

Banana and Plantain Production in Southwest Nigeria

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Abstract

A survey was conducted between 2002 and 2004 to assess the status, consumption pattern as well as constraints to banana and plantain cultivation in southwest Nigeria. Field studies were also carried out to evaluate six varieties of plantain and banana for growth and yield potentials at Ile-Ife under no-external input production system during the same period. A sample size of 210 farmers was taken in 21 villages across seven local government areas. The cropping systems practised by farmers who planted banana and plantain were: land rotation (81%), plantation agriculture (9.5%) and riverbank farming (6.7%). Constraints to banana and plantain production in the area were: diseases (100%), weed (46.7%), animal pest (35%), finance (67.6%), transportation (7.1%), labour (16.2%) and inputs (33.1%). In both the first growth cycle (plant crop) and the second growth cycle (first ratoon crop), Cardaba and BITA 3 banana genotypes showed the most vigorous growth in terms of pseudostem height, pseudostem circumference, leaf area and sucker production and bunch mass while PITA 17 genotype was the least. Cardaba and BITA 3 banana genotypes recorded the best growth and yield potentials in the trials and therefore, recommended for production in the study area.

Key words: Cropping System, Constraints, Varietal evaluation, Growth, Yield,

INTRODUCTION

Banana and plantain (*Musa* spp L.) are giant perennial herbs, which thrive in the humid and sub-humid tropics (Robinson, 1996; Sharrock and Frison, 2004). In Nigeria, the plant is an important fruit crop which grows in southern part of the country (Baiyeri and Ajayi, 2000; Tshiunza, 2001). The country has an annual banana and plantain production of 1.9 million

metric tonnes out of the world 92 million metric tonnes (FAO, 2006). The fruits of banana and plantain are sources of energy food which provide 25% of carbohydrate in the diet of people in Nigeria (Noupadja and Tomekpe, 2001). The fruit of banana and plantain are richer in phosphorus, iron and vitamin A than most other fruits. Ripe fruits of banana are included in diets for

management of ailments like high blood pressure, kidney, heart and peptic ulcer diseases (Robinson, 1996). In major cities, banana is consumed as desserts while plantain is an important component of elite diets. Although banana and plantain are not yet commodities of international trade in Nigeria, the crop are important source of revenue for small holders who produce mainly in compound or home gardens. However, the potential for international trade is immense. The gross value of annual production of the crops exceeds that of several food crops (Ngeze, 1994).

Despite the food, economic, social and therapeutic values of the crops, significant increase has not been recorded in their production in Nigeria. Banana and plantain industry remains unorganized, while the co-ordinated effort to boost the output and quality of the crops is not in place (Baiyeri and Ajayi, 2000; Tshiunza, 2001). Hence, the country is not an exporter of the crops, and local demand for banana and plantain could not be met (Frison and Sharrock, 1999). The country's potentials for banana and plantain production are not realised despite favourable natural factors such as soil fertility and stable climate that are critical for a vibrant and productive banana and plantain

industry.

Diagnostic survey is a standard technique for obtaining first-hand information from farmers on the situation of production of a particular crop (Baiyeri and Ajayi, 2000; Adekunle, 2003). In Nigeria, comprehensive diagnostic surveys of banana and plantain farmers are scanty in literature. The few reports available do not provide information like the level of education of banana and plantain farmers, their sources of agricultural information, detailed cropping system, sources of suckers and distribution of consumers and processing methods. These are vital information required by policy makers for decision making, especially in organising and activating the comatose banana and plantain industry in Nigeria. A survey by Baiyeri and Ajayi (2000) revealed that 55% of farmers planted dessert banana while 45% grow plantain. They reported that 61% of the farmers were involved in traditional compound farm system while 45% had their crop as sole crop. Primary constraints to banana and plantain production identified in southern Nigeria were: lack of funds for establishment of plantation, unavailability of fertilizer to maintain crop yield, scarcity of farmland for expansion,

long growth cycle of the crop, unavailability of storage facility for keeping fruits and poor soil fertility to sustain production (Baiyeri and Ajayi, 2000). Tshiunza (2001) listed household consumption, sales, age, gender, price and ripening stage as factors that influenced farmers' decision to produce cooking banana for market in southeast Nigeria.

