

Baseline Survey on Sorghum (*Sorghum bicolor* L.) Production in Southern Taraba State

Gani, M. and Avidime, J.O.

Department of Crop Production and Protection,
Federal University Wukari, Katsina-ala Road, Wukari, Taraba State, Nigeria, PMB 1020

*Corresponding Author's Email: musagani@fuwukari.edu.ng

D.O.I: 10.56201/ijaes.v9.no1.2023.pg31.38

Abstract

A baseline survey was carried out to assess sorghum production practices namely; years of production, cropping system, hectares cultivated, identification of important pests, diseases and weed species infesting the crop and other cultural practices measures used by the farmers during sorghum cultivation in Taraba state. The study aimed at gathering information on the production status of sorghum in the state. Questionnaires were administered to 12 farmers carefully selected in 5 wards from each of the 5 Local Government areas sampled. This gave a total of 300 farmers. The survey shows that most of the farmers cultivate less than 3 ha of sorghum usually intercropped with maize or millet and most recently with groundnut. Striga hermonthica was identified to be the most destructive weed and one of the major limiting factor to sorghum production in the study area. It was also observed that most of the farmers produced sorghum without application of fertilizer and pesticide generally. In conclusion, there is urgent need to sensitize farmers in this part of the country on the need for the use of proper pesticides to control pests and diseases in sorghum, application of organic and inorganic fertilizers alongside the incorporation of crop residues to improve soil fertility for higher yield of sorghum in this survey area. Also there is need to sensitize them on the practice of cereal-legumes intercrop for sustainable crop production, instead of the commonly practiced cereal-cereal intercrop system. Moreso research effort on finding solutions to the challenges of striga hermonthica in sorghum is strongly advocated in the state. This will encourage the farmers to cultivate more hectares of sorghum, to burst food security in the state.

Keywords: Baseline, Production, Sorghum, Survey and Taraba

1.0 INTRODUCTION

Taraba State is basically an agrarian state with over 80% of the population engaged in active farming. The state is endowed with great agricultural potentials, among are land mass, fertile soil and habitable climatic condition for arable cropping ranging from fertile soils to good climatic conditions. It has a total land mass of about 6 million hectares out of which about 4 million hectares are arable and only about 1.3 million hectares are put under crop cultivation annually. Crops that thrive well and are cultivated above subsistence level in the state include cereals (maize, sorghum, millet and rice), roots and tubers crops (yam, cassava and sweet potatoes), beverages (tea, coffee, cocoa and ginger), legumes (groundnut, soya-bean and cowpea), tree crops (mango, orange, oil palm, guava and cashew). Livestock also plays a vital role in the lives of the people. Sorghum is one of the major cereals cultivated in Taraba state after maize. It is valued worldwide for its grain, stalks and leaves. It is one of the most important cereal crops in the supply of food energy. It ranks fifth with only four other starchy crops namely, maize, rice, potatoes and wheat, consumed more than sorghum (FAO, 2015). Sorghum is the most popular staple food for people throughout the world especially in Asia and Africa where it is mostly grown at subsistence level. Sorghum is adapted to grow in hot, arid and semi-arid climatic conditions (Doggett, 1988). In impoverished countries, it is often grown with limited or no fertilization use. Due to its tolerance of a wide variety of climatic conditions, sorghum production is one of the principal contributors to food security of the rural populations. Sorghum is an important dietary component of people in Taraba state, where it is used for porridge-making, sorghum flour, bread-making, beer-brewing and traditional dishes. The main constituents of sorghum are starch, proteins, unsaturated lipids, minerals and vitamins (Schober *et al.*, 2005). Sorghum starch, proteins and unsaturated lipids are digested at a slower rate than in other cereals. This reduced digestibility positively impacts on gut micro-organisms and issues related to obesity, diabetes, oxidative stress and hypertension (Dykes and Rooney, 2006). Other uses include incorporation of sorghum stems and foliage into livestock feed and extraction of molasses. One of the major constraints in sorghum production in Taraba state is the challenge of *Striga hermontheca* which have decreased the overall production of the crop. Understanding the years of experience of farmer, amount of hectares cultivated, cropping systems as well as identifying the most challenging pests and diseases and weed species in sorghum could be important in improving sorghum production in Taraba state. Therefore, the study aimed at gathering information on the production status of sorghum in Taraba state that will guide future research on sorghum to boost food security in Taraba State.

