ANALYSIS OF INDIGENOUS PRACTICES OF SMALL-SCALE PLANTAIN FARMERS FOR APPROPRIATE ALLEY FARMING TECHNOLOGY IN OYO STATE, NIGERIA.

BY

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DEDICATION

To:

my ALMIGHTY GOD

my wife, Tewogbade,

son, Toluwalope

daughter, Oluwatobi

mother, Mosunmade and

JESUS CHRIST, our Father.

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ABSTRACT

The limitations of conventional technology development gave birth to Farming Systems Research perspective which look at farming practices from a holistic view. This however has innate flaws in its implementation. Recent emphasis therefore is strengthening the need to appreciate a hitherto neglected indigenous knowledge systems. This indigenous knowledge for instance, has been influencing the indigenous practices associated with small-scale plantain production. Before now Plantain has not received favourable attention despite its economic potentials in the Nigerian economy. This is the main reason for this investigation which described the indigenous practices in its production. It is with an intent to illustrate how Alley Farming Technology should be designed to blend with the indigenous practices of the small-scale plantain farmers.

The inquiry was conducted in Irewole and Oranmiyan Local Government Areas (LGAs) of Oyo State (however, since the creation of new states in 1992, these LGAs have become part of Osun State). The objectives of the study were to: describe the socio-economic features of plantain farmers, ascertain their

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indigenous practices, identify constraints to production, examine their agricultural information sources and determine the impact of certain variables on indigenous practices. A mini-study (or field observation) was conducted on ten small-scale (volunteer-farmers less than 3 ha) plantain plots. The monitoring of these plots for about six months was to field-test certain concepts which were empirically investigated in the follow-up survey. The survey was an interview schedule administered to two hundred and seventy (270) small-scale plantain farmers selected through a multi-stage sampling technique in the two LGAs.

Frequency analysis of information obtained from the ten plots indicated that the most common crops intercropped with plantain (26.2%) were cassava, cocoyam, maize and vegetables. Information from the questionnaire revealed that 91% of the respondents had no formal education. Though staking was a practice, recommended spacing and mulching of plantain was not favoured by 98% of the interviewees. Cutlass was frequently used by 99.3% in plantain operations. Male household heads determined planting plantain (99.3%), plots to be used (98.9%) while female household heads/wives of male household heads decided on plantain processing (78.5%), sales (89.6%) and cost of production (69.6%).

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Constraints to plantain production include declining soil fertility (98.5%), insufficient propagules (95.2%) and inadequate extension service (95.9%). Multipurpose trees (MPTs) known to plantain farmers were Cassia (98.1%) and Gliricidia (97.0%).

At a priori P<.05, pearson correlation analysis indicated a significant and positive association between indigenous knowledge and intercropping of plantain (r = 0.25). Use of Radio as a source negatively correlated with staking (r=-0.51) and mulching of plantain (r = -0.23). Stepwise multivariate regression showed that 48% of the variation in indigenous intercropping of plantain was explained by six regressors; household size, social participation, alley farming awareness, extension drama method, farm service centres and poor community market prices for plantain.

These findings have implications for the adoption of Alley Farming technology in the study area. There is a serious need to involve small-scale plantain farmers in alley species (MPTs) selection, establishment and management. A comprehensive extension educational programme is necessary to make plantain farmers more aware of the alley farming technology.

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CERTIFICATION

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CHAPTER ONE

INTRODUCTION

1.1 THE GENESIS OF FOOD CRISIS IN NIGERIA

Prior to the discovery of petroleum oil, the economy had sustained itself on agricultural production (Ahmed, 1985). The contribution of agriculture to the national economy (Gross Domestic Product-GDP) was 61.2% in 1962/63, 53% in 1965, 40% in mid 1970s and 20% in 1980 (Famoriyo 1979, Ajayi, 1989).

Similarly, agricultural export revenue portion was 73.6% (1960-65), 7.5% (1970-75), 4.1% (1976-80) and 2.4% in 1981-85 (Balogun, 1990). The oil boom period of 1973-80 affected the pattern of food production and consumption in that agriculture was neglected (Osakwe,1988; Ojo, 1989). Udo (1987) asserted that in naira value, food import increased from N28.4milion in 1968 to N2,048 million in 1982. He concluded that the ability to pay for larger imports of food and other agricultural products which were sold at lower prices further lowered the relative profitability of local agriculture. However, when the world oil market collapsed in mid 1981 and during the first quarter of 1986 (Yahaya,1988, Ahmed,1988) the consequences were enormous. It

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was reported that external reserves fell, foreign debts mounted and government finances deteriorated (The Presidency, 1990). Economic depression, rising prices and unemployment also became widespread (Oke, 1990). While the economy degenerated, population growth continued unabated thus accentuating the food demand (Ahmed, 1985).

McNamara (1990) indicated that in 1980/81, Nigeria had about 13.7million people faced with the problem of food insecurity. This represented about 17% of the 84.7million people in the same period. The population's growth rate increased from 2.5% in 1965-80 to 3.3% between 1980 and 1988, and in 1990 the total figure was estimated at 117.2million (McNamara 1990). He averred further that in 1988, agriculture contributed 34% to the GDP, yet its average annual growth rate decreased from 6.9 in 1965-1980 to -1.1 between 1980 and 1988. In an attempt to improve the situation, the Federal Military Government in 1986 adopted the Structural Adjustment Programme (SAP). Among the major objectives of the SAP is to restructure and diversify the productive base of the economy. This was aimed at reducing

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dependence on the oil sector and on imports (Oke,1990). Measures taken along this line were integrated rural development, promotion of modern farming methods and institutional reforms.

The scope of modern farming methods and Institutional reforms were in the areas of agricultural research and extension (Ojo, 1988). This initiative created more and enlarged the existing agricultural instututions which became the framework of the National Agricultural Research System (NARS).

Gerhart (1986) however observed that most NARS are characterized by poorly trained staff, low levels of incentives, spotty supervision, inadequate material support, excessive diffusion of efforts and high rates of staff turnover. Specific to the NARS in Nigeria, Ruttan (1987) identified the following constraints among others;

1. <u>Ineffective system of delivery of research</u> results to farmers and
2. <u>Ineffective mechanism for assessing the appropriateness</u> and impacts of their agricultural technologies.

Stifel (1989) concluded that the NARS has not produced the stream of technologies necessary to cumulatively raise food production and national development in Nigeria. In contributing to the goal of raising food production on a sustainable basis therefore, the International Institute of Tropical Agriculture

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(IITA) at Ibadan, among other things, explored the potential of an agroforestry practice referred to as Alley Cropping (See appendix 4).

According to Baumer (1990) the International Council for Research in Agroforestry (ICRAF) defined agro-forestry as "a collective term for system and technologies of land use where perennial woody plants (trees, bushes, shrubs, palms and bamboos) are deliberately cultivated on ground otherwise used for crops and/or stock rearing in a spatial or temporal arrangement and where there are interactions at once ecological and economic between the woody plants and the other components of the system".

Though this is a land use system in practice in the tropics, Kang and VandenBeldt (1990) contended that as a new science however, it lacks suitable experimental methodology and data analysis procedure. When livestock production is integrated into the alley cropping system it becomes alley farming (Okali and Sumberg, 1985; ILCA, 1988). These terms are used interchangeably throughout in the text. Chapter two of this study discusses the nature of this technology, but it is adequate here to highlight the importance of plantain (Musa paradisiaca cv Agbagba) in Nigeria.

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1.2 STATUS OF PLANTAIN IN NIGERIA.

This part is in three aspects. These are the price indices of plantain (as a proxy measure of its importance), the production trend and its local processing and utilization dimensions.

A. Price Indices of Plantain

FAO (1989a) reported that progress in Africa has been constrained by several factors. These include the manner in which priorities for research and development have conventionally been set. As an example, three of the major staples -roots, tubers and starchy banana staples have been neglected. Among the starchy staple is plantain. According to Anojulu and Banjou (1991), more than 100 million Africans consume about 250kg of plantain per person per year, thus providing more than 25% of total calories. Plantain fits easily with established farming systems, reduces degradation of the ecosystem and provides a reliable source of food for the "hungry season" before other crops are harvested (IITA 1989,1990).

It is preferable in areas with labor constraints (Johnston 1958). Though it does not store well, it is often considered a delicacy, thus making prices high in times of scarcity (Wilson 1986). Tables 1.1-1.5 show the retail prices of selected food in

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some state capitals in Nigeria. Plantain is added as a form of comparison.

As seen from Tables 1.1-1.5, retail prices of plantain are relatively high in most of these state capitals. However, the general trend of market prices for plantain and other commodities in Oyo State is presented in Table 1.6. In regular surveys, the price fluctuations of plantain, on monthly basis between 1985 and 1991, at some markets in Ibadan, obtained by the National Horticultural Research Institute (NIHORT) are shown in Table 1.7.

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Table 1.1 Retail Prices of Selected Items -Lagos (N/kg)

ITEM Unit	1985 QUARTER 3rd	4th	1986 Quarter 1st	2nd	3rd	4th	1987 1st
Garri 1kg	1.17	1.32	0.85	1.27	0.96	0.79	0.75
cowpea(Brown)	2.90	1.62	2.29	2.60	2.36	1.94	2.55
Rice (Agric)	3.14	3.44	3.41	3.50	3.53	3.04	2.70
Maize (Grain)	1.19	1.03	0.92	1.06	1.05	0.90	0.90
Yam (tuber)	2.01	1.77	1.79	1.85	1.33	1.65	0.93
Millet	1.64	1.46	1.29	1.03	1.24	1.37	1.20
Guinea corn	1.39	1.30	1.19	1.09	1.10	1.75	1.13
Plantain	2.07	1.02	1.37	1.66	1.83	1.00	1.67

Source: Digest of statistics. F.O.S. Lagos. June, 1987.

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Table 1.2 Retail Prices of Selected Items -Ibadan (N/kg)

ITEM	Unit	1985 Quarter 3rd	4th	1986 Quarter 1st	2nd	3rd	4th	1987 1st
Garri	1kg	0.84	0.50	0.48	0.76	0.77	0.76	0.74
Cowpea (Brown)	"	2.79	1.33	1.73	2.51	2.69	2.12	2.58
Rice (Agric)	"	2.31	2.55	2.58	3.18	3.55	4.06	2.94
Maize (Grain)	"	0.55	0.59	0.63	0.93	0.78	0.75	0.72
Yam tuber	"	0.69	0.42	0.56	0.71	0.66	0.58	0.57
Millet		-	-	-	-	-	-	-
Guinea corn	"	0.91	0.63	0.64	0.78	0.94	1.13	0.83
Plantain	"	1.26	0.92	0.77	1.03	1.07	0.93	0.84

Source: Digest of Statistics. F.O.S. Lagos, June 1987

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Table 1.3 Retail Prices of Selected Items - Kaduna (N)/kg

ITEM	Unit	1985 Quarter 3rd	4th	1986 Quarter 1st	2nd	3rd	4th	1987 1st
Garri	"	0.86	0.64	0.67	0.90	0.93	0.84	0.80
Cowpea (Brown)	"	2.52	2.17	2.75	3.11	3.07	3.28	2.89
Rice (Agric)	"	2.41	2.53	2.25	2.81	3.51	2.98	2.82
Maize (Grain)	"	0.85	0.64	0.73	0.89	0.96	0.82	0.72
Yam tuber	"	1.14	0.64	0.91	1.32	1.20	0.93	0.94
Millet	"	1.04	0.71	0.68	0.61	0.85	0.70	0.60
Guinea corn	"	0.89	0.77	0.65	0.65	0.69	0.63	0.60
Plantain	"	1.80	1.37	0.75	1.28	1.43	1.58	1.30

Source: Digest of Statistics FOS Lagos, June 1987

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Table 1.4 Retail Prices of Selected Item - Enugu (N/kg)

ITEM	Unit	1985 Quarter 3rd	4th	1986 Quarter 1st	2nd	3rd	4th	1987 1st
Garri	1kg	0.72	0.61	0.67	0.86	0.74	0.67	0.78
Cowpea (Brown)	"	2.65	1.66	1.59	1.98	2.15	1.97	1.98
Rice (Agric)	"	2.20	2.29	2.03	2.49	2.64	2.49	2.67
Maize (Grain)	"	1.45	0.86	1.10	0.86	0.73	0.73	0.75
Yam (tuber)	"	1.18	0.63	0.53	0.73	0.94	0.62	0.59
Millet	"	1.91	1.91	1.83	1.84	1.75	1.71	1.70
Guinea corn	"	1.95	2.08	1.85	1.85	1.72	1.71	1.70
Plantain	"	1.30	1.09	0.83	0.90	1.00	1.09	0.94

Source: Digest of Statistics. F.O.S. Lagos, June 1987

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Table 1.5 Retail Prices of Selected Items - Jos (N/kg)

ITEM	Unit	1985 Quarter 3rd	4th	1986 Quarter 1st	2nd	3rd	4th	1987 1st
Garri	"	0.92	0.70	0.69	0.93	0.95	0.83	0.86
Cowpea (Brown)	"	1.99	2.10	2.39	2.95	3.11	2.63	2.74
Rice (Agric)	"	3.30	3.46	2.69	3.24	3.70	4.11	3.97
Maize (Grain)	"	1.23	0.73	0.69	0.91	0.96	0.64	0.61
Yam (tuber)	"	1.26	0.54	0.80	0.93	0.89	0.64	0.55
Millet	"	1.59	1.15	0.93	0.90	0.89	0.79	0.77
Guinea corn	"	1.68	1.33	1.14	1.09	1.50	1.01	0.95
Plantain	"	1.23	0.78	1.05	1.36	1.45	1.20	1.22

Source: Digest of statistics FOS Lagos, June 1987

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Table 1.6: Yearly Producer Average Rural Market Prices for Commodities in Oyo State 1982-1986 (Kobo/kg)

Commodity	1982	83	84	85	86
Yam	57	65	82	80	92
Maize	48	57	54	69	62
Garri	51	49	38	59	50
Cowpeas	58	53	59	104	133
Plantain	61	62	65	69	80
Cassava	56	50	43	52	75
Palm oil	58	89	103	114	140

Note: Price of palm oil is in kobo/Beer Bottle (approximately 0.65 litres)

Source: Oyo State Statistical Handbook (1986) Ministry of finance and Economic Planning (Statistics Division) Ibadan.

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Table 1.7: Monthly Average Retail Price for Plantain in Ibadan 1985-1989 (N/kg)

Month	1985	1986	1987	1988	1989	1990	1991
January	0.84	0.80	0.81	0.84	1.09	2.08	2.20
February	0.80	0.72	0.79	0.87	1.63	2.47	2.02
March	1.00	0.82	0.87	1.00	1.91	3.09	2.30
April	1.04	1.11	1.07	1.04	2.05	4.02	2.37
May	1.38	1.15	1.51	1.37	2.72	4.96	2.98
June	1.20	1.38	1.38	1.27	2.80	4.40	3.45
July	1.14	1.11	1.42	1.09	3.33	4.56	3.04
August	1.06	1.06	1.55	1.06	2.85	4.93	3.17
September	1.05	0.88	1.24	0.97	2.57	2.59	2.78
October	0.80	0.70	1.12	1.00	2.67	3.13	2.98
November	0.70	0.80	1.14	0.71	2.26	2.52	2.66
December	0.77	0.83	1.16	0.79	2.18	12.61	2.88

Note: Markets surveyed are Bode, Bodija, Dugbe and Bere.

Source: Marketing Unit, NIHORT, Ibadan (1992).

B. PLANTAIN PRODUCTION TREND IN NIGERIA

According to FAO (1986b), more than 50% of plantains produced in Africa comes from Nigeria, Zaire, Cameroon, Cote D'Ivoire and Ghana. The West Africa and Central Africa contribute 61% and 21% in that order. It was also found that there was a 26% change in plantain production from 1125 tonnes in 1974 to 1420 tonnes in 1984 (FAO, 1986). Anojulu and Banjou (1991) conservatively estimated total area under plantain cultivation in Nigeria at below 400,000 hectares. The major areas of plantain production in Nigeria are Bendel (now split into Delta and Edo States), Ondo, Ogun, Rivers and Oyo States. Other less important regions are Anambra, Benue, Cross River, Gongola, Imo, Kwara and Lagos States (Martin, 1979). The production figures of plantain in Nigeria from 1981 - 1990, as presented by the Central Bank of Nigeria (CBN 1989, 1990), is shown in Table 1.8.

Considering the general trend between 1981 and 1990, the consistent increase in plantain production could be as a result of established demand outlets for both industrial processing and/or domestic utilization.

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Table 1.8. Estimated output of plantain in Nigeria 1981-1988 (1000 tones)

Year	Plantain Production
1981	1,048
1982	1,054
1983	1,067
1984	1,086
1985	1,113
1986	1,127
1987	1,071
1988	1,549
1989	1,700
1990	1,972

Source: CBN Economic and Financial Review (various reports).

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C. PLANTAIN PROCESSING AND UTILIZATION.

In terms of processing, when in the unripe (or green) form, the astringency (taste) in plantain can be removed by boiling. When ripe it could be eaten raw after peeling the skin. It could also be used or cooked as vegetables. The product from the ripe plantain which is fried in vegetable, groundnut or palm oil is called "Dodo" in south west Nigeria. "Elubo" is derived when green plantain is peeled, cut into pieces and sun-dried to hard brownish substances, which are eventually ground into a fine-powdery form. When plantain is cooked with beans (or Yam or cocoyam) and later mashed together gives a paste locally called "Asaro" (porridge). Both Dodo and Asaro are sweet-tasting delicacies.

Similarly, when green (matured) plantain is boiled and pounded together with cooked yam or cocoyam or sweet cassava it is indigenously referred to as "Iyan Ogede"(in Oyo State). This can be eaten with stew and meat/ fish.

In herbal medicine, plantain is used as a relief for intestinal disorders. Kafaru (1989) reported that it is used to cure infertility in human beings. Ogazi (1985) found that it is often used as a cure for vomitting and diarhoea. This is because of its high potassium content (Anojulu and Banjou ,1991). Also, it is used in curring sore throat (Ogazi, 1985), and Uvulities (indigenously referred to as"Belubelu"). It is reputed to give a

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higher calorie weight compared to any known carbohydrate (Anojulu and Banjou 1991).

In terms of morphological endowment of the plantain tree, its broad green leaves serves as temporary shield against intense sunshine and/or rain. The dried leaves (sheaths from its pseudostem) and petioles, serve as crude ropes for lashing/tieing sticks together. The dried leaves are used to wrap pap for local sale and consumption. Also they are used as wraps for safe-keeping of kolanuts. The petioles are used to make baskets and fish traps. Dried leaves are utilized as head pads to carry heavy loads, and as bedding materials for animals.

Male buds from corm shoot when cooked and fermented serve as delicacies. Pseudostem and skins and male buds, when chopped into pieces, serve as feed for livestock.

Industrially, Ogazi (1985) found that vinegar, ketch-up and syrups could be obtained from over-ripe Plantains. It also serves as source of single-cell proteins. Other industrial uses are as flour in bread, cake and biscuit making. Ethanol and methane (biogas) can be derived as well. Ogazi (1985) further discovered that plantain peels could serve as tenderisers and dish-washing soap. When the peel is dried, ground, sieved and preserved in powder form, it has a softening effect on vegetables such as Telferia, Pumpkin leaf and meat when cooked together. This

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reduces the cooking time. Industrial starch is got from plantain pseudostems while fibres can be extracted for use by the textile industry.

Oyenuga (1965) documented its further uses as source of iron, carotene and potassium. It is also a source of carbohydrate to livestock (Oyenuga, 1967), vitamins A and C and, it contains little protein (Egharevba, 1975).It is also a component of pancake product (Akinboro, 1985). In countries such as Cameroon (Du Montcel, 1987), Phillipines, Cote D'Ivoire and the Carribean states (FAO, 1989a), plantain is a source of foreign exchange.

According to Anojulu and Banjou (1991), the cost of production of plantain per hectare in Nigeria is N6,000.00 (six thousand naira only). The returns after deducting cost of production on a hectare is about N29,625.00 (twenty nine thousand, six hundred and twenty five naira only). On the same hectare, returns from sale of plantain suckers could be as high as N4,000.00 (four thousand naira only). They further averred that returns to cost of plantain production per year is higher than for any other staple. They contended that plantain consumption is favoured by all classes of people when compared to other crop. And high income earners consume the crop most. They also revealed that as per capita income increases, per capita consumption also increases.

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In spite of all these advantages the policy attention given to plantain production and research is not commensurate with its potential . Its promotion has been totally neglected (Anojulu and Banjou, 1991). There is the handicap of inaccurate statistical data concerning production levels. Also, we have lean empirical socioeconomic studies on baseline system of production particularly in Oyo state (despite ecological endowments in the south eastern part of its area). To this extent, appropriate production technology recommendations would be impaired.

1.3 Statement of the Problem

Several constraints to sustainable plantain production at the small farm level have been under focus recently. These include small hectarages, inadequate knowledge of production techniques, capital and marketing facilities (Akinboro 1985). Others are scarce plantain propagules, borer weevil attack and black sigatoka diseases (Adeyemi and Udensi 1988). Pests and diseases, lodging of the plant, low multiplication rate, difficulty in hybridization, insufficient genetic study and somatic variation in tissue culture are also, part of the constrains (Swennen and Hahn 1988).

Black sigatoka is a most formidable disease of plantain (Stifel 1989; IITA 1988, 1989, 1990b; Swennen et al, 1989). The

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"Agbagba" plantain variety, common in Oyo state, has been discovered to be susceptible to the sigatoka disease (Vuylsteke and Swennen,1991). Other constraints include insufficient organic matter supply (Dorosh, 1988) and soil infertility (Wilson and Swennen 1989). In sum, these are the crop-, resource-, pest- or institutional foci, which has less concern for the farmers' perspectives.

Added to these multitude is alley farming - an attempt to address the organic matter and soil infertility management. Even this agroforestry practice, thought to be based on traditional cultivation system, is a technology with its own technical requirements - conjectured by urban-based scientists. Though agroforestry is on the mandate of the Forestry Research Institute of Nigeria (FRIN), it is nonetheless, concerned about the socioeconomic effects of the integration of certain forest trees into the farming systems of the rural populations (FRIN 1991). Along the same line, Jazairy (1989) also warned that, often, well-intended project fail because the technology being applied does not fit the needs or capabilities of the local farmers. This is because, as Sims and Leonard (1990) put it, "Scientists see themselves as defining the issues which they believe ordinary citizen cannot fully articulate, and as solving society's problems in the modern laboratory".

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It is suggested here therefore, that, the appreciation of the technology-need of small-scale plantain farmers requires a farmer-focus. This necessity is entrenched by Sims and Leonard (1990) who averred that "Scientists' research methods traditionally exclude clients from formulating the problems and contributing to their solution. They are highly technical, and based on a reductionist approach involving a limited set of variables whose inter relationships are relatively easy to grasp, at least compared with the complexities facing resource - poor farmers".

In this context, the focus in any agricultural sustainability should be the farmer - the knowledge he/she possess, the attitude(s), skills, beliefs, aspirations and resource capabilities, and constraints to change of practice in order to attain a better living standard in a traditional agricultural enterprise. In traditional agriculture, we should recognise that there is long-established routines in production practices. In essence, according to Schultz (1964), employing a new factor of production implies not only breaking with the past, but coping with a problem because the production possibilities of a new factor also bring risk and uncertainties. The need to appreciate traditional agriculture has been well articulated by Zaag and Tegera (1982). In their view, the major prerequisite of increasing crop

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production requires the thorough understanding of the existing cropping systems utilised by the farmers.

In sum, Kesseba and Mathur(1989) proferred that "Solutions to problems of sustainability of agricultural production therefore, do not rest with science and technology alone" thus, they conclude that "the development of agroforestry systems which can be adopted by small farmers presents a major challenge for research..."

In this realization, to sustain small-scale plantain production through integration of alley trees necessitates the understanding of the plantain farmers native approach or indigenous practices. An insight into indigenous orchestration of resource inputs could be useful in developing sustainable alley farming systems altogether.

The critical elements to be addressed,therefore,are:

a. What are the socioeconomic characteristics of these small-scale plantain producers?
b. What are the indigenous production practices of the small-scale plantain farmers?
c. What are the small-scale plantain farmer -felt constraints in plantain production?
d. What are the small-scale plantain farmers perception of, and attitude to Alley farming?

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e. What sources of information influence their production systems?

1.4 Justification of the Study

The potential of appropriate alley farming technology to sustain plantain production at the small-farm system is not contestable. The process of its suitability however merits inquiries in form of socioeconomic studies in order to highlight technology needs and current practices in the production of a staple crop such as plantain. Understanding what plantain farmers do to their holdings will throw light on what technology will be useful to them. At present, amount of empirical (socioeconomic) information on plantain production is not noteworthy. It is this gap that the study attempts to reduce.

Findings from this investigation would assist researchers in appreciating the mechanics of indigenous practices in small-scale plantain systems. It also highlight area for further enquiries and thus be able to expand the evolving body of knowledge on plantain literature. Overall, the result could be useful for the Extension service in the design of an Alley plantain information package that will be compatible with small-farmers cultivation and land conservation practices.

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1.5 Objectives of the Study

The broad objective of this inquiry is to analyse the indigenous practices of small-scale plantain farmers in two Local government areas of Oyo State, Nigeria. The specific objectives are:

1. to describe the socioeconomic and demographic characteristics of the small-scale plantain farmers;
2. to ascertain their indigenous agronomic and management practices in small-scale plantain production;
3. to identify their constraints in small-scale plantain production;
4. to examine their sources of agricultural information;
5. to determine small-scale plantain farmers level of awareness and attitude to Alley farming technology;
6. to determine the impact of selected socioeconomic and demographic variables on indigenous agronomic and management practices of small-scale plantain farmers;
7. to highlight the implications of the findings for alley farming technology;
8. to suggest recommendations towards an appropriate alley farming technology information package;

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1.6 Hypotheses

1. There is no significant relationship between indigenous knowledge/customary beliefs and intercropping of plantain.
2. There is no significant association between use of Radio as information source in the propping and mulching of plantain.
3. There is a significant correlation between awareness about alley farming and staking and mulching of plantain.
4. There is no significant effect of plantain farming experience on spacing, staking and mulching of plantain.
5. There is no significant correlation between frequency of Extension contact and staking of plantain.
6. There is a significant effect of cosmopoliteness on plantain production decision making,spacing,staking and mulching of plantain.
7. There is a significant relationship between use of labour in weeding and production cost and household size.
8. There is no significant association between social participation and decision making on plantain production.
9. There is no significant association between contact with Extension and inputs used in plantain production.
10. There is no significant association between age of farmer and decision to produce plantain.

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11. There is a significant relationship between farmers land tenure system and production of plantain.
12. There is no significant correlation between plantain farmers level of formal education and awareness about alley farming.
13. There is no significant interaction between level of plantain diseases and farmers contact with Extension agents.

1.7 Limitation of the Study

The political dispensation of creation of new states has put (Oranmiyan and Irewole LGAs), the study area, in Osun state. This two LGAs share a boundary that divides them, approximately, into equal north-south distances. This provides a contiguous landmass, suggesting that cultural practices in small-scale plantain production could be similar. This is moreso because the people are predominantly Yorubas.

Participant observation technique was used to monitor inputs-output on the ten selected plantain plots. This method was carried out in one location comprising few neighbouring villages in Irewole LGA. Overall, the short-term migratory tendencies of respondents limited the scope of activities that could be observed adequately on plantain plots.

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1.8 Definition of Terms

1. Small-Scale plantain production

   A farm- family - managed holding with not more than 300 plantain plants in plot(s) not greater than 7.5 acres (3ha).

2. Plantain mat or stool (locally called "Agbo Ogede")

   Several plantain stools clustered about the parent material (because of non-desuckering).

3. "Agbagba"

   Indigenous (Yoruba) name given to plantain.

4. Indigenous Practices

   Agronomic and management strategies based on traditional knowledge of small-scale plantain farmers

5. Appropriate Alley Farming Technology

   Alley farming technology that fits into indigenous practices of small plantain farmers.

6. Alley

   A corridor/space bound on both sides by live trees/shrubs.

7. Alley Cropping

   Cultivation of crops in the alleys.

8. Alley Farming

   Incorporation of livestock to browse on foliage in the Alley cropped system.

9. Ajile : Yoruba term for "fertilizers" or "making the land more productive" literally -- wake-up-the-land.

10. Igba: Yoruba term for 200 heaps (cultivated land)

11. Igi: Yoruba generic term for a tree.

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CHAPTER TWO

ALLEY FARMING TECHNOLOGY

Stifel (1989a) gave the background to this technology and asserted that the prevalence of shifting cultivation and bush fallowing among small-scale farmers in the tropics was sustainable because the productivity of the land was restored by the regrowth of natural vegetation during the fallow period which ranged from 5 to 20 years. However, the combination of Nigeria's increasing population, expected to hit 164 million in 2000 (IBRD, 1986) and the predominance of inherently infertile Low activity clay (LAC) soil, have shortened fallow period to 2 or 3 years. In fact, Nigerian soils have been classified as fragile and poor (Wilson and Stifel, 1988). It is therefore evident that an improved farming system is inevitable. Against this background, alley farming or cropping appears to merit some discussion.

2.1 Definition and Description.

Kang et al (1986a) defined Alley cropping as a farming method in which food crops are planted in alley (or space) between rows of fast-growing trees or shrubs (see Appendices 1 and 2). The reasons for this technology are:

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1. to replace shifting cultivation and bush fallow system with a stable farming system that keeps useful features and advantages of the traditional fallow system;
2. to allow a piece of land to be continously cropped;
3. to use prunnings from the leguminous trees and shrubs as mulch and green manure to help maintain soil fertility and reduce fertilizer requirements;
4. to promote soil and water conservation on sloping land;
5. to reduce weed growth during the dry season and reduce the need for bush fires to clear land;
6. to provide supplementary browse for small ruminants;
7. o provide staking material for yam and firewood for home cooking.

Alley farming has been described as an improved bush fallow system in that it integrates the "art and wisdom of traditional farmer" with the efficiency of current science (Kang and Van DenBeldt, 1990). In Central and West Africa, the most suitable tree species for alley cropping trials as identified by IITA, are Leucaena leucocephala, Gliricidia sepium, Cassia siamea and Calliandra callathyrsus (IITA, 1990b). The first three are locally referred to as "Igi Ajile", "Igi Agumaniye" and "Igi Agala" respectively.

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In comparison to the traditional bush fallow system, Kang and Reynolds (1986) outlined the features as presented below:

Traditional System	ALLEY Cropping System
1. Retain mixed native woody species	Planting selected, prefarably woody leguminous species
2. Irregular Planting pattern	Grown in hedgerows
3. Before cropping,trees and shrubs are cut back and burnt to release nutrients	Trees and shrubs are periodically prunned; prunnings used as mulch and green manure
4. Fire used for controlling growth	Hedgerows are periodically prunned
5. Allows short-term cropping	Allows continous cropping

Source: Kang and Reynolds (1986)

According to Kang et al, (1986b) tree species that can be used in Alley cropping system should be those that:

(i) can be established easily,

(ii) grow rapidly,

(iii) have deep root system,

(iv) produce heavy foliage,

(v) regenerate readily after prunning,

(vi) have good coppicing ability,

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(vii) are easy to eradicate,

(viii) produce useful by-products.

2.2 Recommended Practice

The practices recommended for the establishment and management of the alley species are based on the works of Kang et al (1981) and Kang et al (1986a & b).

In terms of planting site, some alley species will perform well on non-acid soils in areas with less than 500m altitude and over 1000mm annual rainfall. Seeds of Leucaena should be treated either by soaking in hot water for 12 to 24 hours or scarified in concentrated sulphuric acid for one hour. If hot water is used, the volume ratio of seed to water should be 4:10. But if acid is preferred, then seed-acid ratio should be 10:1 by volumes. Seeds treated with acid should immediately be planted or dry them for storage. The seed rate is three seeds per hole. For an hectare of land, 1.7kg seeds of Leucaena is required while 2.5kg seeds of Gliricidia would be required for same size of land. Stem cutting could be used for Gliricidia when direct seeding is not feasible.

The planting depth for Leucaena and Gliricidia are 1.5cm and 1.0cm deep respectively. Planting is in the mornings when the rains have established i.e. in the rainy seasons. The intrarow

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spacing is generally between 25cm to 100cm. The interrow spacing, on the other hand is between 2m to 4m. For in-situ yam staking, 2m alley width is adequate. The orientation of the plantings should be East-West. This is to minimise shading of food crops by the hedgerows.

Prunning of hedgerows should start one year after establishment. Thereafter, prune periodically every 5-6 weeks. Prunnings could be spread over the cropped plot, incorporate into the soil as green manure and/or where applicable, feed to small ruminants. The prunning height is 25cm - 75cm (approximately knee high). A sharp cutlass is preferred for prunning.

The alley cropping system has been described by Mutsaers (1984) as a composite technology in that, it consists of interdependent elements that cannot be treated in isolation.

