



Baseline survey on groundnut production constraints and practices in Taraba, Nigeria

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Abstract

Groundnut (*Arachis hypogaea* L.) is one of the most important oil seed crop in Nigeria with yields averaging about 800 kg ha⁻¹, less than one-third the potential yield of 3000 kg ha⁻¹. Early and late leaf spots, caused by *Cercospora arachidicola* and *Phaeoisariopsis personata*, are the most common and serious diseases of groundnut, with over 50% yield loss. Questionnaires were administered among farmers of Taraba state in a participatory manner. Responses obtained were analyzed using non-parametric or descriptive statistics. The survey showed that the cropping system has been intercrop mostly with sorghum and maize. The second experiment was to determine the extent of leaf spots by random sampling of four farmers' fields per each of the 5 wards in each Local Governments of namely Wukari, Takum, Donga, Ussa and Ibi surveyed. The result revealed that early leaf spot disease was prevalent in all the areas surveyed, and percentage leaf area damaged, infection frequency, lesion diameter and sporulation index were more in Takum and Ussa than other locations. The findings provide important guides to formulate good farmer consumer oriented researches that will help to address these constraints and to improve the livelihoods of farmers in their rural communities.

Keywords: Survey; Farmers' Perception; Leafspots; Groundnut; Cropping Systems

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1. Introduction

Mukhtar (2009) reported that Groundnut (*Arachis hypogaea* L.) ranked 6th in world oil seed crops production, with very high oil (48 – 50 %) content followed by protein (26 – 28 %), carbohydrate, minerals and vitamin (11-27 %). The highest producer of groundnut in the world was reported to be India, followed by China and Nigeria in that order (Anonymous, 2004). It was further established that 55 % of groundnut grown in Nigeria are in mixtures mainly in mixtures with other crops like maize, sorghum, millet or cassava. (Anonymous, 2004). In Nigeria, the leading producing states include Niger, Kano, Jigawa, Zamfara, Kebbi, Sokoto, Katsina, Kaduna, Adamawa, Yobe, Borno, Taraba, Plateau, Nasarawa, Bauchi, and Gombe States (NAERL, 2011). Groundnut pod yields from farmers' field are low, averaging about 800 kg ha⁻¹, less than one-third the potential yield of 3000 kg ha⁻¹. This is due to several factors, including low access to high yielding cultivars for a particular ecology, poor soil fertility, unreliable rains with recurrent droughts, inappropriate crop management practices, pests and diseases (Ahmed et al., 2010).

In Nigeria leaf spots and rosette virus are the most serious damaging diseases of groundnut (Muhammad and Bdiya, 2011). Early leaf spot (*Cercospora arachidicola*) and late leaf spot (*Phaeoisariopsis personata*), are the most common and serious diseases of groundnut, worldwide which can cause losses in pod yield of over 50 %. Combined attack of foliar diseases like rust can cause yield losses in excess of 70 % (Macdonald et al., 1985). Taraba is one of the major producers of groundnut in Nigeria, and there had not been documented evidence of preliminary information on status of groundnut production in the State. This paper reports the results of a study on farmers' perception of production constraints, field pests, weeds and pest control practices. It further helped to determine incidence and distribution of leaf spots in Wukari, Takum, Donga, Ussa and Ibi Taraba State, Nigeria.

2. Materials and methods

2.1. Description of study area

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, Nasarawa and Benue states. The state has a land area of 60,291km² with a population of 2,300,736, according to 2006 census. Taraba State is regarded as Nature's Gift to the Nation because of its abundant natural resource endowment. The state is blessed with climate and vegetation types that cut across the country, ranging from a more humid climate and forest vegetation in the south to a more seasonal wet and dry climate and savanna vegetation in the north.

