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Farm Practices Adopted for Perennial Productivity of Plantain Production Systems in Ekiti and Ondo States, Nigeria

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Fruit yield decline after two or three production cycles and subsequent less attention given to plantain orchards often lead to their abandonment. This study was carried out to identify the farm management practices in plantain production systems in Ekiti and Ondo States, Nigeria. Two towns were purposively chosen in each local government area and five (5) farmers selected in each town to give 170 and 146 respondents to questionnaire and interview schedules in Ondo and Ekiti States, respectively. False Horn and True Horn plantain cultivars were mostly grown and intercropped with arable and tree crops. Farms cultivated for five (5) years followed by shifting or fallow were 34.2 and 32.2% in Ekiti and Ondo States respectively. Regular farm practices were adequate spacing, weeding, de-suckering, pruning of leaves, earthening up and propping of fruiting plantains while use of manures, mulch and fertilizers was less in Ekiti State. Fertilizer use was affected by non-availability and high prices of the products rather than the negative effects on fruit quality. Information dissemination from extension services was adequate in Ondo State while the responses for adequacy of inputs from government sources, yearly increase in plantain yield and adoption of improved management practices in enhancing plantain productivity were similar in the two states.

Keywords: Plantain, production systems, perennial productivity, management practices, Nigeria

INTRODUCTION

Plantain (*Musa* spp ABB) is an important staple food crop in sub-Saharan Africa and its annual production has a gross value that exceeds that for each of maize, rice, cassava, yam and sweet potato (Ortiz and Vuylsteke, 1996). The pulp obtained when the plantain fruit (finger) is peeled provides a good source of dietary carbohydrates irrespective of the form it has been prepared for

consumption. It can be roasted, boiled, fried (unripe- chips, ripe- *dodo*, overripe- *dodo Ikire*) or sliced, dried and milled into flour which is cooked in boiling water with turning to a brown paste (local delicacy- *amala*) or used in composite flour needed in the confectionery industry (Ogazi, 1996).

The annual production of plantain in Central and West Africa involves over 10 million metric tonnes (MT) which are used in internal trade (INIBAP, 2001). Nigeria is the largest producer in West Africa with an annual output of 2.4 million MT which comes mainly from the humid-sub-humid southern states where plantain is cultivated traditionally as

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a component of the multi-storey cropping systems in homestead gardens and in intercropping with food and tree cash crops on the outlying (distant) farms (Frison and Sharrock, 1994; Oso *et al.*, 2011). These traditional production systems are characterized by low productivity at 5.5-12.0 MT.ha⁻¹ on farmers' plots compared to 30-40 MT.ha⁻¹ cumulative yields obtained under sole cropping (FFD, 2002). Commercial-scale plantain farms being promoted as viable ventures are expected to operate at high levels of productivity in order to supply the huge quantities of plantain fruits needed in the rapidly expanding urban food markets and also provide raw materials for the food and chemical industries. Thus, plantain production contributes to the subsistence economy, ensures all-year-round food security and generates the income producers and marketers need for poverty alleviation (Olorunda, 1998).

The output expansion in all plantain production systems would be possible with a corresponding increase in the adoption of improved management practices with which to sustain orchard perennial productivity. Orchard husbandry practices have been developed for the plant crops (Swennen, 1990, Adelaja and Olaniyan, 2000, FFD, 2002) which are expected to satisfy the management needs of subsequent ratoons. This has not been so. The orchards experience yield decline and are abandoned for new sites after the harvest of two or three production cycles from ratoons (Frison and Sharrock, 1994). On the other hand, traditional production systems that were not the focus of the improved husbandry recommendations appear immune to this drastic yield decline and so tend to attain perennial productivity which sustains plantain output. Smallholder farmers tend to adopt the components of improved crop packages of recommendations they find suitable to their peculiar production milieu (Fakorede, 2001). Therefore, the orchard management practices being used to enhance the prospects of plantain perennial productivity should be promoted. This study involved a survey of the plantain production systems in Ekiti and Ondo States to identify the causes of yield decline from the farmers' perspective which culminate in the consequent abandonment of the orchards and the farm management practices being adopted to reduce the problem.