The element are tree establishment and management, mulching to sustain and enhance soil and crop productivity, soil conservation, animal feed and socioeconomic considerations. He contended that these interrelated aspects must be fully appreciated when adopting the technology in order to be able to achieve the complete benefits.

The bottom line therefore is that, there is a critical point involving the prunning interval and management of the hedgerows species for varied goals and objectives with the target farming

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situation. The potential of alley cropping in plantain production has been examined (see Appendix 6). In such a study carried out on Leucaena leucocephala and Flemingia congesta. Wilson and Swennen (1986, 1989) outlined the advantages of alley cropping Plantain as;

i. the hedgerows can supply mulch

ii. they can recycle nutrients and fix nitrogen

iii. serve as windbreaks to plantain

iv. supply stakes for propping plantain

v. Provide favourable microclimates

As a result of these attributes, this study examines the indigenous practices of small-scale plantain farmers in terms of fallow and mulching practices, spacing, staking materials, management and other crops combined with plantain. This is in order to highlight how alley farming can fit into their small-scale plantain system and, not the other way round. This is the focus of discussion in Chapter three however.

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CHAPTER THREE

LITERATURE REVIEW

3.1 The Concept of Small-Scale Farmer

Since 1986 the Nigerian government has not relented in its effort of enhancing agricultural production. Among the strategies is the nationwide institutionalization of the IBRD/IMF-supported Agricultural Development Programme (ADPs). According to The Presidency (1990), the focus of the ADPs is the small farmers who account for about 90 per cent of the total crop output. This corroborates the assertion that these farmers are willing to accept new crops, new management practices (Johnson et al, 1969), and that, they deserve policy priority (Olayemi, 1980,; Adesimi, 1990). Evidences also indicate that these farmers are more productive per unit of land than their large-scale counterparts (Stifel,1989).

Conceptually, the small-farm system is defined by Byrnes and Shadi-Talab (1976) as a type of social organisation in which an economic unit (the farm firm) is embedded within a social unit (the family of the farm holder). This arrangement is operated in:

a. Size of holding - usually five hectares or less with limited access to production inputs.

b. Level of market interaction;

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(i) The holders family provides the bulk of the inputs; labour, capital and management

(ii) The farmers output primarily meets the direct consumption needs of members of the holders family.

c. Level of living; the farm firm provides subsistence or materially low or small level of living.

Concerning psychological attributes, Gibbons and Schroeder (1983) conceived the small-scale farmer as having:

(i) a holistic outlook -- while agriculture is the main activity, it is a part of total life.

(ii) An enviromental sensitivity -- they perceive from collective and individual observation what elements of the environment are significant to their success as farmers.

(iii) A local focus- they know more about local things than regional, national or global issue.

(iv) A self interest- each farmer has his/her own priorities that may influence decision making.

(v) Farmer bias -- farmers perceive issues from a farmwork stand-point.

(vi) Tradition, fatalism and adaptability to change.

In terms of production characteristics, their land holdings varies from 0.1 ha to 5.99 ha (Olayide, 1980), and between 5acres

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(2ha) and 15 acres (6ha) (McNamara, 1990). Spencer (1990) puts the upper limit of small-scale farms as 3ha. Olayide (1980), noted that the Nigerian agrarian landscape, shifting cultivation and complex land tenure systems are responsible for the small farm sizes. In a study conducted among small farmers in Ijebu, Ogun State, Adesimi (1990) found that most of the field work was done by the men, but were assisted by women in harvesting, processing and weeding operations. Male children were reported to be more significant, relative to female children, in activities such as planting and weeding. The female children help mostly in harvesting (Adesimi 1990). He further revealed that on the average, in a planting season, farm implements used consists of 4.3 cutlasses, 2.1 hoes, 0.3 shovels, 2.7 knives, 1 axe, 5.4 sacks, 4.9 baskets and 0.4 headpans. Intercropping was also the most dominant system.

In the opinion of Kesseba (1989), the small farm systems are complex and diversified. He declared that while the farmers are averse to risk, their production system are susceptible to stress factors such as population pressure and they are increasingly being polarised and marginalised. As regards their prospects, Sands (1986) found that small-farmers are constrained by limited resources and access to both land and capital. In addition, she observed that they regard hired labour as

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a drain on scarce cash resource and is not favoured. Also, they operate in imperfect market conditions. In order to enhance their production, the International Maize and Wheat Improvement Center (CIMMYT, 1988) suggested that researchers should be aware of the human element in small farming.

Against this background, the premise arises for examining the type of technology that will also fit into their cultural and socio-economic characteristics. According to Fafunwa (1983), "traditional African education encourages intellectual growth and development". He asserted that observation, imitation and participation are some of the major learning processes adopted. It was his opinion that African children and adolescents learn the local geography and history of their community. He enumerated that botany and zoology of wildlife in their locality are taught or caught through observation and actual "didactic instruction in the mother-tongue, accompanied by practical demonstrations". This is also true of their agricultural practices especially in the rural areas.

In rural Africa, the internal processes are more significant in economic and social interactions. This is a notion referred to as "Economy of affection" (Hyden 1986). This economy of affection denotes network of support, communications and

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interactions among structurally defined groups that are connected by blood, kin, community or other affinities such as religion.

Subsequently, Kelly (1990) advised western scientists to be sensitive to the ethnographic contexts when operating in the developing economies. He stressed that this sensitivity is by understanding that most "primitive" cultures are going to have problem-solving mechanisms of their own which are for better worked with than against.

This position reinforces the findings of several studies that part of the constraints to effective extension work in most third world countries is the promotion of inappropriate technology (Brown 1983; Sigman and Swanson 1984). In Nigeria, Williams (1989) also noted the preponderance of vague and irrelevant technologies introduced by extension service into the traditional farming system.

Sands (1986) surveyed many of the traditional explanations for unsuccessful technology transfer to small-farmers as including

i. "the technology is good, the farmers are at fault... and

ii. inadequate support systems for small-farm agriculture.

Such systems are extension, credit or input supplies".

While she condemned the first excuse as an armchair conjecture common to both the natural and social sciences, she

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agreed with the other as being part of the problem. However, she raised the point that rarely is the viability of the "improved" technologies meant for the small-farm system ever questioned.

Hilderbrand (1980), similarly, criticised the prevalance of inappropriate technologies. It is adequate here therefore to examine the concept of technology.

3.2 The Concept of Technology

Cultural perspectives influenced Achebe (1983) in his definition of technology as an attitude of mind. Re-echoing this, Stamp (1989) described technology as a social construct and a practice- the product of a particular society's history. Similarly, from a socio-anthropological foundation, Melhuus (1988) perceived a technology as socially constructed, socially consumed and socially evaluated. That is, technology is embedded in social relations. To this extent, he explained that it is how material activities are organised into a sort of division of labour on gender basis.

For operational purposes however, Byerlee and Collinson <u>et al</u>, (1980) defined a technology as a combination of all the management practices for producing or storing a given crop or crop mixture.

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Mutsaers (1984) viewed it as any factor or a combination of factors employed in crop production to improve the farming system's productivity. On a similar note, Engel et al, (1988) conceived technology as a technical method for achieving a practical purpose. They contended that it implies a know-how, a knowledge and information component. They concluded that all farming practices are technologies.

Swanson et al, (1984) gave insights into the types of agricultural technology.These are;

i. Labour - saving technology

ii. Land-saving technology

iii. Scale-neutral technology.

Labour-saving technology implies a large-sacle mechanization generally applicable in large-scale production units. They asserted that this type may also be useful in sparsely populated niches where labour is the limiting factor. Land-saving technologies are suited to small-scale farmers, who practice multiple cropping techniques and intensive farming systems. This type absorb the excess labour of farm families or household in a productive manner.

Scale-neutral technologies are those that can be adopted by the large and small-scale farmers because they reap similar benefit e.g. new varieties of crops. For accurate identification of

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alley farming technology, the classification of agricultural technologies by Spencer (1990) is considered next.

According to Mutsaers (1990) who cited Spencer (1990), agricultural technologies could be classified into three types.

Type I or " Doomsday " Technology are those that mine the soil for some years and destroys the land effectively. This is common when there is large scale mechanical clearing with inappropriate equipment. Monocrop enterprises belong to this type. Type II technologies are those that require purchased inputs such as fertilizers, pesticides, high yielding crop varieties etc.

Type III technologies are those that are within the reach of the average farmers. According to Mutsaers (1990) this is because this technology does not require unavailable inputs or unrealistic infrastructural changes. Example of this includes crop varieties resistant to pests and diseases, biologically fixed-nitrogen by leguminous crops, and alley cropping. Alley farming is in this category because it requires low external inputs (Mutsaers 1990). The goal of sustaining the productivity of small-scale farmers in the third world is the focus of the International Fund for Agricultural Development (IFAD) (Jazairy, 1989). To this fundamental, Jazairy (1989) explained that IFAD's investment in agricultural research has shifted from a top-down, mechanistic and task-oriented exercise to a demand-driven,

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problem-solving approach related to the needs, and contexts of the rural poor. Kesseba (1989) related that IFAD's role in the generation of sustainable agriculture is to promote the appropriate technological change within the resource - poor condition. The term appropriate technology is meshed with sustainable agriculture and these are discussed next.

3.3 Agricultural Sustainability and Appropriate Technology.

According to FAO (1989) sustainable agriculture should manage agricultural resources to satisfy changing human needs while conserving and enhancing the quality of environment. To attain this requires agricultural technologies that are appropriate in the contexts in which they are to be used.

The Canadian Hunger Foundation (1979) defined an appropriate technology as that which is most suitably adapted to conditions of a given situation. The characteristics of such technology are: labour intensive, simple to apply, small-scale, low-cost, Benefitting as many people as possible, Flexible, and not conflicting with local ecology.

Okigbo (1990) and McNamara (1990) also described an appropriate technology as an agricultural technology in which resources are orchestrated in such a way as to provide

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increasingly cost-effective level of productivity with minmum adverse effect on the resource base/environment.

Important as the need for appropriate technology is, literature is however resplendent with cases that most agricultural researches are yet to internalise it. Sands (1986) surveyed the reports on small-farmer adoption, modification or rejection of improved technologies and identified three types of lessons. That:

i. Small-farm families are receptive to change and small-farm systems are dynamic. The concept that traditional agriculture is static is misleading.

ii. Small-farm families are selective and adaptive in their adoption and use of recommended practices and technologies.'

iii. No single attitude, trait, factor or farming conditon explains the patterns of small-farm adoption of all new innovation.

As a form of remedy, Harwood (1979) suggested that the blending of traditional and modern technologies may hold the key to prompting resource-poor farmers along a modernised farming system. Rhoades and Booth (1982) also advised that applied research must begin and end with the farmers. While Norman et al (1982) highlighted the significance of understanding the human

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element in farming systems, Rhoades (1989) noted that small-scale farmers knowledge, inventiveness and experimentation have long been undervalued. There were suggestions that farmers and scientists should be partners in research and extension (Rocheleau and Weber, 1987). The contributions of small-scale farmers to agricultural research have also been documented (Gomez 1977; Norman et al, 1982; Abalu et al 1984; Okali and Sumberg 1986; Atta-Krah and Francis 1987). This input is highly relevant because, as a result of variabilities in farming loci, the small farmers fine-tune the improved technologies to fit their socio-economic and cultural systems (Biggs and Clay,1981).

Sumberg and Okali (1989) gave empirical evidence of small-farmers experimentation with alley farming in south-west Nigeria. Their investigation revealed that their cooperating farmers devised another strategy, different from initial recommendations. This deviation was later seen to be compatible with the diversity of their production locality.

They also buttressed the idea that rather than allowing crop yield to be the central operative in any on-farm trial (as in alley farming trials), the farmers interest should be the main focus. They asserted, therefore, that the adoption by farmers should be the validation of any technology. In order to secure the desired adoption of technologies by the small-farmers, Richards (1989)

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was of the view that agricultural scientists in west Africa should begin to understand agriculture as a social action bound up in larger social processes. This concurs with the submissions of Achebe (1983), Hyden (1986), Melhuus (1988), Stamp (1989), Ogunniyi (1989), and Kelly (1990).

REVIEW OF SOME ADOPTION STUDIES

The adoption of an innovation is a mental process. The process starts when the technology is made known to the farmer, who considers its advantages and disadvantages before trying it on a small-scale and later expanding the use of the technology several factors are known to influence adoption of agricultural technologies however.

In a study on adoption of improved farm practices in Patiala District, Punjal (India) Sinha and Bhasin (1968) found that lack of irrigation facilities, irregular supply of agricultural inputs, higher cost of inputs and poverty were responsible.

Values have also been found to affect adoption. Singh and Babu (1968) noted that in community Development Block Bichpuri (Agra in India), profitability and productability preferences were the highest ranked values.

Das and Sarkar (1970) found that farmers adopt the farming practices only for the economic gains. Other factors were:

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Socio-cultural - such as age, educational status, family type, primary occupation, farm size, income structure, social participation. Higher economic motivation promoted favourable attitude to adoption of improved farm practices.

In the same line, Ogunfiditimi (1981) argued that adoption of improved farm practices is a choice under uncertainty. His premise was that agriculture is characterised by risks and uncertainties. These risks and uncertainties are also non-insurable. In the study carried out by him in Oyo and Ondo states, the adoption of new improved cassava variety was significantly correlated to farmers' level of education, economic status, farm size, leadership role and social interaction, perceived risk and uncertainty of outcome in adopting the new practice, contemporary influence, Extension agents credibility in relation to the new practice and family decision in relation to the new practice.

Strong (1989) reinforced the notion and further adviced that, the external agencies and their experts should realise that they have as much to learn from, as to impart to, small-scale farmers and should devise techniques of working with them to marry traditional and modern insights and practices. Summarising the various perpectives, Sands (1986) asserted that " to understand small-farmers diverse and complex criteria for

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evaluating technologies, analysis must prove below the aggregate level of statistical correlation between adoption practices and discrete variables, and test the hypothesized explanations for observed adoption behaviour." She believed that this more indepth analyses generate the kind of information that is most useful for assisting the appropriate design, and promotion of new technologies. In the case of plantain it is necessary to discuss the recommended practices with a view to comparing it with traditional practices in order to guide in the development of an appropriate alley farming technology.

3.4 PLANTAIN PRODUCTION TECHNOLOGY.

Generally, plantain is found between Latitudes 4° 30'N and 8 10 N. In an FAO (1984) survey covering 1970/74 to 1980/84, it was found that in coastal west Africa, plantain production was about ten times more than that of Banana. The report also revealed that the rate of plantain increase (in cultivation) was 2.5 per cent per year while that of Banana was 2.3 per cent for same period. Plantain is a staple food of millions of people in the tropics (IITA, 1989). Nigeria is reported to be the largest producer in West Africa (Ndubizu, 1985), and its annual output is estimated at 2.4 million metric tonnes. He found that plantain

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performs well in Edo, Delta, Ondo, Rivers, Cross River, Imo, Ogun, Oyo, Anambra and Lagos states.

Botanically, plantain is referred to as Musa paradisiaca (cv Agbagba). Its genomic formula is AAB. There are four varieties of Plantain. These are; Horn, French, French Horn and False Horn. The false horn is the most widely distributed in Nigeria (Ndubizu 1985). Morphologically, it has an incomplete inflorescence at maturity. Its hand consists of large fingers followed by few hermaphrodite flowers with no male bud at maturity (Swennen,1990). It is a giant herb with non-succulent false stem referred to as pseudostem. It may grow as high as 3-5 metres. Its broad leaves are produced serially with each succeeding leaf larger than the preceeding ones. Leaf sizes may be between 10,000 to 15,000 cm2 in area. It could produce between 40-48 leaves before it flowers. Total growth period from the planting of sword sucker to first harvest is about 280 - 450 days (Ndubizu 1985).

In terms of rainfall, suitable areas must have above 1500mm annually. In Nigeria, the northern limit for rainfed plantain is a west-east line joining Ibadan (Oyo state) through Auchi (Edo state) to Gboko (in Benue state). Temperature requirement is between 16°C-38°C. Sunny conditions are

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favourable. This will enable better plantain growth and reduce development of fungal diseases (Du Montcel, 1987).

Heavy clay soils with poor drainage or those which compact easily are not suitable (Adelaja 1985). Sandy loam with adequate moisture is ideal. Plantain tolerates acid soils (PH 5.0-6.5). Application of organic matter, green manure, mulching, household waste, cocoa pods, etc are recommended. Inorganic fertilizers containing Nitrogen, Potassium and Magnesuim are also beneficial. Areas sheltered from winds will also reduce lodging and needs for props. The area for planting should be devoid of weeds and should be cleared before the rainfall commences. Holes should be dug at least 30cm deep and wide enough to accomodate the planting material. Apply two spadefuls of decomposed (poultry) manure to each hole. Also add 5gram of Carbofuran 5G and mix throughly with the soil before planting. Plantains are propagated by lateral shoots (suckers) which are either left with the parent plant to produce a ratoon crop or may be cut from the parent and replanted elsewhere (Dorosh 1988). The adequate propagule is the sword sucker which is not infested by borers and insects. Planting should start when the rains are steady, that is, between April and July. In monocropped enterprise, the recommended spacing is 2.5m between and within the rows. This gives about 1,600 plants per hectare. Spacing of 2m x 3m gives 1,660

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plant/ha. When intecropped the spacing may be wider than this. The range of requirement for NPK fertilizers will be determined by soil or leaf analysis, site and crop history of the land. This is supplemented with Muriate of Potash. The first dose of NPK fertilizer is applied in either a ring or, band, four weeks after planting (4WAP). The other doses are applied at the 5th and 7th month of planting provided there is moisture in the ground. Weeding of plot should be regular. Two suckers per mat is recommended. Where there are prevalent winds, fruit bearing stands should be propped to reduce lodging. Props (or stakes) are usually long support sticks with Y -shaped end (see Appendix 6). Bamboo sticks could also be used. Routine hilling of base with soil is advisable. Depending on the variety, harvesting begins nine to twelve months or 12-14 months after planting. Harvest should be made at full state of fruit-filling for local market and, three-quarters full for distant markets (Ndubizu, 1985). Matured plantain bunch should be cut with a sharp cutlass, prefarably early in the morning or late in the day. In well managed plots, yield ranges between 22-30 tonnes/ha (Adelaja, 1985)

3.5 PLANTAIN PRODUCTION SYSTEMS

According to Dorosh (1988), plantains are mostly grown by small-holders in West and Central Africa (see Appendix 8). They

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are also rarely grown as monocrops. The Three traditional production systems identified by (IITA 1988c) are:

i. Homestead Cultivation: Cultivation of plantain about the dwelling places of farmers. This system receives ample organic matter in form of refuse from the household (see Appendix 9a).

ii. Shifting cultivation: Plantain is planted first among other food crops after fallow in plots far away from the village. It is usually intercropped with maize, cocoyam (or taro), cassava, yam and vegetables (see Appendices 9b and 10a).

iii. Cash Crop Cultivation: Plantain is intercropped with cocoa and Coffee because it provides shade for these cash crops when they are young seedlings (see Appendix 10b).

Wilson and Swennen (1989) also classified the production systems as follows:

a. Shifting Cultivation or bush fallow rotation. This is where plantain is usually combined with other crops.

b. Multistorey Complexes - with plantain occupying an intermediate canopy level between trees and food crops such as maize, cassava and cocoyam

c. Intensively managed compound or backyard gardens - This is where soil fertility is maintained at a high level with household refuse and animal waste.

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In the shifting cultivation system, plantain may be the first or last crop in the sequence after the land recovers from fallow. According to Wilson and Swennen (1989), farmers plant food crops with plantain on land cleared for reafforestation in order to care for the young trees and the food crops. The multistorey complexes consist of trees like oil palm and Kola occupying the upper canopy level, plantain occupies the middle level because it is shade-tolerant while food crops occupy the lower canopy level. The backyard system consists of small plots close to the house, which receives a frequent deposit of organic refuse from the household members. This refuse supplies nutrient, and organic matter. It also serves as mulch, thus prolonging the productivity of the plantains. Nweke et al (1988) found that plantain production under the compound system (in southeastern Nigeria) resulted in nearly four times as much yield as in non-compound systems. This brings to light the potential of alley farming in non-compound plantain systems. This is because the prunnings from the hedgerows can be applied as mulch materials and organic manure to the plantains. When matured alley trees are prunned their sticks can also be used as stakes to prop plantain from lodging (Wilson and Swennen 1986 and 1989) (see Appendix 6).

However in a study to evaluate the socioeconomic aspects of alley cropping maize/cassava in Ayepe, Dvorak (1991) found

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that apart from variability in yield (results), on-farm yields from alley farms two years old were disappointing. .This, she propounded may be connected with farmers delayed prunnings of the hedgerows which might have caused tree-crop competition for nutrients, water and/or solar radiation. While asserting that alley cropping is a complex technology which may be influenced by biological and socioeconomic factors on farmers fields, she concluded that "the diagnostic trials in Ayepe have demonstrated that the biological performance of alley farming does not translate smoothly from the experiment station to farmers fields". This exposition, further explains why farmer(s) do not follow the recommended prunning time/regime for the alley species: Their indigenous practices may have been critically altered. Though it is not the objective of this study to find out why farmer cooperators delay in prunning alley trees, yet, the bottom line is that the indigenous agronomic and management practices of the target farmers, in this case small-scale plantain farmers, needs to be understood from a holistic perspective and not from a reductionist orientation, as is common with scientific research methodology (Sims and Leonard 1990). It is thereafter that it might be possible to determine the appropriate alley farming technology that blends with the farming practices of small-scale plantain farmers.

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3.6 THE CONCEPT OF INDIGENOUS PRACTICES

Knight (1980) noted that food production in the traditional system of Africa is built from a store of information, which comprises a genetic stock of crops and livestock and human information that may be referred to as folk science or ethnoscience. The ethnoscience, according to him, deals with cognition about enviroment, the rules by which agriculture is undertaken, and information on manual and mental skills including decision and logical calculi.

Several terms related to ethnoscience have been proposed. These include Indigenous knowledge systems (IKS) (Brokensha et al, 1980), Rural people's knowledge (Howes and Chambers 1979; van der Kamp and Schuthof, 1989) and indigenous knowledge (Warren 1989). The components of these overlapping terms are explained in Appendix IIa.

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ILEIA (1990) cited Odhiambo (1990) as regarding indigenous knowledge as that which has been accumulated by the people over generations by observation, experimentation and handing-on of old people's experience and wisdom in any particular area of human endeavour. Warren (1989) noted that indigenous knowledge is a local knowledge unique to a given culture. It is also a valuable resource and an essential foundation for the development of sustainable agricultural systems (Brokensha 1986).

Warren (1989) explained further that the knowledge is codified in the language of the society and thus facilitates communication and decisions. He then concluded that solutions offered by development workers often fail because it does not fit in with the clientele's local practice.

Byerlee et al (1980) defined a practice as the timing, amount and type of various technological components such as seed-bed preparation, fertilizer use or weeding. They contend that a subsistence farmer who uses no purchased input is neverthless using a technology which may sometimes be quite complex. This informed the study which conceived of technology as any farming system or resource(s) employed to produce a crop. For this analysis, the technology is in small-scale plantain production. A technology is however defined by ILEIA (1989) as the way knowledge, inputs and services are composed and combined and

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thus facilitate a certain system to function and survive. From the foregoings, a synthesis of these terms is proposed herein as indigenous practices.

For operational purpose, indigenous practices are the timing, amount and type of agronomic and management strategies which originate from and naturally produced in the study area (Oyo state), and is administered to the plantain holding possessed by the small-scale farmers. It is necessary to examine the components of this definition.

In respect of agronomic strategies generally, Chambers (1983) found that many of the practices of traditional farmers which were regarded as primitive or misguided are now recognised as sophisticated and appropriate. An example of this is the cultivation of two or more crops concurrently on the same plot (see Appendices 9 and 10).

Nweke et al (1988) for instance, discovered that in south-eastern Nigeria, arable and perennial crops are interplanted with plantain. The crops in this admixture are cocoyam, oil palm, African breadfruit, coconut, African Pear, Kolanut, Oranges and Oha. Adetiloye and Ezumah (1989) also noted that planting cassava and plantain at the same time in intercrop showed substantial agronomic and economic yield advantages over sole crop. They expanciated that cultural practices of intercropping

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yam, cocoyam, cassava, plantain/banana, and cocoa, kola are not yet amenable to mechanization.

In terms of crop architecture, Knight (1980) remarked that the tropical (small) farmer's "field" is a microcosm of the natural ecosystem. He advanced that the farmers have developed spatial and temporal means for coping with seasonality and variability in production. For the purpose of this discussion, variables that would operationalise the agronomic strategies are crop combinations, spacing, staking and mulching frequencies.

Related to management strategies the resources/inputs being managed by the small - scale plantain farmers are land, labour, information, capital/credit and implements etc. The fundamental issue to the management approach is the decision making process. In Dommen's (1988) view, African agriculture consists of re-arranging the way productive resources are used . He noted that routines derived from precise knowledge of the environment are needed for success. He also concurred that the necessary knowledge for such practices have been acquired by generations of farming experience. However, he opined that during the production process, the farmers skills are oriented toward conserving the fertility of the land base. A need, he contended, that is met by highly adaptive and tested cultural practices. Among the cultural practices are inventiveness in

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labour organisation, crop variety selection, and intercropping in relation to specific micro-environments and soil catenas (Richards, 1985).

In terms of decision-making, Barlett (1980) found that farmers usually make choices within the context of the household. He averred that small-farmers decisions are influenced by the household needs and goals as well as the resources controlled by the household.

CIMMYT (1988) emphasised that decision determinants include:

i. adequate food supply for their families;

ii. economic returns to be obtained from an innovation (or technology);

iii. risk of loss in benefits from an innovation.

Eicher and Baker (1982) characterised the management practices of small cultivators in West Africa as:

a. reliance on family labour

b. a small stock of physical capital

c. abundant land relatively

They found that family labour account for between 80-90 percent of total labour inputs. It is estimated that rural women contribute two thirds of all the time that is involved in traditional agriculture in Africa.

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In a survey of the rural Yoruba people in southwestern Nigeria (including Oyo state), Patel and Anthonio (1973) elicited that 93 per cent of the women were engaged in farm work, growing yams, maize, tobacco and cassava. Their report revealed also that the women were involved in bush clearing, land preparation and weeding.

In the case of the management of Alley farming technology, Okunmadewa (1990) highlighted the factors to recognise in the adoption of this agroforestry practice. These are:

(i). The technological feasibility of the system in respect of current resource situation

(ii). The expected benefits of the production system and

(iii). The attendant risk that management faces in achieving these benefits.

The first two issues have been addressed (Wilson and Swennen 1989), but the risk issue - planting the alley tree species, is still the subject of investigations. This is enumerated hereunder.

3.7 ISSUES IN ALLEY FARMING

Chambers <u>et al</u> (1989a) remarked that generally, before resource - poor farmers plant and protect trees, they require secure land tenure, free choice of tree species and unrestricted

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rights of usufruct. This include felling, unrestricted rights of transit to markets, competitive markets and good market information.

These are also implicit in alley farming.

Igodan (1990) explored the socioeconomic and cultural perspectives in alley farming and traced the implications for the alley farmer/adopter. as:

1. land or tree tenure;
2. organization and support (inputs, policies etc.);
3. labour requirements and timing of alley farming operations;
4. management complexity for traditional farmers;
5. long term benefits of alley farming;
6. social security and equity issues.

Supporting this perspectives, Fortman(1990) disclosed that "in the midst of the excitement engendered by the biological wonders of fast growing, nitrogen fixing multipurpose trees, it is easy to forget that agroforestry is a human and therefore social activity." She emphasised that it is the farmer, not the agronomist or geneticist or economist who practices agroforestry.

She also accentuated that property rights in land and trees, the gender division of space and labour, and the nature of agricultural and forestry bureaucracies affect the farmers view

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of agroforestry. She recognised that it is necessary to appreciate rural people's indigenous knowledge because "each village has its own complex of customs, laws, norms and social relationships".

The village in her view, is also affected in other ways with its links with encompassing systems. The significance of the village on indigenous agricultural practices is the nucleus of the theoretical framework discussed in the next chapter.

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CHAPTER FOUR

CONCEPTUAL AND THEORETICAL FRAMEWORK

4.1 TRANSFER OF TECHNOLOGY

Conceptually, early attempts at agricultural development in Nigeria have been through the conventional generation and transfer of technology to the user system. This is simplified as follows:

RESEARCH -------------> EXTENSION ------------> FARMERS

Fig. 1.

In this transfer-of-technology (TOT) paradigm, priotities are determined by scientists, who generate technology on research stations and in laboratories to be transferred, through extension services to farmers (Chambers <u>et al</u> ,1989b).

While Roling (1990) has criticised the TOT model as assuming a linear, one-way process starting with the breakthrough at the international level and ending on the farm with an adapted innovation, their institutional arrangement is saddled with constraints which mar the appropriateness of their technologies. According to Mellor (1985),the development of a research system requires allocation of adequate finances,

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allocation of trained researchers and administration, and pragmatic coordination of the total process, among geographic regions, across disciplines, and from most basic to most applied research. In Nigeria, unfortunately, this is not the picture.

Ruttan (1987) listed the following as limiting the effectiveness of agricultural research in Nigeria:

1. Inadequate and erratic budgetary resources.
2. Inadequate staffing in research institutes.
3. Lack of materials and required equipment in most research institutes.
4. Grossly inadequate maintenance of equipment.
5. Inoptimal utilization of budget increase because of poor management and planning.
6. Ineffective system of delivering research result to farmers.

The research centres have no effective mechanism for assessing the appropriateness of their technologies; its adoption rate or impact on production. Yet these technologies are passed on to the Extension service. The limitation of the Extension component has been documented by Maunder (1973) and Watts (1984).

Ruttan (1987) criticised the extension system among others, as having many financial and management problems which result in poor performance and an emphasis on office work, rather

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than field work. Added to this, are lack of knowledge and understanding of farming systems, and insufficient information feedback from farmers to research programmes. There is also the need to better understand the enviroment within which farmers work and lack of mechanisms for testing and adapting technology on farmers fields.

The farmers, as humans themselves are confronted with a myriad of decision making contexts. These consists of what to produce, how, when, where, why and the taboos involved in each of these steps. Each decision taken reflects trade-offs that could be explained in terms of cost-return complexes. Added to the intricacies faced by the farmers, are the technologies developed through the TOT structure. In response to the limitation of the prevailing TOT set-up therefore, a farmer-focus is suggested as being needed to re-direct research efforts in order to attain the goal of agricultural sustainability. In this case, sustainable plantain production through the intervention of alley farming technology at the small-farm level.

4.2 FRAMEWORK OF ANALYSIS

The analysis draws from three theoretical paradigms:

(i). Farmer-back-to-farmer,

(ii). Farmer-first-and-last and

(iii). Innovation Adoption Decision Behaviour.

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The framework of this investigation derives from the synthesis of these models.

4.3 Farmer-back-to-Farmer model

This model was proposed by Rhoades and Booth (1982). Its basic philosophy is that successul agricultural research and development must begin and end with the farmers. This orientation emphasised that applied agricultural research cannot begin in isolation (probably on an experimental station or planning committee) which is out of touch with farm conditions. In practice, it means obtaining information about, and achieving an understanding of, the farmers perceptions of the problem and finally to accept the farmers evaluation of the solution. Rhoades (1984) illustrates the model as presented below(Figure 2).