2.2. Methodology

A total of three hundred farmers were interviewed individually in five wards each in five local government areas of Taraba State in 2015 namely Wukari (Bantaje, Tsukundi, Jibu, Ayyi, Rafin kada), Takum [Manya, Dutse Gawhetun, Tikari, Chanchanji], Donga (Gayama, Mararraba, Nyita, Kumbo, Asibiti), Ussa (Jenuwa gida, Lumbu, Kpakya, Tutuwa in Kwesati Lissam I, Lissam II) and Ibi (Rimi uku I, Nwonyo I, Sarkin kudu, Rimi uku II, Nwonyo II). To minimize bias, the questions were interactive and open – ended, rather than asking the farmer to select an answer among fixed choices. The survey was conducted with twelve individual farmers per ward. After covering basic information on education, farming experience, farmers' age, type of crop grown and cropping systems, the questions focused on crop constraints, pests, weeds and pest control methods. The interview was concluded in each ward with random sampling of four farmers' fields to determine the prevalence of early and late leaf spots. The five wards in each local government served as replicates; while the five local governments are the treatments. Data on prevalence of leaf spots were collected on the following: a) Infection frequency - final number of lesions per cm² of leaf obtained by counting lesions on each leaflets of five randomly selected main stems and finding average per leaflet. Leaf area was estimated using a leaf area meter. b) Percentage leaf area damage. It was estimated for each leaf on the five randomly selected main stems and averaging per main stem in comparison to the diagram depicting the known percentage of the area affected and a scale of 1 to 9 (Subrahmanyam et al., 1995) . c) Lesion diameter. The diameters of 10 randomly selected lesions were measured on the leaves of the main stem using millimeter scale. d) Sporulation. Five leaflets were taken from each main stem and incubated on moist filter paper in petri dishes at 25°C under continuous illumination in a plant growth chamber for 5 days. On the 6th day, the lesions were examined under a stereoscopic-microscope (x70) to score the degree of sporulation on a 5-point scale.as follows: Rating description (5-point scale). 1 = No sporulation; 2 = Very few spores; 3 = Moderate sporulation; 4 = More sporulation than score 3; 5 = Extensive sporulation.

2.3. Data Analysis

Responses obtained from farmers were analysed using non-parametric or descriptive statistics. The data was summarised into averages, percentages or ranges. The data obtained from leaf spots disease prevalence were subjected to analysis of variance (ANOVA) for RCBD using the generalized linear model (GLM) procedure of SAS Version 9 (SAS, 2005).

3. Results and discussion

Results of farmers experience in groundnut production indicated that most farmers (50, 59, 50, 51, 46 %) in Wukari, Takum, Donga, Ussa and Ibi respectively had been cultivating groundnut more than 10 years, while among the farmers interviewed in the wards of the five local government areas of Taraba State only 3 – 5 % farmers were new entrants in groundnut cultivation with 1- 3 years' experience. This implies that farmers in Taraba State have been cultivating groundnut many years ago.

Table 2 presents the hectareage of groundnut cultivated in Taraba state. The result showed that 46 – 68 % farmers cultivated up to 1-2 ha of groundnut, 22 – 40 % utilized between 3-5 ha, 6 – 9 % cultivated between 6-9 ha and only 4 – 7 % were engaged in 10 ha and above. This means that most farmers in this part of the country cultivate groundnut majorly within 1-2 ha of land.

Table 1. Farmers Experience in Groundnut Production in Taraba State, 2015

Years	Local Government Areas				
	Wukari	Takum	Donga	Ussa	Ibi
1-3	5.0	4.0	3.0	4.0	5.0
4-6	17.0	17.0	21.0	19.0	17.0
7-9	28.0	25.0	26.0	29.0	32.0
10 above	50.0	59.0	50.0	51.0	46.0

Table 2. Groundnut Hectareage Cultivated in Taraba State, 2015

Hectareage (ha)	Local Government Areas				
	Wukari	Takum	Donga	Ussa	Ibi
1-2	49.0	68.0	55.0	46.0	50.0
3-5	40.0	22.0	30.0	39.0	40.0
6-9	6.0	6.0	9.0	9.0	7.0
>10	5.0	4.0	6.0	7.0	5.0

