



**FACTORS INFLUENCING FARMERS PARTICIPATION IN
SORGHUM (*SORGHUM bicolor L.*) PRODUCTION IN
CENTRAL AGRICULTURAL ZONE OF BAUCHI STATE, NIGERIA**

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ABSTRACT

The study examined factors influencing farmers' participation in sorghum production in central zone of Bauchi State, Nigeria. A multi-stage sampling technique was used in selecting 160 respondents. Data were collected through the administration of structured questionnaires and descriptive and inferential statistics. The result revealed that 90%, 76.9% and 51.9% of the respondents were male, married and were within their active ages of production, respectively. Majority (91.9% and 87.5%) of the respondents were full time and subsistence sorghum farmers with the majority (64.4%) of the respondents had farming experience of 2-7 years. Majority (75.6% and 68.8%) of the respondents belonged to farmers association with annual income of 12,000-49,600 respectively. The result further revealed that factors such as marital status, educational level, farm size, extension contacts/visits, land acquisition and membership of association were significantly influencing farmers participation in sorghum production in the study area at ($P < 0.01$), ($P < 0.05$) and ($P < 0.10$), respectively. Inadequate land (95.6%), high cost of herbicides (94.4%) and insecticides (93.8%) were the major constraints faced by the respondents and were ranked 1st, 2nd and 3rd respectively. The study concluded that, marital status, level of education, farm size, extension contact, land acquisition and membership of association were the factors influencing farmers participation in sorghum production. It was recommended that Government and other stakeholders should provide farmers with adequate and affordable inputs before the onset of raining season, government should recruit more extension agents to facilitate farmers' participation in sorghum production and also, government should provide adequate improved seeds at subsidized rates to sorghum famers.

Keywords: Participation, Sorghum and Production

INTRODUCTION

Agriculture is an important sector in the economic development and poverty alleviation drive of many countries. The role agriculture has played in the industrial growth and development of most of the industrialized countries in the world cannot be over emphasized. The importance of this sector is more pronounced in the developing countries including Nigeria where it is the main thrust of national survival, employment and food (Muhammad-Lawal *et al.*, 2009). Sorghum is a cereal crop grown in various agro-ecological zones, as a single crop or in mixed cropping. It is the fourth most important cereal in the world, next to maize, rice and wheat and with highest production potential among the cereals (De Cock *et al.*, 2013).

Sorghum is a strong grass and usually grows to a height of 0.6 to 2.4 metres (2 to 8 feet), sometimes reaching as high as 4.6 metres (15 feet). Stalks and leaves are coated with a white wax, and the pith, or central portion, of the stalks of certain varieties is juicy and sweet.



The leaves are about 5 cm (2 inches) broad and 76 cm (2.5 feet) long. The tiny flowers are produced in panicles that range from loose to dense; each flower cluster bears 800–3,000 kernels. The seeds vary widely among different types in colour, shape, and size, but they are smaller than those of wheat (Melissa, 2019). Sorghum is of a lower feed quality than corn (maize). It is high in carbohydrates, with 10% protein and 3.4% fat, and contains calcium and small amounts of iron, vitamin B, and niacin. For human consumption, the gluten-free grain is usually ground into a meal that is made into porridge, flat breads, and cakes. The characteristic strong flavour can be reduced by processing. The grain is also used in making edible oil, starch, dextrose (a sugar), paste, and alcoholic beverages. The stalks are used as fodder and building materials. Sweet sorghums, or sorgos, are grown mainly in the United States and southern Africa for forage and for syrup manufacture and are sometimes used in the production of ethylalcohol for bio-fuel (Melissa, 2019).

The latest figures from FAO report that over 214 million people in Sub-Saharan Africa (SSA) suffer from chronic hunger (FAO, IFAD and WFP, 2014). The share of people living on less than \$1.25 a day in this region started to decrease only from 2008, though it still remains the highest in the world (48.2% in 2010) (World Bank, 2010). Without participation, there are obviously no partnerships, no developments, and no program (Aref *et al.*, 2010). Approximately 1.5 billion people are engaged in smallholder agriculture across the world. They include 75% of the world's poorest people, whose food, income and livelihood prospects depend on agriculture (Andrea, 2014). Peasantry is the dominant mode of agricultural production and livelihood in Nigeria with over 70 % of the population engaged in agricultural activities as a career and largely feeding the nation (Atala and Hassan, 2012).

