

Assessment of status, perception of weed infestation and methods of weed control adopted by cassava farmers in Kogi state, Nigeria

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1 SUMMARY

As a prelude to advancing an appropriate weed management strategy for cassava production in Kogi State, Nigeria, it was necessary to ascertain the weed management practices and knowledge base of the farmers. Thus, a survey of cassava farmers in fifteen (15) Local Government Areas (LGAs) in Kogi State, Nigeria was carried out in 2008 to study the perception of farmers with regards to weed infestation and control methods adopted. The study was undertaken in five LGAs from each of the three senatorial districts of the state. In each LGA, five villages were selected; and in each village, six cassava farmers were selected. Stratified random sampling technique and structured questionnaires were used to sample 450 cassava farmers in the study area. The survey indicated that majority of the farmers were males (73%) and aged between 31 - 50 years (88%). Highest frequency of female cassava farmers were found in Kogi East (42%) with Kogi Central having the highest occurrence of unmarried farmers (21%). Farm size was smaller in Kogi Central (< 1 ha) compared to 1 - 3 hectares and 4 - 6 hectares in Kogi West and Kogi East, respectively. Cassava farmers (59%) in Kogi West were better educated than their counterparts in Kogi East (39%) and Kogi Central (49%). Majority of farmers (68%) indicated that grasses were the dominant weed species. Manual weeding was the commonest practice (66%) followed by herbicide application (30%). Herbicide used for control of weeds in cassava farms in Kogi State included 'Primetra', 'Sarosate', 'Roundup', 'Delsate' and 'Touchnodown' with 'Roundup' (47%) being the most commonly used. Majority of farmers in Kogi State weeded their cassava fields three times (63%) manually before the crop attained maturity period. The implication of this study is that farmers in the study area had limited knowledge on the benefit of chemical weed control and thus, need more encouragement to adopt chemical weed control option. Adoption and use of chemical weed control will save cassava crop from early weed interference which could result in considerable yield reduction.

2 INTRODUCTION

Cassava (*Manihot esculenta* Crantz) is an important tuberous crop in which about 70 million people obtain more than 500 calories per day from its roots (Chavez *et al* 2005). It is the second most important staple food in the sub-Saharan Africa and it is a staple food that

accounts for more than 200 calories per day in the diet of an individual (Nweke 1997). It is widely accepted as food for humans in various forms in Nigeria; hence it has wide market (Odi and Obih, 2000). Nigeria is the world's largest producer of cassava with about 46

million metric tonnes (FAO, 2007). Cassava is cultivated as a sole stand or intercropped with maize, rice, millet and groundnut as part of mixed cropping (Godfrey and Bundu, 1997). Nigeria ranks first among cassava producing nations of the world with an annual output of about 34 million tonnes of the root crop (IITA, 1997). Half of the world cassava production is from Africa, with Nigeria, Democratic Republic of Congo and Tanzania producing about 70 percent of this total volume (IFAD, FAO 2000; Nweke, 2003). It is a major crop of the humid tropics and production in Nigeria accounted for about 35% of the total output of Africa (FAOSTAT, 2005). Africa, Asia and Latin America/Caribbean produce 48%, 32% and 20% respectively of world's cassava (Nweke, 1998). Cassava has many uses which gave the crop high potentials as a major foreign exchange earner in Nigeria. Cassava is a source of flour, starch, chips, pellets, adhesive and a carrier of pharmaceuticals among others (FGN, 2004). Cassava production can be limited by a number of factors such as moisture stress, soil fertility (Falaki, 1994), variety of cassava and weed infestation (Anderson, 1992) and rodents (Purseglove, 1992). Weeds are the major constraints to cassava cultivation in Nigeria and are the most common pests of crops in the world, especially in the tropics (Akinyosoye, 1999). Over 70% of Nigerians live in the rural