We carried out survey to identify problems militating against banana and plantain production in southwest Nigeria. Among problems facing banana and plantain growers revealed by the study was identification of improved banana and plantain cultivars that are suitable for specific agroecology. Several disease-resistant and high yielding hybrids of banana and plantain were released by International Institute of Tropical Agriculture (IITA) and *Fundacion Hondurena de Investigacion Agricola* (FHIA) (Ortiz and Vuylsteke, 1997). These hybrids have appropriate agronomic characteristics and are being evaluated across several agroecological zones (Robinson, 1996; Tenkouano and Swennen, 2004). To benefit from newly released banana and plantain hybrids, evaluation is necessary because studies on genotype by environment (G x E) interaction effects on heritability and

intercorelations of phenotype and yield traits have demonstrated the need to identify ideotypes best suited to specific agroecologies (Tenkouano and Swennen 2004). We evaluated some of these hybrids to identify suitable ones for southwest agroecology for recommendation to banana and plantain growers. This study reports result of a diagnostic survey aimed at establishing the status, systems and constraints of banana and plantain production in south western Nigeria. It also examines the growth and yield potential of hybrids banana and plantain under no-external input in Ile-Ife.

MATERIALS AND METHODS

Diagnostic Survey

Preliminary studies were carried out in banana and plantain growing areas of Osun, Oyo, Ogun, Edo, Delta and Ondo States in 2004. Structured interview schedule were used to obtain information from 25 selected farmers at each local government area of each state. Farmers were selected randomly from a list in the areas identified as banana/plantain growing areas by the Agricultural Development Department of the local government councils. Results of the preliminary survey were similar for all the parameters examined for all the states,

consequently Edo state was selected for detail diagnostic study based on its geographical location and widespread cultivation of banana and plantain.

Location of the Study

Edo State was created in 1991 out of the former Bendel State. Edo State lies roughly between longitude 06^o 04'E and 06^o 43'E and latitude 05^o 44' N and 07^o 34' N. It is bounded in the south by Delta state, in the west by Ondo State, in the north by Kogi State and in the east by Kogi and Anambra States. It occupies a land area of about 17,802 square kilometres. According to the 2006 census, the State has a population of 3,218,332 inhabitants (NPC, 2007).

Sampling Procedure and Sample Size

Banana and plantain farmers in seven local government areas (Table 1) of Edo state constituted the population for the study. These local government areas and villages were selected based on information supplied by Edo State Agricultural Development Programme (ESADEP) on banana/ plantain production in the State. A total of 38 villages that spread across seven banana and plantain producing local government areas were covered by the survey. The villages were identified by ESADEP's extension workers. A total of two hundred and ten (210) farmers were randomly selected from a list.

Table 1: Village and local government area of the study

S/N	Local government area	village
1.	Ehor	Iguludu, Okpagma, Igiehudu and Ehor
2.	Ikpobia-Okha	Okha, Uroho, Ikpe, Uyimwendim, Ologbo, Obanyator, Ekoza and Alagba.
3.	Oredo	Ogba, Ihiri and Oko
4.	Orhionmwon	Okogbo, Avbuigo and Eguere
5.	Ovia North East	Evbogun, Obazaugbon, Igueadolor, Aghamokpe, Uhen, Ultesse, Egetta, Ogunwenyin, Isiukhu, Adolor, Igueadolor, Amienghmwan, Ora, Ogbesse, Olumoye Uha, Okada I, Okada II, Okada III and Iguomon.
6.	Ovia South East	Ikpobia, Okomu, Udo, Plantation and Iguariakhi
7.	Ovia South West	Iyekeze, Iyase and Iguobazuo

Data Collection

Structured interview schedule were used to gather information from the selected farmers. Seven enumerators were hired for the administration of the interview schedule. They were trained on how to use and interpret the questions correctly in Edo language. The interview took place either in the selected farmer's home, farm or relaxation areas such as under the after the day's work. Information sought in the interview schedule were those relating to demographic characteristics of farmers like age, sex, marital status, type of marriage and number of children. Age, gender and family size had been to influence banana and plantain production in southern Nigeria (Baiyeri and Ajayi, 2000; Tshiunza, 2001). Other information sought in the interview schedule (e.g. level of education of farmers, source of agricultural information, cropping system, variety grown, source of suckers, production constraints, processing method and consumption pattern) had been established to adequately characterize banana and plantain production in the tropics (Eledu *et al.*, 2004; Sharrock and Frison, 2004; Tushemereire *et al.*, 2004).