MATERIALS AND METHODS

The survey was carried out in the eastern portion of cocoa belt in south-western Nigeria geo-political zone and located between longitudes 4°23'-6°02'E and latitudes 5°50'-8°05' N and comprising Ekiti and Ondo States during the early season (June-August) of 2010. The area lies south of Kwara and Kogi States, east of Ogun and Osun States, west of Edo State and is bound in the south by the Bight of Benin (Atlantic Ocean). The land mass of 21,254 km² is made up of 18 Local Government Areas (LGAs) in Ondo

State and 16 LGAs in Ekiti State and had 3.44 million and 2.38 million population respectively in 2006 (NPC, 2006). The states experience humid and sub-humid tropical climate characterized by the rainy season in March/April-October/November and dry season in November-March; mean temperature range of 21-28°C and annual rainfall of 1,250 mm in the northern extreme that increases to about 2,000 mm on the coast. The rainfall distribution is bimodal with peaks in July and September such that the rainy season is separated into early and late seasons by a dry period in late July to early August ('August break') (Oguntoyinbo, 1982). The duration of humid conditions imposes natural vegetation that consists of freshwater swamp forests in the southern extreme areas near the coast, lowland rainforests in the centre and derived savannah and guinea savannah in the northern and north-east portions (Macmillan Education, 2007).

Multi-stage sampling was used to select the sample for the study. The first stage involved selection of two main plantain producing towns in each LGA based on crop production data available in the Agricultural Development Programme (ADP). The second stage involved snowball sampling to randomly select five (5) plantain farmers in each town which produced a sample size of 160 in Ekiti State and 180 in Ondo State. Questionnaire was administered on the 340 respondents and additional information obtained through personal interviews to avoid misinterpretation and facilitate understanding of some questions. The data obtained from 146 and 170 questionnaire retrieved from the respondents were subjected to descriptive statistical analysis of frequency counts and percentages.

RESULTS

The age, marital status and family size, educational background and farming experience of respondents are presented in Table 1. Majority of the respondents were males aged between 46 and 60 years old and with 90.4 and 95.9% of them married and mostly had 1-2 wives while 88.4 and 95.3% had up to 10 children in Ekiti and Ondo States respectively. The respondents were moderately literate as shown by 45.9 and 48.2% which had formal education at the secondary and tertiary levels and which with the inclusion of primary school education increased literacy to 74.0 and 78.6% in Ekiti and Ondo States respectively.

Table 2 shows the farm features of plantain production systems in Ekiti and Ondo States. Plantain is cultivated mainly in small holdings as shown by 80.8 and 78.8% of the respondents' farms being less than 2.4 hectares (ha) in Ekiti and Ondo States. Half of the farms have been in cultivation for up to 10 years in Ekiti State while the corresponding figure is 58.2% of the respondents' farms in Ondo State. The main plantain cultivars found in the farms

Table 1. The distribution of respondents in the two states according to social characteristics

Characteristics	Ekiti State		Ondo State		
	Frequency	%	Frequency	%	
Age (Years)	<30	11	7.5	2	1.2
	31-45	37	25.4	45	26.4
	46-60	71	41.8	102	60.0
	61-75	31	21.2	19	11.2
	76-90	6	4.1	2	1.2
Sex	Male	134	91.8	143	84.1
	Female	12	8.2	27	15.9
Marital Status	Single	5	3.4	2	1.2
	Married	141	96.6	168	98.8
Number of wives	1-2	134	91.8	162	95.3
	3-4	11	7.5	7	4.1
	5-6	1	0.7	1	0.6
Number of children	1-5	74	50.7	88	51.8
	6-10	55	37.7	74	43.5
	>11	17	11.6	8	4.7
Education	Non-formal	38	26.0	36	21.2
	Primary	41	28.1	52	30.6
	Secondary	44	30.1	57	33.5
	Tertiary	23	15.8	25	14.7