areas where farming is the main occupation. Statistics suggest that the average Nigerian farmer who uses traditional tools for crop production contends with weed problems annually. Indeed, a major factor limiting the acreage of land under cultivation in traditional farming systems in developing countries is the problem of land clearing and weed control (Ogunwolu, 2004). In Nigeria, labour is often scarce and costly, leaving weeds as an intractable problem in the country's agriculture (Adetunji, 2002). Uncontrolled weed growth has been reported to cause yield reduction of 34-55% in maize, 28-100% in rice, 40-67% in grain legumes, 52% in oil and fiber crops (sunflower) and 65-91% in root and tuber crops (Akobundu, 1987). Timely weed control should aim at minimizing weed interference with crop at critical periods in order to reduce yield losses. For optimum cassava production, emphasis should be placed on strategies for combating the weed menace at minimal costs. There is dearth of information on the dominant weed control method in cassava production in Kogi State. Therefore, this study was carried out to assess the weed control strategy employed by cassava farmers in the state with the aim of improving on the practice already in use or fashioning out a suitable control measure for optimum effectiveness and enhanced economic returns

3 MATERIALS AND METHODS

Structured questionnaires were administered to 450 randomly selected cassava farmers in fifteen (15) out of twenty-one (21) LGAs of Kogi State. The fifteen LGAs sampled consisted of five each from the three senatorial districts (Kogi East, Kogi Central and Kogi West) of the state. These were Ankpa, Dekina, Igalamela-Odolu, Ofu, Omala (Kogi East); Adavi, Ajaokuta, Okehi, Okene, Ogori-magongo (Kogi Central); Ijumu, Kabba-Bunu, Mopamuro, Yagba East and Yagba West (Kogi West). Kogi State lies between latitude 6°30'N and 8°51'N and longitude 5°51'E and 8°00'E.

Information obtained included age and gender of cassava farmers, their marital status, education status, household size, farm size and cropping system. Others were years of experience, method of weed control, reasons for non-utilization of herbicide, types and cost of herbicides, frequency of weeding and weed composition. The rate of return was 100% of the administered questionnaires. Data were analyzed and presented as percentage of returned questionnaires.

4 RESULTS



4.1 Gender and age distribution of cassava farmers: Table 1 indicates that the majority of the farmers in the three senatorial districts (3-agricultural zones) were male accounting for about 73% of the sampled population, with the highest frequency in Kogi Central. The highest frequency

(28%) of women involved in cassava production was in Kogi East followed by Kogi West and Kogi Central recorded the least number of women cassava farmers. Most of the farmers were within the age bracket of 31-50 years producing a combined percentage of 88.2.

Table 1: Gender and age distribution (%) of cassava farmers in three senatorial districts of Kogi State

	Kogi East (KE) (n=150)		Kogi Central (KC) (n=150)		Kogi West (KW) (n=150)		Mean (n=450)
% Respondents							
Gender	Frequency	%	Frequency	%	Frequency	%	
Male	108	72.0	112	74.7	109	72.6	73.1
Female	42	28.0	38	25.3	41	27.3	26.9
Age (Years)							
10-20	4	2.7	0	0.0	0	0.0	0.9
21-30	14	9.3	15	10.0	8	5.3	8.2
31-40	37	24.7	110	73.3	40	26.7	41.6
41-50	90	60.0	22	14.7	98	65.3	46.6
> 50	5	3.3	3	2.0	4	2.7	2.7

4.2 Literacy and Educational attainment: Educational level of cassava farmers sampled is shown in Table 2. Cassava farmers without formal education ranged from 12% in Kogi West to 60.6% in Kogi East. Higher percentage of farmers sampled in Kogi East (60.6%) had no formal education. Similarly, most of the farmers in Kogi Central

(51.3%) were illiterate. The level of education of cassava farmers in Kogi West was high. In fact, only Kogi West had cassava farmers with post-secondary education. The frequency of farmers level of educational attainment was in the order primary (39.1%) > secondary (14%) > tertiary education (5.6%).