Pre-testing for Reliability and Validity

Agronomic and extension experts reviewed the draft interview schedule for face and content validity. Also, the data collection instrument was subjected to test-re-test method for reliability test. The instrument was administered to forty farmers at an interval of two weeks. The village selected was not included in the survey. Consequently, analysis of internal consistence was carried out. A reliability coefficient of 0.71 was obtained.

Data Analysis

Data analysis was done using descriptive statistics (such as percent age and frequency count) and chi-square to determine the association among some important parameters.

Growth and Yield Potential Study

The study was carried out at the Teaching and Research Farm, Obafemi Awolowo University, Ile-Ife (04⁰33'E, 08⁰28'N), Nigeria between 2002 and 2004. Ile-Ife lies in the tropical rainforest ecological zone. The weather conditions at the experimental station from 2002 to 2004 are provided in Table 2.

Table 2: Weather conditions at the experimental station from 2002 to 2004

Month	2002			2003			2004		
	Daily	Temp. (°C)	Total rainfall	Daily	Temp. (°C)	Total rainfall	Daily	Temp. (°C)	Total rainfall
	<u>Max</u>	<u>Min.</u>	<u>(mm)</u>	<u>Max.</u>	<u>Min.</u>	<u>(mm)</u>	<u>Max.</u>	<u>Min.</u>	<u>(mm)</u>
January	39.5	13.2	0	40.1	29.5	1.5	40.0	28.5	0.0
February	47.7	13.8	32.0	42.3	29.1	1.8	45.6	29.3	8.1
March	40.0	13.6	65.3	40.1	29.1	120.5	39.2	20.2	77.8
April	38.3	13.4	70.1	37.8	28.9	275.0	38.0	22.1	83.0
May	37.3	14.0	75.0	36.7	28.7	123.0	36.4	24.2	133.8
June	36.3	24.0	110.1	34.8	28.0	51.0	35.2	20.3	185.6
July	34.7	27.4	276.6	33.7	28.9	111.1	34.7	20.1	188.9
August	33.7	28.3	190.1	33.7	29.0	79.9	33.7	21.2	28.5
September	33.3	26.8	285.1	36.1	29.0	165.9	35.6	25.1	191.7
October	38.7	28.8	135.9	36.9	29.1	174.2	37.2	22.3	128.4
November	38.0	33.6	0.0	38.3	33.3	13.2	39.5	24.2	0.0
December	40.0	29.4	0.0	38.8	36.2	35.0	40.2	20.2	0.0
Annual			1317.5			1233.5			1011.7
Mean	37.4	22.2	109.8	37.4	29.9	102.8			84.8

The soil at Ilc-Ife is an alfisol of Iwo and Oba series (Moorman *et al.*, 1975). The pH_(H2O), total N, Organic Carbon, Available P, Cation exchange capacity and textural class of soil of the experimental site were 6.40, 0.08%, 0.94%, 5.52 ppm 1624 C/mol and Sandy loam respectively.

Six *Musa* genotypes were assessed in this study: the cooking triploid banana "cardaba" (AAB), the tetraploid banana BITA 3 (AAAA), the tetraploid plantain PITA 17 (AAAB), tetraploid cooking banana FHIA 21 (AABB), two local plantain varieties of

unknown genome 'Ifenla' and 'Ijeshaloba'. Ploughing and harrowing were carried out. Suckers were used as planting material and were pared before planting. Planting was done in July 2002. The spacing of banana and plantain plants were 3m x 2m. The experiments were laid out using randomized complete block design with three replications. Weeding was done manually as at when needed. No fertilizer application or chemical treatment was made to represent no-input banana production of farmers in Nigeria. Five plants per genotype per replicate were used for data

collection. Pseudostem height and circumference, leaf area, number of leaves and suckers were determined at late vegetative stage (10 months after planting) while bunch weight was determined at fruit maturity. Pseudostem height was measured from ground level to the point where the petioles of the last two leaves met, pseudostem circumference was determined at soil level, leaf area was estimated as: length x width x 0.8 (Obiefuna and Ndubizu, 1979). Data were subjected to analyses of variances and means separated by Duncan's Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

Diagnostic Survey

Age

About 54.0% of banana and plantain growers were in the productive age (31-50 years) while 46.2% of the farmers were above 50 years (Table 3). The mean age of the farmers was 49 years. This indicates that both active and old of farmers are involved in plantain and banana production. A situation suspected to be encouraged by high value placed on banana and plantain as it was reported to outrank fruits like oranges, cashew, mango and apple on returns to labour (Frison and Sharrock, 1999). Age of farmers had been reported to influence production of

cooking banana (Tshionza *et al.*, 2001).