It is now recognized that for Africa to jump start the wheel of economic development, there is need to invest in agriculture which is the major economic activity. This would earn funds that can be invested in other economic activities for increased economic development. Agriculture has been an effective tool for growth and poverty reduction in several countries, but has failed to do so in other countries, due to policy neglect and inappropriate investment by governments and donors towards agriculture. In Nigeria, the agricultural sector is plagued with problems which include soil infertility, infrastructural inadequacy, risk and uncertainty and seasonality among others. Thus, rural populaces are forced to develop strategies to cope with increasing vulnerability associated with agricultural production through diversification, intensification and migration or moving out of farming. In other words, the situation in the rural areas has negative welfare implications and predisposes the rural populace to various risks which threaten their livelihoods and their existence. As a result of this, they struggle to survive and in order to improve their welfare, off-farm and on-farm activities have become an important component of livelihood strategies among rural populace in Nigeria. Hence the need to conduct a study on factors influencing farmers' participation in sorghum production in central agricultural zone of Bauchi State. Therefore this study was conducted to identify socio-economic characteristics of the respondents, determine the factors influencing respondents' participation in sorghum production and describe the constraints faced by the respondents in sorghum production.

METHODOLOGY

The Study Area

The study was conducted in central zone of Bauchi State, Nigeria. Bauchi State occupies a total land area of 49,119 km² representing about 5.3% of Nigeria's total land mass and is located between Latitudes 9° 3' and 12° 3' North and Longitudes 8° 50' and 110 East of Greenwich Meridian (BSADP, 2015). The State consists of 20 Local Government Areas



(LGAs) with three (3) agricultural zones and an estimated population of about 9,000,000.0 (Estimated, 2022; BSADP, 2015). The State is bordered by seven States, Kano and Jigawa to the North, Taraba and Plateau to the South, Gombe and Yobe to the East and Kaduna to the West (BSADP, 2015). Bauchi State is one of the States in the North-Eastern part of Nigeria that span two distinctive vegetation zones, namely, the Sudan savannah and the Sahel savannah. The rainfall in Bauchi State ranges between 1,300 millimeters per annum in the south and only 700 millimeters per annum in the extreme north and the temperature ranges from 9.11⁰C to 40.55⁰C (BSADP, 2015).

In addition, the Gongola River crosses Bauchi state in Tafawa Balewa LGA in the south and in Kirfi and Alkaleri LGA in the eastern part of the state, while the Jama'are River cuts across a number of Local Government Areas in the northern part of the state. Moreover, a substantial part of the Hadeja-Jama'are River basin lies in Bauchi state, which along with various *fadama* (floodplain) areas in the state provides suitable land for Agricultural activities. These are further supported by the number of Dams meant for irrigation and other purposes. These include Gubi Dam among others. There are also lakes such as the Maladumba Lake in Misau LGA that further provide the necessary conditions to support agriculture (Gaur, 2015).

Sampling Procedure

A multi-stage sampling technique was used in selecting the respondents for the study. In the first stage, Central Agricultural Zone was purposively selected out of the three (3) agricultural zones. This is based on the potentials of the area for sorghum production, in the second stage, four LGAs were randomly selected for the study. In the third stage, two (2) districts were purposively sampled from each LGA giving a total of eight (8) districts. Purposive sampling used was based on intensity in sorghum production in the study area. In the fourth stage, two (2) communities were randomly selected from each of the selected district giving a total of 16 communities. In the final stage, 160 registered sorghum farmers were proportionately selected at 5% gave a total of 160 respondents as sample size.

Table 7: Sampling Size Determination Plan

Zone/LGA	District	Communities	Sample frame	Sample size 5%
Central zone				
Darazo	Darazo	Darazo	309	15
		Gafchiyari	200	10
	Sadai	Konkiyel	226	12
		Lago	210	11
		Ganjuwa	K/Madaki	Miya
Kariya	198			10
Soro	Soro		226	11
	Dabenkasa		243	12
	Ningi		Burra	magami
TudunJarkoya		126		6
Ningi		Dingis	149	7
		Siri	137	7
		Warji	Warji	Tudunwada
Dingala	188			9
Warji2	Rumba		203	10
	Baima		195	10
	Total			3,209

Source: BSADP (2022)



Method of Data Collection

Data were collected using a well-structured questionnaire which was administered to the respondents in the selected villages from the study area.

Method of Data Analysis

The data collected were analyzed using both descriptive and inferential statistics. Descriptive statistic was used to analyzed objectives i and iii. On the other hand, Logistic regression is the inferential statistics that was used to analyzed objective ii.