Table 2: Educational qualifications of cassava farmers in Kogi State

Educational Qualifications	Kogi East (KE) (n=150)		Kogi Central (KC) (n=150)		Kogi West (KW) (n=150)		Mean (n=450)
% Respondents							
	Frequency	%	Frequency	%	Frequency	%	
Illiterate	91	60.7	77	51.3	18	12.0	41.3
Primary	53	35.3	67	44.7	56	37.3	39.1
Secondary	6	4.0	6	4.0	51	34.0	14.0
Tertiary	0	-	0	-	25	16.7	5.6

4.3 Marital status and household size: As shown in Table 3, about 85% of cassava farmers in Kogi East, 74% in Kogi Central and 86% in Kogi West were married. Few of the sampled farmers were either divorced or widowed. The trend in household size (family size) across the zones indicated that cassava farmers having less than or equal to five (5) persons per household were 70%. Only a negligible proportion of farmers across the

state have more than fifteen (15) persons per household.

4.4 Farm size and cropping system: As shown in Table 4, most of the cassava farmers sampled in Kogi East (60.7%) cultivated between 4 and 6 ha, while majority of the farmers in Kogi West (56%) cultivated between 1 to 3 ha. Most of the cassava farmers (47.3%) in Kogi Central cultivated less than 1 ha. A few farmers in Kogi East grew cassava on fairly large farms of more than

6 ha. About 55% of cassava farmers in Kogi East practiced sole cropping system. Mixed cropping was more predominant among cassava farmers in Kogi central. Kogi Central had the greatest percentage (74%) of farmers that intercropped cassava. Across the state, most farmers (65%) intercropped cassava

with maize. The greatest percentage of farmers intercropping cassava with melon was found in Kogi West (45%). None of the farmers sampled in Kogi West intercropped cassava with okra.

Table 3: Marital status and household size of cassava farmers in Kogi State

	Kogi East (KE) (n=150)		Kogi Central (KC) (n=150)		Kogi West (KW) (n=150)		Mean (n=450)
% Respondents							
Marital Status	Frequency	%	Frequency	%	Frequency	%	
Single	2	1.3	31	20.7	10	6.7	9.6
Married	127	84.7	111	74.0	129	86.0	81.6
Divorced	14	9.3	4	2.7	5	3.3	5.1
Widow	4	4.7	4	2.7	6	4.0	3.8
Household size							
≤ 5	95	63.3	109	72.7	112	74.7	70.2
6-10	52	34.7	21	14.0	31	20.7	23.1
11-15	3	2.0	13	8.7	5	3.3	4.7
> 15	0	0.0	7	4.6	2	1.3	1.9

4.5 Years of experience in cassava production: Table 5 indicates the summary of the years of experience of farmers in cassava production in the state. Farmers in Kogi East (70%) and Kogi West (67.3%) had more experience in

cassava production compared to those in Kogi Central (54%). In fact, Kogi Central was the only zone with farmers having less than 5 years of experience in cassava production.

Table 4: Farm size, cropping system and crops used as intercrop in cassava fields by farmers in Kogi State

	Kogi East (KE) (n=150)		Kogi Central (KC) (n=150)		Kogi West (KW) (n=150)		Mean (n=450)
% Respondents							
Farm size (ha)	Frequency	%	Frequency	%	Frequency	%	
< 1	0	-	71	47.3	36	24.0	23.8
1-3	53	35.3	67	44.7	84	56.0	45.3
4-6	91	60.7	12	8.0	30	20.0	29.6
> 6	6	4.0	0	-	0	-	1.3
Cropping system							
Sole	82	54.7	22	14.7	31	20.7	30.0
Mixed	47	31.3	111	74.0	82	54.7	53.3
Both	21	14.0	17	11.3	37	24.6	16.6
Crops used as intercrop in cassava field							
Maize	49	72.0	93	72.7	58	48.7	64.5
Melon	14	20.6	20	15.6	53	44.5	26.9
Okra	3	4.4	9	7.0	-	-	3.8
Pepper	2	2.9	6	4.7	8	6.7	4.8