Gender and Marital Status

Higher number of men (94.3%) than women (5.4%) was involved in banana and plantain production (Table 3). This could be explained by different roles played by both genders at different aspect of banana and plantain production. Gender of farmers had been reported to influence production of cooking banana (Tshionza *et al.*, 2001). Men have been reported to be involved in banana and plantain production while women were involved in processing and marketing in other West African countries (Akpeapong, 1999). However, higher number of women was involved in banana production in Ghana than what obtained in this study because of high returns on the enterprise (Banful, 1999). About 89.5% of the respondents were married, 10.5% were widow or widower but there were no single or divorced respondents.

Type of Marriage and Number of Children

About 44.8% and 55.0% of the banana growers had polygamous and monogamous marriages respectively. About 70% of the farmers had more than three children. The mean number of

Table 3: Distribution of respondents based on their demographic characteristics

S/N	Parameter	Frequency (n = 210)	Percentage
1.	<u>Age (year)</u>		
	< 30	00	00
	31- 40	22	10.5
	41- 50	91	43.3
	51-60	76	36.2
	> 60	21	10.0
2.	<u>Sex</u>		
	Male	198	94.3
	Female	12	5.7
3.	<u>Marital status</u>		
	Married	188	89.5
	Single	00	00
	Divorced	00	00
	Widow/widower	22	10.5
4.	<u>Type of marriage</u>		
	Monogamous	166	55.2
	Polygamous	94	44.8
5.	<u>Number of children</u>		
	<2	08	3.8
	2-4	40	19.1
	5-8	80	38.1
	>8	82	39.1
6.	<u>Population of village</u>		
	<1000	03	1.4
	1001- 2000	92	43.9
	2001- 3000	84	40.0
	>3000	31	14.8
7.	<u>Education</u>		
	No formal education	20	9.5
	Incomplete primary education	04	49.5
	Completed primary education	50	23.8
	Completed secondary education	08	3.8
	Post secondary education	28	13.3
8.	<u>Source of Agricultural information</u>		
	Friends and neighbours	48	22.9
	Local markets	08	3.8
	Extension workers	154	73.3
	Media houses	00	00
	Research Institute	00	00

Source: field study, (2004)

children per farmer was 6. Banana and plantain production is a labour intensive farm operation

(Tushemereirwe, 2004). Provision of adequate supply of labour could be the reason why higher numbers

of farmers were involved in polygamous marriage with high number of children.

Village Population

In the study area, 54% of the village had more than 300 people while 45% of the village had less than 300 people. The mean village population was 211 people. This is typical of an African village setting where land allocation for farming plays a prominent role on village size.

Education and Agricultural Information

Only 9.5% of banana growers could not read and write (no formal education). About 50% of the farmers had incomplete primary education while 23.8% of them completed their primary school education. Surprisingly, 13.3% of the growers had post-secondary education. This result agrees with 50% literacy level reported for Nigerian population (NPC, 2007). Similarly, banana and plantain growers in Ashanti region of Ghana had only primary education (Banful, 1999). Extension workers of Edo State Agricultural Development programme provided banana growers agricultural information (73.3%). The information provided included time of planting, source of planting materials, field

management, disease and pest control, suitable herbicides, post-harvest management of banana bunch, processing methods and sales point. Only 22.9% of the farmers obtained such information from friends. Media houses and research institutes provided no agricultural information on plantain and banana.