2.0 MATERIALS AND METHODS

Taraba State is located at the north eastern part of Nigeria. It lies between latitude 6° 30' and 8° 30' north of the equator and between longitude 9° 00' and 12° 00' east of the Greenwich Meridian. The state shares boundaries with Bauchi and Gombe states in the north, Adamawa state in the east, and the Cameroon Republic in the south. The state is bounded along its western side by Plateau, Nassarawa and Benue states. The state has a land area of 60,291km². It is divided into sixteen Local Government Areas (LGAs) and three senatorial districts (Taraba north, central and south). Major cereals produced in the state include maize, rice, sorghum and millet. A total of three hundred farmers were interviewed individually in five wards in each five local government areas of the State in 2015. The LGAs and the wards are; Wukari LGA (Bantaji, Tsukundi, Jibu, Avyi, Rafinkada wards), Takum LGA (Manya, Dutse Gawhetun, Tikari, Chanchanji), Donga LGA (Gayama, Mararraba, Nyita, Kumbo, Asibiti), Ussa LGA (Jenuwagida, Lumbu, Kpakya, Tutuwa in Kwesati Lissam I, Lissam II) and Ibi

LGA (Rimiuku I, Nwonyo I, Sarkin kudu, Rimiuku II, Nwonyo II). To minimize biasness, the questions were interactive and open – ended. The survey was conducted with twelve individual farmers per ward.

2.1 Statistical Analysis

The data collected were computed based on percentages, where the five wards in each local government served as replicates.

3.0 RESULTS AND DISCUSSION

Table 1 highlights the years of farmers experienced in sorghum production. Among the farmers interviewed in the wards of Wukari LGA of Taraba state, 45% have been cultivating sorghum over 10 years ago, 29% between 7- 9 years, 22% between 4-6 years and 4% between 1-3 years. In Takum LGA, 51% of the farmers have been cultivating sorghum more than 10 years ago, 33% between 7-9 years, 11% between 4-6years and only 5% have been cultivating sorghum. At Donga LGA, among the farmers interviewed, 46% have been cultivating sorghum, 32% between 7-9 years, 16% between 4-9 years and 6% between 1-3 years. In Ussa LGA of the state, 40 % of the farmers have been cultivating sorghum, 32% between 7-9 years, 16% between 4-6 years and 12% between 1-3 years. Also in Ibi LGA of the State, 36% of the farmers have been cultivating sorghum for more than 10 years, 33% between 7-9 years, 17% between 4-6 years and 14% between 1-3 years). This implies that farmers in Taraba State have been cultivating sorghum many years ago.

Table 1: Farmers experience in sorghum production in Taraba State, Nigeria in 2015

Years	Local Government Areas					Average
	Wukari	Takum	Donga	Ussa	Ibi	
1-3	4.0	5.0	6.0	12.0	14.0	8.2
4-6	22.0	11.0	16.0	16.0	17.0	10.4
7-9	29.0	33.0	32.0	32.0	33.0	38.0
>9	45.0	51.0	46.0	40.0	36.0	43.4
Total	100	100	100	100	100	100

Table 2 presents the hectarage of sorghum cultivated in Taraba state. 60% of the farmers interviewed cultivate less than 3 ha of sorghum, 35% uses between 3-5 ha, 3% uses between 5-8 years and only 2% cultivate more than 9 ha. In Takum, 65% of the farmers have been cultivating less than 3 ha of sorghum, 32% uses between 3-5 ha, 2% produced between 5-8 ha and only 1% cultivate more than 19 ha of sorghum. Among the farmers interviewed at Donga LGA, 68% have been cultivating sorghum in less than 3 ha, 30% uses between 3-5 ha, 2% uses between 5-8 ha and none cultivate sorghum beyond 9 ha. In Ussa LG area of the State, 50 % of the farmers cultivate sorghum about 3 ha, 43% cultivate between 3-5ha, 5% cultivate between 5-8ha and 2% cultivate between above 9 ha. Also in Ibi L G area of the State, 48% of the farmers cultivate less than 3 ha of sorghum, 38% cultivate between 3-5 ha, 14% cultivate between 5-8 ha of sorghum and none cultivate more than 9ha of sorghum. This means that most of the farmers in this part of the country cultivate sorghum majorly within 1-2 ha of land.

Table 2: Sorghum hectarage cultivated in Taraba State, Nigeria in 2015

Hectarages (ha)	Local Government Areas				
	Wukari	Takum	Donga	Ussa	Ibi
< 3	50.0	65.0	68.0	50.0	48.0
3-5	45.0	32.0	30.0	43.0	38.0
5-8	3.0	2.0	2.0	5.0	14.0
>8	2.0	1.0	0.0	2.0	0.0