Model specification

The explicit form of the model is written as:

$$Z = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \varepsilon \quad \dots(1)$$

where;

Y = Participation in sorghum production (Participate=1, not participate =0);

X₁ = Age of the respondents (years);

X₂ = Labour usage in man days

X₃ = Household size (numbers);

X₄ = Marital status (single =1, otherwise =0)

X₅ = Years of experience in farming (years)

X₆ = Extension contact in number of visit

X₇ = Co-operative membership (member =1 otherwise = 0)

X₈ = Access to credit in Naira

X₉ = Income (₦);

X₁₀ = land size (hectares);

X₁₁ = Education level (1 = Primary, 2= Secondary, 3= Tertiary)

β₀ = Intercept terms;

β₁ – β₁₁ = Regression coefficients of X₁– X₁₀ respectively;

ε = Random disturbance term.

RESULTS AND DISCUSSION

Socioeconomic Characteristics of the Respondents

The result from Table 2 reveals that 38.8% of the respondents were within the age bracket of 29-36 years, while 23.1% of the respondents were within the age brackets of 37-44 years and 45-52 years respectively, the result further shows that 13.1% and 1.9% of the respondents were within the age brackets of 21-28 years and 53 years and above respectively in the study area, this implies that majority of the respondents were within their active ages of production in agriculture that is within their youthful age of 20-40 years. This is also in line with the findings of Chikezie *et al.* (2012) who reported that majority of the youths in Onu-Imo Local Government Area of Imo State were at their productive age where their energies could be harnessed and utilized for productive venture in agriculture especially cassava production. On the other hand, the result shows that most (90%) of the respondents were male, only 10% of the respondents were female. This implies that majority of the respondents were male which is not unconnected to the religious and cultural barriers hindering women from participating into tedious activities in the Northern part of Nigeria and Bauchi in particular. This finding disagrees with that of Nsoanya and Nenna (2011), who observed in their study that majority (85%) were females while only few (15%) were males in their study.

The result also revealed that majority (76.9%) of the respondents were married, while 21.9% of the respondents were single, only 1.3% of the respondents were found to be divorced. This implies that majority of the respondents had responsibilities of feeding their family members which is also an indication that family labour will be effectively use in the production



of sorghum in the study area. The result also indicates that majority (53.1%) of the respondents had attained secondary school level of education, while 43.1% and 3.8% of the respondents had attained primary and tertiary levels of education, respectively in the study area. This implies that most of the respondents had attained certain level of education and can read and write which is a very good indication that the respondents can adopt new technologies and innovations on sorghum production in the study area. This is in line with the findings of Asante *et al.*, (2014) who reported that educated farmers are also capable of searching and processing information and technologies relevant to their production challenges

The result also indicated that 46.3% and 21.9% of the respondents had a household size of 3-6 persons and 6-9 persons, respectively, while 15% and 14.4% of the respondents had a household size of 1-3 persons and 9-12 persons in the study area respectively, only 2.5% of the respondents had a household size of 12 and above persons, this implies that majority of the respondents had a relative number of persons to feed in their household and the same time have available cheap labour in carrying out sorghum production in the study area. This result is also in line with the findings of Akinola (2014) and onyeneke (2017) who posited that households utilize family labour as a coping strategy towards meeting high labour demand. Similarly, family labour helps the households to reduce the production cost incurred on hired labour. Therefore, household size was assumed to have a positive effect on adoption of sorghum production. The result further showed that 41.9% and 35.6% of the respondents were artisan and civil servants respectively, while 15% and 7.5% of the respondents were involved into trading and other occupations in the study area. This implies that the respondents had other sources of income and do not only depend on sorghum production in the study area.

The result in table 2 also shows that majority (64.4%) of the respondents had 2-7 years of experience while 32.5% of the respondents had 7-12 years in sorghum production, 1.3% and 0.6% of the respondents had 12-17 years and 22 years of experience in sorghum production respectively, this implies that majority of the respondents had long term experience in sorghum production which is an indication that such respondents will be willing to accept improvement in the production of sorghum in the study area.