Cropping System and Variety Grown

Land rotation predominated (81%) among the banana growers (Table 4). This is a reflection of agricultural production systems of Nigeria where small-scale farmers practicing traditional land rotation outnumber the commercial farmers. Other banana and plantain cropping systems practiced by the farmers were plantation agriculture (9.5%), riverbank farming (6.7%) and banana with tree crops (2.9%). The world banana and plantain producers fall into two group: exporter and non-exporter. Nigeria belongs to non-exporter category. Land rotation is the dominant cropping systems of non-banana exporters while plantation farming predominates in exporting countries (Frison and Sharrock, 1999). Local varieties of banana and plantain were grown by majority (50%) of the farmers. About 13% of the farmers planted both local and improved varieties

while 8.6% planted only improved varieties (Table 4). This is not unexpected as most countries that are non-exporters of banana and

Table 4: Banana and plantain cropping system, variety grown and production constraint in Edo state

S/N	Item	Frequency (n = 210)	Percentage
1.	<u>Cropping system</u>		
	Land rotation	170	91.0
	Plantation farming	20	9.5
	Riverbank planting	04	6.7
	Planting with tree crop	06	2.9
2.	<u>Variety grown</u>		
	Local	105	50.0
	Improved	78	8.6
	Local and improved	27	12.9
3.	<u>Source of suckers</u>		
	Previous plot	101	48.1
	Friends	07	3.3
	Local market	33	15.7
4.	<u>Production constraints</u>		
	Diseases	210	100
	Weeds	98	46.7
	Animal pests	74	35.2
	Finance	142	67.6
	Transportation	15	7.1
	High cost of labour	34	16.2
	Planting materials	102	48.6
	Scarcity of labour	10	4.8
	Farming inputs	70	33.3

Source: Field study, 2004

plantain have unorganized industry with weak agricultural extension programme. This situation forced farmers to grow banana varieties of their ancestors. The varieties are of low quality with narrow genetic base which are susceptible to biotic and abiotic factors (Banful, 1999; Sharrock and Frison, 2004).

Consequently yield is low and of poor quality. In addition, a limited number of agencies are responsible for multiplication and distribution of planting material (suckers) to growers. Similar conditions were obtained in banana producing areas of Ghana, Cameroon, Coted' Ivoire, Congo

and Gabon. Whereas banana-exporting nations have established sucker distribution centres where improved varieties bred by research institutes are made available to farmers on regular basis and at affordable cost (Akyeapong, 1999; Banful, 1999; Shamebo, 1999). The sources of suckers for planting may greatly influence the types of varieties of banana and plantain grown. The study revealed that 48% of the farmers obtained suckers from previous plot while 3% and 15% sourced their suckers from friends and local markets.

Production Constraints

The banana and plantain production constraints in the study area as distributed among the respondents are as follows: diseases (100%), weed (46.7%), animal pest (35%), finance (67.6%), transportation (7.1%), labour (16.2%) and farming inputs (33.1%). These constraints are similar to problems threatening banana and plantain globally. The most common are pests and diseases. In Uganda, where the industry is large and developed, Seguga (1999) and Tushemereirwe (2004) reported that diseases, pests, soil fertility decline and post harvest losses greatly threaten the industry. They stated that susceptibility to pests and diseases

largely contributed to a low genetic base of the crop in Uganda. The situation is worse in Ethiopia, in addition to those listed problems of the sector in Uganda, drought, salinity, poor research extension and inadequate land compounded the problem of banana industry (Samebo, 1999).

Yield and Market Price

About 82% of the growers recorded more than 4 tonnes per hectare as mean yield (Table 5). This is lower than the banana and plantain yield trend of most African countries. Akyeapong (1999) reported 5 tons/ha for Democratic Republic of Congo, 6tons/ha for Ghana, 15 tons/ha for Eastern states of Nigeria, 10 tons/ha for Central Africa Republic and 26 tons/ha for fertile volcanic soil of Cameroon. Fruit production is limited to the parent crop only and typically for only one ratoon crop after which the field is left to fallow because of very low yield. At the time of the survey, 43% of the growers were selling a bunch of banana and plantain for less than N200; 48% sold a bunch for between N200 and N600 while only 17% sold a bunch for greater than N700. The objective of the growers is subsistence. It is only after the demand for home consumption is satisfied that any leftovers are sold. This represents a

profit to the growers as little was invested on fertilizer, weed, and disease and pest control. However, production of cooking banana in southeast Nigeria has been reported to respond to market forces (Tshionza *et al.*, 2001).

Table 5: Banana/plantain yield, selling price, processing and consumption pattern in Edo state.