Table 5: Years of experience in cassava cultivation by farmers in Kogi State

	Kogi East (KE) (n=150)		Kogi Central (KC) (n=150)		Kogi West (KW) (n=150)		Mean (n=450)
% Respondents							
Year of experience	Frequency	%	Frequency	%	Frequency	%	
≤ 5	-	-	4	2.7	-	-	0.9
6-10	17	11.3	14	9.3	-	-	6.9
11-15	28	18.7	51	34.0	49	32.7	28.5
16-20	41	27.3	78	52.0	82	54.7	44.6
> 20	64	42.7	3	2.0	19	12.6	19.1

4.6 Weed control methods and reasons for non-utilization of herbicides: As shown in Table 6, a greater percentage of farmers across the state used manual weeding as a weed control strategy in cassava production, producing a combined

percentage of 66.2. A high percentage of farmers in all the three zones (64.4-79.5%) indicated high cost as a major constraint to the use of herbicide in cassava cultivation in the state.

Table 6: Methods of weed control used by cassava farmers and reasons given by non-herbicide users in Kogi State

Method	Kogi East (n=150)		Kogi Central (n=150)		Kogi West (n=150)		Mean (n=450)
% Respondents							
	Frequency	%	Frequency	%	Frequency	%	
Manual	112	74.7	101	67.3	85	56.7	66.2
Herbicide	30	20.0	43	28.7	62	41.3	30.0
Both	8	5.3	6	4.0	3	2.0	3.8
Reasons for non-utilization of herbicide							
High cost	89	79.5	65	64.4	63	74.1	72.7
Scarcity	5	4.5	10	9.9	7	8.2	7.5
Operational problem	18	16.0	26	25.7	15	17.6	19.8

4.7 Type and cost of herbicide : Table 7 reveals “Roundup” as the most preferred herbicide (47%) used to control weeds in cassava farms in the state. This was followed by “Delsate” (20%) and “Touchdown” (12%). “Sarosate” and “Primextra”

(11%) were the least preferred herbicides in use. The table also shows that herbicides were more costly in Kogi Central compared to Kogi East and Kogi West.

Table 7: Type and cost of herbicide used by farmers to control weeds in cassava farms in Kogi State

	Kogi East (KE) (n=38)		Kogi Central (KC) (n=49)		Kogi West (KW) (n=65)		Mean (n=152)
% Respondents							
Types of herbicide	Frequency	%	Frequency	%	Frequency	%	
Primextra	5	13.2	-	-	12	18.5	10.6

Sarosate	-	-	15	30.6	2	3.1	11.2
Roundup	22	57.9	10	20.4	41	63.0	47.1
Delsate	11	28.9	7	14.3	10	15.4	19.5
Touchdown	-	-	17	34.7	-	-	11.6
Cost (₦) of herbicide/L							
Primextra	1000		-		1,100		
Sarosate	-		1,200		1000		
Roundup	1000		1,300		1000		
Delsate	950		1,200		900		
Touchdown	-		1,200		-		

4.8 Frequency of weeding: The majority of the farmers across the state manually weed their cassava farms three times per cropping cycle.

Percentage of farmers weeding thrice was highest in Kogi East (72.3%), followed by Kogi West (68.2%) and the least was in Kogi Central (49.5%).

Table 8: Frequency of manual weeding of cassava farms by farmers in Kogi State

Method	Kogi East (n=112)		Kogi Central (n=101)		Kogi West (n=85)		Mean (n=298)
% Respondents							
Weeding frequency	Frequency	%	Frequency	%	Frequency	%	
1	11	9.8	9	8.9	3	3.5	7.4
2	20	17.9	42	41.6	24	28.2	29.2
3	81	72.3	50	49.5	58	68.2	63.3

4.9 Weed composition: About 61-73% of the sampled population of cassava farmers in the state indicated that grasses were more than broadleaf weeds on their farms (Table 9). About 25% of the farmers in Kogi Central indicated that grasses and

broadleaf weeds were proportionate. Higher percentage of cassava farmers in Kogi West indicated that broadleaf weeds were more than grasses on their farms