In terms of diagnosing or understanding, Rhoades (1984) suggested that more emphasis should be placed on what could be regarded as an "emic" perspective. This implies putting oneself as much as possible into the farmers shoes to understand how they view the problem in both technical and socio-cultural terms. For this to be possible, he suggested that methods such as on-farm experiments, questionaires, participant observation, Farmer advisory boards etc are vital towards obtaining the desired

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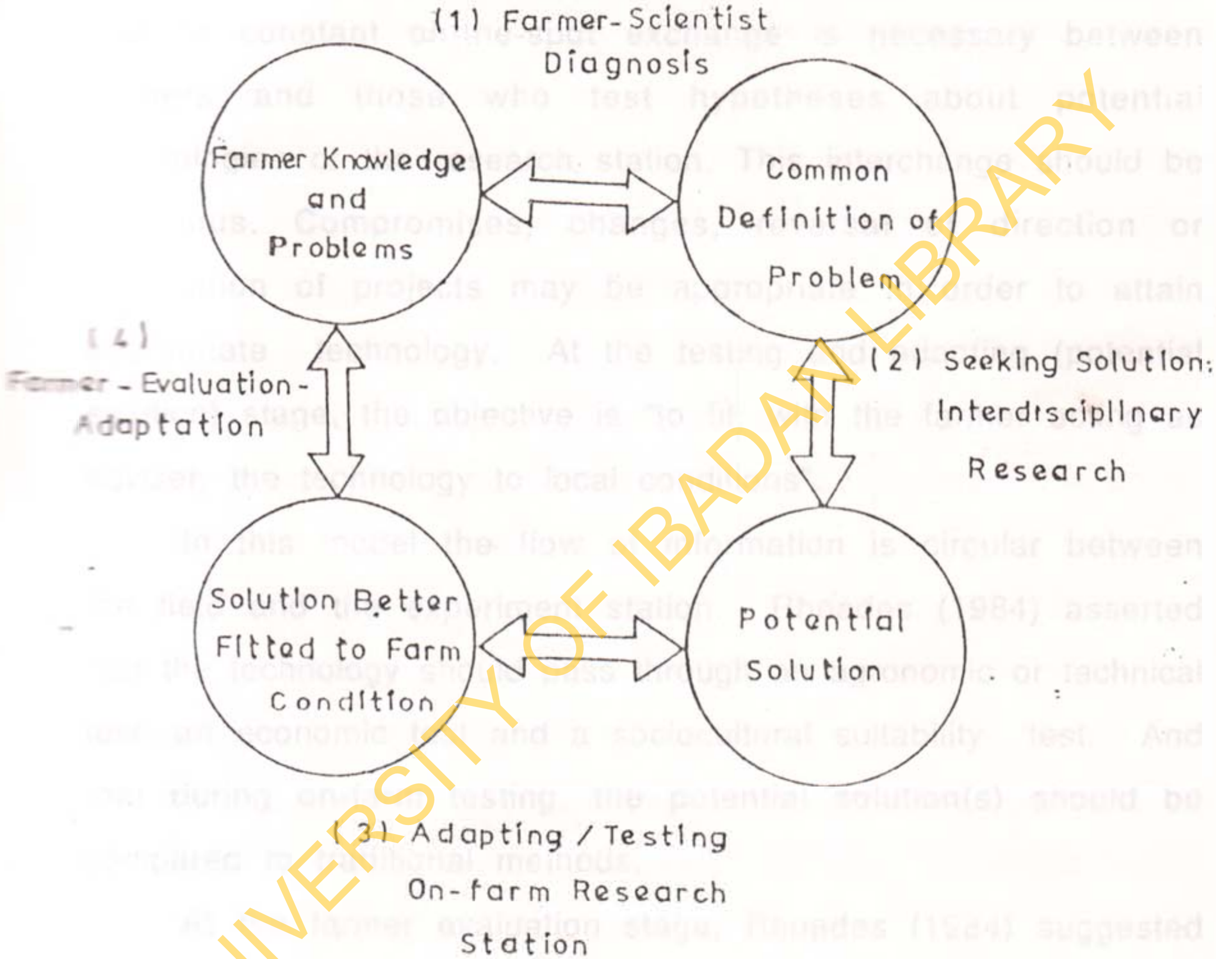

Figure 2. Farmer - back - to - farmer model.

Source: Rhoades (1984)

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information. At this stage, the farmers, social scientists and biological scientists are involved.

Concerning the seeking of solution, Rhoades (1984) believed that "a constant on-the-spot exchange is necessary between farmers and those who test hypotheses about potential technologies of the research station. This interchange should be continous. Compromises, changes, reversal of direction or termination of projects may be appropriate in order to attain appropriate technology. At the testing and adapting (potential solution) stage, the objective is "to fit, with the farmer acting as adviser, the technology to local conditions".

In this model the flow of information is circular between the field and the experiment station. Rhoades (1984) asserted that the technology should pass through an agronomic or technical test, an economic test and a sociocultural suitability test. And that during on-farm testing, the potential solution(s) should be compared to traditional methods.

At the farmer evaluation stage, Rhoades (1984) suggested that scientists must not only determine acceptability but understand how farmers continue to adapt and modify the technology. He advised that if the technology is rejected by farmers, the research process should be repeated to determine the reasons and seek ways to overcome the problem. He concluded

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however that accepted technology must be monitored to be sure that the technology does not have detrimental effects on the welfare of the farmer or the society at large.

4.4 Farmer-First-and-Last model

Chambers and Ghildyal (1985) proposed the farmer-first-and-last (FFL) model. The thesis of their paradigm is that since there are differences in the physical, social and economic conditions in the technology generation, dissemination and utilization systems, the basis of the TOT orientation is thus deficient. The FFL logic entails fundamental reversal of learning and location. The model, as conceived in this present study is simplified in Figure 3.

The proponents of this structure contended that for technologies to better satisfy the needs and conditions of resource-poor farmers, there should be a systematic process of scientists learning from, and understanding resource poor families, their resources, needs and problems.

Chambers and Ghildyal (1985) explained that the main locus of research and learning is the resource-poor farm, rather than the research station and the laboratory. The FFL asserts that the major reversal is that explanations of non-adoption shifts from

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FARMER- FIRST - AND- LAST MODEL

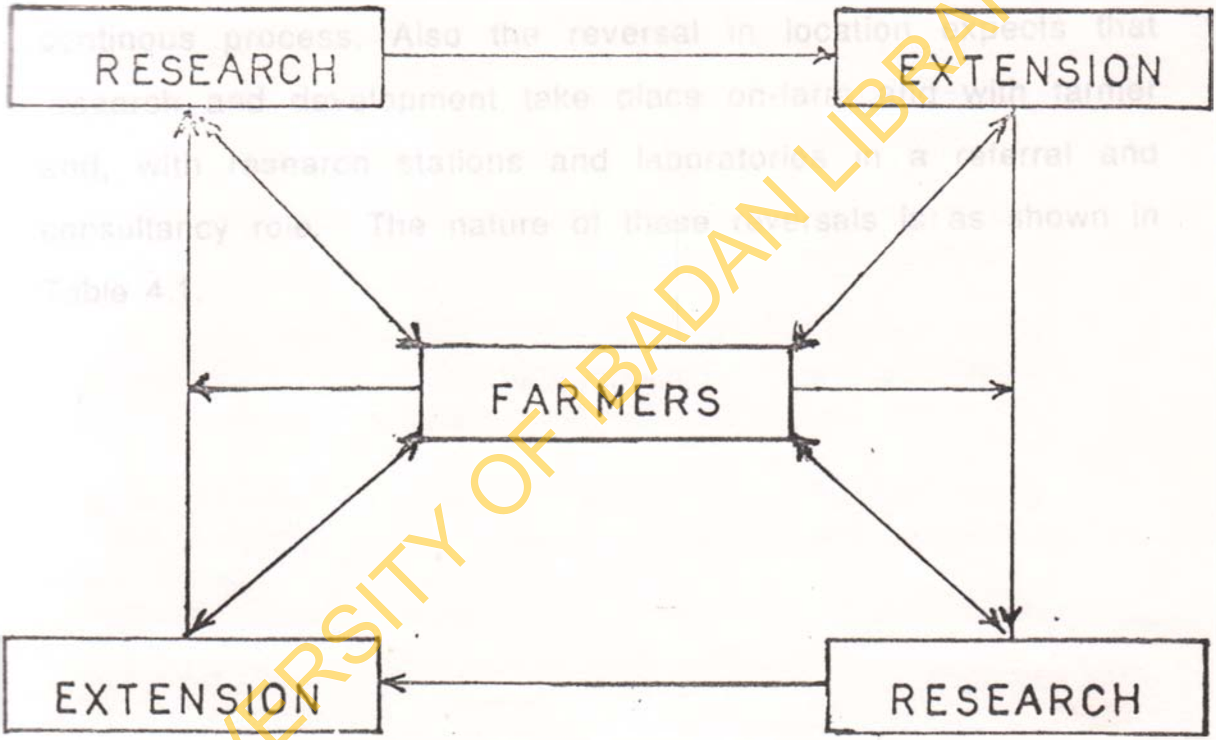

Figure 3. (Adekunle 1992)

deficiences of the farmers and the farm level, to deficiencies in the technology and in the technology-generating process.

It is also argued that the reversal of learning requires that scientists start by systematically learning from farmers with transfer of technology from farmers to scientists as a basis and continous process. Also the reversal in location expects that research and development take place on-farm and with farmer and, with research stations and laboratories in a referral and consultancy role. The nature of these reversals is as shown in Table 4.1.

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Table 4.1. Contrasts in Learning and Location

Issue	TOT	FFL
Research priorities and conduct determined mainly by	Needs, Problems perceptions and environment of scientist	Needs, problems, Perceptions and environment of farmers
Crucial learning is that of	Farmer from scientists	Scientists from farmers
Role of farmer	Beneficiary	Client and Professional colleague
Role of scientists	Generator of technology	Consultant or collaborator
Main Research and Development (R and D) location	Experiment station laboratory, glass house	Farmers fields and conditions
Physical features of R and D mainly determined by	Scientists' needs and preferences, including statistics and experimental design	Farmers needs and preferences
	Research station resources	Farm-level resources
Non-adoption of innovations explained by	Failure of farmer to learn from Scientists.	Failure of scientists to learn from farmers
	Farm-level constraint	Research station constraints
Evaluation	By publication	By adoption
	By scientists peer	By farmers.

Source: Chambers and Ghildyal (1985)

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4.5 Innovation Adoption Decision Behaviour model.

Hailu (1990) in a study conducted in Ghana, provided a model highlighting innovation adoption decision behaviour of African farmers. He advanced that farmers decision to adopt or not to adopt (and intensity of use thereafter) is conditioned by a set of internal and external factors.

While citing the work of Feder et al (1983), Hailu (1990) sustained that adoption of new agricultural technology is determined by the production objectives of the producer. He asserted that "his decision in a given period is assumed to be derived from the maximization of the expected utility-his production objective, subject to, among other restrictions, his choice between traditional and modern technology".

The study indicated that at the household level attributes such as age, educational background, resource endowments etc highly influence adoption behaviour. The external factors include marketing, extension, physical and financial infrastructures as significant. Added to these are economic and technical characteristics of the innovation and the environmental factors such as climate and soil. The model is represented in Figure 4.

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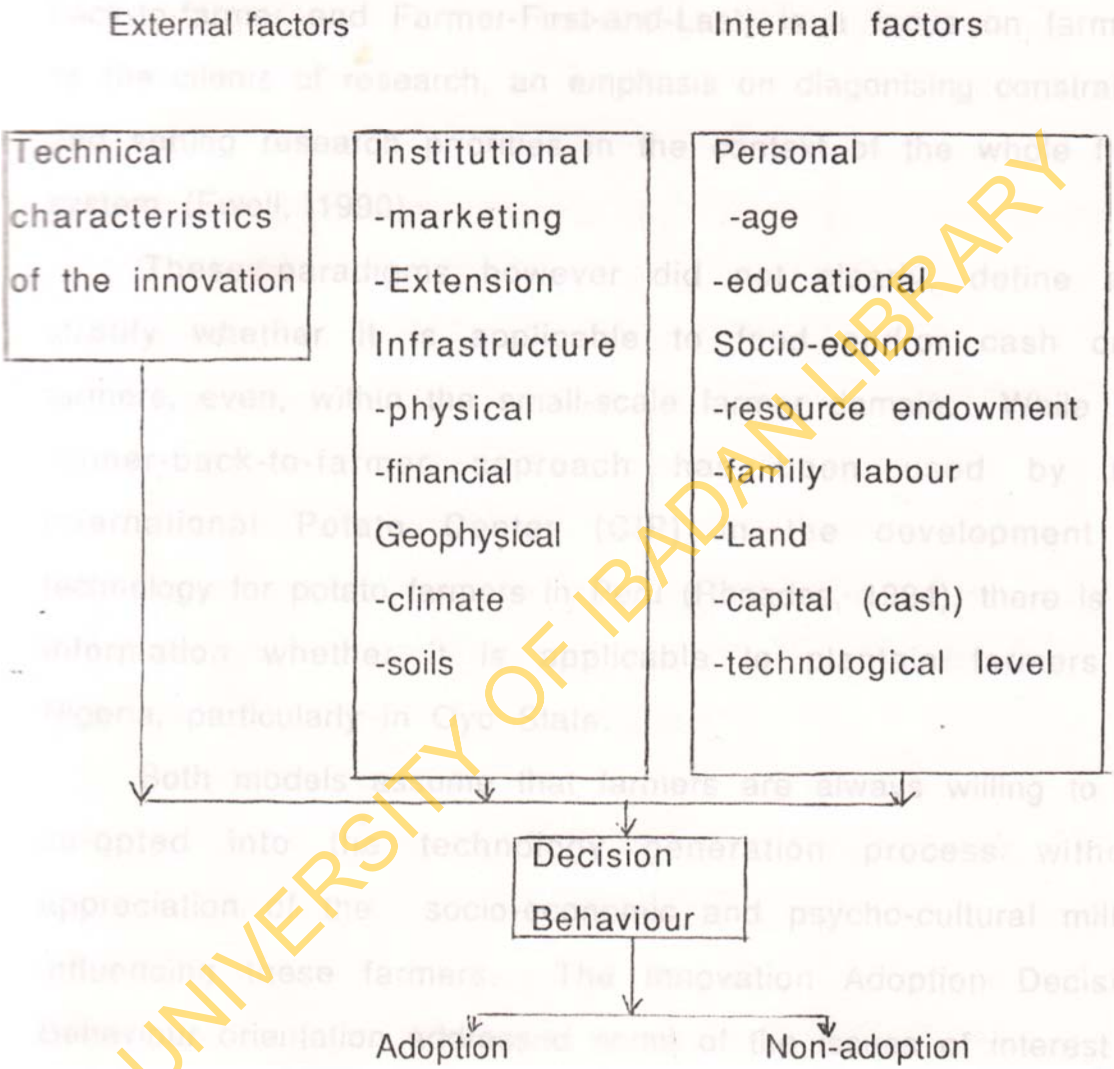
Innovation Adoption Decision Behaviour model



Source: Hailu (1990)

Fig. 4.

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4.6 SYNTHESIS AND ANALYSIS OF THESE MODELS.

A common denominator of the first two models (Farmer-back-to-farmer and Farmer-First-and-Last) is a focus on farmers as the clients of research, an emphasis on diagonising constraints and setting research priorities in the context of the whole farm system (Ewell, 1990).

These paradigms however did not clearly define and stratify whether it is applicable to food and/or cash crop farmers, even, within the small-scale farmer domain. While the farmer-back-to-farmer approach has been used by the International Potato Center (CIP) in the development of technology for potato farmers in Peru (Rhoades, 1984), there is no information whether it is applicable to plantain farmers in Nigeria, particularly in Oyo State.

Both models assume that farmers are always willing to be co-opted into the technology generation process without appreciation of the socio-economic and psycho-cultural milieu influencing these farmers. The Innovation Adoption Decision Behaviour orientation addressed some of the issues of interest in this discourse but whether it is applicable to small-scale plantain farmers in Nigeria is yet to be confirmed. In view of these, this analysis proposes a farmer-focus framework. This

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framework is schematised in Figure. 5. The assumptions of this framework are:

1. All Small-scale plantain farmers in the study area have their technology need .
2. These farmers are risk averters and concerned with their survival and conservation of their production environment.
3. They want to make economic gains from the production of plantain among other crops they cultivate.
4. Their agronomic and management strategies are similar. The same applies to their plantain production output.
5. Under risk and uncertainty, these farmers are subject to similar consequences for adopting alley farming technology.
6. Small-scale plantain farmers are effective and efficient relative to their resource limitations.

4.7 GENERAL EXPLANATION OF THE FARMER-FOCUS FRAMEWORK.

The small scale plantain farmers are conceived as influenced by three levels of variables. These are culture-specific, farmer-specific and institution-specific. Together, these components-input capacity, determine their indigenous practices. It is expected that in order to attain an appropriate alley farming technology, cultural variables must be considered.

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The critical issues are the values, belief/indigenous knowledge and Land Tenure operating in the study area.

Consideration for cultural specifics should be operationalised by also involving the farmers in alley farming technology design and development. Essentially, farmers preference should be encouraged in terms of alley (multipurpose tree species-MPTs) species selection, establishment and management.

The extent to which the alley technology is compatible with the needs, resource base and indigenous practice of the plantain farmers, to such extent, then will changes be brought about in the farmers knowledge, attitudes, skills and aspiration about alley cropping plantain. This may lead to adoption of the technology which may sensitize the farmers to a plantain pull. That is, being able to cultivate plantain more sustainably by alley farming intervention. The process of alley farming development will enhance the capacity of institutions such as Extension service and commercial/cooperative societies or NGOs. The Extension personnel, presumed involved, in the alley trial, would be in a position to provide more information or service to the farmers in order to make them acquire the appropriate skills in alley farming.

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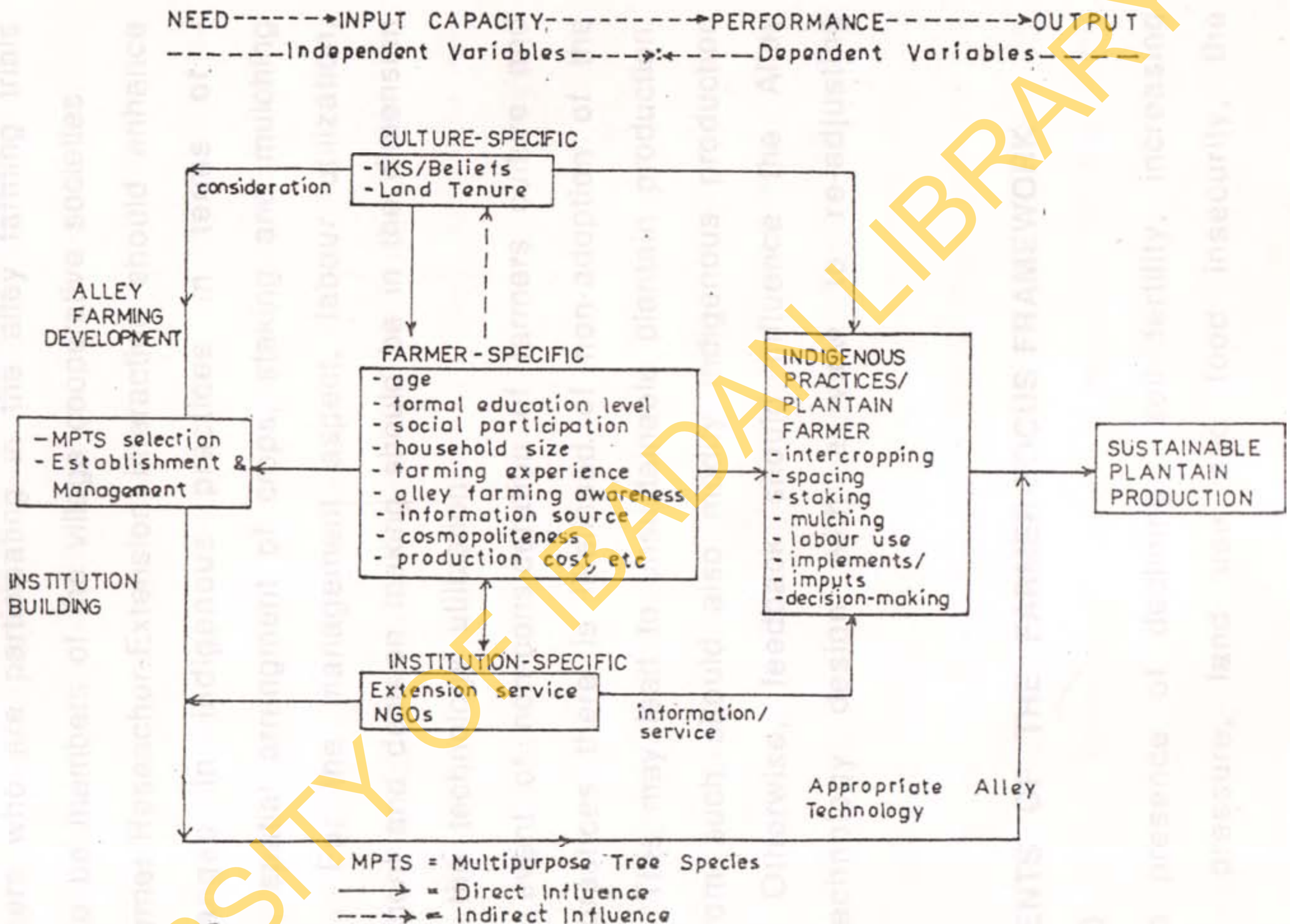

Figure 5:

A FARMER-FOCUS FRAMEWORK FOR THE ANALYSIS OF INDIGENOUS PRACTICES OF SMALL-SCALE PLANTAIN FARMERS.

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Similarly, the farming system research and extension team (on alley farming) should be able to impress the cooperative activities taking place at the research domain. This is possible through farmers who are participating in the alley farming trials who may also be members of the village cooperative societies. Effective Farmer-Reseacher-Extension interaction should enhance desired changes in indigenous practices in terms of - intercropping, spatial arrangment of crops, staking and mulching of plantain. For the management aspect, labour utilization, capital/implement and decision making should be in the dimension that favours the technology utilization.

In the event of non-consideration of farmers culture and indigenous practices there is likelihood of non-adoption of the technology. This may lead to unsustainable plantain production. Feedback from such should also modify indigenous production perpetually. Otherwise, feedback should influence the Alley Farming Technology design with a view to re-adjusting strategies.

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4.8 ELEMENTS OF THE FARMER-FOCUS FRAMEWORK

A. NEED

In the presence of declining soil fertility, increasing population pressure, land use and food insecurity, the continuation of the indigenous practices might lead to unsustainable plantain production. The feedback from this might generate modification of the indigenous practices. This modification process may suggest to the farmers to realise the need for an improved/appropriate technology. It is probable that the technology-need could be satisfied by alley farming. However, this technology need to be compatible with farmers indigenous practices. For it to be so, it presupposes that farmers involvement (as colleagues and consultants) is appreciated. In the Farming System Research and Extension framework, this is especially so in the selection of alley (MPTs) species, its establishment and management.

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B. INPUT CAPACITY

This is made up of those variables (inputs) that influence the indigenous practices of small-scale plantain farmers. The variables are at three levels: Culture-specific, Farmer-specific and institution-specific. These are the independent variables.

The capacity of these variables is theoretically defined as the state which enhances and/or empowers the farmers to integrate appropriate technologies (e.g alley farming) into their native practices.

a Culture (-specific) Variable

i. Values and Beliefs/Indigenous knowledge: Acceptable ways of behaviour that form the normative (indigenous) practices are embedded in customary values and beliefs. Values are defined as conceptions of the desirable, as standards of evaluation, as guides for decision making behaviour or simply as expressions of preference (Kahl,1968) as cited by Sofranko, (1984).

Sofranko (1984) adduced that values have central role in the change process because they influence farmers goals and behaviours; and that technological change requires behavioural change on the part of the farmer.

Beliefs, according to him are the mental convictions one has about the truth or actuality of something. It refers to what people accept to be true, what people can trust or place confidence in. They also influence behaviour.

Through oral tradition method and the process of living and farming in a community for a long period, there will be accumulation of indigenous knowledge about values and beliefs concerning plantain production. This is significantly correlated with indigenous approaches. This is probably why farmers have been described as" natural experts" (Chambers, 1989b).

The culture of the community to which a small-scale plantain farmer belongs has an implicit impact on the land fallow and improvement practices he or she must operate. As a social

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entity and member of a social system, he/she is governed by the community's (reward/punishment) sanction system for conformity/deviance Primarily, his ethnoscientific (indigenous land fallow) knowledge, attitude and skills draws from his socio-cultural setting.

ii. Land Tenure Right: Most rural and small-scale farmers do not seek land from the national government before they cultivate for agricultural production. Though a land use decree (1978) exists, its abuse have been issues of enquires (Famoriyo,1979; Williams, 1981).

Williams (1981) reported that communal ownership appear to be the commonest feature of the landlord-tenant arrangements in Nigeria. He noted that these do not give individuals any incentive to invest on the improvement of the land. Fragmentation of holding as a result of inheritance is another constraint. The nature of the security to land will determine the type of development to be given to the plot . This has bearing on the indigenous practices. Technology-generating systems are expected to appreciate this.

b. Farmer (-specific) Variables

Age-wise, it is expected that the younger farmers would have more tendency for adventure and introduce alley farming technology into their plantain production systems. Rogers and

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Shoemaker (1971), Lele (1975) and Chaudhri (1979) found that age affects the rate of adoption of crop innovations.

In terms of formal educational level, it is recognised that those farmers that are more literate might have higher propensity to innovate while those with little or no formal education could opt for their traditional practices. Feder and Slade (1983,1984) have confirmed the impact of formal education on adoption behaviour of (contact) farmers for example. Other variables such as social participation (Sharma and Nair, 1974; Akinola, 1983; Adeyeye, 1986 and Ladele, 1990), househould size, farming experience, alley farming awareness are, also, believed to have "presumed cause" (Kerlinger, 1973) upon the indigenous practices (presumed effect) given by the farmers to their plantain holding.

c. Institution (-specific) Variable

These are extension service, and non-governmental organizations such as marketing and cooperative societies. They are perceived to influence cultural practices in crop production (Jaiswal, et al 1978; Patel, 1985). The importance of rural institutions in agricultural development have been discussed (Williams, 1981). It is presumed that these institutions will provide information and services to aid the indigenous methods towards improved plantain production. The significance of Extension service and commercial ventures in adoption of

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technologies have also been affirmed (Gamser,1988). Since all these (input capacity) elements implicitly interrelate, it is hypothesised that they have significant relationship with indigenous practices in small-scale production of plantain.

C. PERFORMANCE

Performance is defined as the translation of a system's capacity into visible results, into action (IDMC/DPMC,1988). Thus the indigenous practices depends on the translation and state of cultural, farmer and institutional variables interplay in plantain production. It is the dependent variable of the study because certain researches have emphasised the yield component in plantain production (Adetiloye, 1989; Adetiloye and Ezumah, 1989) without adequately looking at the farmers practices before yield can be obtained. Also, if farmers traditional practices remain unchanged, its likely that the full potential of improved technologies would not be realised.

This suggests that alley farming scientists/proponents should understand it before coming up with alley technology package. This indigenous practice (performance) is operationalised as agronomic and management strategies.

The agronomic strategies are disaggregated as consisting of:

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i. Intercropping: The various crops that are grown with plantain.

ii. Spatial : The spacings of these crops intercropped, whether it is regular (recommended) or irregular (indigenous).

iii. Staking of Plantain: Whether it is realised as significant or not.

iv. Mulching of Plantain bases: Whether it is frequent or not.

The management strategies on the other hand consists of

i. Labour utilization:

The operations performed by men, women, and children of the plantain household would be highlited. The frequency of these operations and the use of hired labour were focussed.

ii. Capital/Implements:

It is significant to know the type and use of various implements or inputs involved in small-scale plantain production identified with indigenous practices.

iii. Decision making.

The study inquired into:

- Who makes the decisions to use a plot for plantain cropping? - the category (gender or age) of labour that operates the plantain holding.
- Who makes the decision to purchase, harvest, consume, process and sell plantain?

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- Who or what determines the decisions to use implements and/or cash?
- Who or what determines the use of money accruing from plantain sales?

Allimi (1991) found that management ability of small-holder farmers was affected by age, literacy level, farming systems, farm size, number of farm locations, contact with extension agent and level of income.

D. OUTPUT

The alley technology research system is expected to have considerations for the cultural issues that may animate the plantain farmers indigenous practices. The alley species selected must not conflict with the norms, values and beliefs of the farmers. It is likely that the incorporation of local fallow practices, indigenous knowledge and farmers in technology generation process would enhance appropriate technology which would fit farmers socio-cultural contexts. The adoption of such technology should not have much, if any, resistance.

Farmers participation would also influence their level of knowledge (awareness), change their attitudes, skills and aspirations (KASA). This could give rise to a plantain pull and subsequently, sustainable plantain production (the desired output).

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CHAPTER FIVE

METHODOLOGY

5.1 THE STUDY AREA

GENERAL

Oyo state is one of the thirty states that make up the Federal Republic of Nigeria. It is situated between longitudes 2º 30' East and 5º 30' East of the prime meridian, and between latitudes 6º 45' North and 9º 15' North of the equator. Located in southwest Nigeria, the state is bound by Kwara state in the north, Ondo state in the East, Ogun state in the South while its western border coincides with that of the Republic of Benin.

In land area, the state is about 37,705 square kilometres with a projected (1988) population of 11, 412, 300 (Oyo state Diary 1990). The state is made up of the Yoruba ethnic group. Figure 6 illustrates the map of Oyo state, indicating the study area.

i. Climate

Rainfall varies from 1125 mm to 1475 mm p.a. in the extreme south to 1100 mm - 1250 mm p.a. in the central nothern parts (FACU, 1986). Rainfall is bimodal with peaks in July and September.

There is no significant temperature variation in the state. FACU reported that maximum temperature could be about 39ºC in

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MAP OF OYO STATE SHOWING LOCAL GOVERNMENT AREAS

KEY

Area of study

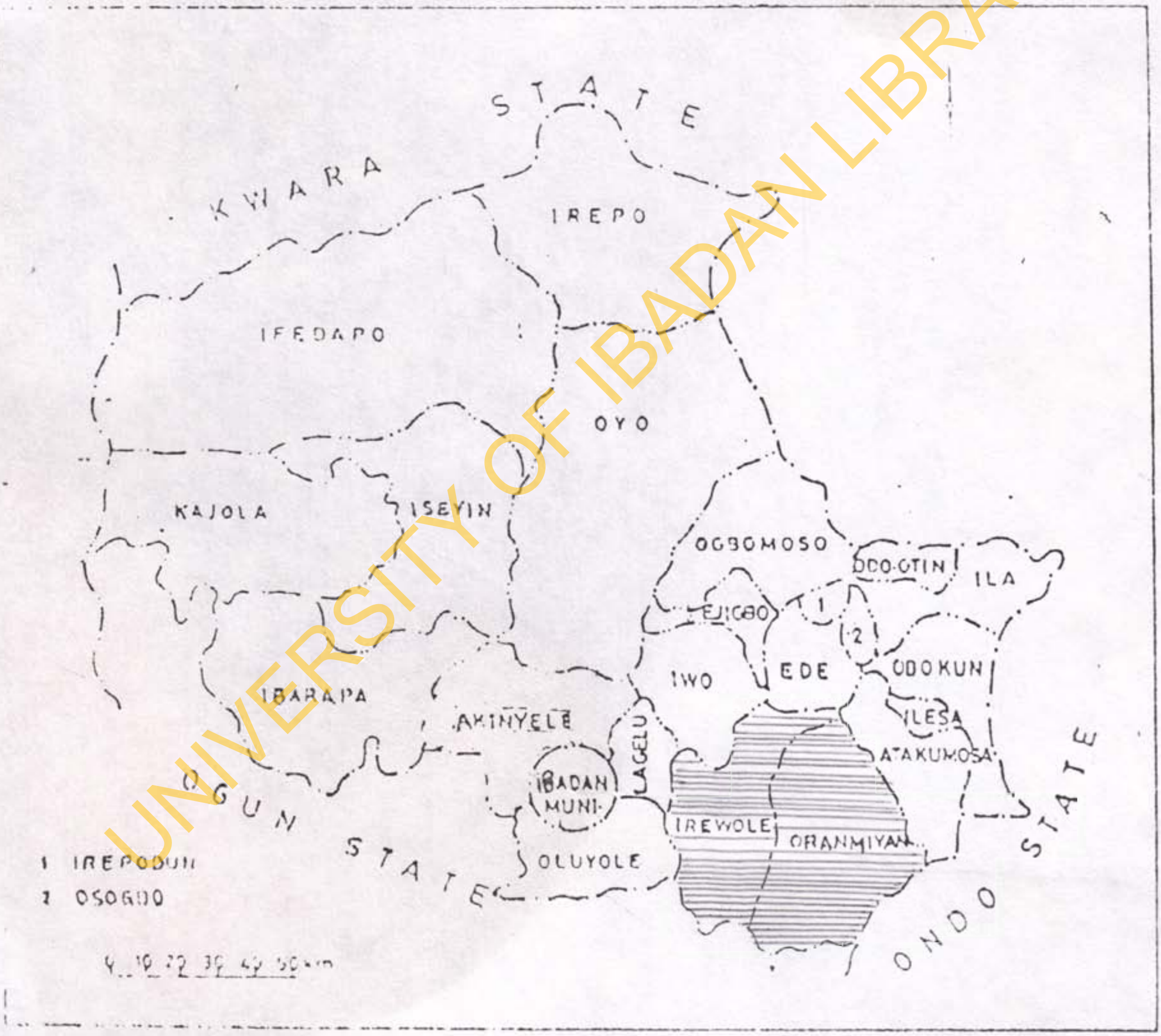

Figure 6 Local Government Areas of Oyo State (Courtesy: Surveys Division, Ministry of Lands and Housing, Oyo State)

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December, February, March, and lower in January (32.2°C), April (32.8°C), May (31.1°C) and much lower between June (27.2°C) and November (31.1°C).

ii. Vegetation and Farming system

FACU (1986) reported that the vegetation consists of two ecological groups: the tropical rainforest and the Guinea Savanna. The rainforest consists of decidous and semi-decidous trees of economic values. The rainforest occupies the most southern and eastern parts of the state. As we proceed northwest, the decidous rainforest changes to woodland forest Savannah or derived savannah (FACU, 1986). This is characterised by decrease in tree density, height and increasing abundance of grass. The state is also drained by the following all-season rivers which flow southwards: Ona, Oshun, Shasha, Oba and Ogun.