Table 2. Features of the plantain production systems in Ekiti and Ondo States

Characteristics	Ekiti State		Ondo State		
	Frequency	%	Frequency	%	
Farm age	<5 years	50	34.2	53	31.2
	6-10 years	35	24.0	32	18.8
	11-15 years	13	8.9	20	11.8
	>15 years	48	32.9	65	38.2
Farm size (ha)	<2.4	118	80.8	134	78.8
	2.5-6.0	21	14.4	31	18.2
	6.1-10.0	5	3.4	4	2.4
	>10.0	2	1.4	1	0.6
Cultivar:	False Horn	105	71.9	101	59.4
	False Horn + Horn	9	6.2	39	22.9
	False Horn + French	5	3.4	5	2.9
	French + Banana	4	2.7	1	0.6
	False Horn + Banana	19	13.0	18	10.6
	All	4	2.7	6	3.5
Cropping systems	Sole	47	32.2	36	21.2
	Intercropping	99	67.8	134	78.8
Spacing for sole	2.5x2.5m	88	60.3	118	69.4
	3.0x3.0m	31	21.2	47	27.6
	Others	27	18.5	5	2.9

Table 2. Continue

Intercrop spacing	2.5x2.5m	68	46.6	91	53.5
	3.0x3.0m	22	15.1	32	18.8
	5.0x5.0m	26	17.8	15	8.8
	10.0x10.0m	26	17.8	32	18.8
	Others	4	2.7	0	0.0
Plants/mat	2	11	7.5	76	44.7
	3	38	26.0	69	40.6
	4 and above	97	66.4	25	14.7

Table 3. Features of intercropping systems involving plantain in Ekiti and Ondo States, Nigeria

Characteristics	Ekiti State		Ondo State	
	Frequency	%	Frequency	%
Intercropping components				
Arable crops alone	20	20.2	24	17.9
Tree crops alone	43	43.4	35	26.1
Trees and arable crops	36	36.4	75	56.0
Arable crops in mixtures with plantain				
Maize	9	17.0	61	61.4
Cassava	17	32.1	64	64.7
Yam	21	39.6	42	42.4
Vegetables	18	34.0	38	38.4
Legumes	3	5.7	5	5.1
Tree crops in mixtures with plantain				
Cacao	54	69.2	89	80.9
Oil palm	32	41.0	23	20.9
Kola	40	51.3	21	19.1
Citrus	31	39.7	50	45.5

in Ekiti State were False Horn (71.9%) followed by False Horn + Banana (Senior) (13.0%) while False Horn (59.4%) followed by False Horn + True Horn (22.9%) and False Horn + Banana (Senior) (10.6%) were planted in Ondo State. The number of plants/mat was four (4) and above in 66.4% of the farms in Ekiti State while 44.7 and 40.6% maintained 2 and 3 plants/mat in Ondo State. Plantain intercropping was the practice in 67.8 and 78.8% of the respondents' farms but sole in 32.2 and 21.2% of the farms in Ekiti and Ondo States respectively. In the sole plantain farms, 60.3 and 69.4% of respondents adopted the 2.5x2.5 m spacing whereas 3.0x3.0 m spacing was adopted by 21.2 and 27.6% of respondents in Ekiti and Ondo States respectively. In the intercropped farms, the 2.5x2.5 m spacing was adopted by 46.6% of the respondents in Ekiti State followed by 5x5 m (17.8%) and 10x10 m (17.8%) while majority adopted (53.5%) adopted 2.5x2.5 m spacing

followed by 3x3 m (18.8%) and 10x10 m (18.8%) in Ondo State.

Table 3 shows the features of plantain intercropping systems in the two states. The intercropping involved mixtures of arable and tree crops. In Ondo State, the intercropping components were arable crops (17.9%), tree cash crops (26.1%) and mixtures of arable and tree crops (56.0%). The component crops used in Ekiti State were 20.2, 43.4 and 36.4% for arable, tree cash and mixtures of arable and tree crops respectively. The arable crops were cassava (64.7%), maize (61.6%), yam (42.4%) and vegetables (38.4%) in Ondo State and yam (39.6%), vegetables (34.0%) and cassava (32.1%) in Ekiti State. The tree crops in the mixtures were cacao (80.9%), citrus (45.5%), oil palm (20.9%) and kola (19.1%) in Ondo State and cacao (69.2%), kola (51.3%), oil palm (41.0%) and citrus (39.7%) in Ekiti State.