Table 3 presents sorghum cropping system in Taraba state. Among the farmers interviewed in Wukari LGA of Taraba State, 45% of the sorghum farmers intercrop sorghum with maize. 43% intercrop sorghum with groundnut. 8% intercrop sorghum with millet and only 2% grow sorghum sole. In Takum, 32% of the farmers intercrop sorghum with maize. 27% of the farmers intercrop sorghum with millet and 22% intercrop with groundnut. 19% cultivate sorghum sole. In Donga LGA, 35% practiced sorghum/millet intercrop. 30% intercrop maize with sorghum and 22% intercrop groundnut with sorghum. 13% cultivate sorghum sole. In Ussa, 35% practiced sorghum/maize intercrop, 25% intercrop sorghum with millet and 23% intercrop sorghum with groundnut. 17% cultivate sorghum sole. In Ibi, 45% intercrop sorghum with maize, 32% intercrop sorghum with millet, 15% practiced sorghum/millet and 8% cultivate sorghum sole (Table 3.). This implies that most farmers in Taraba State rarely cultivate sorghum sole but intercrop sorghum with other crop particularly maize, groundnut and millet. This agrees with Olukosi *et al.* (1991) who reported that mixed farming and mixed cropping had been traditionally practiced and were still very common in Nigeria.

Table 3: Percentage Sorghum intercropped system in Taraba State, Nigeria in 2015

Cropping System	Local Government Areas				
	Wukari	Takum	Donga	Ussa	Ibi
Sole	2.0	19.0	13.0	17.0	8.0
Sorghum / Ground nut	33.0	22.0	22.0	23.0	32.0
Sorghum /Maize	43.0	32.0	30.0	35.0	45.0
Sorghum /Millet	10.0	27.0	35.0	25.0	5.0

Table 4 shows the important weed species infesting sorghum during production in Taraba state. Among farmers interviewed, 60% perceived that *Striga hermonthica* dominated sorghum fields. This was followed by 23% *Rottboellia cochinchinensis*, 6% *Imperata cylindrical*, 5% *Digitaria horizontalis*, 4% *Commelina benghalensis* and 2% *Pennisetum pedicellatum*. This shows that, farmers in the state are face with the challenge of *Striga hermonthica* infestation during sorghum production. This was followed by *Rottboellia cochinchinensis*. This agreed with Ejeta and Gressel (2007) who reported that *Striga* spp orghas long been recognized as the greatest biological constraint to maize, sorghum, pearl millet (*Pennisetum glaucum*), upland rice and cowpeas (*Vigna unguiculata*) in African savanna. Also Parker (1991) reported that parasitic angiosperm, *Striga*, is an obligate root parasite which infects cereal and legume crops in sub-Saharan Africa, often causing yield losses in excess of 50% *S. hermonthica*, endemic in Africa, constitutes the most important biological constraint to cereal production in sub-Saharan Africa (M'Boob, 1989; Lagoke *et al.*, 1991).

Table 4: Dominant weed species in sorghum field in Taraba State, Nigeria in 2015 cropping season

Weed Species	Common Name	Family	Growth Habit	% Respondent
<i>Rottboellia cochinchinensis</i>	Itchgrass	Poaceae	AG	23.0
<i>Imperata cylindrical</i>	Spear grass	Poaceae	PG	6.0
<i>Pennisetum pedicellatum</i>	-	Poaceae	AG	2.0
<i>Commelina benghalensis</i>	Tropical spiderwort	Commelinaceae	PSP	4.0
<i>Digitaria horizontalis</i>	Crabgrass	Poaceae	PG	5.0
<i>Striga hermontheca</i>	Purple weed	Witch Srophulariaceae	ABL	60.0

PG = Perennial Grass, AG = Annual Grass, PSp = Perennial Spiderwort, ABL = Annual Broadleaf, PS = Perennial Sedge. - = Not Available

Farmers identified 3 insect pests and 4 diseases as constraints to production of sorghum in Taraba state (Table 5). Downy mildew was reported as the most important diseases (41 – 58 %) across the 5 local governments (LG) follow by Grey leaf spot disease, while the least was smut disease. It was further revealed that stem borers was most damaging insect pest of sorghum (33-50%) in all the LGs visited. This was followed by leaf hopper and termites. This supported Lynch (1980) who reported that stem borers can cause severe damage at different stages in the development of cereal crops; from seedling to maturity. When infestation is severe, there is a physiological disruption of plant growth, and panicle emergence and grain formation are severely affected, resulting in reduction in kernel number and mass.

