

## Response of Farmers to the Adoption of a New Resistant Hybrid Plantain Variety in Nigeria

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**Abstract:** The International Institute of Tropical Agriculture (IITA) based in Nigeria developed and introduced a new variety of plantain, (PITA-14) into the country. This variety is resistant to black sigatoka disease which had devastated plantain production in Nigeria. It has been stated that getting new ideas adopted even when it has obvious advantages is often very difficult. The objectives of this study were to identify the socio-economic characteristics of the farmers who have tried this variety and to determine whether the agronomic and physical qualities of PITA-14 met the socio-economic needs of the farmers. All the 53 respondents who agreed to plant the new variety were identified and interviewed. The results showed that the majority of the farmers implemented the recommended agronomic practices like pruning, desucking, weeding and applied manure. However, the other practices like correct spacing, watering and mulching were not practiced by the majority of them. It was also found that there was no significant difference in preference between the hybrid and the local variety. The majority of the respondents preferred the hybrid plantain in terms of number of fingers per bunch, tolerance to drought, resistance to diseases, high yield and early maturing. However, in comparison with the local variety, respondents indicated that it attracted low market price, length of fingers are shorter, poor shelf life, smaller girth of fingers and poor taste of the hybrid plantain. The poor taste of the plantain meant that it attracted low prices in the market. In general, farmers preferred the local to the hybrid variety. This study has demonstrated that if farmers are not involved in technology development, the result may not address farmers' needs, hence, low adoption.

**Key words:** Adoption, plantain variety, resistant hybrid, market, shelf life

### INTRODUCTION

Plantain (*Musa Paradisiaca*. AAB Group) is an important crop in sub-Saharan Africa. It is said that about 70 million people in this region derive their livelihood from it (Vuylsteke, 2001). According to Sharrock and Frison (1999) and Vuylsteke (2001), plantain is fast becoming more important as cash crop, providing the sole source of income to the rural population. The West and Central Africa is one of the major plantain producing regions of the world, producing 9 million tons per annum (CTA, 2001).

Africa produces about 75% of the total world plantain output, with 2/3rd of this concentrated in West Africa (IITA, 1994). Plantain has become a major staple food. It is used for brewing, cooking, roasting, as well as sweet dessert. Starch, flour and chips are made from plantain (IITA, 2007). In Nigeria, Nweke (1996) noted that about 49% of farming households produce plantain as a main crop. Nigeria is the largest producer of plantain in West

Africa, with an annual production of about 2.4 million metric tons, mostly produced from the Eastern States (Ogazi, 1996).

Unfortunately, plantain in Nigeria came under a heavy attack of black sigatoka disease from 1986 (Dumpe and Oritz, 1996; Vuylsteke, 2001; Viljoen *et al.*, 2004). Black Sigatoka is a leaf spot disease caused by the fungus-*Mycosphaerella fijiensis morelet* on plantain (Fig. 1). Once established, the pathogen causes severe leaf necrosis, with the result that yields were reduced by more than 50%, while in more severe cases, an entire plantation were wiped out (Stover, 1990; Mubamba *et al.*, 1993; Opolot, 1995; AUF, 2007). All known plantain landraces were susceptible to Black sigatoka disease.

To combat this disease, the International Institute of Tropical Agriculture, (IITA) Nigeria, developed a high-yielding resistant variety to Black sigatoka called PITA-14. This variety out-yields the best landraces (Agbagba) by about 100% (Lemchi *et al.*, 2001). IITA has conducted several tests on PITA-14, including



Fig. 1: Black sigatoka infested plant

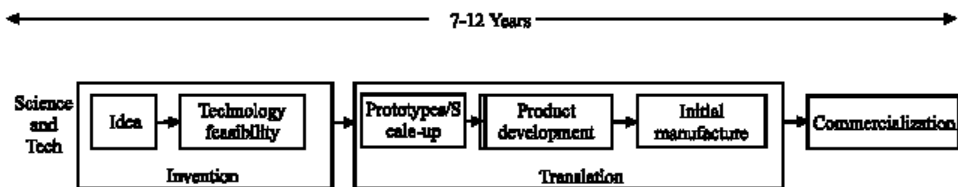


Fig. 2: Technology diffusion model

early evaluation, yield trial and multi locational trials, preparatory to mass introduction to the farmers. Smallholder managed performance evaluation tests were also conducted to determine the level of acceptance of the new variety.