Table 4. Improved husbandry practices adopted in the plantain production systems

Characteristics	Ekiti State		Ondo State		
	Frequency	%	Frequency	%	
Weeding	Yes	142	97.3	168	98.8
	No	4	2.7	2	1.2
Pruning	Yes	77	52.7	119	70.0
	No	69	47.3	51	30.0
De-suckering	Yes	132	90.4	123	72.4
	No	14	9.6	47	27.6
Earthening up	Yes	96	65.8	127	74.7
	No	50	34.2	43	25.3
Frequency	1-2	111	76.0	140	82.3
	3-4	35	24.0	26	15.3
	5-6	0	0.0	4	2.4
Reasons:	(1) High mat	66	45.2	66	38.8
	(2) Toppling	57	39.0	43	25.3
	(3) Yield increase	11	7.5	11	6.5
	(1) + (2)	5	3.4	35	20.6
	(1) + (3)	1	0.7	5	2.9
	(2) + (3)	3	2.1	5	2.9
	(1) + (2) + (3)	3	2.1	5	2.9
Manuring	Yes	42	28.8	71	41.8
	No	104	71.2	99	58.2
Propping	Yes	117	80.1	102	60.0
	No	29	19.9	68	40.0
Mulching	Yes	41	28.1	104	61.2
	No	105	71.9	66	38.8
Mulch:	Sawdust	118	80.8	105	61.8
	Oil palm bunch	3	2.1	30	17.6
	Others	25	17.1	35	20.6
Types of insect pests					
Ants		98	67.1	77	45.3
	Grasshoppers	15	10.3	21	12.3
	Termites	27	18.3	34	20.0
	Grasshoppers + termites	1	0.7	1	0.6
	Ants + termites	4	2.7	32	18.8
	Ants + grasshoppers	1	0.7	3	1.8
	Ants + grasshoppers + termites	0	0.0	2	1.2
Insect Control	Pest				
	Use of chemicals	112	76.7	150	88.2
	Non-chemical control	34	23.3	20	11.8

The husbandry practices associated with the plantain production systems in Ekiti and Ondo States are shown in Table 4. Adoption of recommended agronomic practices was: weeding by 97.3 and 98.8%, de-suckering by 90.4 and 72.4%, pruning of leaves by 52.7 and 70.0% and earthening-up by 65.8 and 74.7% of the respondents in

Ekiti and Ondo States respectively. The earthening-up was done 1-2 times in 76.0 and 82.3% of the respondents' farms and the main reasons were high mat formation (45.2 and 38.8%) and as solution to the problem of plant toppling (39.0 and 25.6%) but less to improvement in yield (6.5 and 7.5%) in Ekiti and Ondo States respectively. Application of

Table 5. Features of fertilizer use in plantain production systems in Ekiti and Ondo States

Characteristics		Ekiti State		Ondo State	
		Frequency	%	Frequency	%
Fertilizer use	Yes	48	32.9	101	59.4
	No	98	67.1	69	40.6
Fertilizer types	Urea	132	90.4	100	58.8
	NPK	14	9.6	59	34.7
	MOP	0	0.0	11	6.5
Frequency of application	1	135	92.5	129	75.9
	2	8	5.5	32	18.8
	3	2	1.4	7	4.1
	4	1	0.7	2	1.2
Reasons for not using fertilizer					
	1. Non-availability	87	59.6	122	71.8
	2. High cost (expensive)	29	19.9	26	15.4
	3. Lack of technical knowhow	11	7.5	1	0.6
	4. Fertilizer affects fruit quality	17	11.7	1	0.6
	5. Increases weed problems	1	0.7	6	3.5
	6. Scarcity of labour for application	1	0.7	14	8.2
Reasons for non-availability					
	1. No sale outlet	122	83.6	157	92.3
	2. Lack of official connection	13	8.9	12	7.1
	3. Fertilizer store too far away	11	7.6	1	0.6

manure was not a common practice as shown by 28.8% adoption rate in Ekiti State and 41.8% in Ondo State. Mulching was adopted by 28.1% of respondents in Ekiti State whereas this was practiced in 61.2% of the farms in Ondo State. The most commonly-used mulch material was sawdust as shown by 80.0 and 61.8% of respondents followed by others (which include mixtures of grass and broadleaf weeds) at 17.1 and 20.6% while the least used was oil palm bunch waste at 2.1 and 17.6% in Ekiti and Ondo States respectively. The propping of fruiting plantain was adopted in 80.1 and 60.0% of the respondents' farms in Ekiti and Ondo States. Ants, termites and grasshoppers were the insect pests identified by 67.1, 10.3 and 18.5% of the respondents in Ekiti State while 45.3, 20.0, 18.8 and 12.3% of the farmers in Ondo State recognized ants, termites, ants + termites and grasshoppers respectively.