In terms of crop variety, maize, cassava, Yam, melon, and cowpea are the major staples. Other crops (like plantain etc), however, assume significant status in different parts of the state. Intercropping is the major farming system. Most planting commences soon after the rain have set in.

iii. Choice of study Location

Two Local Government Areas (LGAS) were involved:

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Irewole LGA

Irewole LGA has an estimated population of 468,000 and a total land of 1650km2 (Mutsaers et al, 1987). The predominant ethnic group is the Yoruba people.Apart from Ikire as the headquarter, other towns in the LGA are Apomu, Orile-Owu, Ikoyi, Gbongan and several hundreds of small villages and hamlets. Irewole LGA is bounded in the north by Iwo and Ede LGAs, in the south by Ijebu-North LGA (in Ogun state) while its entire eastern boundary is shared with Oranmiyan LGA. The major food crops are, plantain, banana, cocoyam, cassava, yam, maize, sweet potatoes and a variety of vegetables.

Oranmiyan LGA

This LGA has a population of 417,048 (1963 census) and its projected (1983) population is 617,296. The area also comprises the Yoruba group. Actually, Ile-Ife (or Ife) the headquarters of the LGA, is the cradle of the Yoruba race.

Oranmiyan LGA is bounded in the west by Irewole LGA; in the north by Ede LGA; in the north-west by Atakumosa LGA; in the south-east by Ile Oluji/Okeigbo (now called Ifesowapo) LGA (in Ondo state) and in the south by Ijebu-east LGA (in Ogun state). The LGA has several other towns such as Modakeke, Ipetumodu, Akinlalu, Ashipa, Yakoyo etc.

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Agricultural activities dominate the occupation of the people. Cocoa, Oil Palm, Kola, and Cashew are the dominant tree crops. The food crops are similar to those in Irewole LGA.

Criteria for Selection of the two LGAS

The two LGAs are located in the most south easterly part of Oyo state and within the rainforest belt and the 8º north latitude boundary for plantain production (Ndubizu, 1985).

Plantain production is reported to be significant in southern Nigeria (Oyebanji, 1985), in Oyo state (Martin, 1979; Ndubizu, 1985; and FACU, 1985) and in both Ikire and Ife (headquaters of the LGAs respectively).

Further more, one of IITA's On-Farm Research (OFR) site, Ayepe, is located in Irewole LGA. At Ayepe village, Alley-plantain trials are conducted on farmers plots. Irewole and Oranmiyan LGAs respectively belong to Ibadan/ Ibarapa and Ife/Ilesha administrative zones under the current Oyo state Agricultural Development project (OYSADEP) dispensation. These two zones concern themselves with food crops, tree crops, forest products and horticulture (FACU, 1986).

The two LGAs are within the 1250 mm to 1500 mm of mean annual rainfall. That is both Ayepe and Ife are bounded by these two isohyetes (lines of equal rainfall) (Mutsaers et al, 1987).

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Finally, the two LGAs share a boundary that divides them into approximately equal north-south distances.

5.2 SOURCES OF DATA

a Primary sources:

Field observation and structured interview with a questionaire were used to collect primary information.

b. Secondary sources:

Information was solicited from public documents and official records from the following organizations: Central Bank of Nigeria (CBN), Federal Office of statistics (FOS), Federal Agricultural Coordinating Unit (FACU), Oyo state ministry of Finance and Economic Planning, Oyo state Agricultural Development Projects (OYSADEP), United Nations Food and Agricultural Organization (FAO, Rome), National Horticultural Research Institute (NIHORT) Ibadan.

5.3 DATA COLLECTION PROCEDURE

This study involved field observation and survey methods.

a. Field Observation (or mini-study)

Ten volunteer - respondents with, small-scale plantain plots were purposively selected and monitored for about 6 months (July-December 1989). The plantains in these plots were above 5

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years. In order to understand their indigenous practices, a worksheet was developed to collect input-output data (see Appendix 2). The ten respondents were selected, two each, from Ayepe, Faru, Alapata, Ori-ire and Iraye villages (all in Irewole LGA and within 5km to each other).

This mini-study also measured twelve plots owned by some farmers at Ologan village. Tape, compass and ranging poles were used. The purpose was to determine the exact plot sizes (and crops combined) with small scale plantain production.

It is to be noted that the sample size is small at this level. In a survey similar to this, Nweke et al (1988) highlighted that " in studies of this nature involving frequent collection of information by direct observation over extended period, large samples would prove too expensive". They contented that" in traditional agricultural production, practices are generally fairly similar among producers in the same village and marginal effect on level of accuracy of increase in sample size may not be significant".

b. The Survey

i. Development of Instrument

The questionnaire was pretested at Badeku village in Oluyole Local Government Area of Oyo State. The aim of the pre-

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testing was to assess the clarity, focus and scope (i.e adequacy) of the instrument. The instrument is divided into two sections: demographic and non-demographic. The non-demographic concerns;

i. farm status

ii. indigenous agronomic practices in plantain production

iii. fallow practices

iv. indigenous management practices in plantain production

v. indigenous knowledge in plantain production

vi. plantain consumption

vii. extension contact

viii. awareness about alley farming

ix. plantain production constraints

x. aspiration and motivation of small-scale plantain farmers

The demographics highlights issues such as age, educational level, household size, social participation, etc.

ii <u>Sampling Procedure and Sample Size</u>

The population of study are small scale plantain producers in the two LGAs. The two LGAs were divided, with the aid of cardinal points, into four zones which were labelled, in clockwise fashion, as I, II, III and IV. For Irewole LGA, each number was written on separate pieces of papers which were squeezed together and put into a hat. After several throws, a kid was asked

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to pick a paper out of the hat. The paper picked contained I. This corresponds to the North-east part of the LGA. Ndubizu (1985) however estimated the northern favourable limit of plantain production (in Oyo State) as the Ikire-Ife line.

In order to concentrate on areas of plantain production, villages above the Ikire-Ife line, and those that are peripheral and/or on the cardinal lines were excluded. The remaining villages listed were one hundred and twenty (120). Ten percent (10%) of this, that is twelve villages were then selected by writing out the names on separate pieces of paper, thrown-up several times, and an elderly lady was invited to pick any twelve. The villages selected were: Alaguntan, Odeyinka, Bamidele, Papa, Akiriboto, Sagba, Base, Iwata, Olukunle, Alate, Ajo, and Ori-oke (see Figure seven). From each village, ten plantain farmers were interviewed. A total of 120 farmers were involved in the LGA.

For Oranmiyan LGA, the same procedure was used, zone three, representing the south-western part was selected. Villages listed were one hundred and fifty. Ten percent of this was 15. The villages selected were: Kinkinyinun, Onirinrin, Oriokuta, Sarajo, Kilibi, Ogosun, Olorunda, Alagbede, Kondo, Atiba, Kajola, Ara Joshua, Amosan, Olomijoja and Ologede (see Figure eight).

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From these villages, and because Oranmiyan was a greater area of plantain production compared to Irewole LGA (Ndubizu, 1985), ten plantain farmers were interviewed per village. Thus, a total of 150 farmers were involved. In aggregate, two hundred and seventy (270) respondents were interviewed during the survey.

This sample was based on the following criteria:

- To roughly represent Ndubizu's (1985) ranking of Plantain production areas in OYO state.
- Total population estimates in the two LGAs.
- Non-availability of official data indicating the population of small-scale plantain farmers in both LGAs.

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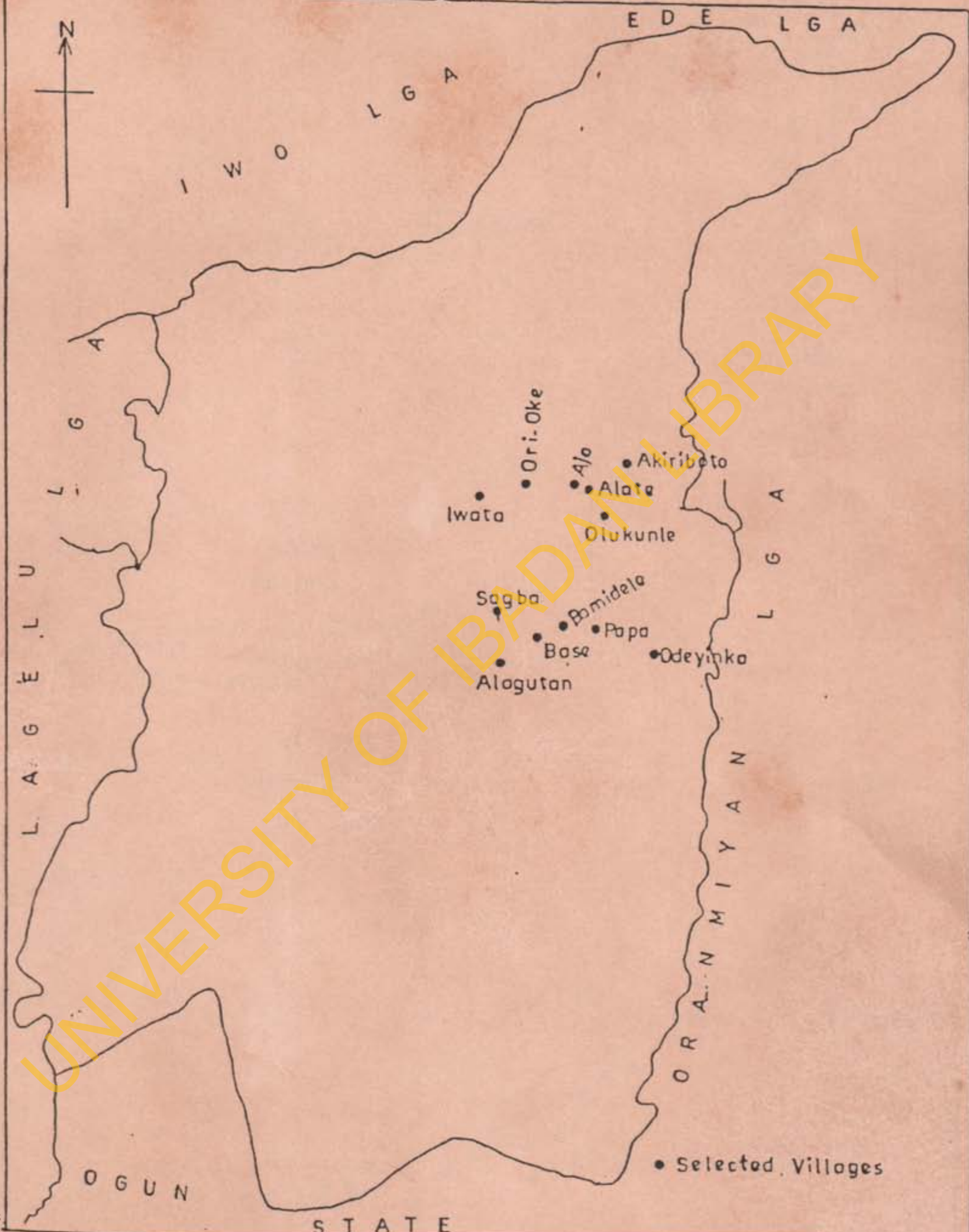

Figure 7: Map of Irewole LGA Showing Selected Villages.

Adapted from: Pocket Map of Irewole LGA., Secretariat, Ikire.

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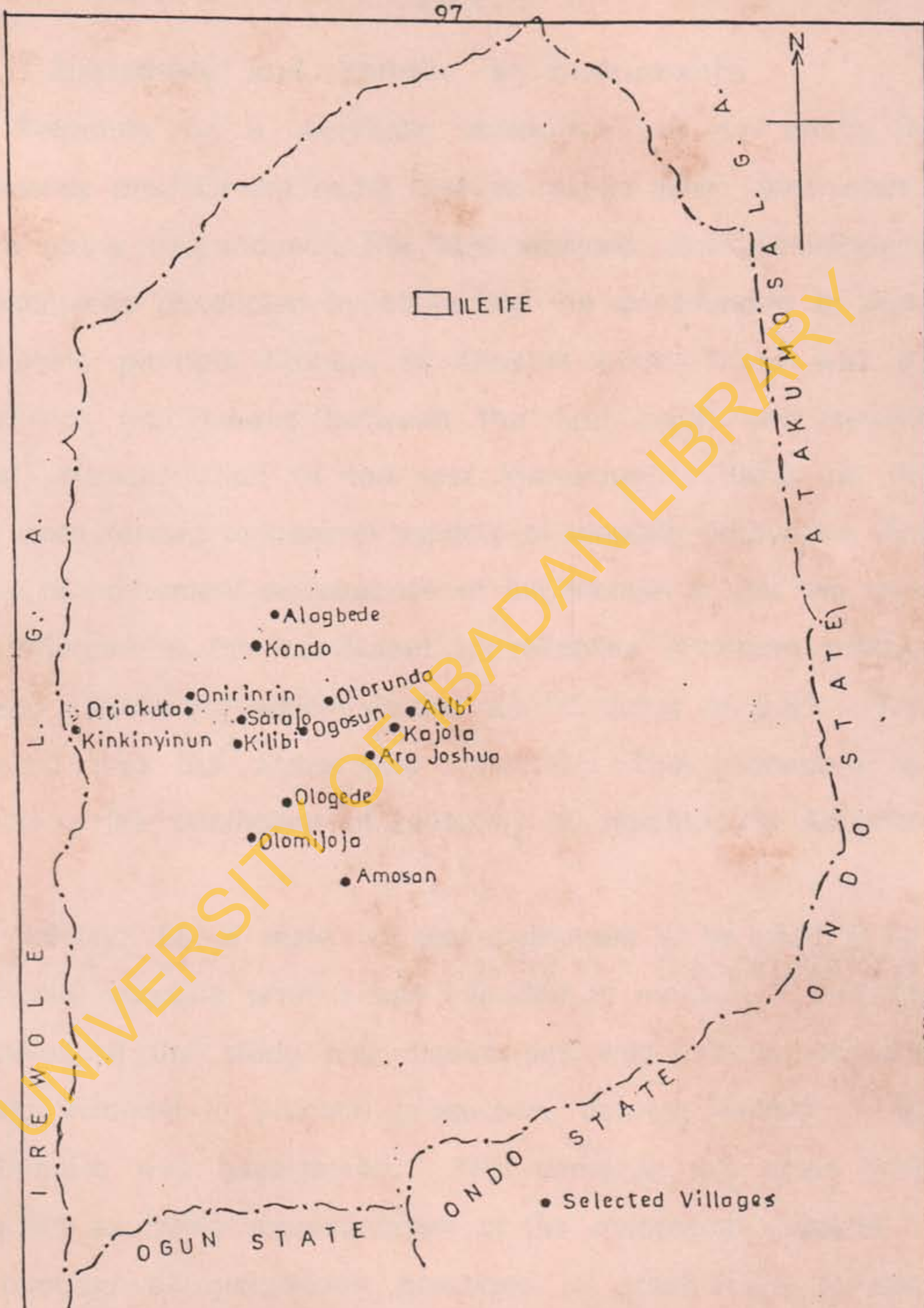

Figure 8: Map of Oranmiyan LGA Showing Selected Villages

Source: Town Planning Division, Oranmiyan L.G.A.

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5.4 Reliability and Validity of Instruments

Reliabilty of a research instrument is its ability to consistently produce the same type of results when administered to the same respondents. For this analysis, the "Test-Retest" approach was conducted by subjecting the questionaire to thirty small-scale plantain farmers in Oluyole LGA. There was an interval of four weeks between the first (test) and second (retest) administration of the test instrument. Items on the scale were related to general aspects of plantain production. The degree of agreement or response of the sample to the two tests was reflected in the coefficient of reliability (Pearson product moment correlation) which yielded an "r" value of 0.85. This indicated that the scale was reliable. The procedure for calculating the coefficient of reliability is indicated in Appendix 3.

Validity:- For a scale or test instrument to be valid, it has to actually measure what it was intended to measure. With the objectives of the study and discussions with researchers and farmers involved in plantain production, content validity of the questionaire was ascertained. The items in the scale were presumed as being representative of the theoretical universe of the concept of indigenous practices in small-scale plantain enterprises.

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5.5 DATA ANALYSIS

Data collected by the field observation method were subjected to descriptive statistics. On the other hand, information generated by the 270 farmers were analysed through descriptive and Inferential statistics:

Apart from frequency counts, Pearson product moment correlation analysis was used to determine significant association (at P<.05) between independent variables and the dependent ones. Stepwise Multiple Regression Analysis was used to account for the amount of variation in indigenous practices explained by the significant independent or regressor variables.

The various hypotheses and statistics were tested at .05 and .01 alpha levels. Analysis was performed by the computer using the Statistical Analysis System (SAS) package at IITA.

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CHAPTER SIX

RESULTS AND DISCUSSION OF FINDINGS

6.1 DEMOGRAPHIC CHARACTERISTICS OF SMALL-SCALE PLANTAIN FARMERS.

One of the objectives of this study was to describe the demographic feature of the small-scale plantain farmers. The study found that 98.9% (267) of the respondents were male while 1.1% (3) were female (see Table 6.1). This phenomenon is closely related to the position of rural women relative to the menfolk in terms of ownership of land. According to Igbozurike (1988), rural women have only, vicarious usufructuary rights over land i.e. through the rights of their husbands, male children and male relatives. This lack of clear access to land could be a disincentive to production of a perennial such as plantain by the women.

In terms of age, 28.9% of the respondents were between 21 and 48 years. About 63% were between 49 and 69 years while those from 70 years to 89 years were 7.8%. This suggests a substantial proportion of the sample is available for agricultural and non-agricultural engagements. Nearly all (98.5%) were married. Out of this category, for the males, 23.3% had one wife

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Table 6.1

Distribution of Respondents according to Socioeconomic/Demographic characteristics (n= 270)

Characteristics		Frequency	%
Gender:	male	267	98.9
	female	3	1.1
Age:	21-48 (yrs)	78	28.9
	49-69 (yrs)	170	63.3
	70-89 (yrs)	22	7.8
Morital status:	single	3	1.1
	married	266	98.5
	widow	1	0.4
Number of Wives:	one	63	23.3
	Two	185	68.5
	Three	10	3.7
	Four	8	3.0
	None	4	1.5
Number of children:	None	6	2.2
	1- 6	51	18.9
	7-12	24	8.9
	13-18	187	69.3
	over 19	2	0.7
Formal Education:	None	245	90.7
	Primary Sch.	14	5.2
	Sec. Sch.	7	2.6
	Grade II Cert.	4	1.5
Religion:	Christianity	33	12.2
	Islam	236	87.4
	Traditional	1	0.4
None-formal Education:	None	77	28.5
	Adult Lit. Classes	2	0.7
	Extension/Farmers Day	1	0.4
	Koranic classes	190	70.4
Language/Literacy Abilities			
	In English: speak	2	0.7
	Speak, Read & Write	17	6.3
	None	251	93.0
In Arithmetic:	Proficient	53	19.6
	None	217	80.4
In Yoruba;	speak	232	85.9
	Read	1	0.4
	Speak, Read	2	0.7
	Speak, Read & Write	32	11.9
	None	3	1.1
In Igbo	Speak	1	0.4
	Speak, Read & Write	2	0.7
	None	267	98.9
Number of Dependants:	None	5	1.9
	1-10	29	10.7
	11-20	231	85.5
	21 and above	5	1.9
Travel pattern/month:	Never	1	0.4
	Once	-	-
	2-5 times	24	8.9
	above 5 times	238	88.1
	occassionally	7	2.6

Source: Survey data (1991)

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each; 68.5% had two each, while 2.6% and 3% had three and four wives respectively in each case.

The actual number of their children ranged from 1-6 (18.9%) and 7-14 (78.2%). Eighty seven per cent of those interviewed believed in Islamic religion while 12.2% were christians. The highest educational level attained by the respondents are also shown in Table 6.1. This indicate that the highest education of Grade II teachers was received by only 4 (1.5%) of the respondents. This attitude to formal education could be as a result of lack of financial resources among farmers in addition to, probably, few schools withing their locality. The study ascertained the type of non-formal education that was recieved by the respondents.

Evidenced in Table 6.1 is the support of the finding that 87.4% of interveiwees believed in Islamic religion. This attest to the high attendance in koranic classes, and it is one of the injunctions of their beliefs. Concerning literacy abilities, only 6.3% of the sample could speak, read and write English language-our official medium of communication. Other language proficiencies of the respondents are as displayed in Table 6.1. Implication is that, the government should establish more functional adult literacy classes and/or, extension messages should only be handled by agents who are also proficient in the

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use of Yoruba language. This is in order to give the message, accurately, to the farmers.

In terms of arithmetic abilities, only 19.6% of the sample had the skill. This indicates tendencies to quickly assess profitability of purchases, and likelihood of keeping records by the respondents. The primary occupation of the respondents were crop farming (94.1%). While 18.9% did not have any secondary occupation, 71.1% were petty traders who sell retail goods. One percent have carpentry as their secondary occupation. Agricultural labourers, palm-wine tapping, bicycle-repairers and brick-laying had 0.4% respondents in each category.

6.2. SOCIO-ECONOMIC CHARACTERISTICS OF SMALL-SCALE PLANTAIN FARMERS.

Respondents were asked to indicate the number of people they cater for including husbands/wives, children and relatives; 10.7% indicated that between one and ten people were dependent on them (see Table 6.1). On the other hand, 85.5% revealed that they fend for between 11 and 20 individuals.

Plantain farmers were requested to indicate their level of participation in religious organizations. While 77.0% belong to religious groups, these alone, attend meetings and commit their financial resources. Others (10.7%) do these in addition to being

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committee members. Another, 1.5%, apart from doing all afore-mentioned, hold offices to manage the religious organization. This awareness subsumes a high social participation for all respondents in this dimension.

Eighty four per cent of the sample did not belong to any cooperative union. The 14.8% who belong, only attend meetings and contribute financially. In terms of participation in adult farmers and youth clubs, 99.3% and 99.6% respectively, did not belong. For parents/teachers association however, 93.4% admitted that they belong,, attend meetings and contribute financially. This could be a way to promote the educational development of their children. Cosmopoliteness of the interviewees were also determined.

Table 6.1 suggests that majority of the respondents regularly visit towns and other locations away from their villages. This might be connected with the cyclic market days in neighbouring communities, towns or traditional festivals which draw people from different locations. With respect to migrant status, 94.1% indicated that they were indigenes of the villages where they were interviewed. This supports the 94.4% who averred that their source of land for farming was through inheritance. In terms of farm size and number of plots, Table 6.2 illustrates the composite situation.

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Table 6.2. Distribution of plots and plot-sizes (n = 270)

PLOT 1/SIZE	CONVERTED SIZE	FREQUENCY*	%
1-20 igba	0.02-0.39ha	237	87.8
21-40 igba	0.40-0.79ha	22	8.1
above 40 igba	0.80ha and above	11	4.1
		270	100
PLOT 2			
1-20 igba	0.02-0.39ha	190	70.4
21-40 igba	0.40-0.79ha	10	3.7
above 40 igba	0.80ha and above	38	14.1
no plot		32	11.8
		270	100
PLOT 3			
1-20 igba	0.02-0.39ha	16	5.9
21-40 igba	0.40-0.79ha	186	68.9
above 40 igba	0.80ha and above	33	12.2
no plot		35	13.0
		270	100
PLOT 4			
1-20 igba	0.02-0.39ha	226	83.7
21-40 igba	0.40-0.79ha	3	1.11
above 40 igba	0.80ha and above	2	0.74
no plot		39	14.44
		270	100
PLOT 5			
1-20 igba	0.02-0.39ha	31	11.5
21-40 igba	0.40-0.79ha	4	1.5
above 40 igba	0.80ha and above	5	1.8
no plot		230	85.2
		270	100

Source: Survey data (1991).

* These were those who indicated "Yes" to possession of more than one plot

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As observed in Table 6.2, about 15% of the respondents have as much as five plots. The remaining 85% have at most, four plots. In both cases, the majority (at least 60%) had plots ranging from 0.02 - 0.40 hectares. All the farmers met the definition of "small-scale" that is, less than or equal to 3ha (150 igba). Concerning tenure of farmed land, 99.6% implied that they have an indefinite time frame. Survey data also indicate that at least, 89% of the respondents possess a minimum of eleven years of plantain farming experience. The ecological endowment of the study area could be the factor. The next section discusses the indigenous agronomic practices of the study subjects.

6.3 INDIGENOUS AGRONOMIC PRACTICES OF SMALL-SCALE PLANTAIN FARMERS

The aspects of the indigenous agronomic practices relevant to this treatise are;

i. plantain intercrop ii. spacing

iii propping and iv. mulching

In terms of plantain intercrop, Table 6.3 illustrates the various crops interplanted with plantain.

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Table 6.3. Distribution of plantain intercrop

Crop combination	Frequency	%
1. YAM+COCOYAM+CASSAVA+PEPPER*	184	68.1
2. CASSAVA+COCOYAM+MAIZE	45	16.7
3. OTHERS-varied combinations of; Cassava, Maize, Oil palm, Okro, Melon, Pepper, Pine-apple, Cocoyam, Cocoa, Leaf vegetables, Yam and Banana.	41	15.2
	270	100.0

* Capitalised for emphasis.

Source: Survey data (1991).

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Table 6.3 shows that about 84% of respondents cultivate at least, three other crops with plantain. This is not surprising since they are near-subsistence producers. The risk of total loss in monocropping plantain is reduced and spread over other crops which could be used as sources of food and/or cash. This corroborates the findings of Dorosh (1988); and Adetiloye and Ezumah (1989) that plantains are rarely monocropped and that, intercropped plantain have agronomic and economic yield advantages over sole crop. Swennen (1990) also documented that groundnut, yam, and cocoyam are suitable intercrops with plantain.

Crops such as pepper are planted probably because of the unexploited interrow spaces created by the major crops. The short cycle of such plants reduces their competition for nutrients with plantains. Plantain is protected when low centre-of-gravity crops such as yam, cocoyam and cassava are planted in periods of wind drought. These crops also complement whatever carbohydrate-need that exists in the households.

In terms of plantain spacing, the recommended dimension for sole cropping is 2.5m by 2.5m or 3m between the rows and 2m within the rows (Swennen,1990). Small-scale plantain farmers attitude to spacing is as indicated in the findings, is that while

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four (1.5%) respondents comply, two hundred and sixty six (98.5%) do not follow recommended spacings for plantain.

This may be related to the 89% who have had a minimum of eleven years experience in plantain business. Their results over these period might have reinforced their doubt in the spacing proferred by agricultural scientists. The 1.5% (respondents) who follow spacing recommendations might have done so for certain reasons; probably to appease the agricultural agents who may want to extend some considerations to such people, in future, when such opportunities exists. In terms of staking, Table 13 depicts the types of wood species used by the interviewees.

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Table 6.4 Materials used in staking plantain

Material(Yoruba names)	Frequency	%
1. Igi Oparun(Bamboo)*	37	13.7
2. Bamboo and/or Igi Ayunre	5	1.8
3. Bamboo and/or Igi Agala	1	0.4
4. Bamboo and/or Ire or Okan or Ahun	6	2.2
5. Others ; any of Igi Akoko, Poopo, Opala, Ita Iyeye, Agunmaniye, Epin, Afara, or any Y-shaped stick	201	74.4
6. No staking	5	1.8

Source: Survey data (1991).

* Scientific names

Igi Oparun	Bambusa vulgaris (English name = Bamboo)
" Ayunre	Albizia zygia
" Agala	Gliricidia sepium
" Ire	Funtumia elastica
" Okan	Combretum spp.
" Ahun	Alstonia congensis
" Akoko	Newbouldia laevis
" Poopo	Lophira alata
" Opala	Pentaclethra macrophylla
" Ita	Celtis zenkeri
" Iyeye	Spondias mombin
" Agunmaniye	Gliricidia sepium
" Epin	Ficus exasperata
" Afara	Terminalia spp.

Source: Gbile, Z. O. (1984).

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Revealed in Table 6.4 is that staking is a practice among the respondents. While majority (74.4%) could not specify exactly the tree species used, 13.7% affirmed that Igi Oparun is their choice material. It was not found whether the operation is performed when due or only when the plant lodges either by weight of fruit or wind damage, etc. However, some of the reasons adduced for using these trees for staking are given in Table 6.5.

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Table 6.5. Reasons for using selected trees in staking plantain.

Reasons		Frequency	%
a.	Strong and reliable + Uneasily affected by termites	226	83.7
b.	Easy availability + Strong and reliable	5	1.9
c.	Strong and reliable alone	5	1.9
d.	b. + have Y-shape	3	1.1
e.	Easy availability	2	0.7
f.	Others; minor combinations of; -lasts long -gives good support -will not germinate/ sprout -easy availability -unaffected by termites	29	10.7
		270	100.0

Source: Survey data(1991).

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The most dominant reason is that "strong and reliable" and "unaffected by termites" (83.7%). Because plantains are very susceptible to lodging when heavy winds arise, the need for strong props becomes all-important. Termite resistance capacity is also a major factor. Trees prone to this could harbour more damaging pathogens to the plantain. The productivity of plantain appears to be related to its ability to remain upright (to obtain necessary sunlight for photosynthetic processes) so as not to affect the formation of fruits-the source of food and cash.

In terms of mulching, 267 (98.9%) of respondents indicated "never", while the remaining did not even respond to the question. Apparently, this is not a bother to them. This could be due to the fact that since they do not follow recommended spacing, plantain is allowed to produce several suckers or a mat. When the mat matures, with some of the (former) suckers bearing fruits, their broad leaves, together, may create sufficient shade for the plantain base, thus eliminating the need for mulching materials. Also, the challenge of searching for mulch matter may be too much for the farmer to bear on a crop which have been traditionally known to require a minimal attention. It has been categorised as the cheapest staple crop produced (Swennen,1990).

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6.4 INDIGENOUS MANAGEMENT PRACTICES IN SMALL-SCALE PLANTAIN PRODUCTION

The following are the variables studied;

a. labour use

b. implements/input use

c. decision making

Concerning the type of labour used, it is evident that the operations peculiar to its production need to be itemised to see if there are differences in labour regimes. Table 6.6 illustrates the picture. Illustrated in Table 6.6 about land clearing operation is that while adult male (family) labour represented the most dominant used (83.3%), hired labour (16.3%) was not left out. It appears that operations that are strenous often necessitate the use of paid assistance. This is evidenced in weeding (9.6%) and Stumping (3.7%). For land clearing, this is probably done once. The use of paid labour however might not be because of plantain alone but, inclusive of other crops interplanted with it. Since it has been found that small-scale plantain holders rarely monocrop plantain, benefits derived from hired labour output would spread to other crops and wiil enable the employer to use the time for other income-making ends. The extent of use of this paid labour would be determined by the farmers socioeconomic status. Adult male (family) labour is prevalent in all the operations except slashing of dead leaves and mulching. This is not surprising since the sample belongs to the small-scale classification-with limited resources. This however corroborates the findings of Adesimi (1990) who noted that most of the field work were performed by men in the study he conducted in Ogun state. The structural adjustment programme in the country made the naira to greately depreciate, thus making them save the little money they have, by using more of family labour.

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Table 6.6. Labour utilization in small-scale plantain production

Operation	Most dominant Labour type	Frequency	%	Next dominant Labour type	Frequency	%
Land clearing	FALAM*	225	83.3	HLAM**	44	16.3
Stumping	-do-	258	95.6	-do-	10	3.7
Planting	-do-	265	98.1	-do-	4	1.5
Weeding	-do-	241	89.3	-do-	26	9.6
Desuckering	-do-	261	96.7	-do-	4	1.5
Fertilization (organic)	-do-	208	77.0	N.S	61	22.6
Staking	-do-	259	95.9	N.S	9	3.3
Slashing dead leaves	N.S***	198	73.3	FALAM	72	26.7
Hilling base	FALAM	258	95.6	N.S	12	4.4
Mulching	N.S	265	98.1	FALAM	5	1.9
Harvesting	FALAM	267	98.9	-	-	-

Source; Survey data(1991).

Note: * FALAM represents FAmily Labour, Adult Male.

** HLAM represents Hired Labour, Adult Male.

*** N.S. represents Non-Significant to demand labour.

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One striking feature potrayed in Table 6.6 is that slashing of dead leaves was considered a non-significant operation by 73.3% of the respondents. This attitude has implications when we consider that the most damaging disease of plantain is black sigatoka (Stifel 1989a; IITA 1988c,1989 and 1990; Swennen et al,1989). This disease is caused by a fungus referred to as Mycosphaerella fijiensis.

Apart from the possibility of the fungal spores being air-borne, or non-charlant approach to the slashing of withered leaves could be an aid to the spread of this disease. By virtue of physical contact with healthy leaves, deformed leaves might harbour vectors or spores of the disease which might spread to other healthy parts much faster than when diseased leaves are religiously removed. Mulching of plantain plots is also not considered as important to ninety eight per cent of the sample.

This could be as a result of the problem of obtaining sufficient mulching matter, plant stubble or spent maize stems and cobs or cut grasses or any other dead material. The use of live matter such as melon or sweet potato has limit. They compete with plantain for nutrients since they are also surface feeders. The planting of legume species such as stylosanthes or flemingia (Swennen, 1990) just for the sake of its mulching effect seems not favoured. Again the frequency of the operation

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is supported by 98.9% who showed no interest. Collecting and distributing mulch materials are both labour and time consuming. Live mulch also requires the farmer to prune regularly so as not to affect the growth of plantain or accompanying crops. The labour to perform such operations is not readily available.