Table 3 indicated the major groundnut cropping system in Taraba state. Among the farmers interviewed 49 – 61 % of the groundnut farmers intercropped with sorghum. 25 – 35 % intercropped groundnut with maize. 5 – 10 % intercropped groundnut with millet; 4 – 8 % grew sole groundnut. This implies that most farmers in Taraba State rarely cultivate sole groundnut, but intercrop groundnut with other crops particularly sorghum and maize . 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 4 shows the important weed species infesting groundnut and sorghum fields during production in Taraba state. Among farmers interviewed, 60% perceived that *Rottboellia cochinchinensis* dominated crop fields. This was followed by 13 % *Commelina benghalensis*, 12 % *Digitaria horizontalis*, 8% *Imperata cylindrica*, and 4% *Pennisetum pedicellatum*. This shows that, farmers in the state are faced with the challenge of itch grass infestation in fields occupied by groundnut crop, followed by tropical spiderwort.

Table 3. Percentage Groundnut Intercropped System in Taraba State, 2015

Cropping System	Local Government Areas				
	Wukari	Takum	Donga	Ussa	Ibi
Sole	7.0	4.0	13.0	7.0	8.0
Groundnut / Maize	35.0	33.0	28.0	23.0	31.0
groundnut/ Sorghum	52.0	56.0	49.0	61.0	53.0
Groundnut / Millet	5.0	7.0	10.0	9.0	8.0

Table 4. Important Weed Species in Groundnut Field in Taraba State in 2015 Cropping Season

Weed Species	Common Name	Family	Growth Habit	% Respondent
<i>Rottboellia cochinchinensis</i>	Itchgrass	Poaceae	AG	63.0
<i>Imperata cylindrica</i>	Spear grass	Poaceae	PG	8.0
<i>Pennisetum pedicellatum</i>	-	Poaceae	AG	4.0
<i>Commelina benghalensis</i>	Tropical spiderwort	Commelinaceae	PSp	13.0
<i>Digitaria horizontalis</i>	Crabgrass	Poaceae	PG	12.0

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

Farmers listed a total of 17 production constraints of which 7 were insects, 3 diseases, 2 weeds (non-parasitic category), 1 birds, 5 abiotic constraints such as drought or low soil fertility (Table 5). This supported the works by Amatobi et al. (1988) which stated that insects were the most ubiquitous among the arthropod pests. Leaf spots were reported as the most important diseases (55 – 92 %) across the 5 local governments (LG) follow by Rosette virus disease, while the least was Rust disease. This confirms report by Muhammad and Bdliya (2011) that leaf spots and rosette virus were the most serious damaging diseases of groundnut in Nigeria. It was further revealed that termites and aphids were considered very prominent in all the LGs visited. Dominant weed species in most groundnut farms as reported by most farmers was itch weed or *Rotboellia* (Table 5).

The results on production practices showed that farmers employed a range of practices in groundnut production namely: early planting, use of improved varieties, intercropping, pesticide application, use of herbicides, crop rotation, burning of crop residues, fallowing among others (Table 6). Among the recommended management practices, early sowing was the management common and was being practiced by 89 % of the farmers. Pesticide application and fertilizer application were the least employed with 5.7 % and 9.8 % of farmers interviewed implementing them respectively. 46 % of the farmers practiced crop rotation, while 31.4 % reported that they adopt fallows for exhausted fields. Also 8.3 % burned crop debris after harvest. 58 % farmers weeded their farms twice during the growing season, while 39 % weeded only

once during the season. Control of leaf spot diseases in Nigeria has depended on some cultural practices and on multiple applications of fungicides, though fungicidal treatment was not reported by farmers as one of the management practices. According to Kucharek (2004) sustainable management of leaf diseases can be achieved by applying combination of recommended fungicides and other management strategies. Other methods of reducing initial inoculum is reported to be by cultural measures such as crop rotation, removal of volunteer plants, burial of groundnut residue and use of resistant cultivars (Shokes and Culbreath 1997; Amatobi,1984).