The adoption of chemical control against insects was a common practice in 76.7 and 88.2% of the farms in Ekiti and Ondo State.

Table 5 shows the fertilizer management practices in plantain production systems by the respondents in Ekiti and Ondo States. Fertilizers are regularly used in plantain production by 32.9% of respondents in Ekiti State compared to 59.4% in Ondo State. Urea was the most used product slate at 90.4 and 58.8% whereas the use of NPK fertilizers was by 9.6 and 31.7% in Ekiti and Ondo States respectively. Muriate of potash (MOP) was least used in the two states. Fertilizers are applied in one dose to plantain by 92.5 and 75.9% of respondents while 5.5 and 18.8% apply fertilizers in two splits application in Ekiti and Ondo States respectively. Non-availability of products was the main cause of low adoption of fertilizer use at 59.6

Table 6. Responses to perceptions statements on plantain production in Ekiti and Ondo States

Characteristics	Ekiti State		Ondo State	
	Frequency	%	Frequency	%
Pest infestation serious				
Strongly agree	14	9.6	2	1.2
Agree	46	31.5	50	29.4
Undecided	26	17.8	38	22.4
Disagree	54	37.0	69	40.6
Strongly disagree	6	4.1	11	6.5
Pests affect productivity				
Strongly agree	22	15.1	17	10.0
Agree	58	39.7	94	55.3
Undecided	24	16.4	24	14.1
Disagree	36	24.7	33	19.4
Strongly disagree	6	4.1	2	1.2
Agricultural inputs are adequate				
Strongly agree	4	2.7	7	4.1
Agree	14	9.6	25	14.7
Undecided	7	4.8	26	15.3
Disagree	25	17.1	76	44.7
Strongly disagree	96	65.8	36	21.2
Adequate information dissemination from agricultural extension services				
Strongly agree	5	3.4	43	25.3
Agree	8	5.5	108	63.5
Undecided	11	7.5	14	8.2
Disagree	45	30.8	3	1.8
Strongly disagree	77	52.7	2	1.2
Adoption of management practices enhances plantain productivity				
Strongly agree	71	48.6	50	29.4
Agree	59	40.4	110	64.7
Undecided	11	7.5	4	2.4
Disagree	5	3.4	6	3.5
Strongly disagree	0	0.0	0	0.0
Production of plantain increases on annual basis				
Strongly agree	67	45.9	48	28.2
Agree	55	37.7	79	46.5
Undecided	7	4.8	11	6.5
Disagree	9	6.2	26	15.3
Strongly disagree	8	5.5	6	3.5

and 71.8% followed by the high cost of products at 19.9 and 15.4% in Ekiti and Ondo States respectively. The negative effect of fertilizer on fruit quality was the reason given by 11.7% of the respondents in Ekiti State. The non-availability of fertilizers was attributed to lack of fertilizer sale outlets (83.6 and 92.3%) and not the distance to the farming community (7.6 and 0.6%).

Table 6 shows the responses to several perception statements related to plantain production systems in the two states. The suggestion of pest infestation being a serious problem was accepted by 30.6% of respondents in Ondo State but 47.1% disagreed while an equal proportion (41.1%) agreed and disagreed in Ekiti State. There was agreement that insect pest infestation affects plantain

productivity by 54.8% of respondents in Ekiti State compared to 65.3% in Ondo State whereas 28.8 and 20.6% disagreed in the two states. The respondents in Ekiti State (81.9%) and Ondo State (65.9%) disagreed that inputs from government sources were adequate. Few of the respondents in Ekiti State (8.9%) agreed that information dissemination from extension services to farmers was adequate compared to 88.8% in Ondo State. There was agreement that plantain yield tended to increase yearly by 83.6 and 74.7% of respondents in Ekiti and Ondo States respectively. Majority of the respondents in Ekiti State (89.0%) and Ondo State (94.1%) agreed that the adoption of improved management practices enhances plantain productivity.