Table 6.7 illustrates the implements/inputs used in small-scale plantain production.

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Table 6.7 Implements/Inputs used in small-scale plantain cultivation

Implements/Inputs	Regularly		Occasionally		Never	
	Freq	%	Freq	%	Freq	%
Cutlass	268	99.3	2	0.7	-	-
Hoe	3	1.1	259	95.9	8	3.0
Basket	-	-	267	98.9	3	1.1
Knife	-	-	3	1.1	266	98.5
Herbicides	-	-	1	0.4	268	99.3
Insecticides	-	-	4	1.5	265	98.1
Fungicides	-	-	1	0.4	268	99.3
Credit loan	-	-	1	0.4	263	97.4

Source: Field survey data(1991)

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As shown in Table 6.7 is that cutlass is the implement often used. Its utilization could be in operations such as land clearing, stumping, planting (when digging hole), weeding, desuckering, cutting of sticks for prop, slashing of dead leaves (probably occassionally) and harvesting.

Cutlass has composite uses and functions in the production of plantain and this justifies its frequent use by 99.3% of the sample. Hoes could be used in weeding and digging of hole when the objective is to plant suckers or, when sand/soil matter are added to the base of plantain to make it more stable. These operations are not required frequently hence its (hoe) occassional employment as acclaimed by 95.9% of the sample. Other inputs are seldom used. This is not strange especially in the case of agrochemicals such as herbicides, insecticides and fungicides. These chemicals are not only scarce but very expensive for the limited resources of plantain farmers.

Only one respondent indicated to have used credit. This might have been necessary when plantain propagules are made ready for sale in limited quantity. Farmers interested in purchasing such may go to any extent-borrowing inclusive, to obtain the propagules for planting. Management of small-scale plantain enterprises requires ability to harmonise labour resources with implements/inputs in such a way that the farmer

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Table 6.8. Decision determinant in crop production (general)

Decision Determinant	Structure					
	Agree		Undecided		Disagree	
	Freq	%	Freq	%	Freq	%
season of the year	270	100	-	-	-	-
cash requirement	268	99.3	1	0.4	1	0.4
food preference	269	99.6	-	-	1	0.4
govt. incentive	-	-	-	-	269	99.6

Source: Field survey data (1991).

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would not experience total crop failure and economic loss. Central to this is the way decisions are made. The significance of decision making have been documented (Barlett, 1980; Hailu, 1990). The decision maker is a reflection of the power structure and distribution in the household. It is the person that makes the critical decisions that may determine the type of plantain firm farm possessed by a household. Table 6.8 potrays respondents decision making structure.

llustrated in Table 6.8 is that all respondents agree that decision on crop production generally, is influenced by season of the year, cash requirement and food preference of the household. They were also unanimous in disagreeing with the notion that they produce crops because of government incentives.

Government incentive such as policy statements, infrastructural development, provision of inputs such as agrochemicals and implements at subsidised rates and low interest credit are known to exist (The Presidency,1990). But very few farmers, probably belonging to cooperative/credit associations can readily utilise such facilities. Such credit advances require collaterals which most non-cooperative members do not possess individually. Granting that season of the year, food preferences and cash requirement, in that order, determine the decision on which crops to produce, it is necessary to examine the decision maker within the plantain household. This is the objective of Table 6.9, presented below.

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Table 6.9 Household decision maker on plantain production

	*Decision maker (% of respondents)									
Plantain production	1	2	3	4	5	6	7	8	9	0
planting plantain	99.3	-	-	0.4	-	-	-	-	-	0.4
plots to be used	98.9	-	-	0.4	-	-	-	-	-	0.7
inputs used	99.3	-	-	0.4	-	-	-	-	-	0.4
purchase plantain	12.6	-	-	0.4	-	-	-	-	-	87.0
harvest plantain	95.9	1.1	-	1.9	-	-	-	-	-	1.1
process plantain	4.1	78.5	-	17.4	-	-	-	-	-	-
consume plantain	4.8	5.6	0.4	88.5	-	-	-	-	-	0.7
sell plantain	6.3	89.6	-	3.3	-	-	-	-	-	0.7
use plantain income	98.5	0.4	-	0.4	-	-	-	-	-	0.7
cost of pltn prod.	29.6	69.6	-	0.4	-	-	-	-	-	0.4
hire labour	97.0	0.4	-	0.4	0.7	-	-	-	-	0.4

*Note; 1= household head (male)

2= wife/wives of household head

3= children; 4= 1+2; 5= 1+2+3

6= relatives of household head; 7= 1+3; 8= 2+3

9= 5+6 0= no response

Source: Field survey data (1991)

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The male household head, principally, determines the choice of planting plantain among 99.3% of the respondents .Similar power, influences or controls applies to the selection of plots to be used, inputs for its production, hiring of labour, when to harvest and utilize revenue obtained from sale of plantain bunches or fingers. This male-dominated decision making is supported by Makinwa-Adebusoye (1985) who observed that in farm decision making, rural women usually defer to their husbands. They take an inferior status.

Ogunniyi (1989) found that there was an organised body of knowledge, beliefs, values, customs, conventions, routines, social institutions and/or way of life which is prevalent in African agriculture. The African farming household arrogates all power to make decisions to the male household head. In some circumstances, however, other members of the household could make the less critical decisions (Adeyokunnu,1980; Favi, 1977).

This is probably the case in processing of plantain for either consumption or sale.Seventy eight per cent of the respondents revealed that it was the wife/ves who looks after these. This upholds the findings of Williams (1988) that women are more active in food preparation and household maintenance relative to their menfolk in Africa. When it comes to decision on consuming plantain, it was found that both the male household

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head and his wife/ves jointly determine this. This is reflected in 88.5% of the respondents.

This outcome is likely probably because a household head might want to eat a plantain meal but if he is not a good cook, he may have to request his wife to prepare this . But if the wife is not around, specially engaged, or ill, preparing plantain meals may be postponed. Also, women often prevail on the food roster (if any) when their husbands are not around or when they are very busy Williams (1988) study, which covered Oyo, Kwara, Anambra and Cross River states, found that "time spent on food preparation ranked highest" among the activities performed by the forty women respondents. As earlier indicated, government incentive was not a factor in crop production generally. Similarly, agrochemicals and credit input were rarely used. This probably implies that there were constraints to the use of these. This is discussed in the next section.

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6.5 Constraints in small-scale Plantain production.

In the absence of adequate government incentives, limitations to increased productivity of small-scale plantain farmers is more pronounced, given their limited resource base. Against this backdrop, Table 6.10 highlights the constraints peculiar to the plantain enterprise of the respondents.

Table 6.10 Constraints in small-scale plantain production

Constraints	Significance: Least Freq	Least %	Fairly Freq	Fairly %	Greately Freq	Greately %
Declining soil fertility	-	-	3	1.1	266	98.5
Competition for suitable land	2	0.7	190	70.4	77	28.5
Insufficient plantain propagules	5	1.9	6	2.2	257	95.2
Inadequate storage facility	255	94.4	3	1.1	10	3.7
Cost of transportation/ plantain	246	91.1	15	5.6	7	2.6
Poor community market prices/ plantain bunch	211	78.1	46	17.0	12	4.4
Pests/rodents attack	5	1.9	10	3.7	254	94.1
Diseases infestation	4	1.5	4	1.5	260	96.3
Wind damage	241	89.3	14	5.2	13	4.8
Scarce mulching matter	260	96.3	3	1.1	3	1.1
Expensive/unavailable hired labour	12	4.4	10	3.7	247	91.5
Community beliefs/values	263	97.4	1	0.4	3	1.1
Shading by other crops	260	96.3	5	1.9	1	0.4
Plantain-tree crop competition	253	93.7	4	1.5	8	3.0
Inadequate Extension service	5	1.9	5	1.9	259	95.9
Inadequate agro-input supply	1	0.4	4	1.5	262	97.0
Land tenure	4	1.5	8	3.0	254	94.1
Inadequate credit	1	0.4	4	1.5	262	97.0
Reduced land fallow	8	3.0	236	87.4	22	8.1
Uncertain rainfall	63	23.3	11	4.1	4	1.5

Source: Field survey data (1991)

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As represented in Table 6.10, greatly significant constraints in small-scale plantain production are declining soil fertility (98.5%), insufficient plantain propagules (95.2%), pests/ rodents attack (94.1%), diseases (96.3%), expensive/unavailable hired labour (91.5%), inadequate agricultural Extension services (95.9%), inadequate agro-input supply (97.0%), land tenure restrictions (94.1%), and inadequate credit facility (97.0%).

Concerning the issue of declining soil fertility, Spencer (1990) affirmed that chronic soil degradation have occured in areas of both high and low population densities as a result of considerable pressure on the available arable lands. This is also not unlikely in the face of intercropping practices in certain respects. When many crops are interplanted with plantain, there is high nutrient demand and there is the tendency that after a few years, plantain productivity would decline. Declining soil fertility could as well be attributed to the effect of unplanned tree felling - which opens up virgin lands. The tree cut for fuelwood probably served as shield against the effects of intense tropical sunshine and rainfall. The removal of those trees results in rapid erosion of soil surfaces, thereby degrading further the low-activity clay soils (Wilson and Stifel, 1988). Opening up new land (implying, loosely, shifting cultivation) have been a serious threat to sustainable agricultural production in Africa (Stifel,1989). The

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issue of declining soil fertility confirms the findings of Wilson and Swennen (1989).

In terms of insufficient plantain propagules, it appears that with the exception of the National Horticultural Research Institute (NIHORT), which engages, among other things, in the multiplication of plantain planting materials, there is no other research institute of local origin, that performs such ventures. It is to be noted that NIHORT also is faced with the problem of inadequate funding to be able to carry out such mandate. Adeyemi and Udensi (1988) have documented the problem of inadequate plantain popagules for purchase by those interested in plantain production.

Pests and rodents that attack plantain are grass-cutter, wild rats and monkeys (personal communications with plantain farmers,1991). These animals are a menace through their eating of the base of the plantain (high mat) because of its succulent and nutritive taste. Plantain bunches are prefered by the monkeys if the crops are sited close to dense forests. Other pests are minute worms (nematodes) inhabiting the soil and stem-borer (or Banana weevils) (Swennen, 1990). Swennen and Hahn (1988) have reported the threat of these pests in plantain production.

Related to pests are the diseases that affect plantain. The most devastating disease is Black sigatoka. This disease has been

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found to transform plantain leaves from green to yellow spots which later turn brown and black. The leaf later dies. This makes the entire leaves dysfunctional. In this way fruit-bearing plants are affected because of remarkably reduced photosynthetic surfaces. Yield losses due to this have been estimated at between 30 and 50 per cent (Swennen, 1990).

The problem of expensive and unavailable hired labour was expressed by 91.5% of the respondents. This might seem unexpected since these farmers are small-scale, yet, it should be recognised that agricultural operations are time-and season-specific. Farmers being humans are subject to uncertainties and contingencies which could necessitate their use of paid labour in some cases. Overall, the level of inflation and the devaluation of the naira might have contributed to the expensive fees charged by the hired labourers, when available. Availability of hired labour is a function of alternative employment opportunities (opportunity cost). Now that the economy is being encouraged to diversify from mono-exporting of oil alone, several job opportunities for both skilled and unskilled labour now exists (The Presidency, 1990). Hired labourers may opt for any of these alternatives if the returns are better than being employed in agriculture.

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Inadequate agricultural extension service to small-scale plantain farmers seem to re-echo the general inadequacy of the extension service in developing nations. Williams (1978) had reported that in Nigeria, many farmers had complained of lack of regular visit by these agents. He attributed this to shortage of staff, and non-payment of their travelling allowances. The recent restructuring of the former ministry-based agricultural extension service into the state-wide agricultural development projects in Oyo state (OYSADEP), might also be attributable for the (temporary) lack of effectiveness of the extension service in disseminating information on plantain production. The effect of contact with extension agents and adoption of innovations (by farmers) has been documented (Clark and Akinbode,1968).

Inadequate agricultural input supply is a constraint from the commercial and manufacturing firms. Most of these enterprises are located in the urban areas with a handful of distribution network. Their outreach to rural areas is however not very commendable. The consequence is that farmers who intend to purchase such agrochemicals and other inputs need to travel to these market/urban centres at great cost in most cases. Also, the shelf-life of these agrochemicals might have expired, thus rendering the investment on them a loss.

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With regards to land tenure restrictions, it appears this is a contradiction of the (94.4%) respondents who indicated that they inherited their cultivated plots. This development is adduceable to the fact that inheriting a land does not guarrantee fertility for plantain production. Where rainfall is steady and above 1500mm (Ndubizu,1985), it may not be widespread, despite geographical homogeneity. Distribution of rainfall is certainly beyond human control. Such rainfall disparity could urge plantain farmers to look for areas close to ponds, streams or rivers where sufficient regular moisture could be obtained for plantain. Choice locations as these, may possess very critical land tenure requirements for would-be plantain cultivator, etc. Having discussed the constraints, it is appropriate to examine the sources of agricultural information peculiar to these level of plantain farming.

6.6 Sources of Agricultural Information forSmall-scale plantain farmers

As highlighted above, constraints to small-scale plantain production could be reduced if not totally eliminated if these farmers are aware of the correct and adequate information which can assist in their plantain production. Table 6.11 illustrates the sources of agriculture - related information to the plantain farmers.

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Table 6.11. Sources of Agricultural Information to small-scale plantain farmers.

Source	Never Freq	Never %	Significance Occasional Freq	Occasional %	Frequently Freq	Frequently %
Radio	188	69.6	45	16.7	36	13.3
Extension black boards	84	31.1	1	0.4	184	68.1
Extension leaflets	79	29.3	190	70.4	-	-
Extension posters	76	28.1	192	71.1	1	0.4
Village extension agents	69	25.6	14	5.2	185	68.5
Extension drama	269	99.6	-	-	-	-
Group demonstration	267	98.9	2	0.7	-	-
Farm service centre	256	94.8	-	-	8	3.0
Friends/neighbours	4	1.5	3	1.1	257	95.2
Relatives	4	1.5	235	87.0	29	10.7
Village leader/Baale	64	23.7	202	74.8	3	1.1
Contact farmer	46	17.0	5	1.9	186	68.9

* more than one source cited.

Source : Field Survey (1991)

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As seen in Table 6.11, the modal cases of the information sources are :

1. Never used sources
   a. Radio (69.6%)
   b. Extension Drama (99.6%)
   c. Group Demonstration (98.9%)
   d. Farm Service Centre (94.8%)
2. Frequently used Sources are :
   a. Extension Blackboards (68.1%)
   b. Village Extension Agents (68.5%)
   c. Friends/Neighbours (95.2%)
   d. Contact farmer (68.9%)
3. Occassionally used sources
   a. Extension leaflets (70.4%)
   b. Extension posters (71.1%)
   c. Relations (87.0%)
   d. Village leader/Baale (74.8%)

The non-use of radio by 69.6% of the respondents probably indicate that since Radio as a channel of communication appeals only to the sense of hearing its impact is limited. This is because, plantain production requires certain skills in (for example) desuckering, staking, identification of healthy

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propagules. These operations though can be explained on Radio, but the assimilation by the farmers of these radio programmmes could be distorted by elements of noise in transmission channel if very close to any electrical gadget or any energy radiating machine. Also, farmers understanding of radio messages presupposes that the language used for transmission is understood by the receivers/listeners etc. Again, cost of and availability of cell batteries could limit the reliance on battery-operated radio transistors in many rural areas where electricity is found irregular. Finally, what is learnt by hearing alone, can not be as understood as what is heard and also, seen with the eyes.

Contrastingly, 13.3% indicated that they use radio frequently as their source of information. This is probably due to the advantages of radio broad-cast whose transmission coverage could reach several farmers at diverse locations.

"Agbelere" (Yoruba language phrase which means "Farming profits") is a five-minute radio programme which is broadcast daily except Friday and Sunday by the Broadcasting Corporation of Oyo State (BCOS). "Agbe-loba" (Farmer is the king) is another radio programme from BCOS. This is aired on Fridays alone (Olasupo 1990). These programme might have attracted the listenership of the respondents who indicated so.

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While radio (channel) is very popular among rural farmers in Africa (Hatchen 1971), and in Oyo State (Patel and Ekpere 1978), its impact on agricultural production can not be generalised. According to Olasupo's (1990) study, it was found that;

(i) there was no difference in the knowledge of improved farm practises among respondents who had access to radio and those who do not.

(ii) there was no difference in the knowledge of improved farm practises among respondents who attentively listen and discuss broadcast content and those who do not.

His conclusion therefore was that radio listen pattern and listening behaviour have no significant relationship with knowledge of improved farm practises among the seventy eight (78) farmers randomly selected in Lagelu Local Goverment Area of Oyo State. This finding is corroborated by the 69.6% who indicated that they never used radio as their source of information on agriultural activities.

Extension Drama is a relatively new development in the agricultural development projects. Its perfection may still be in the making to elicit farmers preference. Probably the shortage of extension staff could be a limiting factor to its effectiveness in the rural areas.

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Group Demonstration is an extention method which has been well known. Yet (98.9%) of respondents indicated they never use it. Group Demonstration may also be limited by lack of teaching materials or specimens for the demonstration. Intra and Inter-village conflicts may also jeopardize the desirable location for such activity.

Farm Service Centres (FSC) have also been recognised with the introduction of agricultural development projects (ADPS). Within the ADPS are the Technical Services, including Extension, which assists farmers as to how they can obtain information on agricultural imputs from the FSC. In most cases, the location of the farms to FSC may be too far for the farmers who may need to ask several questions frequently.

Frequently used sources are Extension chalkboards by 68.1% of the respondents and village Extension agents (68.5%). This might be due to the fact that extension agents understand the local language and some could be indigenes of the area. Thus, farmers would feel"safe" by requesting from such "well - known" individuals questions related to plantain production. Olufemi (1988) had found that most farmers seek and obtain information on improved farm practises from three main sources---Radio, Extension agents and fellow farmers. Similarly, Undiandeye (1988) asserted that the Training and Visit (T&V) agricultural

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extension system being operated in the ADPS have been effective in terms of familiarity of village extension workers with farmers. This familiarity also might include the use of blackboard to explain, illustrate graphically or represent ideas to farmers apart from method demonstration.

Contact farmers occupy a unique position in the ADP set-up. According to Benor and Harrison (1977), these contact farmers are requested to assist the extension agents in the (block or cell) area to pass to other farmers, who could not be reached by the extension agent or when the agent is yet to come, information related to improved agricultural practices. Most of these farmers have their limitations (because they are better than most farmers socioeconomically) and may not play their role as demanded by T & V set-up (Jaiswal et al 1978); yet, they are people often found in the communities to whom assistance could be sought. They also represent all the socio-economic groups within a community (Benor and Baxter, 1984).

Friends and neighbours apppear to be the most used sources of information for 95.2% of the respondents. This is probable, because most dwellers in rural communities are subject to the same community of fate. Their "destiny" appears tied together. When a farmer has heard of any useful information, related to plantain (and/or other crops), the news often spreads quickly.

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Informal relationship between village farmers enhance the dissemination of functional information. Whenever extension agents, contact farmers and farmers neighbours are not around, plantain farmers may resort (occassionally) to use posters, relatives, village Baale/leaders etc. These other alternatives also have contributions to agricultural developments.

Having discussed these information sources, it is adequate to examine the level of awareness of plantain farmers about, and, their attitude to alley farming technology.

6.7 AWARENESS AND ATTITUDE TO ALLEY FARMING TECHNOLOGY BY SMALL-SCALE PLANTAIN FARMERS

Small-scale plantain (farmer) respondents were asked to indicate whether they have heard of alley farming technology or not. Findings reflect that only 4.4% of the respondents were aware of alley farming technology. This level of awareness could be due to the scope of IITA's on-farm alley trials which is restricted to a handful of villages within 20km radius of Ayepe. Plantain farmers in villages, farther than Ayepe, are not likely to have heard. It is probable that movement of IITA's field staff could have become a common sight yet their activities could be seen as evidence of IITA's general interest in crop production, and not particularly, alley farming. It is also possible that since this

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technology is still at the trial stages, on-farm, its spread could be suspect. This is because, management practices of these alley species are still variable (on-farm) and multipurpose trees are still being screened to determine which is most suitable to the research domain.

The study went further to ascertain from the farmers if they know some of the multipurpose trees (MPTs). Their reaction is shown in Table 6.12.

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Table 6.12 Multipurpose trees known to small-scale farmers

multipurpose tree known	Yes (%)	No (%)
Leucaena spp.	2.6	83.7
Cassia spp.	98.5	1.1
Gliricidia spp.	97.0	2.2

Source : Field Survey (1991)

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Data from Table 6.12 suggests that leucaena spp. (Igi Ajile) is relatively unknown to 83.7% of the respondents. It appears that Leucaena is not found relevant (or useful) to the production practices of the forefathers of these respondents, hence, they are not-aware of it. International Development Research Centre (IDRC 1982) indicated that leucaena Spp. originated from Central America and Mexico. It is probable that, of all exotic tree Spp. brought into Nigeria, Leucaena is just being given attention by the research system. In essence, the rural farmers may not be aware of its utility.

A high percentage of respondents are aware of Cassia and Gliricidia Species. Cassia is locally reffered to as Igi Agala which means "tree of giant size occupying open spaces". It is found most commonly as a shade tree
in front of houses in rural areas (personal communications with indigenes of Ologun Village 1991). It is also known to be a very hard tree, useful in furniture making. It is favoured by quela-quela birds to make nests and breed.

Gliricidia specie is locally referred to as Igi Agunmaniye, that is, "tree that grows tall without wisdom". Its indigenous uses are;

a. to serve as live-fence around bathing spaces in most rural homes

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b. live-fence to demarcate plots of land and compounds etc. Because it is widespread and tender in tissue, primary school kids in rural areas cut it during inter-house sports to construct booths or sheds for temporary uses.

In terms of attitude of small scale plantain farmers to alley farming, respondents were requested to indicate whether they are willing to know more about the technology. Almost all the respondents (99.6%) indicated their willingness to learn more about alley farming. It was also intended to know if respondents would "Encourage" "Discourage" or be "Indifferent" to their neighbours if they (neighbours) try alley farming. While only one respondent (0.4%) inclined towards discouraging others, 99.3% were of the opposite view. This shows the potential of this technology if only farmers are made aware of, and involved (on a more larger scale) in its development. Particularly, in the identification/selection of multipurpose trees.

The next section presents the findings of the participant observation conducted on selected plantain plots in 1989/90.

6.8 REPORT ON PARTICIPANT OBSERVATION OF SMALL-SCALE PLANTAIN PLOTS.

This analysis is the report of particpant observation carried out on ten plantain plots with the cooperation of the plot-

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owners. Each visit to the plot by the farmer is the unit of analysis.

INPUT ANALYSIS:

The (ten) respondents whose plots were monitored for about 6 months, revealed that their most common time of visit to the plantain plots were in the morning period between 6.00 a.m. and 12 noon. Out of a total of two hundred and six (206) pooled visits by these (ten) plantain farmers to their plots, the morning period accounted for 88.3%. While the afternoon period, between 12noon and 7.00 pm, had 7.3% of the visit times, only 4.4% of the times did farmers visit their plantain plots between 6.00 am and 3.00 pm.

The preference for the morning period suggests that it could be as a result of cool temperature in the early morning hours. Cool temperature reduces fatigue which enables a lot of work to be done on the plots before the sun rises. The debilitating effect of the sunshine increase physiological activities and sweating which may make working under the sun to be tedious. In terms of operations carried out during the period of visits to their farms Table 6.13, illustrates the picture.

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Table 6.13. Major Operations on monitored Plantain Plots.

Operations	frequency	Percent
Weeding	90	43.7
Harvesting food crops	31	15.0
Harvesting and weeding	21	10.2
Harvesting plantain Only	14	6.8
Planting Plantain	5	2.4
Weeding and Planting Plantain	5	2.4
Planting food crops	6	2.9
Others / Miscellaneous	34	16.6
	206	100.0

Source: Field Observation (1989)

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Weeding was a major preoccupation of the respondents during the duration of the study. Perhaps it could be because the study commenced in the middle of the rainy season, July and ended in December 1989. Weeds are unwanted plants when goal of production is not on them. These unwanted plants compete with plantain and associated crops for nutrients, light, etc.

The weeding performed on the plots are for creating a conducive growth environment for plantain and associated crops etc. Because, the climatic conditions (in that period of the year) favour the rapid growth of crops, by virtue of available moisture, weeds also become a menace, thus the chunk (43.7%) of total operations given to weeding alone.

Harvesting food crops also attracted 15% of the operations performed on the plots. This could be connected with the number of food crops that become mature during the rainy season. These include maize (two croppings), vegetables, pepper, tomato, cassava etc. Plantain harvest took only 6.8% of the operations observed or performed on the plots. This may be due to the plantain suckers that were planted earlier, or between ten to twelve months, prior to the time of observation/visit by the author.

Concerning the type of labour engaged in these operations, the observation revealed that while family labour accounted for

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94.2% of total labour used, the number of people involved ranged from one person (44.2), two persons (38.3%) to three individuals (13.6%). Eighty five per cent of family labour used was made up of adults, majority (63.6%) of whom were males. Female adult labour accounted for 5.3% of the family labour used. Child (less than 16 years old) labour accounted for 2.4% of total labour used on the farm. In terms of total hour per visit (through the duration of the monitoring) Table 6.14 indicates this.

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Table 6.14. Hours worked by farmers at each visit to plantain plots

Actual Hour (nearest whole)	Frequency	Percent
1	4	1.9
2	7	3.4
3	18	8.7
4	37	18.0
5	22	10.7
6	25	12.1
7	16	7.8
8	22	10.7
9	16	7.8
10	5	2.4
11 and above	34	16.5

Source: Field observation (1989)

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As highlighted in Table 6.14 the modal number of hours worked on plantain farms by their cultivators was 4 hours. This accounted for 18% of the cases observed. The next common category is that of 6 hours. The proportion of this is 12.1% of the total. Five-hours on the plot also accounted for 10.7% of the cases. By virtue of these categories, one could sum that four to six hours accounted for two-fifths (40.8%) of the frequency of hours spent on the plantain plots. This seems to buttress the initial finding that 88.3% of the visit to the plantain plots by farmers were between 6.00 am and 12 noon during the period of the observation. Further observation revealed that farmers whose houses were not too far from their plots returned to their dwellings, shortly, before the sun was to be directly overhead, over the equator, in the tropical region. That is when the insolation is most intense. The break period for these farmers appears to be the period the sun is overhead, till when the farmers eat their lunch, take some rest before deciding to return to their plots much later, probably as from 3.30p.m. For those (16.5%) that may opt to spend longer hours on their plots, it could be due to several factors among which are multiple or urgency of operations to be carried out when time is against, availability of hired labour or adequate financial resources, distance of plots to house, age of farmers and the state of the weather or intense

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cloud cover which shields the sun and keeps the temperature cool to permit such continous work. While the most common length of time spent on work by both adult males and females were four hours, the number of occurrence differ.

In the case of males, the occurrence of such is 55 while it is only 21 for women. This indicates that adult male labour is prevalent in small-scale plantain production in the villages where the plots were monitored. The observation revealed further that cutlass and hoes were the implements used together in 37.4% of the cases whenever implements were required. While hoes alone were used in 7.8% of the occasions, cutlass was often preffered in 30.1% of the occurrence .

OUTPUT ANALYSIS:

This deals with the amount of output/work performed on each operation. Included are the types of crops harvested and the destination of such harvests. Table 6.15 illustrates the output per operation performed on monitored plantain farms.

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Table 6.15 Operation Output on monitored plantain plots

Operation Output	Frequency	Percent
1. Weed: 0.1-2.0 Igba	63	30.6
2. Weed: 2.1-4.0 Igba	27	13.1
3. Weed:above 4 Igba	14	6.8
4.Harvest food crops < 1 basketful	6	2.9
5.Harvest food crops;1 basketful-1 jutebag	25	12.1
6.Harvest plantain 1-5 bunches	6	2.9
7.Harvest plantain; 10+ bunches	6	2.9
8.(1) + (5)	10	4.9
9.Others/miscellaneous	49	23.8
TOTAL	206	100.00

Source : Field Observation (1989)

Note: An Igba is equivalent to 200 heaps (cultivated land).

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As illustrated in Tables 6.13 and 6.15, weeding operation was the dominant operation on plantain plots. Distribution of output of labourers engaged in this operation ranges as follows 0.1 - 2.0 Igbas (30.6%), 2.1 -4.0 Igbas (13.1%) and above 4 Igbas (6.8%). It is necessary to be cautious in respect of the harvest of foodcrops which accounted for 12.1% of the cases. There appears to be a coincidence of observation time with harvesting of foodcrops. Crops harvested are indicated in Table 6.16.

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Table 6.16. Distribution of crops harvested on monitored plantain plots.

Crop Harvested	Frequency	Percent(%)
Plantain	16	7.9
Cassava	6	2.9
Maize	13	6.3
Cocoyam	3	1.0
Okro/vegetables	11	5.3
Melon	4	1.9
Yam	1	0.5
Cocoa	3	1.5
Foods crops combined*	11	5.3
Plantain + food crops combined	6	2.9
No harvest	133	64.6
	206	100.0

Source; Field observation (1989)

* Combination of cassava, maize, vegetables, melon, pepper.

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Table 6.16 indicates that plantain, maize and vegetable/food crops were the common harvests during the period of the survey. The percentage for "no harvest" (64.6%) reflect the period for agronomic and management operations carried out by the farmers on their plantain plots.

ANALYSIS OF SALES

In terms of destination of the crops harvested, those for home -consumption, those sold in the market and both took 7.8%, 18,9% and 8.7% of the crops harvested respectively Category of crops sold at the markets however reveal that food crops was the most dominant (16.5%): Next was the plantain (7.8%) while cash crops took 1.5%. In terms of the actual returns from sales, respondents reported that plantain bunches were sold at a range of six naira (6N) per bunch to seven naira (7N) per bunch. Actually during the survey period, at differing intervals, five bunches were sold for six Naira each. Another 10 bunches were exchanged for Seven Naira each. The sales were however at the local community markets, for example Ayepe market on the regular 5-day market days. Others were reportedly sold at village premises (personal communications,1989).

Prices offered for food crops sold at the local community market ranged from two Naira to Six Naira. There was only one

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occasion each when revenue from food crops sales was twenty Naira and Sixty Naira.

This analysis suggests that probably most of what is provided is consumed in the households. The nature and quantity of food crops also determine how much revenue can be realised by the plantain farmers. Crops grown on the plots seem relevant here. Table 6.17 illustrates the observed crop combinations on the ten plots.

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Table 6.17. Distribution of plantain intercrop on monitored plots.

Plantain Intercrop	Frequency	%
1. PL + CS + CY +BN + MZ	16	7.8
2. PL + CY + BN +MZ +CC+VG + CS	38	18.4
3. PL + CY + CS + VG	25	12.1
4. PL + ML + VG	27	13.1
5. PL + CS + CY+ BN	4	1.9
6. PL + CS + CY+BN + MZ + VG	10	4.9
7. PL + CC + CY+CS+ VG +MZ	12	5.8
8. PL + CS + CY + MZ	20	9.7
9. PL + CS +CY +MZ +VG	54	26.2
	206	100.00

Note:

PL = Plantain

CS = Cassava

CY = Cocoyam

BN = Banana

MZ = Maize

CC = Cocoa

Ml =Melon

VG = Vegetables such as Okro, Pepper, Leaf vegetables, Onions and Tomato

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At first, it appears that Table 6.17 illustrates the crop combinations observed in 206 plots. This is not the case. Rather, what is expressed were observations of the researcher at different visits to the farmers' plots. There were harvest and additional plantings of same crops and/or new crops. Farmers often plant some crops regardless of whether they informed the author or not. This is not unlikely because they are not social isolates. There interaction with members of the community could have led to making decisions about which crop to add to the existing ones.

Some of the respondents were suspicous of the intentions of the survey. Others were either not around until several days later or completely forget to inform the author of their latest plantings. In such circumstance the author would go to their plots and observe whether new crops have been planted or not.

The modal (26.2%) combination of crops include plantain, cassava, cocoyam maize and vegetables. Actual size of areas covered by these crops were not measured. The next common combination (18.4%) concerns plantain, cocoyam, banana, maize, cocoa, cassava and vegetables. The latter arrangement occurred more on plots with very old cocoa trees. This confirms the findings of Dorosh (1988) that plantain production at the small-scale level was never a monocrop.

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This also reflects the attitude of the small-scale plantain farmers to risk. Rather than relying solely on one crop, they plant as many different crops (subject to nutrient and space availability) in order to realise produce for consumption and or sales. Even if insects or diseases affect one or two crops, there is the possibility that at least others (crops) free from or less damaged would generate a sustenance.