Table 9: Weed composition in cassava farmer's farms in Kogi State

	Kogi East (KE) (n=150)		Kogi Central (KC) (n=150)		Kogi West (KW) (n=150)		Mean (n=450)
% Respondents							
Weed composition	Frequency	%	Frequency	%	Frequency	%	
Grasses > Broadleaves	109	72.7	91	60.7	105	70.0	67.8
Grasses = Broadleaves	20	13.3	36	24.6	16	10.7	16.2
Grasses < Broadleaves	8	5.3	10	6.7	24	16.0	9.3
Sedges > both	13	8.7	12	8.0	5	3.3	6.7

5 DISCUSSION

Farming in Nigeria is characterized by energy sapping operations. Therefore, it is not surprising to note that an overwhelming percentage of farmers in the study area were males and in the age bracket of those considered energetic enough to carry out the work. The majority of farmers in the study area

were illiterates which is a common feature of farmers in the tropics (Nyambeki and Ikpi, 2009). However, it is interesting to note that majority of the farmers were married and within the active age (21-50 years). The rather young age of some farmers in the lower age range indicate opportunities for a

younger generation of farmers who could potentially comprehend new farming techniques including adoption of herbicides. Ikuenobe *et al* (2005) noted that the small family sizes and unmarried status of some cassava farmers could serve as motivation to adopt more efficient or modern weed management technologies where prospects for hired labour are low. The use of herbicides requires expertise which might be difficult to understand by farmers as a result of high degree of illiteracy recorded among them. Fadayomi (1991) and Akobundu (1989) observed that most of the Nigerian farmers have no formal education. In consequence, they find it difficult to read instructional labels on herbicide containers and understand the functionality of herbicides. Umeh *et al* (2001) found the rate of illiteracy among Nigerian farmers to be quite high across the country with a national average of 27.6%. However, prospects for utilization of herbicides were higher among cassava farmers in Kogi West probably on account of their fairly increased literacy level in contrast to those in Kogi East and Kogi Central. Because the level of illiteracy among cassava farmers in the study area was high and widespread, the use of herbicide to control weeds on the farm was common. This is in agreement with the findings of Fadayomi (1991) who stated that the use of herbicides whether selective, pre-plant or pre-emergence to control weeds was a common feature among the literate farmers. Farm size and cropping system were reflective of the farmers' agro-ecological circumstances. Kogi Central characterized by rough, rocky and undulating terrains had smaller cassava farms with corresponding preference for intercropping cassava. Higher costs of herbicide in this zone could be attributed to poor road network. This agrees with the reports of Ogunsami (2007),

who stated that the poor quality road infrastructure that characterized the semi temperate (SMT) of Taraba State would increase marketing margins of inputs making things including herbicide more expensive for small scale farmers. Weed distribution is influenced by vegetation, rainfall pattern and cropping system (Medlin *et al* 2001, Naeem, 1993). The study area is located within the guinea savanna ecological zone where frequent bush burning commonly occurs. The vegetation of the area coupled with the attendant bush burning has favored the preponderance of grass species in relation to broadleaf weeds. This corroborates the findings of Akobundu (1987) and Chikoye *et al* (2002) who observed that frequent bush burning in the vegetation zone of Nigeria has been widely reported to favor proliferation of grass weeds. Intensive land use and lack of long fallow periods could also favor the proliferation of grass weeds. Higher weeding frequency as observed in all the zones may discourage or hamper the zeal of young farmers who may wish to expand their farms. Manual weeding is the most popular (66.2%) with three times weeding frequency (52%) as the commonest in the state. Another popular option was herbicide application (30%). The use of herbicide is seen as the most effective immediate solution to most weed problems although not necessarily the only or best option. Various researches have indicated that melon, sweet potato, cowpea, water melon can be effectively used to manage weeds (Okpara, 2000, Akobundu, 1989, IITA, 1979, Akinyemi, 1989). Considering the poverty status of farmers in the sampled area, the use of cover crops in addition to high yielding profusely branching cassava genotypes could reduce the manual weeding frequency, and boost the level of cassava production at minimal cost in Kogi State.