DISCUSSION

Plantain is the choice nurse plant used to provide the natural shade needed in cacao plantations at the juvenile stage (Opeke, 2003). Thus, the main plantain production systems are in association with cacao (*Theobroma cacao*) which dominates the tree crop economy of Ekiti and Ondo States as a source of employment and income for the growers. This association explains the dominance of men in the cultivation of plantain. Cacao plantations are usually located on the best fertile lands found in the distant farms characterized by forests or forest re-growth not subject to the existing land tenure and bush fallow systems and whose manual clearing is arduous and beyond the capacity of women. Besides, the male children are given the exclusive rights and preference in the inheritance of their fathers' cacao plantations (Olujide and Adeogun, 2006) while the culture of people in the two states places the responsibility of providing the family needs in the hands of men. Akalumbe (1998) had observed this dominance of men in plantain production and that the post-harvest handling activities are within the exclusive domain of the women-folk. This is unlike the situation in the cultivation of short-duration arable food crops that are not soil-exacting and grown in farms subject to land rotation and for which the numerical strength of women has ensured their substantial presence and contribution to the food and nutrition security in developing countries (Barasa, 2006; Sabo, 2006).

Most of the respondents are fairly old being in the 46-60 year-old bracket which is within the United Nations' middle age classification (40-60 years old) and so still an active population that can go about the business of plantain production with vigour. Olujide and Adeogun (2006) noted that 60% of cacao growers in Ondo State were 41-60 years old. The ageing farming population (25.4% and 12.4% of respondents above 60 years old in Ekiti and Ondo States) and the apparent disinterest of younger people in farming activities (7.5% and 1.2% of respondents <30 years old in Ekiti and Ondo States) but

who are preferentially engaged in the informal sector, especially city transportation, further stresses the negative impact of the huge rural-urban drift on rural labour availability and supply (Manyong *et al.*, 2007). This breaking of the backbone of the rural sector is at the root of the intractable crisis in agriculture and is set to get worse unless the reversal, identified as one of the critical issues in addressing the declining crop productivity needed for the desired agricultural transformation in Nigeria, takes place. The high literacy level in the two states, as indicated by 78.8 and 74% of the respondents with formal education in primary to tertiary institutions, is a positive trend which should be exploited to enhance the adoption of improved technologies especially those requiring that farmers read the information on labelled products (Fakayode *et al.*, 2011).

The small sizes (<2.4 ha) of plantain farms are related to the fact that most farmers in the cocoa trade are smallholders who own a few trees to about 3 ha land planted to cacao (Ojo, 2005). The preference for 1-2 wives and 1-5 children means fairly small family sizes and whose members are probably not deployed to farming activities because of a national policy on education that makes school attendance up to Junior Secondary School Class III compulsory and encourages institutions to provide adult and extra-mural classes, sandwich and part-time studies. Thus, farmers would rely more on the scarce and costly hired labour which probably explains the small sizes of the plantain farms and the dominance of intercropping mixtures with arable and tree crops in various agroforestry systems. The preference for intercropping stems from the advantages which include: effective use of available production resources and efficient use of labour, risk minimization through reduction in pest and disease problems, erosion control and increased productivity of diverse crops thereby ensuring food security and long-term management of farmlands (Morris and Garrity, 1993). However, sole plantain farms appear to be on the increase probably because of the growing awareness of plantain as a profitable venture and so being promoted for the alleviation of rural poverty.

A large number of respondents cultivating farms for five years in both states probably relates to the proportion of plantain as a sole crop and the nurse plants in juvenile cacao plantations but which the farmers actually shift from or allow going into fallow. Within the five years, the possible two or three ratoon production cycles are characterized by progressive decline in fruit yields and thereafter the plantains receive less management attention. The observation of annual increase in plantain productivity contradicts this trend but should probably be due to combined output from the larger number of fruiting ratoon plants in each mat. Due to weed infestation and unrestricted sucker production without the necessary de-suckering practice, the farms become moribund and are abandoned. On the other hand, the large number of farms

cultivated for over 15 years probably contain ratoons in mats but which would be severely pruned and eventually destroyed as an orchard management practice to give way to complete canopy closure of the desired cacao plants (Opeke, 2003). The number of pseudostems at 3-4.mat⁻¹ in the study area indicates the adoption of de-suckering recommended practice with which to maintain two or three strong suckers along with the planted crop (Adelaja and Olaniyan, 2000).

