inclusiveness	1.283	0.160	0.183	0.183
Security threats	1.122	0.070	0.160	0.344
Cultural and religious barriers	1.052	0.035	0.150	0.494
Lack of Awareness	1.017	0.105	0.145	0.639
Inadequate Capital	0.912	0.064	0.130	0.769
Poor infrastructural facilities	0.849	0.084	0.121	0.891
Poor extension services	0.765	.	0.109	1.000

Bartlett Test of Sphericity
Chi-Square = 753.335 ***
Rho = 1.0000
KMO = 0.6270

Source: Computed Field Data (2021)

DISCUSSION

The agricultural interventions in the study area provide wide range of benefits for the participants. Some of the benefits include training and capacity building on modern and climate resilience agricultural practices, provision of inputs such as seeds, fertilizer, and herbicides at subsidize prices, provision of soft capital and grants, information sharing and linkages from extension agent officers and subject matter specialists, among others. These are similar to the gains recorded in food security programme in Bangladesh (Sranoniet *al.*, 2014). Over 50% of the costs were spent on fertilizer and land acquisition (least/rent). This implies that production inputs such as fertilizer and land can constitute major setback for women in agriculture where accessibility, availability and affordability are critical for survival for going concern of the entrepreneur. Women today lack input, credit, market information, and less access to land for production and other economic activities (Ingutia and Sumelius, 2022).

The gross margin ratio (GMR) was positive and encouraging. GMR of 67% implies that for every one Naira invested in agribusiness ventures 67 Kobo covered profits, interests, taxes, and depreciation. This shows that agri-entrepreneurship is a lucrative enterprise in the study area. It was observed that active female participation in agribusinesses across African countries was generally profitable (Alabi *et al.*, 2019; Mkpado and Mkpado, 2020). The BCR and ROI imply that agri-entrepreneurship business outlook is worthwhile and profitable. The result is in line with the findings of Larson *et al.*, (2021) that asserted that the profits were mostly used to send their children to school while others used it to expand their business portfolio. Furthermore, the major challenges faced by women in the area revealed that lack of inclusiveness, insecurity of lives and properties as well as cultural/religious taboos constitute major hindrances to food security. Chiriacòet *al.*, (2022) reported that rural women investment on food security and gender equality override the interests of rural working men. Similarly, the result is in line with the finding of Aluko (2018) where inclusiveness of women plays significant role in curbing security and enhancing sustainable development.

CONCLUSION

Women participated in agricultural enterprises particularly those interventions by government and multinational agencies in the study area. Based on the research findings, women have contributed immensely to agricultural development during land preparation, cultivation, production, and processing. They also participated sales and marketing of produce in the local markets and more importantly in food preparation at home as well as during ceremonies. The research highlighted that the major constraints that debar the numerous contributions of women were lack of inclusiveness, security threats, cultural and religious barriers and lack of awareness about agricultural programmes and interventions. Based on the findings of the research study, the following recommendations were made

- (i) Agricultural programmes should be implemented with reasonable and acceptable number of women involvement and participation as stated in international conventions and treaty.
- (ii) Security apparatus should collaborate with local inhabitants to curtail threats to the barest minimum.
- (iii) Agricultural extension agents should intensify efforts towards re-orientation of the local community leaders through capacity building and skill acquisition aimed at addressing socio-cultural and religious barriers that prevent women from public participations in programmes.
- (iv) Access to information on agricultural development should be made available to women in agriculture.

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development of the manuscript while Usman, Ibrahim monitored data collection, entering and coding as well as proof reading of the manuscript.

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**APPENDIX I
RESULTS**

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----- (R)
/  /  /  /  /
/  /  /  /  / 14.1 Copyright 1985-2015 StataCorp LP
Statistics/Data Analysis StataCorp
4905 Lakeway Drive
Special Edition College Station, Texas 77845 USA
800-STATA-PC http://www.stata.com
979-696-4600 stata@stata.com
979-696-4601 (fax)
    
```

Single-user Stata perpetual license:
 Serial number: 10699393
 Licensed to: Mengkimtong
 CSUK family

Notes:

1. Unicode is supported; see help unicode_advice.
2. Maximum number of variables is set to 5000; see help set_maxvar.

running c:\ado\personal\profile.do ...

Average interitem covariance: .0397513
 Number of items in the scale: 7
 Scale reliability coefficient: 0.6077

Determinant of the correlation matrix

Det = 0.076

Bartlett test of sphericity

Chi-square = 753.335

Degrees of freedom = 36

p-value = 0.000

H0: variables are not intercorrelated

Kaiser-Meyer-Olkin Measure of Sampling Adequacy

KMO = 0.6270

Principal components/correlation Number of obs = 351

Number of comp. = 7

Trace = 7

Rotation: (unrotated = principal) Rho = 1.0000

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	1.283	0.160	0.183	0.183
Comp2	1.122	0.070	0.160	0.344
Comp3	1.052	0.035	0.150	0.494
Comp4	1.0170.105	0.145	0.639	
Comp5	0.912	0.0640.130	0.769	
Comp6	0.849	0.084	0.121	0.891
Comp7	0.765	0.109	1.000	

Principal components (eigenvectors)

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6	Comp7	Unexplained
ii	-0.2033	0.4707	0.2791	-0.3918	0.0769	-0.2882	0.4202	0
iii	-0.1110	0.5411	-0.1152	0.0912	0.2419	-0.4772	-0.4420	0
iv	0.2989	0.2831	0.4485	-0.4255	0.1180	0.5556	-0.3093	0
v	0.4728	0.2570	-0.1514	0.1093	-0.0331	0.0553	0.6605	0
vi	0.2480	0.0227	0.6082	0.3910	-0.5529	-0.2695	-0.1201	0
vii	0.2466	0.4038	-0.1987	0.5525	0.2150	0.3016	-0.1127	0
viii	-0.4683	0.2857	0.1914	0.2603	-0.1348	0.2006	0.1932	0