Table 5: Percentage (%) farmers' responses to pests and diseases in sorghum production in Taraba State, Nigeria in 2015

S/N	Pets and Diseases	Percentage farmers' responses				
		Wukari	Takum	Donga	Ussa	Ibi
1	Downy mildew	45	50	41	53	45
2	Gray Leaf spot	20	30	29	29	35
3	Anthracnose	10	13	18	11	11
4	Head Smut	6	3	4	4	6
5	Stem Borer	50	42	32	33	33
6	Termites	13	15	16	22	19
7	Leaf hopper	30	32	20	27	23

The results on sorghum production practices showed that farmers employed a range of practices such as varieties to be sown, time of sowing, intercropping system, pesticide application, weed management, crop rotation, burning of crop residues, fallow system among others (Table 6). Among the production practices, 88% of the farmers use local varieties of sorghum. Late sowing of sorghum was the management common and was being practiced by 94 % of the farmers. 87 % of the farmers combined both pre-emergence herbicides and manual for weed control in sorghum and 13% uses manual weed control in sorghum. Pesticide application and fertilizer application were the least employed with 4 % and 5 % of farmers interviewed implementing them respectively. 86 % of the farmers practiced crop rotation, Also 99.5 % burned crop debris after harvest. While 37.5 % reported that they adopt fallows for exhausted fields. These are the production practices. This shows that most of the farmers in Taraba state still uses local varieties of sorghum as planting material. Usually the sorghum is sown lately in the raining season. The farmers control weeds using pre-emergence herbicides, supplementing with manual weeds control in sorghum. The farmers don't usually apply pesticides and fertilizer to sorghum. This result to poor yield due to pests and diseases infestation and poor soil fertility. They further destroy the soil fertility by burning crop debris which could have been ploughed back to improve the fertility of the soil. The farmers only improve the fertility of the soil by the practice of fallowed system to enable them improve soil fertility to increase grain yield of sorghum in the state. Furthermore, most of the farmers practiced crop rotation, to eliminate the challenged of *striga* spp infestation in sorghum.

Table 6: Mean percentage (%) farmers sorghum production management practices in Taraba State, in 2015

S/N	Management practices		% Farmers responses
1.	Varieties planted	Improved	12
		Local	88
2.	Sowing date	Early planting	06
		Late planting	94
3.	Weeding	Manual	13
		Herbicide and manual	87
4.	Pesticide application	No	07
		Yes	04
5.	Fertilizer application	No	96
		Yes	5
6.	Crop rotation	No	95
		Yes	86
7.	Burning of crop residues after harvest	No	14
		Yes	99.5
8.	Fallowed fields	No	0.5
		Yes	37.5
		No	62.5

3.0 CONCLUSION AND RECOMMENDATION

Based on this study, there is urgent need to sensitize farmers on the recommendations below, to improve sorghum production in Taraba State;

- i. Farmers should be educated and provided with improved sorghum seeds for sowing
- ii. They should be sensitised on the proper use of pesticides to control pests and diseases
- iii. There is need to educate farmers on the application of fertilizers and incorporation of crop residues to improve sorghum grain yield and soil fertility
- iv. The practice of cereal-legumes intercrop should be encouraged, instead of the usual cereal-cereal intercrop system.
- v. More research effort to finding solutions to the challenges of *striga hermonthica* in sorghum is strongly advocated for in the state.

REFERENCES

- Doggett, H. (1988). Sorghum, Longman Scientific and Technical, London, UK.
- Dykes, L. and Rooney, L. W. (2006) Sorghum and millet phenols and antioxidants, *Journal of Cereal Science* 44: 236 – 251.
- Food and Agriculture Organization of the United Nations, (2015) FAO Statistical databases. <http://faostat.fao.org>, (accessed Sept. 2015).
- Ejeta, G. and Gressel, J. (2007). Integrating New Technologies for *Striga* Control: Towards Ending the Witch-Hunt . World Scientific Publishing Co. Pte. Ltd. USA. Pg. 3.
- Lagoke, S. T. O., Parkinson, V., and Agunbiade, R. M. (1991). Parasitic weeds and control methods in Africa, In *Proceedings of International Workshop on Combating Striga in Africa*. 3–13. (Ed. S. K. Kim) Ibadan, Nigeria: International Institute of Tropical Agriculture (IITA).
- Lynch RE (1980). European corn borer: yield losses in relation to hybrid and stage of corn development. *Journal. Of Econ. Entomol.*, 73: 159-164.
- M'Boob, S. S. (1989). A regional program for *Striga* control in West and Central Africa. In *Striga – Improved management in Africa*. (Eds T. O. Robson and H. R. Broad). FAO Plant Production and Protection Paper, 96:190–194. Rome:
- Parker, C. (1991). Protection of crops against parasitic weeds. *Crop Protection* 10:6–22.
- Olukosi JO, Elemo KA, Kumar V, Ogungbile AO. (1991) .Farming systems research and the development of improved crop mixtures technologies in the Nigerian. *Savanna. Agricultural Systems in Africa*. 1(1):17–24.
- Schober, T. J., Messerschmidt, M., Bean, S. R., Park, S - H., Arendt, E. K. (2005) Gluten free bread from sorghum: quality differences among hybrids. *Cereal Chemistry* 82 (4): 394 – 404.