Plantain is soil nutrient-exhausting but the intercropping with arable and tree cash crops grown on relatively fertile lands conceals the extent of nutrient-related constraints and hardly emphasizes the need to supply nutrients from external sources to raise output. The farmers' preferred opinion of high soil fertility is strengthened by the fact that plantain would still give substantial output in these farms without the use of fertilizers. Farmers are now increasingly aware about the benefits of application of fertilizers in causing yield increases in crops but there are several constraints to the adoption with the most critical being availability of the products as and when needed rather than the rising costs of fertilizers. Banful *et al.* (2010) made similar observation that the main constraint to fertilizer use in Nigeria is the physical absence of the product at the time it is needed rather than farmers' awareness about the benefits of the use of fertilizers and the techniques of application. There are two major causes of rising fertilizer prices. First, the costs of running fertilizer manufacturing industries have increased in response to global energy and economic crises which levelled off production and tightened availability due to higher competition from developing countries whose demands and consumption of fertilizer products have increased. Second, the fertilizer market deregulation going on in Nigeria since 1997 has meant the withdrawal or reduction of subsidy on fertilizers while the quantities and types of fertilizer products procured and made available to farmers have shrunk considerably (Liverpool-Tasie *et al.*, 2010). The attendant increase in prices compels farmers to apply fertilizers selectively to more remunerative crops, especially cereals, relevant to food security rather than plantain. Despite the popularity and long history of NPK fertilizer use in Nigeria, farmers in the two states preferred urea for plantain production. This is not in tune with the nutrient requirements of the crop. Urea supplies only nitrogen nutrient while the NPK 15-15-15 and 20-10-10 commonly procured would be more appropriate formulations to meet the 1:1:2 nutrient needs (FFD, 2002).

The low farmers' awareness that pests seriously affect plantain would probably arise due to the difficulty in identifying pests and their infestation in the typical intercropping systems. However, the farmers were able to identify insect pests as problems, especially ants, termites and grasshoppers. Ants and termites are found in the mats where the presence of decaying organic materials (pruned leaves and cut pseudostems), moist and shaded

environment encourage their multiplication and activities. The bites from ants can prevent farmers from carrying out critical farm operations such that the chemical control measures are often the main requests.

The agricultural extension service has a dual role in adoption of improved farm practices, especially in the use of inputs. The Agricultural Development Programme (ADP) extension workers influence farmers' adoption of improved technologies by driving the demand for farm inputs through the through information transmission in farmer education activities and providing the access to farm inputs (Banful *et al.*, 2010). Unfortunately, the service has become highly stretched such that only a small proportion can have access to extension workers. This limited reach of the extension service was the situation in Ekiti State. Since the ADP represents the government agency from which inputs can be sourced, the prevailing limited reach contributed to the poor rating as a reliable source of inputs in both states. Nevertheless, the adoption of improved technologies, especially those related to farm hygiene (clean propagules, adequate spacing and weeding, pruning, mulching, earthening-up and propping) and use of external inputs (fertilizers/manures and pesticides), to improve productivity of plantains, must be emphasized.

CONCLUSION

Information obtained from 316 respondents selected from two towns in each local government area in Ekiti and Ondo States, Nigeria showed that the plantain production systems consisted mainly of small holdings (<2.4 hectares) grown to False Horn and True Horn cultivars maintained at 2-4 plants/mat and in various mixtures with arable and tree crops. Management practices adopted to ensure perennial plantain productivity involved recommended spacing, weeding, de-suckering, pruning of leaves, earthening up and propping of fruiting plantain pseudostems while mulching and application of manures and fertilizers were lower in Ekiti State. Non-availability of the products and high prices, and absence of sales outlets caused the low adoption of fertilizers. Farmers' perspectives to the adequacy of inputs from government sources, improved plantain productivity due to adoption of management practices and information dissemination from extension services indicate the impact points to emphasize for the desired high output levels and perennial productivity of plantain production systems.

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