S/N	Item	Frequency (n = 210)	Percentage
1.	<u>Banana/plantain output (tons/ha)</u>		
	<1	00	00
	1- 2	18	8.6
	2- 4	18	8.6
	4- 6	68	32.4
	>6	106	50.5
2.	<u>Banana/plantain bunch selling price (N/bunch)</u>		
	<100	92	43.8
	100- 200	64	30.5
	200- 300	18	8.6
	> 300	36	17.1
3.	<u>Processing</u>		
	Local processing	206	98.1
	Factory processing	14	1.9
4.	<u>Consumption pattern</u>		
	Eaten fresh (banana)	210	100
	Eaten boiled	94	44.8
	Fried plantain	124	59.0
	Plantain flour	76	36.2
	Plantain chips	60	28.6

Source: field study, (2004)

Consumption pattern

Local processing (98.1%) and factory modification (1.9%) were the processing methods for banana and plantain grown in the study area. About 100% of banana grown in the area were eaten raw. Plantains are consumed boiled (45%), fried (59%), or made to

plantain flour (36.2%) and as plantain chips (29%). This is the general trend all over the world (Frison and Sharrock, 1999). Even in banana and plantain exporting country like Mexico, 95% of production enters domestic market while only 5% reach international trade. About 90% of domestic

market is in fresh fruit (Romero, 1999). In India, 98% of their production is consumed locally while 2% is for export. The bulk of domestic market is in fresh fruit consumption while very little is processed into different forms such as banana puree, powder, flour and chips (Sundararaju, 1998). Banana is consumed as dessert throughout Ghana. Banful (1999) reported that all plantain produced in the country is consumed locally. In some cases, boiled plantain, both green and ripe is served as breakfast, lunch and supper. Generally, there is no clear pattern in the consumption of plantain at the household level in both rural and urban area of the study area.

It is evident from the survey that banana and plantain cultivation in Edo State operated on subsistence level. Though the farmers obtained their agricultural information from extension workers, it appeared that its content was not adequate to transform banana and plantain farming practices. Most farmers practiced land rotation and grow local varieties of the crops. This situation created production constraints like diseases, pest, weeds and limited yield. Consequently, there is no improvement in the production of the crop over years.

Growth and yield potential study

Pseudostem heights of the *Musa* varieties were significantly different ($P < 0.05$). The pseudostem height of Cardaba (84.3 cm) was the highest while Ifenla had the lowest pseudostem height (52.4 cm) (Table 6). The pseudostem heights of the *Musa* genotypes assessed were as follows: Cardaba, FHIA 21, BITA 03, PITA 07, Ijeshaloba and Ifenla. However, in ratoon crop, the pseudostem height of BITA 3 (95.3 cm) was the highest while the two local varieties (Ifenla and Ijeshaloba) recorded the lowest pseudostem height (Table 7). The pseudostem circumference of Cardaba (32.5cm) was the largest while Ifenla had the least (20.1 cm). Similarly, in ratoon crop, BITA 3 had the largest (35.3 cm) pseudostem diameter while Ifenla had the least (23.7 cm) (Table 7). Expectedly, the two local genotypes (Ifenla and Ijeshaloba) had the highest number of leaves in both plant crop and ratoon crops (Tables 6 and 7), but this did not translate to large leaf area for the local genotypes as the local genotype had the least leaf area while Cardaba had the largest leaf area in both crops. Number of suckers produced did not differ significantly ($P > 0.05$) among genotypes in plant crop (Table 6), but the number of suckers produced differed significantly

($P > 0.05$) among genotypes in ratoon crop (Table 7). BITA 3 produced the highest number of suckers while FHIA 21 had the least. Ifenla and Ijeshaloba had the shortest period from planting to flowering (12 months) while FHIA 21 took the longest period (18 months) in plant crop. Similarly, the local *Musa* spp. had the shortest period to flowering while PITA 17 and FHIA 21 had the longest in ratoon crop. The differences in growth characteristics observed were expression of genotypic constitution of banana/ plantain genotypes assessed.

Similar genotypic variation in growth characteristics was reported by Ortiz and Vuylsteke (1997) at preliminary trials before the release of the *Musa* germplasm. The bunch mass of BITA 3 was the largest (2.8 kg) while FHIA 21 had the lowest (2.0 kg) in main plant (Table 6). The bunch weights of *Musa* spp. in plant crop were in this descending order: BITA 3, cardaba, Ifenla, Ijeshaloba, PITA 17 and FHIA 21. In ratoon crop however, bunch mass of FHIA 17 and FHIA 21 were the lowest while that of Cardaba was the largest (3.3 kg) in the following descending order: Cardaba, BITA 3, Ifenla, Ijeshaloba, FHIA 21 and PITA 17.