PLOT SHAPES AND SIZES;

Twelve plots of small-scale plantain production were also measured with the aid of compass, ranging poles and tapes. All the plots were irregularly shaped. And the measured plots bearings were logged into the computer and analysed with the Clipper program (software) in Word Perfect IBM PC. All the plots had less than the conventional minimum closing errors of 5%. This percentage according to (Nweke, et al, (1989) makes the measurements to be valid.

In terms of sizes, the plots range from 0.04 hectare to 0.44 hectare. These plot sizes perhaps reinforce the need to appreciate the actual production patterns of the small-scale plantain farmers. The variables determining these are discussed next.

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6.9 Influence of Selected Socioeconomic/Demographic Variables on Indigenous Agronomic and Management Practices of Small-scale

The indigenous agronomic variables are :

(i) Plantain intercrop

(ii) Spacing

(iii) Staking

(iv) Mulching

The Indigenous management practises are:

(i) labour utilization

(ii) implements/inputs use

(iii) decision making.

HYPOTHESES TESTING

The inquiry ascertained the influence of selected socioeconomic/demograghic variables on indigenous agronomic and management practices of small-scale plantain farmers. The aim of this is to highlight certain issues which could throw more light in the understanding of small-scale plantain production.

Pearson correlation and stepwise multivariate regression techniques were used for this purpose. Hypotheses raised are discussed as follows.

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Intercropping of Plantain

1. The hypothesis tested in the null form states that:

"There is no significant relationship between indigenous knowledge/customary beliefs and intercropping of plantain": Pearson correlation analysis coefficient (r =0.247) indicate a positive and significant association between indigenous beliefs and inter-planting of plantain with other crops (see Table 6.18).

Indigenous knowledge and customary beliefs are what small-scale plantain farmers have accepted (from their predecessors) as true, regardless of how those beliefs were founded. Because rural farmers have limited exposure to the developments in modern scientific research, it is likely that the prevailing influence, on what small-scale plantain farmers should intercrop with plantain should be determined by the knowledge obtained from their progenitors. It appears also that the more these beliefs are reinforced probably through social interaction the more they are adhered to. It has been discussed earlier (in Table 6.3) that Yam, Cocoyam, Cassava and pepper were the dominant intercrops with plantain.

This occurrence could be due to the dietary custom and fact that cocoyam is a shade-tolerant crop while cassava's growth rate could be reduced during critical foliage development and production of fruits in plantain. By the time the plantain is

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harvested cassava would have matured. Yam is a deep feeder unlike plantain, thus competition between these crops are minimised, moreso, when yam is planted much later in the season/year. Bits of areas where sunshine can penetrate among plantain leaves can enable the pepper plant to grow. Sole cropping of plantain is not a practise among small-scale farmers. This is attested to by the findings of Dorosh (1988). Risks of loss of income and food are reduced where inter-cropping is performed. The calculated coefficient (r=0.247) compared with tabulated Pearson product-moment correlation (r=0.215) was positive and significant. This suggests that the more of indigenous knowledge inherited from traditional elders the more small-scale plantain farmers tend to continue planting above- mentioned and probably other crops with plantain simultaneously.

Thus, the null hypothesis is rejected for the acceptance of the alternative hypothesis (at alpha=0.05 level), that, there is a significant relationship between indigenous knowledge and intercropping of plantain.

Table 6.18 shows the correlation matrix of selected variables influencing indigenous agronomic and management practices in plantain production.

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Table 6.18

Correlation matrix of selected variables influencing indigenous agronomic and management practices in small scale plantain production.

	x3	x10	x23	x25	x30	x42	x60	x62	x83	x94	x102	x123	x132	x141	x162	x237	x238	x297	x320	x329
x3	1																			
x10	0.339	1																		
x23	0.098	-0.265	1																	
x25	0.097	0.093	-0.18	1																
x30	- 0.143	0.189	-0.15	0.11	1															
x42	0.304	- 0.532	-0.2	0.11	-0.04	1														
x60	- 0.066	0.154	0.09	- 0.17	0.18	.001	1													
x62	0.087	- 0.24	0.06	- 0.3	0.02	0.13	0.32	1												
x83	0.035	- 0.198	0.15	- 0.4	- 0.29	0.06	0.07	0.21	1											
x94	0.097	- 0.109	0.11	0.04	0.03	0.05	0.01	0.25	0.15	1										
x102	0.073	0.212	-0.04	- 0.02	- 0.01	- 0.13	- 0.34	0	0.02	0	1									
x123*	0.179	0.393	-0.12	- 0.03	0.053	- 0.22	0.25	- 0.33	- 0.07	0.01	0	1								
x132	0.286	0.555	0.2	- 0.07	- 0.45	0.23	- 0.21	- 0.03	0.29	0.12	- 0.13	- 0.49	1							
x141	0.231	- 0.345	0.09	- 0.19	- 0.39	0.2	- 0.14	0.24	0.19	0.19	- 0.11	0.03	0.51	1						
x162	- 0.089	0.224	-0.08	- 0.01	- 0.23	- 0.11	0.25	- 0.09	- 0.16	0.02	- 0.09	- 0.02	- 0.39	- 0.25	1					
x237	0.066	- 0.272	0.28	0.546	- 0.45	- 0.04	- 0.05	0.05	0.66	0.1	- 0.06	- 0.04	0.48	0.39	- 0.26	1				
x238	- 0.251	0.555	-0.16	0.42	0.32	- 0.17	- 0.03	- 0.22	- 0.51	- 0.23	0.08	0.13	- 0.49	- 0.5	0.22	- 0.73	1			
x297	0.097	- 0.144	-0.08	- 0.09	- 0.23	- 0.07	0.01	0.14	0.27	0.29	- 0.16	0.02	0.36	0.22	- 0.34	0.29	- 0.35	1		
x232	0.125	- 0.161	0.16	- 0.07	- 0.29	0.21	- 0.17	- 0.02	0.22	- 0.02	0.01	0.02	0.46	0.38	- 0.28	0.28	- 0.13	0.316	1	
x329	0.036	- 0.076	0.13	- 0.05	- 0.03	- 0.08	- 0.13	- 0.02	0.3	- 0.02	0.31	0.02	0.46	0.31	- 0.18	0.37	- 0.21	0.45	0.44	1

* Significant at $p < .05$ = 0.215

Note: x3 = Age; x10 = Formal educ. level; x23 = household size; x25 = Social participation; x30 = Cosmopoliteness; x42 = Plantain Farming experience

x60 = Plantain intercrop; x62 = Spacing; x83 = Staking; x94 = Mulching; x102 = Decision making/Plantain production; x123 = Implement/imputs used; x132 =Plantain production cost; x141 = Labour Use; x162 = Indigenous Knowledge; x237 = extension contact; x238 = Radio as information source; x297 = Alley farming awareness; x320 = Plantain diseases; x329 = Land tenure constraints.

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SPACING, STAKING AND MULCHING OF PLANTAIN

The following hypotheses were tested:

2. There is no significant positive association between use of radio as information source in the staking and mulching of plantain.
3. There is a significant impact of awareness about alley farming on the staking and mulching of plantain.
4. There is no significant effect of plantain farming experience on the spacing,staking and mulching of plantain.
5. There is no significant correlation between frequency of extension contact and staking of plantain.
6. There is a significant correlation between cosmopoliteness and plantain production,decision-making,spacing,staking and mulching of plantains.

Pearson product-moment statistic show that between use of Radio as information source and staking, "r" is -0.510 and; between radio and mulching "r" is -0.231. These inverse relationships implies that as an information source, radio, though a mass medium, is limited in its inability to exhibit skill which needs to be demonstrated such as in staking and mulching practises. Radio appeals only to the sense of hearing and not sight, but staking and mulching appeals to both.

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Invariably, as much agriculturally-related information that is relayed on air by radio, they are useful if they are only creating awareness, but not in adequate training about the "how" in staking and mulching. The more of such radio broadcast, the less adherence to information about staking and mulching. Radio broadcast cannot effectively treat method demonstration. Essentially, we accept the null hypothesis that there is no significant positive correlation between the use of radio as information source in the staking and mulching of plantain.

In respect of the impact of awareness about alley farming on the staking and mulching of plantain, pearson correlation analysis indicate the association between alley awareness and staking as positively significant (r=0.265) and (r=0.291) with mulching. These tends to reflect the influence of IITA's on-farm alley cropping trials in those areas where the farmers are involved. The positive association suggests that the more awareness about alley farming technology the higher the propensity of small-scale plantain farmers to prop and mulch their plantain.

Perhaps, the features of alley cropping makes staking and mulching of plantain possible. When foliage from alley species are periodically pruned, they can be spread over plantain plots to serve as mulch materials. Similarly, when very matured alley

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species branches are pruned, they can be used as props to support plantain from lodging. Because the alley species are right on the plot of the farmers, the time that should have been spent searching around for them is reduced or spent on other operations that could enhance plantain productivity . Thus, the hypothesis that there is a significant impact of awareness about alley farming and the staking and mulching of plantain is sustained. The effect of plantain farming experience was also determined. Pearson correlation coefficient indicated the relationship with spacing (r=0.125), staking (r=0.058) and mulching (r=0.048).

These relationships indicate that none is significantly related to plantain farming experience. It could be argued that length of years of plantain cultivation does not make it a guarantee to spacing, staking and mulching of plantain as recommended. Spacing of plantain requires a farmer to observe geometric proportions or ordered spatial arrangement as is often done (though not deliberately) in heaping. Where, for instance, a plot of land undulates, it will not be very possible to follow exact spacing arrangements. Also where soil fertility is not uniform across a plot it might be better to concentrate (at least by non-desuckering) plantain in areas where they have access to adequate nutrients. Perhaps the longer the experience, the better equipped

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the farmers are which may make them not to see spacing as a must for plantain.

Staking and mulching operation demands that farmers search for poles and mulch materials respectively. Experience might assist the farmer to have seen that such search brings little gains. Apart from time consumed, how much live or dead foliage materials would be needed to effectively mulch a plot? Since experience might have informed the farmers that plantain would be harvested whether properly spaced, staked and mulched or not, then choosing the latter option is not a big risk.

Spacing, staking and mulching of plantain do not guarantee freedom from attack of rodents especially rats and grasscutter, and monkeys which prefer to each fruit bunches. In sum, the null hypothesis that there is no significant effect of plantain farming experience on spacing, staking and mulching of plantain is accepted.

The fifth hypothesis is stated as:

There is no significant correlation between the frequency of extension contact and staking of plantain.

Obinne and Anyanwu (1991) reported similar significant relationship between extension communication and adoption of new cassava by farmers in Edo State of Nigeria. Pearson correlation statistic (r=0.664) indicate a positive and significant

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association between these variables . Extension agents have a key role to play in the development of agriculture in Nigeria. As reflected (in Table 6.4), staking operation is a practise among the small-scale plantain farmers. The more exposed the farmers are to extension service the better their knowledge about staking, the necessary staking materials etc., and where the props are to be placed whether at the rachis of the fruit/bunch or at the pseudostem.

Regular interactions with extension service have a multiplier effect on the farm enterprise of farmers. Apart from gaining knowledge and skill about particular crops, farmers may also learn about certain issues(such as forth coming trade fairs, goverment programmes etc) which may spur the farmers to want to be friendly with the "extension people". The coefficient suggest that the more the interaction between the farmers and Extension services the more the tendency for recommendations in staking operation to be adopted. The alternative hypothesis that there is a significant correlation between the frequency of Extension contact and staking of plantain is hereby accepted and the null hypothesis is rejected.

The sixth hypothesis, concerns the influence of cosmopoliteness on decision making (r= -.011), spacing (r =0.024), staking (r=-0.291) and mulching(r =-0.032) of plantains.

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Cosmopoliteness infers the situation where an individual is at home in diverse locations. Such well exposed individuals or plantain farmers could also be more socially involved such that the more travellings to urban centres or different locations, the more the tendency to be exposed to varying opinions about the advantage, disadvantages and opportunity cost of staking plantain. Such shades of opinion could conflict with the interest of the small-scale farmers to the extent that decision making to continue staking plantain may be diminishing. This may be responsible for the inverse but significant relationship with staking (r= -0.291).

On the other hand, at $p < .05$ cosmopoliteness has no significant effect (positive or negative) on decision making about plantain production (r = -0.011), spacing (r=0.024) and mulching (r=-0.032) of plantain. This may imply that, there could be several other intervening factors that could determine plantain cultivation practices. Some of them could be extension contact, marketing facilities for plantain, taste and food preferences, land tenure, etc. With the exception of staking practice, we reject the alternative hypothesis that there is a significant correlation between cosmopoliteness and decision, spacing and mulching of plantain.

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DECISION MAKING,INPUTS/IMPLEMENTS AND LABOUR USE

The following hypothesis were tested:

7. There is a significant relationship between production cost and household size and use of labour in weeding

8. Social participation is not significantly associated with decision making on plantain production.

9. There is no significant association between contact with Extension and inputs used in plantain production.

10. There is no significant association between age and decision making on plantain production.

In relation to the seventh hypothesis stated as: There is a significant relationship between production cost and household size and use of labour in weeding. Pearson correlation coefficient indicates a significant and positive relationship (r = 0.511) between cost of production and use of labour in weeding operation; but, this is not so in terms of household size and weeding whose correlation coefficient indicates a non-significance (r = 0.088)

It is likely that as more plantains are sold with better prices, revenue derived could make the farmers want to engage more in plantain production thereby, setting aside, a portion of their income for production purposes. Such purposes may include

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paying for hired labourers who do not only weed the plots, but may slash withered/diseased plantain leaves, look for sticks to prop plantain from lodging and also search for materials to mulch the plots.

Increases in production costs are redeemable when higher prices are placed on plantain fruits. Since farmers are sure of the ready markets for plantain they could take on the extra cost of hiring labour etc. Likely increases in production cost could sensitive more labour being utilised in weeding probably if the plantain fruits are still marketable.

The study also determined whether participating in social activities had any effect on decision making to cultivate plantain. The "r" is -0.015. This shows that there is no significant effect of social participation on decision making about plantain. It could be because, plantain production at the small-scale level may be subjected to other variables precluding social participation. Whether a farmer is socially involved or not has no relevance in small-scale plantain production. Perhaps plantain production is a function of crop preferences, depending on the sociocultural and economic status of the small-scale farmers. Because of lack of significant association we accept the null hypothesis that there is no significant association between

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social participation and decision making to cultivate small-scale plantain.

Contact with Extension was determined whether this had impact on the inputs used in small-scale plantain. It is expected that interaction with the Extension service would guide the farmer in the choice or selection of appropriate inputs/ implements in order to ensure better plantain fruits. This is the basis of the ninth hypothesis. But correlation coefficient reflect a non-significant impact (r = -0.044).

This suggests that interaction with Extension service has no impact on inputs/implements used in a small-scale plantain production. A small-scale farmer may not have the necessary financial resources probably as a result of large number of dependants or a physical disability or other shortcomings and which the extension service can not afford to render free-of-charge to the farmer. It is one thing for the Extension service to recommend an input; it is another for the clientele to be able to afford it. Since plantain is often intercropped, farmers may prefer to follow only the advice that also enhance the output of other crops planted alongside plantain.

Where these are not forthcoming, whatever recommendation is made about plantain tends not to be given considerations. Inevitably, the null hypothesis that states that there is no

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significant association between contact with Extension service and inputs used in plantain production is upheld.

It is further intended in the tenth hypotheses to verify if significant association exist between age of farmers and decisions to cultivate plantain. Pearson correlation coefficient reveal a non-significance (r = -0.073). This probably explains that regardless of age, small-scale plantain production has several other determining issues.

Age reflects physical ability or disability to pursue vigorously whatever it takes to sustain production of plantain. These endeavours may include seeking for staking and mulching materials,learning about improved production practices and sustain the interest in these dimensions. While younger farmers may be more pushful and adventurous, older ones with their accumulated experiences could be more careful. Either way, it appears a combination of other variable can actually determine whether plantain would be cultivated or not. The null hypothesis that there is no significant association between age and decision making to cultivate plantain is consequently accepted.

<u>Other Socioeconomic Issues</u>

The following hypothesis were tested:

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11. There is a significant relationship between farmer's land tenure and production of plantain.
12. There is no significant correlation between plantain farmers level of formal education and awareness about alley farming.
13. There is no significant association between level of plantain diseases and farmers contact with Extension agents.

Land tenure rights, before 1978, was vested in the Village leaders, the ruling family or community ownership of land. Since 1978 however, the land use Decree has abrogated such rights and these are now the exclusive preserve of the government. It is expected that a tenure that is long could lead to conscious effort on the part of the farmer to develop or improve the productivity of such lands. Thus, perennials could be planted for purposes of making money and also for conserving soil erosion tendencies. The basis of the eleventh hypothesis is to determine the effect of this on plantain production. Correlational statistics show that there is a significant and direct interaction between these issues (r= 0.305).

Plantain is a perennial crop. It is often after the tenth to twelve months that fruits can be harvested in the first year of planting. Good fruit formation could be obtained after the first

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cropping. For this purpose, a plot to be used for plantain must be such that the cultivator will not be under pressure of relinquishing it to the original owners. The coefficient indicates that the longer the tenure rights to land, the more the propensity for plantain cultivation. Alley cropping benefits can not be realised on annual or short-leased land. As such, farmers being encouraged to alley-crop should be those whose rights over the land are not threatened, at least, in the forseable future. The alternative hypothesis that there is a significant relationship between land tenure and plantain production is hereby accepted.

Concerning formal educational level and alley farming awareness, correlation statistics indicate a non-significance ($r=-0.144$) at $p<.05$. It is expected that the more learned a farmer is formally, the higher the probability of knowing about alternative farming practises, such as alley farming. But this may not be so because, interest may be changing when the farmer becomes more learned. Perhaps rather than seeking information which may proffer alternative farming strategies, the plantain farmer may want to combine other crops, change from farming to other profitable non-agricultural activities, seek political fortunes or completely hand-over his farming business to the children while he/she exploits other income-generating ventures.

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After all, being educated opens the door for many more opportunities which may not be agricultural. The null hypothesis is subsequently upheld that there is no significant correlation between plantain farmers level of formal education and awareness about alley farming technology.

The thirteenth hypothesis indicates a correlation coefficient of r=0.283 which imply a significant positive association between farmers' contact with Extension service and level of disease infection on plantain. The coefficient suggests that small-scale plantain farmers tend to seek more assistance from Extension service when their plantains are increasingly being affected by diseases. It is recognised that a diseased plant will produce stunted fruits which will not command attractive prices in the market. And because small-scale plantain farmers may want steady income from plantain sales, they could take the necessary steps to ensure that whatever (little) plantain is taken to market should at least generate a reasonable price. This income could then be used in attending to other pressing needs.

As an attempt at exploratory analysis, the stepwise regression procedure was used to provide an insight into the relationships between the independent variables and the response variables. Also, it is a useful tool which assisted in highlighting

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variables to be included in a theoretical regression model. The model selection method utilised is the maximum R^2 improvement technique. This technique determines if removing one variable and replacing it with the other variable increases R^2 (SAS, 1982). The R^2 is the coefficient which indicates the amount of variation, in the dependent variable, that is explained/determined by the independent variables included in the regression.

6.10 PREDICTORS OF INDIGENOUS AGRONOMIC PRACTICES IN SMALL-SCALE PLANTAIN FARMING

Several factors determine the indigenous intercropping practices of small-scale plantain farmers. Six factors were included into the model on intercropping practises. The analysis is as shown in Table 6.19 below.

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variables to be included in a theoretical regression model. The model selection method utilised is the maximum R^2 improvement technique. This technique determines if removing one variable and replacing it with the other variable increases R^2 (SAS, 1982). The R^2 is the coefficient which indicates the amount of variation, in the dependent variable, that is explained/determined by the independent variables included in the regression.

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Table 6.19 Analysis of stepwise regression on indigenous Intercropping practices in small-scale plantain farming.

Source of Variation	DF	Sum of Square	Mean Square	F- Value
Regression	6	3.863	0.644	** 40.93
Error	262	4.122	0.016	
Total	268	7.985		

$R^2 = 0.484$ ** significant at $p<.01$

b values (the corresponding estimated regression coefficient)

	b-value	standard error
Household size	0.004	0.001
Social participation	-0.000	0.000
Alley farming awareness	0.109	0.025
Extension drama method	-1.631	0.147
Farm service centres	-0.096	0.022
Poor community market prices	0.215	0.020

At $p<.01$, tabular $F6;262= 2.80$

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Shown also in Table 6.19 are the partial regression coefficients of the variables in the model. Since $R^2 = 0.484$, the Independent variables explained about forty-eight percent of the variation in indigenous intercropping practises in small-scale plantain production. The calculated F-value (40.93) is significant when compared to the tabular F-value $P<.01$ $F_{6,262} = 2.80$. The probability that the calculated F-ratio, this size, will occur by chance is less than $p<.01$ (it is actually .0001). This implies that the relationship between the indigenous practice of intercropping plantain and the independent variables could probably not have occurred by chance.

The b-values indicate the relationship and the relative contribution of the independent variables to total variation in the dependent. Extension drama method ($b = -1.631$) is negatively correlated, probably the more of such drama presentation the less adherence to indigenous inter-cropping practises with plantain. Following this is the significant positive effect of poor community market prices on intercropping of plantain ($b = 0.215$). This suggests probably that the poorer the community prices offered for plantain fruits, the more small-scale plantain farmers intercrop plantain. This may be an element of spreading risk of failure to earn a sufficient income when plantain is the sole crop. The predicted indigenous intercropping of plantain

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could not be wrong by 0.147 (for Extension drama method) and 0.020 points for poor community market prices.

In terms of indigenous spacing practices, the result is as indicated in Table 6.20.

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Table 6.20. Analysis of stepwise regression on indigenous spacing practises in small-scale plantain farming.

Source of Variation	DF	Sum of Square	Mean Square	F-Value
Regression	6	2.383	0.397	**40.29
Error	262	2.583	0.009	
Total	268	4.966		

R^2 = 0.479 ** sig. at p<.01

Variables	b-values	std. error
Social participation	-0.000	0.000
Extension blackboards	0.243	0.027
Contact with VEA	-0.273	0.026
Group demonstration	0.350	0.063
5-yr plot fallow	-0.142	0.015
Last season production cost	-0.055	0.013

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The above variables were able to predict up to about forty eight percent the total variation in indigenous spacing practices in plantain. At $P<0.01$, $F2, 262=2.80$. This indicates that the F-value is significant and the probability of being due to chance occurrence is less than 0.01 significance level. Thus we can accept the above variable as significant explanatory variables.

Among the partial regression coefficients (b-values) only four variables made substantial contribution to the prediction variability in the dependent variable. Two of these were negative; contact with village extension agent (VEA) and 5 year plot fallow. These suggest that the more the interaction with Extension agents, the less the tendencies of the small-scale farmers to continue with traditional (not recommended) spacing for plantain. The extension agents would have been passing useful information in such cases.

Similarly, 5-year plot fallow leaves room for less space to cultivate more plantain. In such cases, the less the time of fallow the more the tendency to space plantain in accordance with Extension recommendation. The relative contribution of these variables are (b = -0.273 and b = -0.142 respectively. The most important predictor in the list is Group demonstration method (b = 0.35). This expresses that within the limits of the significance level (95%), the more of group demonstration method

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used in educating farmers about recommended spacing practices, the more the farmers also want to continue with their indigenous practices. Probably the venue or forum for the group demonstration or the approach of the Extension personnel may not be convincing enough to the farmers to warrant a change in their old practices. The same argument goes for Extension blackboards (b = 0.243). Illustration of spacing on chalkboards does not represent realities on the plots, as such, farmers probably tend to adopt less recommended practices etc.

In relation to indigenous mulching practices, Table 6.21 highlights the determining variables.

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Table 6.21 Analysis of stepwise regression on indigenous mulching practices in small-scale plantain production.

Source of Variation	DF	Sum of Square	Mean Square	F-Value
Regression	6	12.429	2.071	** 38.03
Error	262	14.270	0.054	
TOTAL	268	26.699		

R^2 = 0.465 ** sig. at p<.01

Variables	b-values	std. error
Source of knowledge about IK	-0.002	0.000
VEA as information source	0.255	0.036
Extension drama	-2.387	0.472
Law tenure constraint	-0.213	0.038
Priority Aspiration	-0.001	0.000
Soil fertility decline	0.969	0.143

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At $p<.01$ the above variables,in concert, explained about forty- six per cent of the variability in indigenous mulching practices. The significance of these variables is reflected in the calculated F-value (38.03) whose propensity of being due to chance occurrence is less than 0.01.

Extension drama method contributed most to the determined variability in the response variable (b = -2.387). The inverse correlation reflect that as more of the drama presentation performed succesfully the less the tendency of small-scale plantain farmers to continue with their native traditional practices. Land tenure constraint(b = -0.213) contributed the second most indirect relationship to the dependent variable. This suggests that the more the land tenure constraint the less the tendency to retain indigenous mulching practices. Probably, uncertainties associated with land tenure rights might make small-scale plantain farmers to change mulching strategy either by refusing to mulch plantain or to resort to other alternatives, whose benefit can be realised probably within the limited time tenure rights are held over plot lands.

On the other hand, soil fertility decline (b = 0.969) seems to encourage indigenous mulching practices. It could be that since declining fertility entails either expansion of cultivable plots or change of plots/location, the proven indigenous practices could be

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retained in order to, at least, realise some benefits. Since fallowing plots may take longer period with obvious temporary constraints, plantain producers may not have the wherewithal to embark on costly mulching practices. Option left to them therefore is their indigenous practices.

Village extension agent (VEA) (b = 0.255) as information source also appear to animate indigenous mulching methods. It could be that probably the VEA rather than prescribing whole-sale recommended techniques in mulching, they recognise the farmers circumstance, and only advice such farmers as to the likely way of managing their plantain. Inadequate resources could be a major barrier. This is not impossible if one considers the Structural Adjustment Programme (SAP) which has made most agricultural inputs to be very expensive and inaccessible.

6.11 PREDICTORS OF INDIGENOUS MANAGEMENT PRACTICES IN SMALL-SCALE PLANTAIN FARMING

Decision-making about cultivation of plantain and implements/inputs used are explained by the variables shown in Table 6.22.

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Table 6.22 Analysis of stepwise Regression on decision making about small-scale plantian cultivation

Source of Variation	DF	Sum of Square	Mean Square	F-Value
Regression	6	2.927	0.488	** 18.11
Error	262	7.058	0.027	
Total	268	9.985		

$R^2 = 0.293$ **sig. at 0.01 level

Variables	b-values	std. error
Farm Service Centres	0.168	0.029
Information from relatives	0.139	0.029
Fault in IK on plantain prod.	0.507	0.089
Pest/Rodent attack	-0.268	0.047
Disease attack	0.156	0.049
Cash crop-plantain competition	-0.110	0.029

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Fault percieved in indigenous production practices (b=0.507) appears not to be a major deterence in decision making to continue to plant plantain on a regular basis. As a result of dynamic adjustments in indigenous knowledge and practices in plantain production, the changes have not reduced the interest in plantain production by the native methods. This is inclusive of the cutlass,hoe and other implements used. Contrastingly, Pest/rodent attack (b = -0.268) appears to reduce probability of making decision on plantain farming. The more severe these pests the less the tendency to want to continue with plantain. Efforts and cost of eradicating or checking the pests may be beyond the purse of the small-scale plantain farmer.

Furthermore, cash crops such as cocoa, oil palm, coffee competing with plantain seem to be gaining upper hand. There is the likelihood that as these crops attract better prices, and can be processed and stored, their production will certainly attract more attention than plantain.

Farm service centres (b = 0.168), disease attack(b = 0.156) and information sourced through relatives (b = 0.139) all have direct positive correlation with making decisions on producing plantain. The extent of these variables, determines the propensity to make appropriate decision and inputs on plantain enterprise. Disease attack, particularly, have not deterred

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interests on plantain production etc. The specific standard errors of those explanatory variables are almost negligible. Collectively, therefore, these variables explained about 29% of the total variability in decision making on plantain farming. The calculated F-value (18.11) was also significant at P<.01. This signifies that the regressors are significant explanators. In terms of labour utilization in small-scale plantain enterprise, the explanatory regressors are as indicated in Table 6.23.

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Table 6.23 Analysis of stepwise Regression on labour used in small-scale plantain enterprise.

Source of Variation	DF	Sum of Square	Mean Square	F-Value
Regression	6	220.469	36.745	**52.12
Error	262	184.72	0.705	
Total	268	405.197		

R^2 =0.544 **sig. at 0.01 level

Variables	b-value	std error
Cosmopoliteness	-0.396	0.109
Source of IK knowledge	-0.004	0.000
Extension leaflets/folders	1.634	0.209
Information sourced from Baale	-1.321	0.196
Plantain prod.cost last season	0.579	0.096
Cash crop-plantain competition	1.363	0.162

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Corresponding estimated regression coefficients indicate that Extension leaflets/folders (b =1.634) is the most important estimator of labour used on small-scale plantain production. The nature of the coefficient however indicates that the more of such Extension information method used, the more small-scale farmers tend to adhere to traditional use of labour (by category and gender) in plantain enterprise. Probably, the Extension leaflets are not well illustrated to effect desirable changes in the use of labour (if any).

Cash crop competition with plantain (b = 1.363) supports the argument preceeding. Probably taste or prefernce of farmers really determine plantain production and use of labour (family labour especially) regardless of whether more revenue is derived from sale of cash crops. Cost of plantain production the previous season also seem not to alter the customary labour utilised on small plantain plots.

On the other hand, information sourced from village leader or Baale (b=-1.321) contribute most significantly to effecting desirable change in traditional use of labour. The medium of interpersonal communications and the importance attached, (culturally) to the position of leaders in village seems to have strong influence on changes. The more of such avenues utilised,

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the less the tendency for small-scale plantain farmers to want to rely solely on family labour in their production practices.

Similarly, the more cosmopolite (b = -0.396) a farmer is, the less the tendency to want to use internal (family) labour resources to cultivate plantain. Exposure and knowledge of other areaS might have informed such tendencies.

In concert, these regressors were able to estimate up to about fifty percent (R^2 = 0.544), the variability in indigenous uses of labour (by categories and gender). The variables were also significant explanators because the calculated F-value (52.12) was greater than tabulated F-value (F2, 262) of 2.80 at 0.01 level of significance.

Chances of the explanatory variables being wrong as indicated by their respective standard errors were 0.109 (cosmopoliteness), 0.000 (source of indigenous knowledge about plantain production), 0.209 (Extension leaflets/folders), 0.196 (Information sourced from village leaders/baale), 0.096 (plantain production cost last season) and 0.162 (cash crop-plantain competition) units deviation in approximately three quarters (R=0.737) of the predictions. This shows that the sample offers evidence that the explanatory variables have effect on the (mean) labour utilization component.

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CHAPTER SEVEN

IMPLICATIONS OF SELECTED FINDINGS FOR ALLEY FARMING TECHNOLOGY.

The focus of this section is tailored along the findings on indigenous practices, that is; intercropping, spacing, staking and mulching on one hand, and labour use, capital/implements inputs and decision-making to cultivate plantain on the other hand.

7.1 Agronomic practices:

i. Intercropping: Majority (84%) of the respondents plant at least three different crops concurrently with plantain.

ii. Spacing: Ninety eight per cent (98%) of interviewed small-scale plantain cultivators do not follow any regular or recomended spacing for plantain.

iii. Staking: Bamboo (Igi oparun) is the stick preferred by 13.7% of the sample. The major reason was because it is strong, reliable and uneasily affected by termites. About three quarters (74.4%) of the interviewees do stake plantain but they appear to prefer any particular wood, as far as it satisfies some expectations.

iv. Mulching: Nearly all the respondents (98.9%) indicated that they never mulch plantain.

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In terms of intercropping and spacing, small-scale plantain farmers plant more than two crops alongside plantain and do not follow recommended spacing; it was noted during the field observation that crops were planted in an undefined geometric fashion. This may affect the East-West (hedgerow) orientation recommended for planting alley species. Farmers may want to plant certain crops at particular periods during the planting season; it is probable that the exact spot where the alley species are located could be the areas the crops may creep to for phytogenic/growth reasons. Effects of crop-alley species competition/interaction might have some unforseen disadvantages.

Personal communications with plantain farmers in 1990 and 1991 reflect that they want to ensure that they get enough variety of foodcrops from their plots first before they can commit their land to "tree-planting" as in alley farming.

The recommended inter-row spacing of the alley species (2m-4m i.e. alley width) implies that on, for instance, such small plots for farmers, ranging from 0.02ha to 0.4ha (one to twenty igba), the alley species might be the dominant planting on the plot. It is recognised that after the first year of planting, alley species are to be prunned at every six weeks interval. The

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issue is, probably before the end of the first year, alley species planted in fertile spots could grow to alarming heights which could affect the accompanying crops.

It is to be noted also that Dvorak (1991) had found that alley-trial farmers do not prune at the recommended periods. This suggests probably that the alley species (since they are fast-growing) might out-grow the real food crops-regardless that some food crops have very short growth cycle. Overall, the expected yield from food crops might be influenced.