The result further shows that majority (87.5%) of the respondents were subsistence producers, while 8.1% and 4.4% of the respondents were into commercial and both subsistence and commercial production of sorghum in the study area respectively. This implies that most of the respondents only produce sorghum for their family consumptions with only few producing for sale in the study area. The result also shows that most (91.9%) of the respondents were full time sorghum producers while 8.1% of the respondents were part time producers of sorghum in the study area. This implies that most of the respondents are primarily involved into production of sorghum only for long time in the study area which may not be unconnected to the fact that sorghum requires less attention over the stages of production. The result also reveals that 48.8%, 34.4% and 16.9% of the respondents had a farm size of 3 hectares, 2 hectares and 1 hectare of land in the study area respectively. This implies that most of the respondents are small scale farmers who use family labour to cultivate crops in the study area. The results corroborate with that of Ogeto *et al.*, (2013) where they reported that sorghum farmers had larger farm sizes averaging 0.72 hectares compared to 0.46 hectares for non-sorghum farmers. The result also indicates that majority (68.8%) of the respondents had annual income of ₦12,000 - ₦49,600, while 14.4% of the respondents had an annual income of ₦162,400 and above, only 7.5%, 5.6% and 3.8% of the respondents had an annual income of ₦124,800 - ₦162,400, ₦87,200 - ₦124,800 and ₦49,600 - ₦87,200 respectively. This implies that majority of the respondents are small scale farmers with relatively small annual income for sustainability of their families in the study area, it is also an indication that such respondent



will be willing to have an increase in their annual income by so they will be willing to adopt new technologies aim at improving their productivity.

The result further shows that majority (55%) of the respondents had no access to extension service/agents, while 16.3% and 15% of the respondents had access to extension service forth nightly and monthly, only 8.8% and 5% of the respondents had extension services yearly and weekly respectively. This implies that extension services were limited among sorghum producers in the study area which in turn affects their yield. The result also shows that majority (58.8%) of the respondents had acquired their land through inheritance, while 41.3% of the respondents acquired their land through purchase. This implies that land availability and access is limited to only few who can afford to purchase land or had inherited from parents in the study area. The result further reveals that majority (75.6%) of the respondents were members of one association or another, while 24.4% of the respondents were not members of any association in the study area.



Table 8: Distribution of Respondents According to their Socioeconomic Characteristics (n = 160)

Variables	Frequency	Percentage	Mean
Age (years)			
21-28	21	13.1	37
29-36	62	38.8	
37-44	37	23.1	
45-52	37	23.1	
53 and above	3	1.9	
Sex			
Male	144	90.0	
Female	16	10.0	
Marital status			
Single	35	21.9	
Married	123	76.9	
Divorced	2	1.3	
Educational level			
Primary	69	43.1	
Secondary	85	53.1	
Tertiary	6	3.8	
Household size			
1-3	24	15.0	5
3-6	74	46.3	
6-9	35	21.9	
9-12	23	14.4	
12 and above	4	2.5	
Secondary occupation			
Civil servant	57	35.6	
Trader	24	15.0	
Artisan	67	41.9	
Others	12	7.5	
Sorghum farming experience (years)			
2-7	103	64.4	6.9
7-12	52	32.5	
12-17	2	1.3	
17-22	2	1.3	
22 and above	1	.6	
Type of Production			
Subsistence	140	87.5	
Commercial	13	8.1	
Both	7	4.4	
Time devoted to farming			
Full time	147	91.9	
Part time	13	8.1	
Farm size (ha)			
1.00	27	16.9	2.3
2.00	55	34.4	



3.00	78	48.8	
Annual income (₦)			
12,000-49,600	110	68.8	
49,600-87,200	6	3.8	
87,200-124,800	9	5.6	66,520
124,800-162,400	12	7.5	
162,400 and Above	23	14.4	
Extension contacts/visits			
None	88	55.0	
Weekly	8	5.0	
Forth nightly	26	16.3	
Monthly	24	15.0	
Yearly	14	8.8	
Land acquisition			
Purchase	66	41.3	
Inheritance	94	58.8	
Membership of association			
Yes	121	75.6	
No	39	24.4	

Source: Field survey (2022)

Factors Influencing Participation in Sorghum Production

The result from Table 3 shows the socioeconomic factors influencing farmers participation in sorghum production. Age, sex, marital status, household size, secondary occupation, sorghum farming experience, type of farming practice, time devoted to farming and annual income were found not significant which implies that such factors have no influence on participation of respondents in sorghum production in the study area. Educational level and membership of association were found to be positive and significant ($P < 0.001$) influencing farmers participation in sorghum production that is the higher the level of education the more the participation into sorghum production and also the more the respondents become members of association the better their participation into sorghum production. This finding agrees with that of Wongnaa *et al.* (2018) and Khonje *et al.* (2015) who found a positive significant influence of education on adoption decision of sorghum production practices. Samuel *et al.* (2020) also posited that majority of the farmers were literate as portrayed by mean years of schooling of 9 and 10 for adopters and non-adopters respectively that was significant at 5% level. High literacy level implies the farmers are capable of adopting and applying improved production technologies which is likely to increase sorghum productivity in the area