Swennen and Ortiz (1997) suggested that yield per growth cycle of *Musa* cultivars with long growth cycle is higher than that of *Musa* cultivars with a short growth cycle. This was not however confirmed by the result of this study as PITA 17 and FHIA 21 with longest days between planting and flowering did not have the largest bunch mass meaning that the genotype is inherently low yielding. Nevertheless, low soil fertility of the experimental location may also affect yield per hectare. Soil nitrogen (0.08%) and phosphorus (15.00 ppm) content of the experimental soil fell below the critical level for good growth of *Musa* spp. reported by Rubaihayo (2003). The higher growth and yield of ratoon crop than plant crop confirms the report of Swennen and Ortiz (1997) that the yield of second cycle is usually higher than the yield of the first cycle in banana/plantain production. The mean bunch mass for this study was very low as mean bunch mass under optimum condition according to Robinson (1996) was 35 kg. Cardaba and BITA 3 showed the best performance among *Musa* spp. evaluated in terms of growth, sucker production and fruit yield.

Table 6: Growth characteristics and yield of plant crop of *Musa* spp at Ile-Ife, Nigeria (2002-2003).

<i>Musa</i> spp	Pseudostem height (cm)	Pseudostem circumference (cm)	Number of foliage leaves	Leaf area (cm ²)	Number of suckers	Months to flowering	Bunch mass (kg)
Cardaba	84.3a	32.5a	7b	35.3a	2a	14ab	.6ab
BITA 3	74.6b	24.7b	9b	14.2c	1a	14ab	2.8a
PITA 17	67.8c	33.1a	8b	19.1ab	1a	17a	2.2c
FHIA 21	75.1b	33.1a	8b	15.1c	1a	18a	2.0c
Ifenla	52.4d	20.1c	11a	10.2d	1a	12c	.5ab
Ijeshaloba	54.7d	21.4c	12a	11.3d	1a	12c	.4ab

Note: values in the same column followed by the same letter do not differ significantly at P=0.05

Table 7: Growth characteristics and yield of ratoon crop of *Musa* spp at Ile-Ife, Nigeria (2003-2004).

<i>Musa</i> spp	Pseudostem height(cm)	Pseudostem circumference (cm)	No of foliage leaves	Leaf area (cm)	No of suckers	Months to flowering	Bunch mass (kg)
Cardaba	74.7c	28.1b	9b	76.4a	5b	10ab	3.3a
BITA 3	95.3a	35.3a	9b	37.3b	8a	10ab	3.2b
PITA 17	77.8c	34.1a	7c	21.3ab	5b	12a	2.4c
FHIA 21	79.1b	35.3a	7c	17.0c	2c	12a	2.5c
Ifenla	58.9d	23.1c	15a	11.2d	3c	9c	2.6ab
Ijeshaloba	57.1d	24.3c	13a	11.2d	3c	9c	2.6ab

Note: values in the same column followed by the same letter do not differ significantly at P=0.05

CONCLUSIONS

It can be concluded from this study that a significant number of plantain/banana farmers obtained information on modern production practices from agricultural extension workers. The survey revealed that land rotation practices predominated among the farmers with 50% of them planting improved varieties mainly circulated among them. Diseases and pests are the major constraints affecting banana/ plantain

production in the area. The banana/ plantain yield is lower than the average yield obtained in other African countries which can be attributed to declining soil fertility. Eating of banana as dessert, and limited factories for processing of plantain are the main consumption pattern of banana/plantain in the study area. The result of the varietal evaluation suggests that cardaba and BITA 3 have potentials for good performance under no-external input traditional

system among farmers in the rainforest areas of Nigeria.

RECOMMENDATIONS

Based on the conclusions, the following recommendations are suggested for revamping banana/plantain industry in Nigeria: creation of sucker distribution centre in banana/plantain growing areas for supplying improved, high yielding, disease and pest resistant germplasm to farmers; inclusion of modern diseases and pest control management techniques in agricultural extension package; local processing capacity should be improved to take care of increase in banana/ plantain production; and fertilizer application should form part of banana/plantain production practices. Cardaba and BITA 03 are the recommended banana varieties for southern Nigeria farmers to boost production.

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