REFERENCES

- Adetunji, A.P. (2002). Weed control in Rice. Farmers weed control Handbook. Doane Publishers, St, Louis, Missouri pp 101
- Akinyosoye, V.O. (1999). Senior Tropical Agriculture, BAS
- Akobundu, I.O. (1989). Weed Science in the tropics. Principles and practices. John Wiley and sons Limited, New York 522 pp
- Akobundu I.O. (1989). Intercropping and weed control. A paper presented at the workshop on Research on Intercropping, Opportunities for further studies. IITA, Ibadan. July 10-15, 1989.
- Anderson, R.L. (1992). Effect of duration of jointed goat grass interference on cassava tuber yield. Res Pro. Rep Weed Sci 3pp
- Chavez, A.I., Sanchez, T. Jaramillo, G; Bedoya, J.M. (2005). Mechanisms of Cyanide Reduction during the Fermentation of cassava. Ph.D Thesis, University of Nottingham , United Kingdom 143:125

- Dadey, C.A. (2009). Plant protection for the Cassava Crop Seminar on Plant Protection for the cassava crop, 21-25 May, Monrovia, Liberia.
- De Datta, S.K. (2006). Principles and practices of cassava production. John Wiley and sons, New York, pp 15-20
- Fadayomi, O. (1991). Weed management in Nigeria agriculture in the 90's. the chemical weed control option, Nigeria Journal of Weed Science, 4: 79-81
- Falaki, A.M. (1994). The response of dwarf wheat varieties (*Triticum aestivum* L.) to different water stress levels; dates of sowing and nitrogen fertilization. Ph.D Dissertation, ABU, Zaria pp200
- Federal Government of Nigeria (2004). National Medium-Term Investment Programme. New Partnership for Africa Development Comprehensive Africa Agriculture Development Programme. Pp16
- FAO (2007). Food and Agricultural Organization Statistical Database Results.
- FAOSTAT (2005). Food and Agricultural Organization Statistical Database. www.fao.org
- Godfrey, W. and Bundu, H.S. (1997). Cassava production in Sierra Leone. World Crops 31: 188-190pp
- IITA (1997). Cassava Development in Nigeria. A Country Case Study towards a Global Strategy for Cassava Development. Prepared by International Institute of Tropical Agriculture; FAO Publication, Rome, Italy.
- IFAD, FAO (2000). International Fund for Agricultural Development, Food and Agricultural Organization 2000 pp 18-24
- Ikuenobe, C.E; O. Fadayomi, JO. Adeasun, N.A. Girorgwo; A.A. Melifouwu and A.O. Ayemi (2005). State of adoption of improved weed control technologies by farmers in three agro-ecological zones of Nigeria. Nigerian Journal of Weed Science 19: 16-17
- Nweke, F.I. (1997). Cassava is a cash crop in Africa. A viewpoint. IITA Research No. 14/15: 26-27. United Nations (1980). Rural Women Participation in Development, New York.
- Nweke, F.I. (2003). "Cassava Processing in the sub-Saharan Africa. Implications for Expanding Cassava Production". In IITA Research March, 2003, IITA Ibadan No 12 pp 7-10
- Nweke, F.I. (1998). Weed flora of cassava and their management strategies. Annual Conference of Weed Science Society of Nigeria held at Federal University of Technology, Akure between 9th-12th Nov. 1998.
- Odi, M and U. Obih (2000). "Optimizing Cassava Marketing and Efficiency for Agricultural Development in the 21st Century", In Nwosu Nwajimba and Mbanassor (ed). Agricultural Transformation in Nigeria. Proceeding of a national conference in honor of Professor Martins O. Ijere held at Federal University of Agriculture Umudike 24-26 August, 1998. Novelty Industrial enterprises Ltd, Owerri, Imo State pp 144-147.
- Ogunwolu, e.O. (2004). Weed problems in Nigerian Agriculture and the environment. Key note address WSSN Vol. 17, 2004 pp 75.
- Purseglove, J.W. (1992). Tropical Crops (Dicotyledons) 6th edition Longman Scientific Technical 620 pp.
- Smith, T.L. (1983). Weed Control in Cassava in South and Eastern Asia. Food and Fert. Tech Centre Ext. Bull 156 Japan city, Taiwan 16 p.