Staking of plantain is a feature among the interviewees. But the materials used were those that are not only strong but also unaffected by termites. It implies that alley species should meet same requirements. Added to these, some respondents indicated that they would prefer staking materials that do not sprout when put to support plantain. It is to be recognised that cuttings from Gliricidia species have been known to germinate after planting. Observations during the investigation revealed also that Gliricidia is often used as live-fence around backyard and cultivated plots or/and bathing spaces and not necessarily as stakes for food crops. This phenomenon is common in livestock production enterprises. While livestock has been known to browse on Gliricidia, it is reported that "mimosine toxicity" is a

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potential hazard when ruminants are fed a high proportion of Leucaena (Atta-Krah and Francis, 1989).

In terms of mulching, this is not a common practice. Probably, the problem of obtaining sufficient mulch materials made this practice to be reinforced. But if some farmers opt for alley farming ,they might resort to any of or, all the following options;

- to leave the alley species to grow to gigantic heights until they (farmers) have the time to trim/prune them,
- prune alley species at very close intervals in order to dry prunnings and use the matured sticks as fuelwood for cooking, or to reduce shading of foodcrops,
- allow alley species to grow indefinitely on (partially abandoned) plots left to fallow . This may later be cleared when the plots have sufficiently rested, and when planting resumes.

Communications with plantain farmers indicated that in cocoa groves, as illustrations, a lot of leaves shed by these crops allow snails and other reptiles such as snakes to come and habitate the cool atmosphere provided by the fallen foliage, and the shade presented by the overhead canopy made of the cocoa and plantain trees. This experience (and belief) might be a disincentive to plantain farmers to want to mulch their plots.

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They resent the possibility of stepping on dangerous snakes particularly. Invariably, the purported advantage of obtaining mulching materials from alley species is not considered as such by the respondents. The indigenous management practices are examined in the succeeding sections.

7.2. Management practices:

i. Labour use: For almost all the operations involved in small-scale plantain production, adult male (family) labour was preferred by the majority 180 (83.3%). Also, male adult hired labour were used in operations such as land clearing (16.3%), weeding (9.6%) and stumping (3.7%).

ii. Capital/Implements inputs: Cutlass was the implement frequently used by 99.3% of the respondents. Hoes and baskets were occassionally employed by 95.9% and 98.9% of the interviewees respectively.

iii. Decision-making: Season of the year (100%), fool preferences (99.6%) and cash requirements (99.3%) were the "agreed" determinants of crop production generally. On the other hand, 99.6% of the farmers "disagreed" that governments'

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incentives influenced/encouraged their crop production activities.

*Male household-head determined planting plantain (99.3%), plot to be used (98.9%), inputs used (99.3%), harvesting plantain (95.9%), use plantain (sales) revenue (98.5%) and hiring labour for plantain (97.0%).

*Female household-head and wives of male household heads determined plantain processing (78.5%), plantain sales (89.6%) and cost incurable in plantain production (69.6%).

*Both male household-heads and their wives jointly determined when to consume plantain (88.5%).

In terms of labour use, adult male family labour was frequently used in almost all the operations in plantain cultivation. This suggests that introduction of alley farming into the small-scale plantain systems might increase the workload of the adult male (family) labour. This is especially so in

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establishing/planting of the alley species in recommended patterns. Regular prunning of the alley species may be a rigid schedule for the flexible approach preferred by the small-scale farmers.

At every occassion the hedgerows are to be prunned (depending on the length of each row, the number of rows per site and the number of plots containing the hedgerows), it appears that a considerable time would be needed to perform this operation. Since the prunning level for the alley species should be at the knee-height, it becomes an assignment for only the adult in order to achieve a uniform pattern. Depending on the variables in indicated above, the prunning time may take over two (working) days, subject to the objectives for the alley species, according to the farmers belief systems and other farming activities the farmers might want to achieve.

In a period of a year, for instance, at six weeks prunning interval, adult male family labour would be engaged in prunning operations, at least, eight times. If each operation takes more than one (working) day, say two, it means the farmer would spend about sixteen (working) days. If the prunning regime is strictly adhered to, the prunnings could be used as mulch, thus requiring more time. On the other hand, if this operation coincides with another operation such as planting some crops, weeding or

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harvesting plantain or other crops for sale, the prunning might be shelved until when there is enough time. In sum, the workload of the family male (adult) labour is increased.

This, perhaps, explains the findings of the Resource and Crop Management Program (RCMP,1991) at IITA Ibadan, on constraints to the adoption of alley cropping among farmers introduced to it in 1987/88 in one village in southwestern Nigeria. The findings indicated the failure of the hedgerows (on-farm) to produce enough biomass for mulching. The conclusion from the report stated that;" from among the farmers who were introduced to alley farming in 1987/88 in one village in southwestern Nigeria, only one farmer has planted an alley farm "on his own". No other farmers have extended alleys or planted new alleys, nor have any family members or neighbours. Only one alley farmer from those in all trials was cultivating crops on his alley farm in the 1990 cropping season. From existing trials, it is not possible to completely specify high potential regions/cropping systems for alley farming in West and Central Africa". The labour and time demand by this technology might be the issues. These also, are mutually exclusive to the land constraint.

Concerning implements/inputs, cutlass was frequently used. Additional employment of this in digging holes (for planting alley

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species) and prunning the foliage implies that its wear-and-tear would increase thus reducing the use-period. It suggests that farmers might have to buy more cutlasses per annum. The cost of each cutlass, given the Structural Adjustment Program (SAP) in Nigeria could be a disincentive to the farmers to want to adopt alley farming.

The issue of decision making in plantain production involves key items such as plots to be used, when to plant, inputs to use, hire labour and use of income from plantain sale which were male household-head dominated. In the absence of supporting (say, child) labour for instance, decision to adopt alley farming would have to scale-over assessment by the individual male adult (family) farmer. He would look at the number of plots at his disposal and consider which is most probable for incorporation of alley species. His decisions might be easier if he has, in addition to homestead, shifting and cash-crop cultivation systems for plantain production (IITA,1988a).

The homestead cultivation may consist of several crops interplanted together which might reduce the available space to try alley species. But in case of the other two i.e. shifting and cash-crop systems, the number of crops interplanted may be reduced thus allowing the farmer to try alley species. Moreso, when he attends to these other (two) systems, only when he has

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enough time. That is, he does not have to tend these plantain systems as often as he does with the homestead cultivation. He would appraise the technology on the benefits accruable to him - considering his loss of land to the trees, vis-a-vis long term (potential) benefits of the alley species.

Vogel (1989) attempted several mathematical paradigms to determine the economic returns of alley farming. He concluded that "subsidizing alley farming may be a worthwhile investment if the enterprise benefits society as a whole, even though it may be unprofitable for individual farmers". This appraisal expects the society (local, state or federal government) to subsidize a technology whose benefits at the small-scale, real-farm situation has not been verified. The appraisal also asserted that it is unprofitable to individual-probably risk-averse, but (the) predominantly small-scale/subsistence-farmers as we have in Nigeria.

The bottomline from the foregoings is that, the society has not created enough incentives in terms of increasing plantain production. This is supported by the 99.6% of the respondents who "disagreed" that government incentives encouraged their crop production activities. To this extent, it becomes non-issue for the "society" to subsidize such improved technologies. Particularly, since the ecological endowments in the study area

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seems favourable to the growth of crops, at least, generally. Added to this is the chronic problem of land tenure and the propensity of government in power (as they come and go), to shift or redefine focus on paths to food security. Against this backdrop, alley farming technology should be sensitized to fit with these patterns portrayed by the small-scale plantain farmers, probably, within the study area alone.

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CHAPTER EIGHT

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This chapter provides a background position for the understanding of small-scale plantain farmers. The summary of findings is presented, some conclusions and recommendation are drawn and areas identified for further inquiries are indicated.

8.1 BACKGROUND CAVEAT:

According to Plucknett (1991), "modern agriculture had its origins in the latter part of the nineteenth century, but especially during the twentieth century". This development, in his view, was due to the advent of scientific agriculture which attempted to change, as it were, the slow and halting progress of traditional agriculture. The slow pace, vis-a-vis increasing food demand, probably informed the position of this scientific advisor to the Consultative Group on International Agricultural Research (CGIAR) who, in his article titled; "Saving lives through Agricultural Research", recommended increased investments in scientific agricultural research. This includes areas of fertilizers, pesticides, pest and disease resistance among others. His premise was influenced by (the explosion in rice yields as a result of the scientific) "Green Revolution" in Asia in the 1970s.

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The consequence of reliance on external inputs in the farming systems of the African agriculture had less significance in the orientation of the preceedings. Similarly, the toxic effects of the agrochemicals on the soil had less attention. In reaction, the farmers in this region, especially the predominant small-scale ones, had adopted, far less than expected of, the technologies developed in the scientific agriculture. But the chairperson of the same CGIAR sustainability committee, Hubert Zandstra (1991), reflected that food security "has come at high cost to the environment".

To counter this inimical trend, he stated that "to meet future challenges, the CGIAR has recently undergone extensive restructuring. The objective has been to increase the ability of researchers to help farmers adopt more sustainable and environmentally friendly farming practices".

This issue of sustainable agriculture has been found to be in conflict with the basic aim of increasing productivity (Walsh, 1991). This old dilemma spiced the foundation of his (Walsh's) paper titled; "Preserving the Options: Food productivity and Sustainability". He noted that"coming up with an improved crop variety or farming technique is one thing for the CGIAR centers. Persuading farmers in developing countries to use it may be quite another". According to him, "poor farmers living on the edge of

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subsistence in Africa, depend on what they produce to feed their families and cannot afford to gamble on novel technology. ...in Africa, where shifting cultivation is a prevailing pattern, land tenure and land use practices provide weak incentives for farmers to take the long view on the environment". In recognition of the need to increase the ability of the research systems to help farmers adopt more sustainable and friendly farming practices, this investigation sought to understand the indigenous practices of the small-scale plantain farmers. This is with the hope of sensitizing the case for appropriate alley farming technology. The findings on the indigenous practices are summarised in the next section.

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8.2 SUMMARY OF FINDINGS

In terms of the first objective, the study revealed that 63% of the respondents were between 49 and 69 years of age. Sixty eight percent of the male respondents had two wives each, while the number of children were between seven and fourteen for about 78% of the interviewees. Though 90.7% of the sample had no formal education, 68.9% received Koranic education for up to 104 weeks. About eighty five percent of the 270 respondents could speak only Yoruba language. Similar percentage, (88%), frequently travel out of their villages more than five times in a month. The second objective of the study was to ascertain the indigenous agronomic and management practices of the small-scale plantain farmers. The dimensions of relevance or focus, have been discussed in the preceeding chapter seven.

Concerning the issue of constraints in small-scale plantain production, the very significant ones were declining soil fertility (98.5%), insufficient plantain propagules (95.2%), plantain pests/ rodent attack (94.1%), plantain diseases (96.3%), Expensive/ unavailable hired labour (91.5%), inadequate extension service (95.9%), inadequate agro-input supply (97.0%), land tenure restrictions (94.1%) and inadequate credit (97.0%).

Regarding the sources of agricultural information, the fourth objective of the study, the frequently used sources were friends/neighbours (95.2%), contact farmers (68.9%), village extension agents (68.5%) and Radio (13.3%). This scenario is in line with the arguement that farmers are not social isolates, but members of a cultural milieu which influences their agricultural practices. Walsh (1991) posited that farmers make decisions based on social and economic factors. Related to this, Vogel (1989) declared that the decision to invest in alley farming is an individual one. This suggests that before farmers can make the determining choice, they would prefer information from fellow

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farmers who subsist in the same cultural and ecological background.

The fifth objective was about the level of awareness and attitude of the small-scale plantain farmers to alley farming technology. Ninety three percent of the respondents indicated that they never heard of alley farming, though they know multipurpose trees such as Cassia (98.1%) and Gliricidia (97.0%) species. They wished to learn more about the technology (99.6%), and 99.3% "agreed" to encourage their friends/neighbours to try it. This gives an indication of a positive attitude to the technology.

For the proposed theoretical (farmer-focus) paradigm, the impact of selected variables on indigenous practices were found through the use of two inferential statistics; Pearson correlation and stepwise multiple regression. The culture-specific domain indicated that indigenous knowledge and intercropping of plantain were positively and significantly related (r= 0.247). Similarly, land tenure was found to determine the decision to cultivate small-scale plantain (r= 0.305).

Farmer-specific variables that were significantly associated with indigenous practices were radio-sourced information and staking (r= -0.510), and mulching (r= -0.231); alley farming awareness versus staking (r = 0.265) and mulching (r = 0.291). The first relationships were inverse which suggests that the more of the use of radio, the less the tendencies of the respondents to change from their indigenous staking and mulching practices. Probably, the information on the radio were neither explicit nor sufficient. The timing of the slot and increasing cost of radio advert, in these days of economic adjustment, and rapidly depreciating value of the naira, might be responsible for this. The positive correlation on the other hand reflect that the more informed these farmers were about the technology, the higher the probability to stake and mulch plantains.

Farming experience was not significantly related to indigenous practices of spacing (r= 0.125), staking (r= 0.058) and mulching (r= 0.048). Similar result were obtained between plantain farmers' cosmopoliteness and decision making (r = -0.011), spacing (r = 0.024) and mulching (r= -0.032). However, with staking, there was a significant but negative relationship (r = -0.291). Other non-significant interactions were social participation and decision making (r = -0.015) and, farmers age and decision making on plantain cultivation (r = -0.073). In terms of institution-specifics, extension contact (r = -0.044) was not significantly related to input/implements used in small-scale plantain firms.

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For the regression analysis, certain variables were variously grouped into models in order to estimate the level to which they could predict selected indigenous practices. The variables which explained 48% of the variability in indigenous intercropping practices were household size, social participation, alley farming awareness, extension drama method, farm service centres and poor community market prices. For these variables, the calculated F-value of 40.93 was greater than the tabulated value of 2.80 at P< .01 (that is, 99% confidence level). This justifies the parameters as being sufficient explanatory issues and their inclusion in the model.

In terms of indigenous spacing practices, variables that explained 48% of the predictions were social participation, extension chalkboards, contact with VEAs, group demonstrations, 5-year plot fallow, and previous season (plantain) production cost. At P< .01, these variables were found to be sufficient explanators because the tabulated F-value was lower than the calculated. Similarly, about 46% of the variance in indigenous mulching practices in plantain production were sufficiently explained by source of knowledge about indigenous practices, VEAs as information source, Extension drama method, land tenure constraints, farmers priority aspiration and soil fertility decline.

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The issue of decision making to cultivate plantain was explained by farm service centres, information from relatives, fault in indigenous knowledge, pest/rodent attack, disease attack and cash-crop-plantain competition. In concert, these determined about 29% of the variability in the response variable. In terms of labour use, 54% of the variance in it were predicted by cosmopoliteness, source of indigenous knowledge, extension leaflets/folders, information sourced from Baale/village leader, plantain production cost in the previous season and cash crop-plantain competition.

8.3 CONCLUSION

The goal of increasing food production is paramount in both the International and National Agricultural Research Systems. But the path towards achieving this appears to have created two schools of thought; those prone to scientific, "quick-fix" (Walsh, 1991) breakthroughs at any cost and, those in favour of breakthroughs with environmental conservation. Whichever approach is determined, the denominator should be the adoptability of any technology.

The case of alley farming technology, acclaimed as ensuring a sustainable agriculture, has been examined against the background of the traditional production system for a staple crop

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such as plantain. It is true that the level of plantain production is not adequate, but some of the constraints highlighted by the respondents were cultural, economical, institutional/political-to which they have limited opportunity to solve/change. These constraints are sufficient "headaches", and should not be compounded by a technology which has been verified mostly on-station. This appears to be a quick-fix pattern. This might have contributed to the low awareness-not to indicate adoption-by the small-scale plantain farmers.

In fact, Vandenbeldt (1992) averred that " it remains to be seen whether alley cropping, which has been so succesful on-station, will be widely 'adapted by farmers in West Africa, ...". It is against this background that this study concludes that: there is low relationship (or appropriateness) between the alley farming technology and the indigenous practices of the small-scale plantain farmers. This is found in the following issues:

i. Staking was considered more important than mulching. There appears to be preference for certain staking stick. This could question the utility of alley species as staking materials. While only 14% of the respondents preferred Bamboo tree, others opted for other woody species. As such, alley species that would be cut for same reason must

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be strong, reliable, easily available, unaffected by termites and do not germinate when propping plantain.

ii. Since mulching is not a practice in small-scale plantain production, it suggests that farmers who intercrop would have less need for alley prunnings in their arable crop enterprise.

iii. In terms of spacing, there is low correlation between specification for alley technology and indigenous intercropping and spacing practices. While regular 2-4m (alley width) space should be maintained between alley species rows, and 25cm to 100cm within alley rows, small-scale plantain farmers practice undefined geometric spacing patterns. They, for instance, do not follow recommended spacing for plantain. Their multidirectional cropping arrangement might constraint the East-West orientation proffered for the alley technology.

iv. Concerning labour use, alley farming technology hints that only adults could be involved both in the establishment and maintenance stage. The study found that adult male (family) labour was predominantly used in plantain production. It implies therefore that adoption of this technology would increase the work schedule of this labour unit.

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v. The use of cutlass in small-scale plantain production was frequent. If the producers opt for the alley technology, the rate of wear-and-tear of this input would increase, thus more cutlasses might need to be purchased per cropping season(s).

vi. The decision making process on crops to produce is principally influenced by the male household-heads ,as found in this study. Since this is the same frequently used labour in the enterprise, it highlights the less favour this individual might have for a technology that would expand his job scope.

vii. The propensity of adopting the technology is rather inhibited by the "no formal education" indicated by 91% of the respondents. Issues such as alley species planting time, depth, spacing and prunning height and regime might be too much for the target systems to comprehend, memorise and practice.

viii. The most frequently used information source to the respondents were friends/neighbours, contact farmers, and village extension agents. It suggests that there could be need for more replication of the on-farm trials in several more locations than the number of sites maintained by

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the IITA -in the study area. As many farmers that can participate the higher the probability of obtaining those with sympathy to the technology. Such farmers could convince their contemporaries to have a try on the technology.

ix. Indigenous knowledge significantly and positively relate to intercropping of plantain. It reveals the need for the alley technology development to be considerate of this factor, probably in areas of alley species selection.

x. The technology might be more favoured where land tenure is not a major constraint. This factor was found to be principally related to decision making to cultivate plantain. It might be necessary, however, to note that if the secured land is not fertile, at least to allow plantain to grow, it might be a difficulty for the target systems to adopt the technology.

8.4 RECOMMENDATIONS

Based on the highlighted conclusions, the following recommendations are suggested for the Alley Technology Research System on one hand, and the Extension System on the other hand.

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* <u>Alley Research System</u>:

i. In terms of MPTs species selection, it could be an informative experience if farmers are allowed to indicate their preference(s).

ii. Spacing of alley species should not be made uniform across the target cropping zone. Since the intended beneficiaries (small-scale plantain farmers) do not follow recommended spacing, this feature should be allowed to be displayed in the alley technology. Their skills at adaptation of technology should be encouraged.

iii. The issue of staking with the alley sticks could be deemphasised if this is not a feature of the target system.

iv. Whenever the technology is tried on-farm, farmers should be allowed to decide whether they would prune the alley species or not and, the use to which the prunnings could be made. Since mulching is not a feature of the small-scale plantain system, this aspect of the technology should be deemphasised. Prunnings when cut, could be reserved for instance, for yam planting soon after the yam setts (or seed yams) are planted .

v. Since the alley farming is adult-related in terms of decision making to adopt, it behoves on its research systems to allow a wide-ranging flexibility in the

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technology, in order to attract this key decision maker. More on-farm alley trials within (and between) the target zones are necessary for better farmer participation.

* Extension System:

i. There might be need to develop comprehensive education programme to make the smallscale plantain farmers aware of the alley farming technology.

ii. Such awareness campaign should include the basic feature of the technology and the flexibilities inherent that the adopters could exploit.

iii. There could be need for emphasis on the group and individual extension teaching methods. This is in order to be more personal with the clientele system in information dissemination.

iv. The extension systems should really participate in the Alley Technology Research.Not as casual colleagues but as collaborators determining modifications independent of what the basic scientists opine. The extension system need to encourage the farming clientele to partake in the alley trials by asking their opinions frequently, at every stage of the alley technology development.

For the two systems, there is need to have a serious respect for the involvement of the small-scale plantain farmers in alley

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species selection, establishment and management. Importantly, the opinions of these farmers should be made the main determinant in establishing specifications for the technology. Otherwise, according to Vandenbeldt (1992), part of the problem of the limited success (or outright failure) of many agroforestry projects " has been overambitious expectations on the part of those planning such programmes". For maximum success, he advised that "agroforestry technologies should be addressed to a limited range of problems and products, and in the future must be designed to mesh closely with local farming realities, needs and constraints" (Vandenbeldt, 1992).

The extent to which this is actualised could determine the appropriateness of the alley farming technology to the small-scale plantain farmers in Irewole and Oranmiyan LGAs- the focus of this study.

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8.5 AREAS FOR FURTHER RESEARCH

In the course of this investigation, certain areas revealed themselves as requiring further enquiry. These were:

i. to examine the structure of the indigenous knowledge affecting plantain production.

ii. the use to which small-scale plantain farmers could put their plantain plots -after changing from plantain production - as a factor of determining the potential of alley farming in the systems

iii. the tree species often found on fallow plots and the indigenous knowledge behind them.

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APPENDIX 1

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DEPARTMENT OF AGRIC.EXTENSION SERVICES

ANALYSIS OF SMALL-SCALE PLANTAIN FARMERS INDIGENOUS PRACTICES FOR APPROPRIATE ALLEY FARMING TECHNOLOGY IN OYO STATE, NIGERIA.

NAME: ADEKUNLE,O.A.

STRUCTURED INTERVIEW SCHEDULE FOR SMALL-SCALE PLANTAIN FARMERS.

This study is an attempt to analyse the Indigenous practices associated with small-scale plantain prodution. It is hoped this will assist in the development of Appropriate Alley Technology which, should increase plantain production.

Honest and free responses would be appreciated. Information disclosed would be treated as confidential and used strictly for this research.

Thank you.

Respondent Code/Form No:___________: Interviewer-----------

Date:-------------: Village/Community:--------------------

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Distance to LGA Headquaters__________(km): LGA:__________________

1. Gender Male /__/ Female /__/

2. Age (in years):____________-

3. Marital Status: (a) single /__/ (d) Divorce /__/

(Check one) (b) Married /__/ (e) Separated /__/

(c) Widow /--/

4. If male, umber of wives (check one)

/__/ One /__/ Two /__/ Three /__/ Four and more

5. If female, how many wives has your husband?

/__/ One (me alone) /__/ Two /__/ Three /__/ Four and more

6. If more than one wife, rank your position among them:____________

7. Number of Children:______________________

8. Religion: (a) Christian /__/ (b) Islam /__/

(c) Traditional /__/ (d) Others (Specify) /__/

9. Highest educational level attained:______________________

10. Period spent in non-formal education.

	Day	Week	Month	year
(a) Adult literacy Classes				
(b) Extension/Farmers Day				
(c) Koranic Classes				
(d) Others (Specify)				

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11. Literacy-Numeracy:(Please check as applicable to you).

Language	Speak	Read	Write	Calculate *
English				
Yoruba				
Igbo				
Hausa				
* Numerals/arithmetic				
Others (Specify) -----------				

12. Occupation: Main/Primary: ______________________

Others/Secondary---------------------

13. How many people do you cater for (including wife, husband and relatives)?--------------

14. If you belong to any organisation/ Society

(Please check/fill/complete the table below)

TYPE STATUS

	Member	Attend meeting	Contribute financially	Committee member	Office held
Religious					
Cooperative					
Adult Farmer Club					
Youth Club					
Parent/Teacher					
Others (specify) -----					

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15. How often do you travel out of your Village in a month?

(a) More than 5 times

(b) 2-5 times

(c) Once

(d) Occasionally

(e) Never

16. Are you an indigene of this village? (a) yes /__/ (b) no /__/

17. How many years have you spent in this village?

NON DEMOGRAPHIC SECTION

FARM STATUS

18. How did you obtain land for farming? (Tick as many)

(a)Inherited /__/; (b) Purchase /__/; (c)lease from friends/ community /__/; (d) Lease from Govt./__/; (e) Gift /__/;
(f) Others (Specify):---------

19. Do you allow non-indigenes of this village to use land here?

/__/ No /__/ yes

20. If yes, how do they pay for it? (tick one)

________Loan; ____________Rent; _____________Pledge (Ishakole)

__________Share crop; ______ Buy (average price/plot N__________)

___________Gift.

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21. Indicate the size (in heaps) of the plots) you cultivate presently.

Plot	Size (acre or heaps)
1.	
2.	
3.	
4.	
5.	
6.	

NB: 10,000 heaps = 1ha
or 40-60 Igba.

22. If your farming plot(s) is /are leased, for how many more years can you still possess it them? ______________(years)

PLANTAIN PRODUCTION

INDIGENOUS AGRONOMIC PRACTICES

23. How many years ago did you start cultivating plantain?__________(years)

24. Rank (1 =High; 2= Fair;3= least)the following crops as important to you for.

	Food	Cash income	Both
(a) Melon			
(b) Peper			
(c) Rice			
(d) Groundnut			
(e) Cocoyam			
(f) Cassava			

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Question 24 contd./

(g) Yam

(h) Maize

(i) Plantain

(j) Banana

(k) Tomato

(l) Oil palm

(m) Cocoa

(n) Kola

(o) Okro

(p) Onion

25. What are the crops you plant/intercrop with plantain in order of priority (in the present season)?

(a)________ (b)________ (c)________

(d)________ (e)________ (f)________

(g)________ (h)________ (i)________

26. Is the above crop combination fixed (from previous years)?

Yes /__/ No /__/

27. Did you comply with Extension/Technical recommendation in plantain production in -

	Yes	No
- Planting time		
- Spacing		

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FALLOW PRACTICES

28. What do you do to enrich your plot soil?

	Agree	Undecided	Disagree
(a) Leave it to fallow (at most 2yrs)			
(b) Leave it to fallow (at most 5yrs)			
(c) Plant legume (cover) crops			
(d) Add inoganic fertilizer			
(e) Others (specify) ______________			

29. What is the best number of years to allow a plot to rest after cropping?

Cropping__________years; Fallow____________ years

Full cycle__________years

30. Do every farmer in this village move(ie.rotate) their cultivated plots every year ?

31. Has the resting period for plots changed since 20 years ago?

/__/ No /__/ Yes

32. If yes, which type of change

/__/ Increasing rest period /__/ Decreasing rest period

33. If it is decreasing rest period, why

____

____

____

____

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34. Nowadays (since 1990) what do you suggest should be the

(a) shortest rest period for plots?________years

(b) longest rest period for plots?_________years

35. Do you have compound farms with plantain?

/__/ Yes /__/ No.

36. Do you allow the compound farms to rest?

/__/ No /__/ Yes

37. If No, why? ____

____

____

38. If yes, for how long? ________years; why?

____

____

____

39. When a plot is resting, do you plant any tree(s) in it?

/__/ Yes /__/ No.

40. If yes, which tree(s) do you plant?

____

____

41. Why do you plant tree(s)?______________________________

____

____

42. What is the best and most common plant for staking plantain?

____________________________(local name)

____________________________(scientific name to be provided by enumerator later).

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43. Why? ______________________________

____

____

44. How often do you perform the following operations in your plantain crop? (check as appropriate)

	Frequently	Occassionally	Never
(a) Weeding			
(b) Desuckering			
(c) Fertilization (NPK etc)			
(d) Staking			
(e) Slash withered/diseased leaves			
(f) Remove other shading trees			
(g) Harvest matured green bunches			
(h) Harvet ripe yellowing bunches			
(i) Hill the base with soil			
(j) Mulching			
(k) Disposal of spent pseudostem			
(l) Others (specify) ______________			

INDIGENOUS MANAGEMENT PRACTICES

DECISION MAKING

45. What influences you on which crop(s) to produce

	Agree	Undecided	Disagree
(a) Period of the season			
(b) Cash requirement			
(c) Food preference			

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(d) Government incentive

(e) Others(specify)

46. Who in your household makes the decision on:

(check as appropriate)

	A Self	B Wife	C Children	A+b	A+B+C	Relatives
a. Planting plantain						
b. Plots to be used for plantain						
c. Inputs to use						
d. Plantain purchase						
e. Plantain harvest						
f. Plantain bunch/ finger processing						
g. Plantain comsumption						
h. Plantain sales						
i. Use of income from plantain sales						
j. Cost of plantain production						
k. Use of hired labour.						

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47. Tick between 1 to 5 the reason(s) for planting plantain

Note: 1 = least important; 5 = most important.

	1	2	3	4	5
a). Food source					
b). Fertile plot soil					
c). Cash source					
d). Easy processability/Consumption					
e). multipurpose use (shade crop, boundary marker etc.					
f). Government incentive					
g). Community tradition					
h). Extention advice					
i). Friends/Neighbours advice					
j). Others (specify) ____________					

CASH/IMPLEMENT:

48. How often do you use the following inputs in plantain production?

	Frequently	Occassionally	Never
a). Cutlass			
b). Hoe			
c). Basket			
d). Knife			
e). Herbicides			
f). Insecticides			
g). Fungicides			
h). Credit			
i). Others(s) (specify)__________			

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49. Estimate the total amount (N) expended on your plantain plot last season.

(a) less than N50.00 /__/

(b) N51.00 - N100.00 /__/

(c) N101.00 - N150.00 /__/

(d) above 151.00 /__/

50. List the items/operations and amount spent on each

Items/Operation	Amount (N)
a.	a.
b.	b.
c.	c.
d.	d.

LABOUR UTILIZATION

51. What type of labour do you use on the following plantain operations.

	Hired		Exchange		Family			
	Male	Female	Male	Female	Adult		Children	
					M	F	M	F.
i) Land clearing								
ii) Stumping								
iii) Planting								
iv) Weeding								
v) Desuckering								
vi) Fertilization								
vii) Staking								

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49. Estimate the total amount (N) expended on your plantain plot last season.

(a) less than N50.00 /__/

(b) N51.00 - N100.00 /__/

(c) N101.00 - N150.00 /__/

(d) above 151.00 /__/

50. List the items/operations and amount spent on each

Items/Operation	Amount (N)
a.	a.
b.	b.
c.	c.
d.	d.

LABOUR UTILIZATION

51. What type of labour do you use on the following plantain operations.

	Hired		Exchange		Family			
	Male	Female	Male	Female	Adult		Children	
					M	F	M	F.
i) Land clearing								
ii) Stumping								
iii) Planting								
iv) Weeding								
v) Desuckering								
vi) Fertilization								
vii) Staking								

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viii) Slash withered leaves

ix) Hilling base

x) Mulching

xi) Harvesting bunches

xii)Others (specify)

Plantain Sales

52. From your plantain plots, estimate the number of bunches (Siri) harvested altogether last season________________________

53. How many bunches did you:

(a) Sell in you village/residence_________av. cost (N)/Bunch

(b) Transport to sell at distant market______ av.cost(N)/Bunch

54. Who determines the price/bunch? /__/ You; /__/ the trader; /__/compromise

55. What is the cost of transporting each bunch to distance market?

N_______________

INDIGENOUS KNOWLEDGE:

56. How did you know about plantain production?

(a) Parent's/Father's practices /__/

(b) Relatives /__/

(c) Friends /__/

(d) Extension services/Research workers /__/

(e) Can't remember /__/

(f) Nobody /__/

(g) Others (specify) /__/

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57. If you know through parent's/father's practices.

	Yes	No	Don't know
(a) Does the practice belong to your community alone?			
(b) Have you found anything wrong with it?			
(c) Do you want it improved?			
(d) Did the practices emerge in periods of food stress/crisis?			
(e) Will the practices be able to produce plantain indefinitely?			

58. What are the customary beliefs about, and symbolic or medicinal uses of plantain in your community?

	Beliefs	Symboli/medicinal uses
(a)		
(b)		
(c)		
(d)		
(e)		

59. List the local plantain varieties (names) that you know

(a)________________ (b)________________ (c)________________

(d)________________ (e)________________ (f)________________

(g)________________ (h)________________ (i)________________

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60. Rank between1-3 the followwing as they are important to you as sources of technical/agricultural information. Note: 1 = Least important, 2= fairly important, 3 = very important (check one)

	1	2	3
a). Cooperative societies			
b). Radio			
c). Farmers day/Exhibition			
d). Friends			
e). Relatives			
f). Parents practices/experiences			
g). Research Institutes/Staff			
h). Extension service			
i). Farm service centres			
j). Commercial input sales agent			
k). Drama sketches/play			
l). Local newspapers/magazines			
m). Community social gatherings			
n). Palmwine parlor			
o). Others (specify)_______________			

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PLANTAIN CONSUMPTION

61. Indicate for yourself or household the Quantity, Nature, Frequency and prefered meal time for the following foods.

ITEM	Check as appropr. self	HH	Preferred nature (Green or) ripe Green =1 Ripe =2	Quantity No of fingers	Frequency 3=regular 2=occass-ional 1= seldom	Preferred meal time 1=morning 2=Afternoon 3= Evening
a. Plantain eaten raw						
b. Boiled plantain						
c. Plantain+ bean Poridge (Asaro)						
d. Plantain + Coco-yam Poridge(Asaro)						
e. Dodo						
f. Dodo Alagbon (or"dodo ikire")						
g. Boli						
h. Pounded PLtn + cocoyam(Iyan						
i. Pounded PLtn + Yam(Iyan)						
j. Pounded PLTn +						

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EXTENSION CONTACT

62. Frequency of Extension contact in the last 12 months

a). Never /__/ (b)less than twice /__/

c). 3-6 times /__/ (d) above six times /__/

63. Source of farm imformation: How often do you use

		Never	Occassionally	Frequently
i)	Radio			
ii)	Extension Black Boards			
iii)	Leaflets/Folders			
iv)	Posters			
v)	Village Extension Agents			
vi)	Extension Drama			
vii)	Group demonstrations			
viii)	Farm Sevice Centre			
ix)	Friends/neighbours			
x)	Relatives			
xi)	Village leaders (eg. Baale)			
xii)	Contact farmers.			