On the other hand, farm size and land acquisition were also found to be negative and significant ($P < 0.001$) while extension contact was negative and significant ($P < 0.05$). This implies that farm size, extension contacts/visits and land acquisition have influence on respondents' participation in sorghum production in the study area, which implies that the larger the farm size the more the participation in sorghum production, also the more the extension contacts/visits the higher the participation in sorghum production and the easier the access to land the more the participation of respondents into sorghum production in the study area. The result implies that socioeconomic factors influence respondents' participation in sorghum production. This study is in tandem with Danso-abbeam *et al.*, 2017; Digal and Placencia 2020 and Ghimire *et al.*, 2015, they reported a positive effect of farm size on adoption of sorghum production in their studies. The result is also in line with that of Onyeneke (2017)

who reported that extension visit is positively influencing participation in sorghum production, therefore, farmers who have better access to extension services are more likely to adopt new or improved varieties to increase productivity.

Table 3: Socioeconomic Factors Influencing Respondents Participation in Sorghum Production

Model	Unstandardized Coefficients	Standardized Coefficients		T	Sig.
	B	Std. Error	Beta		
(Constant)	.872	.274		3.185	.002
Age	.001	.002	.045	.557	.578
Sex	.017	.069	.025	.251	.803
Marital status	-.066	.038	-.140	-1.722	.087*
Educational level	.246	.060	.675	4.123	.000***
Household size	-.007	.005	-.100	-1.249	.214
Secondary occupation	-.010	.016	-.048	-.612	.542
Sorghum farming experience	.002	.005	.025	.329	.743
Type of farming	-.022	.033	-.052	-.673	.502
Time devoted to farming	.010	.063	.014	.160	.873
Farm size	-.116	.040	-.421	-2.862	.005***
Annual income	-3.766E-007	.000	-.120	-1.201	.232
Extension contact/visits	-.050	.026	-.348	-1.932	.050**
Land acquisition	-.153	.052	-.369	-2.951	.004***
Membership of association	.392	.104	.823	3.783	.000***

Source: Field survey (2022)

***Significant at 1% ($P < 0.001$), **Significant at 5% ($P < 0.05$) and * Significant at 10% ($P < 0.10$)

Constraints Faced by the Respondents in Sorghum Production

The result from Table 4 revealed that inadequate land, high cost of herbicides and high cost of insecticides were the major constraints faced by the respondents and were ranked 1st, 2nd and 3rd respectively, while inadequate extension agents, inadequate improved seeds, poor soil fertility and drudgery in production were ranked 4th, 5th, 6th and 7th by the respondents in the study area. The result further shows that poor market price, high cost of seeds and labour were ranked 8th, 9th and 10th respectively in the study area. This implies that like any other production sorghum is not an exception it is faced by numerous constraints which could be reduced or minimize so that sorghum production will increase and living standard of sorghum farmers will also be improved. This result is in agreement with Abdullahi *et al.* (2015) on their research titled “Factors influencing small holder farmers participation in IFAD-Community based Agricultural and Rural Development Project in Katsina State”, the major constraint to participation in the project were inadequate capital 16.1%, inadequate agricultural credits 11.3%, inadequate storage facilities 15.7%, limited access to market information 15.5%, poor extension agent output 11.3%, inadequate agricultural insurance 10.7%, poor leadership 5.7%, lack of awareness 5.5% and socio-cultural barrier 3.5% as the factors affecting the effective participation in IFAD-CBARDP



Table 4: Constraints faced in Sorghum Production

Variables	Frequency	Percentage	Rank
Inadequate land	153	95.6	1 st
High cost of herbicides	152	94.4	2 nd
High cost of insecticides	150	93.8	3 rd
Inadequate extension agents	144	90.0	4 th
Inadequate improved seeds	141	88.1	5 th
Poor soil fertility	132	82.5	6 th
Drudgery in production	126	78.8	7 th
Poor market price	95	59.4	8 th
High cost of seeds	80	50.0	9 th
High cost of labour	46	28.8	10 th

Source: Field survey (2022)

*Multiple response recorded

CONCLUSION AND RECOMMENDATIONS

The study concluded that, marital status, education level, farm size, extension visit, land acquisition and membership of association of farmers were the factors influencing participating in sorghum production in the study area.

- Government and other stakeholders should provide adequate and affordable inputs for farmers before the onset of rainy season
- Government should recruit more extension agents to facilitate farmers participation in sorghum production
- Government should provide adequate improved seeds at subsidized rates to sorghum farmers
- Government and NGOs should provide a platform to enlighten other farmers and the masses on the nutritional value of sorghum in the study area

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