Table 5. Percentage (%) farmers' responses to groundnut production constraints in Taraba State, Nigeria

S/N	Constraints	Percentage farmers' responses				
		Wukari	Takum	Donga	Ussa	Ibi
1.	Diseases					
	Early and late leaf spots	55	72	86	92	69
	Rust	15	18	5	2	10
	Rosette virus	30	10	9	6	21
2.	Arthropods					
	Millipedes / Insects	22	13	26	19	26
	Pod sucking bugs	6	-	-	3	-
	Caterpillars	8	-	-	16	-
	Aphids	35	27	37	29	36
	Beetles	13	2	8	5	-
	Grasshoppers	14	5	11	2	8
	Termites	14	53	44	35	56
3.	Weeds					
	Rotboellia	87	92	87	97	89
	Spear grass	13	8	13	3	11
4.	Abiotic constraints					
	Drought	35	28	19	14	23
	Poor germination	20	14	15	25	15
	Poor yield	39	27	25	32	19
	Lack of manure or fertilizers	4	7	18	15	23
	Poor soil fertility	2	24	23	13	20

There were no statistically significant differences in percentage leaf area damaged, infection frequency, lesion diameter and sporulation index across the surveyed locations (Table 7). The result revealed that early leaf spot disease was prevalent in all the areas surveyed. This was supported by the works that both early and late leaf spots diseases are widely distributed and occur in epidemic proportions in all groundnut growing regions of the world (Nutsugah et al., 2007; Adeoti, 1992). It was further noted that percentage leaf area damaged, infection frequency, lesion diameter and sporulation index were more in Takum and Ussa with scores of 18.5, 2.6, 2.5, and 4.7 respectively than other locations. Leaf spots of groundnut are reported to have polycyclic life cycle with several cycles in a season. The progression of leaf spots within a season was also dependent on favourable environmental conditions such as warm temperatures and long periods of high humidity or leaf wetness. (Butler, 1990).

Table 6. Mean Percentage (%) farmers using different groundnut management practices in Taraba State, Nigeria

S/N	Management practices		No of practicing farmers	% farmers responses
1.	Varieties planted	Improved	111	37
		Local	189	63
2.	Weeding regime	Once	117	39
		Twice	174	58
		Thrice	9	3
3.	Inter cropping	Yes	219	73
		No	81	27
4.	Pesticide application	Yes	17.1	5.7
		No	282.9	94.3
5.	Fertilizer application	Yes	294	9.8
		No	270.2	90.2
6.	Crop rotation	Yes	138	46
		No	162	54
7.	Burning of crop residues after harvest	Yes	111	37
		No	189	63
8.	Fallowing fields	Yes	112.5	37.5
		No	187.5	62.5
9.	Planting date	Early planting	267	89
		Late planting	33	11
10.	Herbicide	Yes	225	75
		No	75	25

Table 7. Mean groundnut leaf spot disease scores in the surveyed areas of State during 2015 wet season

S/N	Location	%leaf area damage	Infection frequency (lesion per cm ²)	Lesion diameter	Sporulation index
1.	Wukari	15.0	2.4	2.3	4.5
2.	Takum	18.5	2.6	2.5	4.7
3.	Donga	17.3	2.4	2.2	4.5
4.	Ussa	16.5	2.6	2.5	4.6
5.	Ibi	12.2	2.4	2.1	4.5
	Mean	15.9	2.48	2.32	4.56
	SE	0.96	0.053	0.067	0.46

4. Conclusion

The result of the survey revealed the production practices, production constraints, farmers' preferences and important reasons for growing groundnut in the studied areas. Early leaf spot disease was prevalent in all the areas surveyed. The results are important guides to formulate good farmer consumer oriented researches that are geared towards addressing some of these constraints and findings to improve the livelihoods of farmers in their rural communities.

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