64. Familiarity with Extention service

		Yes	No
i).	Do you know the name of your village/cell Extension workers?		
ii).	Do you know the VEW's office?		
iii).	Do you know when the VEW visits this village?		
iv).	Are those days and time fixed?		

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v). Does the VEW treat all farmers equally?

vi). Has the Extension agent assited you to try any recommendation on your plot before?

vii). Has VEW ever chosen you to demonstrate some skill to other farmers?

65. Did you recieve and followed the advice on the following plantain production recommendation from Extension service and/or Research institute staff?

	Receive advice		Followed advice	
	Yes	No	Yes	No
(i). Land selection				
ii). Land clearing				
iii). Stumping				
iv). Plant density				
v). Planting time				
Vi). Improved planting material				
vii). Sole cropping				
viii). Intercropping				
ix). Weeding				
x). Regular desuckering				
xi). Fertilization				
xii). Staking				
xiii).Pesticide utilization				
xiv). Slash withered/diseased leaves				
xv). Hilling base				
xvi). Mulching				

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xvii). Harvesting

xviii). Storage

xix). Transport/marketing

xx). Others (specify)...........

ALLEY FARMING AWARENESS

66. Have you heard of Alley farming technology?

(a) Yes /__/ (b) No /__/

67. If yes, how did you know? (check as applicable)

(a) Fellow farmers /__/

(b) Radio /__/

(c) Exension agent /__/

(d) Cooperative Societies /__/

(e) IITA Staff /__/

(f) Farm Service Centre /__/

(g) Agric. Fairs/Exhibition /__/

(h) Others (specify)........... /__/

68. Do you know

	Yes	No
Leucaena spp?		
Cassia spp?		
Gliricidia spp?		

69. If No, indicate/list the local trees which you have planted or know to enhance soil fertility:

(Trees' local name)

a) ______________________________

b) ______________________________

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c) ______________________________

d) ______________________________

70. Did you plant those local trees for soil enhancement because of:

	Agree	Undecided	Disagree
i) Tradition from (fore) fathers			
ii) Improving soil fertility			
iii) Smothers/reduce weeds			
iv) To serve as wind/rain break			
v) Browse for livestock			
vi) Source of firewood			
vii) IITA involvement			
viii) Friends/relatives who have tried it.			
ix) Used as fence around plots			
x) Others (specify)______________			

71. PLANTAIN PRODUCTION CONSTRAINTS

Indicate the significance of any of the following constraints which you have experienced in plantain production:

1 = least significant 2 = fairly significant 3 = very significant (check one as applicable).

	1	2	3
i) Delining soil fertility			
ii) Competition for suitable land			
iii) Lack of/inadequate improved planting			

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	1	2	3
material			
iv) Lack of/inadequate storage facilities			
v) Cost of transporting to distant markets			
vi) Poor community market prices			
vii) Rodent/grass cutter attack/pests			
viii) Diseases			
ix) Wind damage			
x) Scarcity of mulching materials			
xi) Labour to weed (costly and unavailable)			
xii) Community beliefs and values			
xiii) Shading from big trees			
xiv) Competition with tree/cash crops			
xv) Inadequate Extension Service			
xvi) Inadequate agro-input supply			
xvii) Land Tenure restrictions			
xviii) Lack/inadequate credit facilities			
xix) Reduced opportunity for land fallow			
xx) Uncertainties in rainfall			
xxi) Others (Specify)................			

ASPIRATION/MOTIVATION

72. Estimate the degree of your concern in:

	Always	Sometimes	Indifferent
(a) Plantain yield variation			
(b) Plantain price variation			

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73. How many days each fortnight do you work on your plantain plots?

(a) 1-3 days /__/ (b) 4-6 days (excluding worship days)

(c) Everyday /__/ (d) Anyday I feel /__/

74. What would you like to acquire most now? ----------------

75. Are you willing to know more about Alley farming?

/__/ Yes /__/ No.

76. Would you enourage, discourage or be indifferent to your neighbour if he:

(i) Tries Alley farming (tick one)

(a) Encourage /__/

(b) Discourage /__/

(c) Indifferent /__/

(ii) Decreases his plantain farm size (tick one)

(a) Encourage /__/

(b) Discourage /__/

(c) Indifferent /__/

(iii) Increases his plantain farm size (tick one)

(a) Encourage /__/

(b) Discourage /__/

(a) Indifferent /__/

77. Would you like to cultivate more plantain next season?

(a) Yes /__/ (b) No /__/ (c) Don't know /__/

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Appendix IIa

Indigenous - implies originating from and naturally produced in an area (Chambers,1983) .

Knowledge - refers to the whole system of concepts, beliefs and perceptions, the stock of knowledge, and the processes whereby it is acquired, augmented, stored and transmitted Systems - are sets of things that are sufficiently well-related to one another to deserve study (IDMC/DPMC 1988)

Rural - includes those farmers both small and large who are thoroughly in the market purchasing inputs etc. It also includes those farmers whose 'habitats and farm enterprises are in the rural areas.

People- emphasises that the much of the knowledge is located in people and only rarely written down .

Technical - emphasises the practical nature of this knowledge (Chambers, 1983).

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Appendix IIa

PLANTAIN PLOTS

SOCIOECONOMIC DATA FORM

Village: ____________ Respondent: ____________ Farm location: ____________

Plot No: ____________ Plot size: ____________ Date: ____________

TIME	OPERATION	LABOUR TYPE	CATG.	SEX	NO.	HR.	RATE	IMPLEMENTS	OTHER INPUTS	OPERATION OUTPUT	HARVEST (WHEN NEC)	HARVEST DESTIN.	HARVEST MKT. RATE
									DATE:				
									DATE:				

NOTE: Indicate by *2 if respondent has moved to another plot on same day.

Labour Type: F = Family; E = Exchange; H = Hired

" Category (Catg.): A = Adult (above 16 yrs.); C = Child

" Sex: M = Male; F = Female

" No: Number of workers

" Rate (Hired labour only) = ₦/hr. or ₦/heaps (igba)

Operation output = actual area/amount of work completed.

ENUMERATORS' OBSERVATION:

a) Crops associated with plantain:..

b) Distance of plot(s) from Resp. home: (metre or km):..............................

c) Actual inputs (e.g. chemical, etc.):...

d) Other useful hints:..

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APPENDIX 3

MEASUREMENT OF VARIABLES.

a. Indigenous Agronomic Practices:

- Intercropping - Are the crops combined with plantain fixed?

  Yes = 1 No = 2

- Spatial: Do you comply with the (Extension) recommended spacing of plantain and other crops)?

  Yes = 1 No = 2, Don't know = 3

- Staking: How often do you stake your plantain stools?

  Frequently = 3 Occassionaly = 2 Never = 1

- Mulching: How often do you mulch your plantain stools?

  Frequentlly = 3, Occassionally = 2, Never = 1

b. Indigenous Management Practices.

- Capital: Total estimated amount spent on plantain plots last season

  a. Less than N50 ________ 1
  b. N51.00- N100 ________ 2
  c. N101 - N150 ________ 3
  d above N150 ________ 4

- Use of Labour

  Family labour ________ 1
  Exchange labour ________ 2
  Hired labour ________ 3

- Decision making

  Self(husband) ________ 1
  Wife ________ 2
  Children ________ 3
  Husband + Wife ________ 4.

c. Social Participation

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By the use of a Guttman-type scale developed by Chapin (1955), respondents were requested to indicate whether they are members of social organisations, attend meetings, contribute financially, committee member or hold office in any social organisation they belong. These criteria were scored as 1, 2, 3, 4 and 5 respectively.

For any organization, the maximum score, for Social Participation Index (SPI), is 15 while the minimum is zero (i.e non membership). For example, if a respondent is a member of more than one organisation, say two, and satisfies all the above 5 criteria, then such individual has an SPI of 30.

For ranking purposes, a score between 1 and 3 represents low social participation while 4 and above imply high social participation.

d. Farm Size:

Respondents were asked to indicate the number of heaps obtainable from their plantain plot(s). The heaps were converted to acres or hectares. 10,000 heaps make 1 heactare (Phillips,1970) while about 3,000-4,000 heaps make an acre. In the local language "Igba" = 200 heaps.

" Oko sile kan" = 10 Igba = 2000 heaps

" Egbeedogun " = 15 Igba = 3000 heaps (1 acre)

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e. Extension Contact:

Frequency of extension contact in the last twevle months

Never = 0

Less than twice = 1

Three to six times = 2

More than six times = 3

Literacy level:

Speak Language = 1

Read Language = 2

Write Language = 3

Calculate Figure = 4

Rank: O-3 = low literacy

above 4 = high literacy

f. Aspiration/Motivation:

Degree of concern in

Plantain yield variation = 2

Plantain price variation = 1

g. Alley Cropping Awareness

Knowledge of technology

Yes = 1

No = 0

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Scores used in the determination of the reliability of the scale on Indigenous Practices in Plantain Production.

Farmer	Scores: First Administration	Scores: Second Administration
1	184	194
2	185	199
3	170	210
4	185	294
5	199	184
6	220	229
7	188	193
8	288	310
9	176	180
10	191	250
11	190	191
12	204	206
13	301	301
14	289	311
15	271	279
16	172	250
17	211	210
18	160	298
19	211	219
20	318	316
21	381	401
22	363	364
23	187	189
24	200	201
25	111	190
26	216	218
27	110	116
28	134	124
29	211	214
30	199	202

Pearson r correlation was used to find out the level of agreement of scores on the two administration of the scale in determining its reliability. The formula for the Pearson r correlation and coefficient obtained is as shown below.

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$$r = \frac{NEXY - (EX)\ (EY)}{\sqrt{(NEX^2 - (EX)^2)\ (NEY^2 - (EY)^2)}}$$

Where r = coefficient of reliability of the scale

E = Summation of all values

X = Scores from first administration

Y = Scores from second administration.

N = Number of farmers involved in testing the scale.

From the computation

N = 30

EX = 6425

EX^2 = 1,500,635

$(EX)^2$ = 41,280,625

NEX^2 = 45,019,050

EXY = 1,616,752

EY = 7052

EY^2 = 1,783,594

$(EY)^2$ = 49,730,704

NEY^2 = 53,507,820

NEXY = 48,502,560

After substituting the above figures into the formula

$$r = \frac{3,193,460}{3,757,720.7}$$

$$= \underline{0.85}$$

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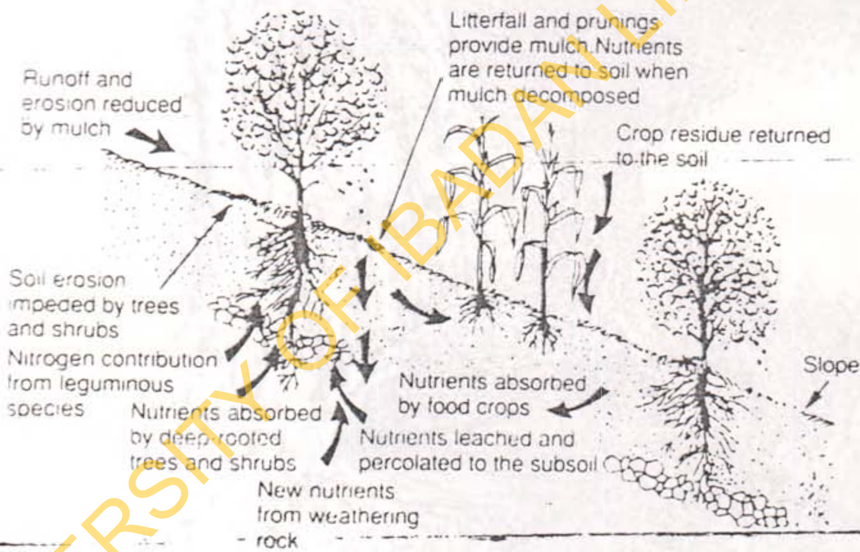
APPENDIX 4



The alley cropping concept.

Kang et al (1989)

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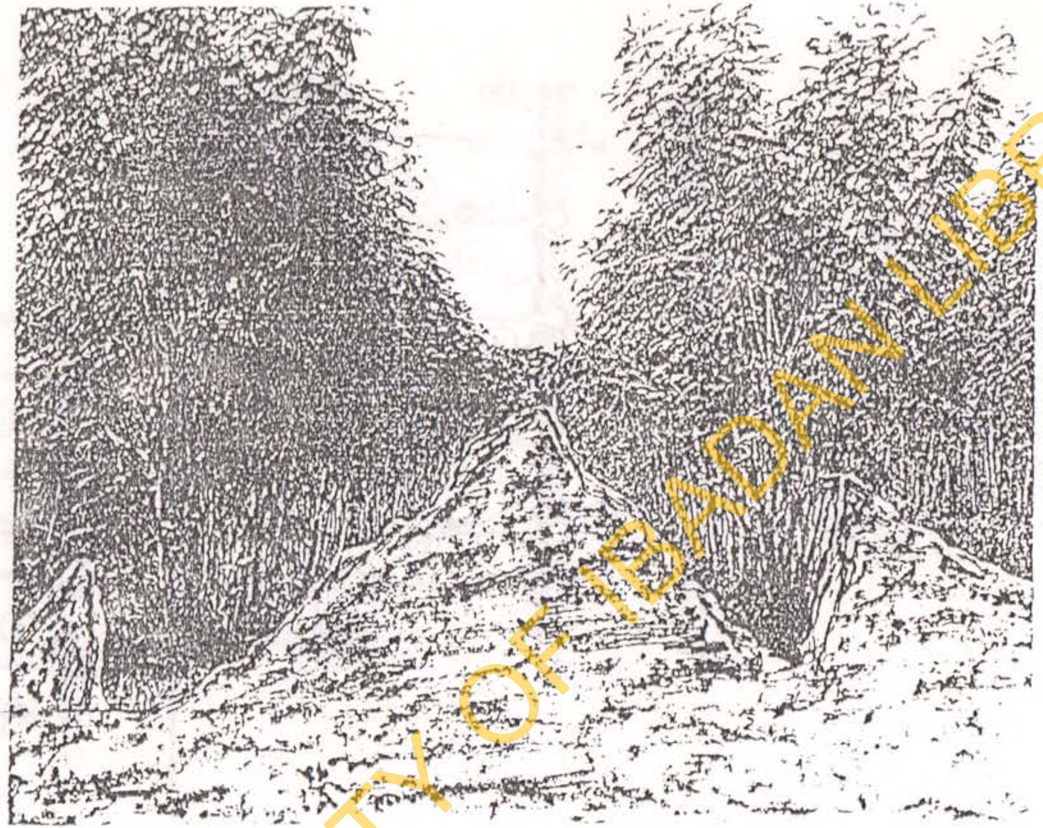
APPENDIX 5

Figure. 4 An Alley (corridor) formed by multipurpose tree planted in a hedgerow 4m apart.



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APPENDIX 6

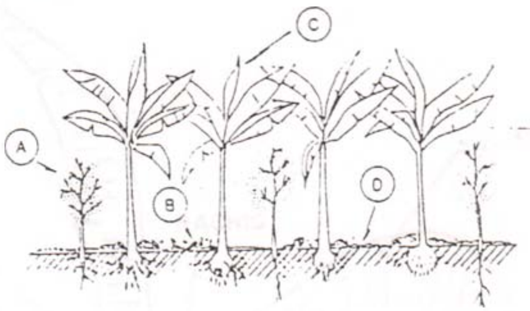

Fig. 1. Alley cropping with top of the hedgerow plants below the plantain canopy. A, hedgerow plant; B, leaf litter; C, plantain/banana; D, soil surface.

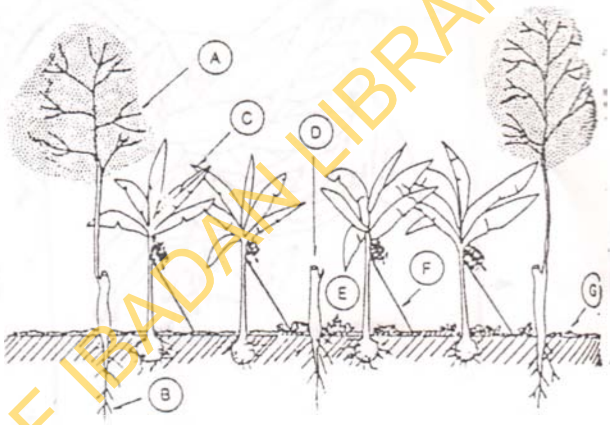

Fig. 2. Alley cropping with hedgerows, which provide poles, serve as windbreaks, and help to recycle nutrients. A, tall tree; B, deep roots; C, plantain/banana; D, cutback tree; E, leaf litter; F, support pole; G, soil surface.

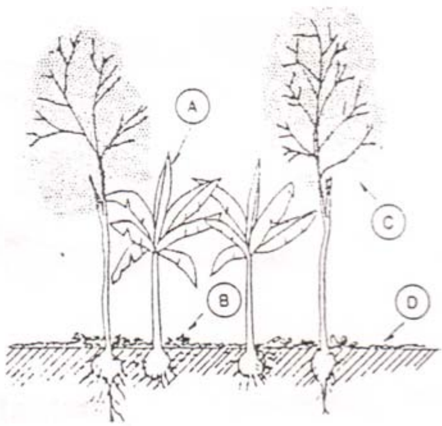

Fig. 3. Alley cropping with the hedgerow canopy above the plantain canopy. A, plantain/banana; B, leaf litter; C, hedgerow plant; D, soil surface.

Wilson and Swennen (1989)

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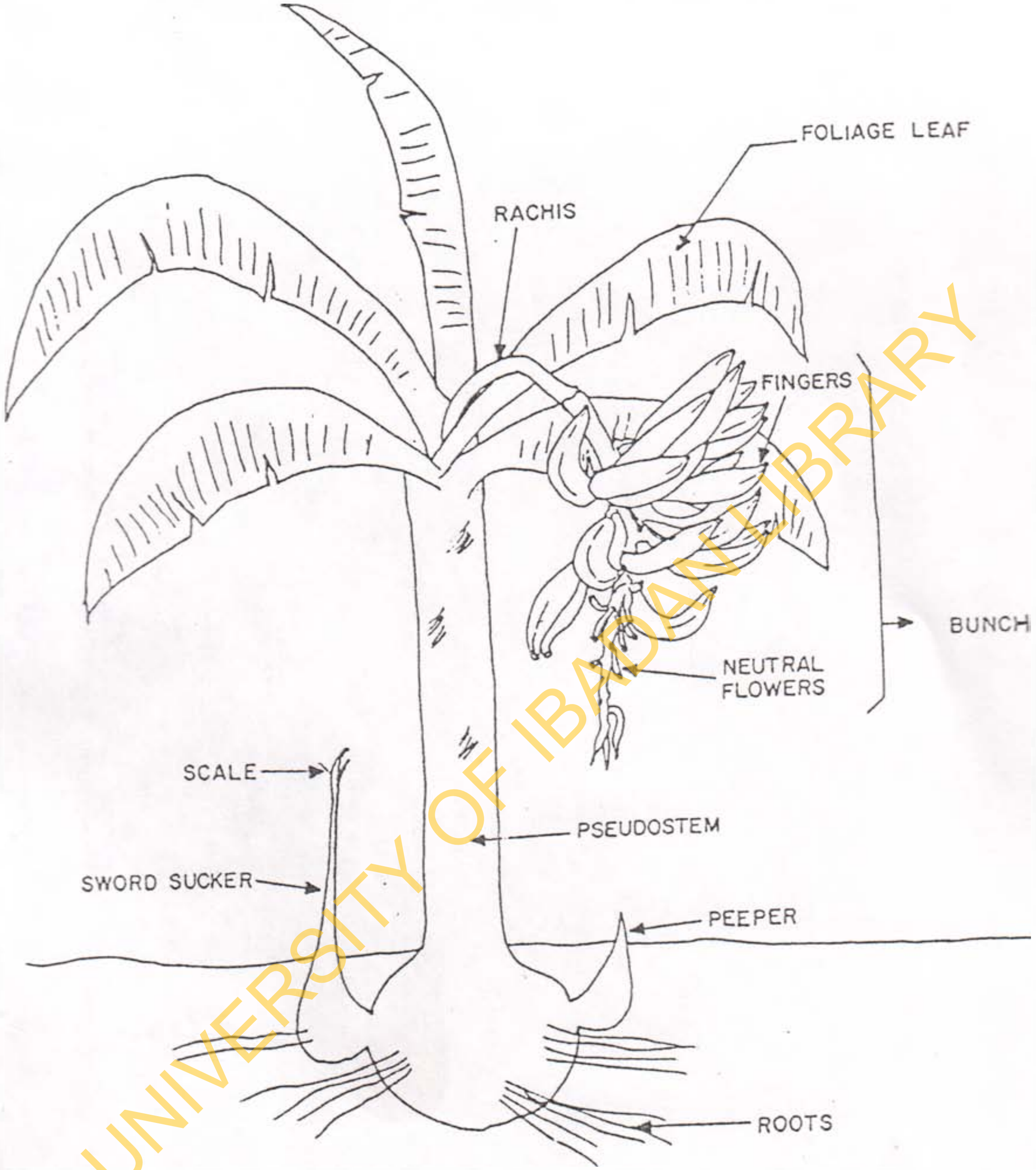
APPENDIX 7



False Horn plantain (Swennen, 1990)

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APPENDIX 8

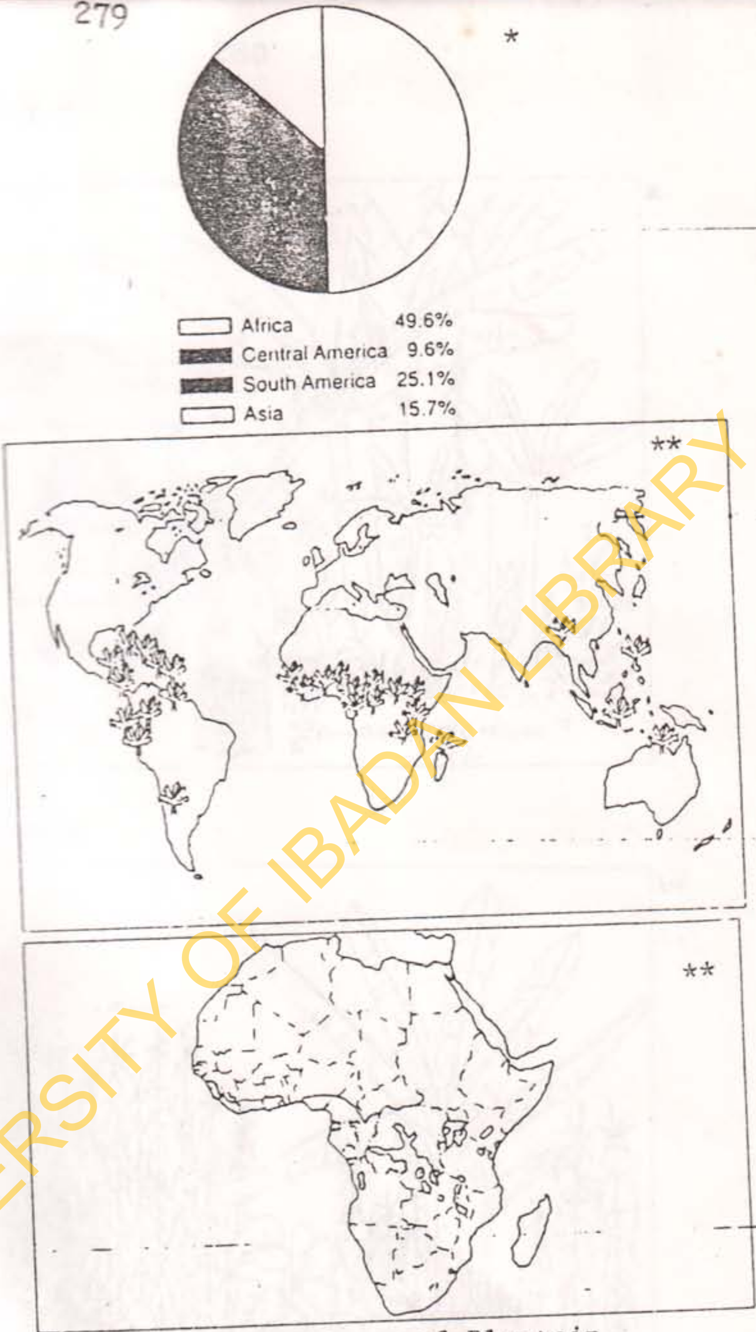

Figure Major Areas of Plantain Production in the world

Adapted sources :
*Swennen (1990)

**Du Montcel (1987).

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APPENDIX 9

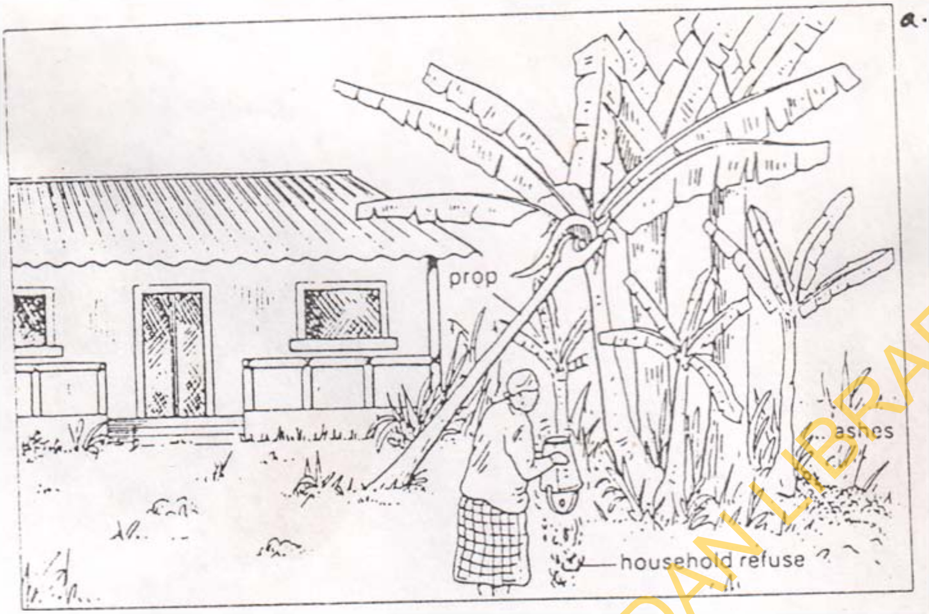

Fig 'Backyard' cultivation

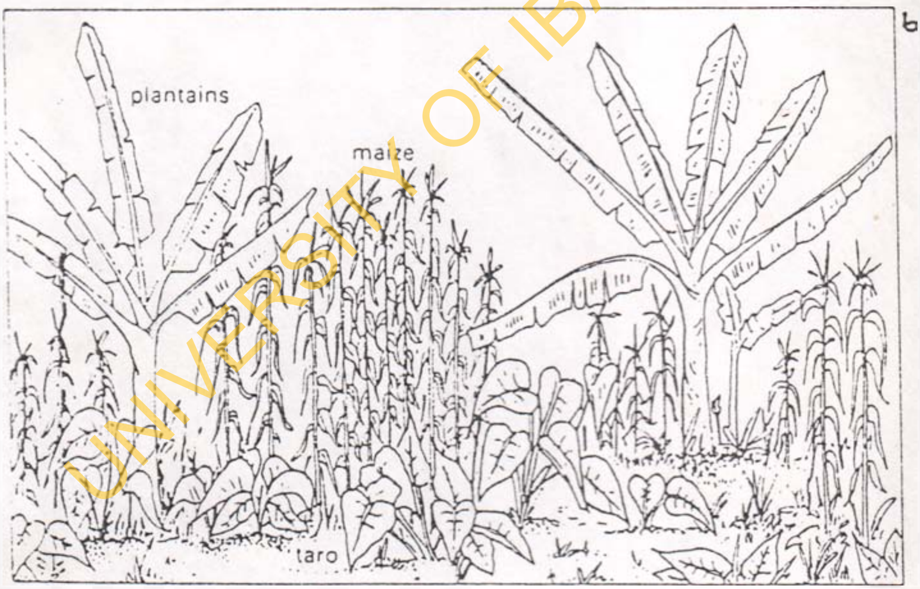

Fig Traditional cultivation

Plantain cultivation systems.

Adapted from: Du Montcel (1987).

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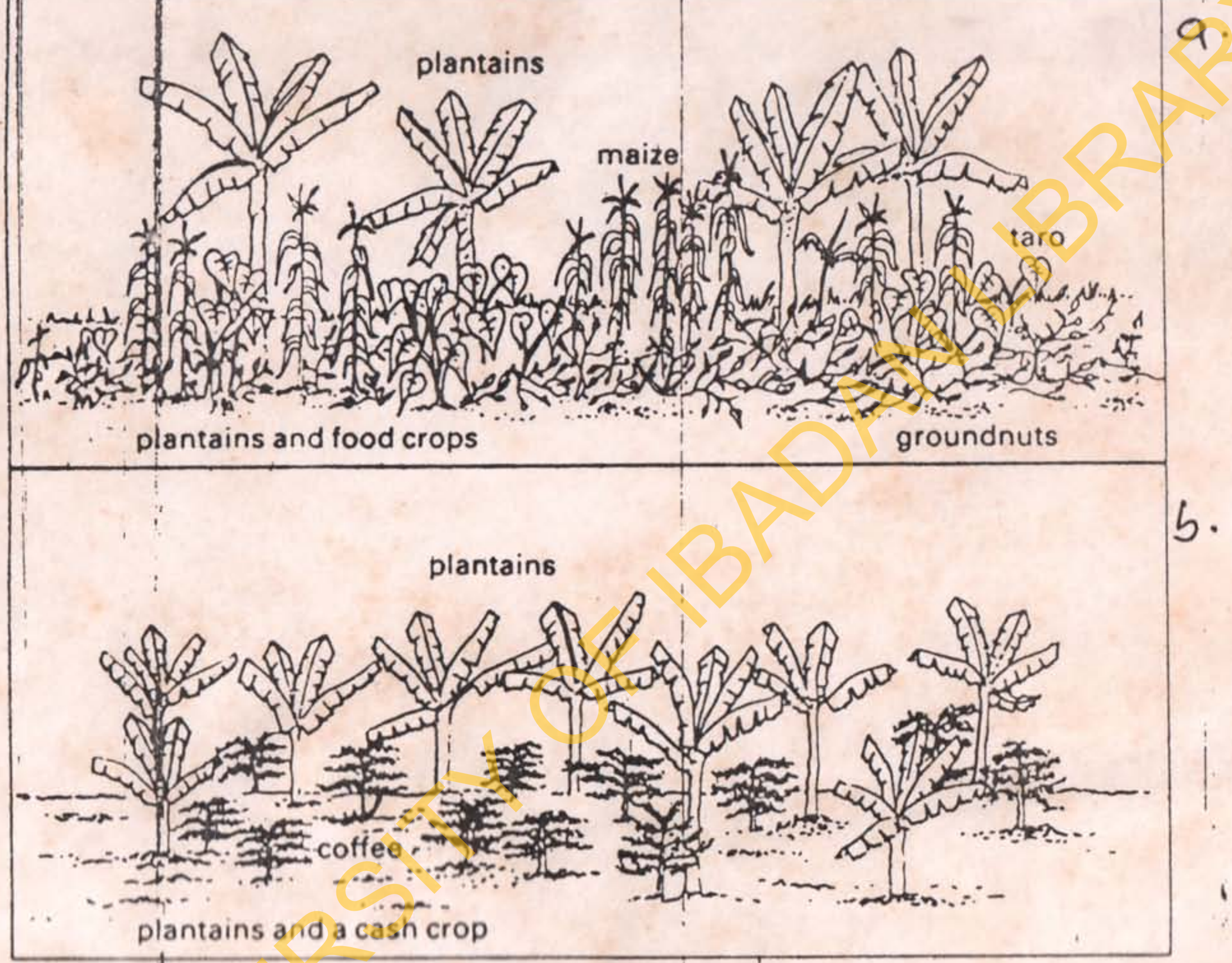

Plantain intercropped with food and cash crops.

Adapted from: Du Montcel (1987).

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