In technology development and transfer, Rogers (2003) indicated that the obvious advantages of the technology are not enough to ensure its adoption. He stated that adoption will depend on the technology being compatible with the values, beliefs and past experiences of individuals in the social system. This will be achieved if farmers are actively involved in participatory research and extension (Ellis-Jones *et al.*, 2005).

This study therefore, reports the result of that trial, with the following objectives:

- Identify the personal and socio-economic characteristics of the farmers in the project.
- Determine the agronomic and physical qualities of PITA-14 meet the socio-economic needs of the farmers.

**Technology development and transfer systems in Nigeria:** Agricultural technology development and

transfer in Nigeria operates under the Research-Extension-Farmer-Inputs-Linkage-Systems (REFILS) (Unanma *et al.*, 2004). This strategy ensures effective agricultural research and extension services in the country. The system identifies 4 sub-systems that are interlinked to ensure effective technology development and transfer. Through a Monthly Technology Review Meeting (MTRM) researchers and extensionists meet to identify farmers' problems that need research intervention. Researchers then develop the technology and transfer to extension agents. Before mass transfer of the technology, Small Plot Adoption Trials (SPAT) are conducted in multi-locations to determine the acceptance of the technology. The result of SPAT will determine whether the technology will be transferred to the general farming population. Where the SPAT results are favourable, input agencies are linked up with the farmers to supply the inputs required for the effective utilization of the technology. In a reverse order, farmers' problems are brought back to researchers through the extension agents.

This model that is being used in Nigeria has not ensured effective diffusion of innovations. This is because there is a weak link between research and the farmers. Very often, farmers are not involved in designing

research projects. The result is that technologies are developed but fail to meet the socio-economic needs of the farmers. In agricultural technology, it takes between 7-12 years from the time the technology is developed to the period it is effectively diffused to the intended beneficiaries (Fig. 2). This means that huge resources are put into technology development, therefore care must be taken to ensure that such technologies are adoptable.

**MATERIALS AND METHODS**

The study area was the South Eastern Nigeria. The research work was conducted in 6 selected states out of the 9 that make up the region. The States are Abia, Akwa-Ibom, Ebonyi, Enugu, Imo and Rivers. The villages where the adoption studies were conducted comprised of 3 blocks namely: Port Harcourt, Umuahia and Abakaliki. Within these blocks, nine villages were purposively selected, that is, 3 villages from each block. Farmer-managed on-farm trial of the hybrid had already been conducted on 53 contact farmers’ plots. The average farmer in the trial had about 81 mats of PITA-14 as against 52 mats of the local variety. Thus, all the 53 selected farmers were interviewed to generate data for this study.

The study was conducted in 2004 and the data generated were analysed descriptively and presented in frequency distribution and percentages.

**Location and population:** The South Eastern agricultural zone of Nigeria lies between latitude 4° 20’ and 7° 25’ and longitudes 5° 25’ and 8° 51’ East. This covers a land area of approximately 109,524 km<sup>2</sup> or 11.86% of the total land area of Nigeria. This area lies mainly on plains under 200 m above sea level. It is bounded on the south by Blight of Benny, on the east by the Republic of Cameroon, on the west by River Niger and Delta state and on the north by Benue State (Monanu, 1975).

To determine the level of the management practices adopted by the farmers, uniform value of 1 was assigned to the 9 recommended agronomic practices (which were, pruning, desucking, weeding, manuring, spacing earthening-up, propping-up, watering and mulching). Thus, the highest adoption score was 9. Respondents who had 5-9 scores were categorized as high managers, while those below 5 points were low managers of the practices. In determining the preference level of the hybrid plantain, respondents indicated yes or no to eleven qualities of the hybrid plantain. The qualities were, yield (bunch size), length of fingers, girth of fingers, pulp/peel ratio, taste of product, shelf life, resistant to diseases, number of fingers/bunch, tolerance to draught, early maturing and market price.

**RESULTS AND DISCUSSION**

**Personal and socio-economic characteristics of the respondents:** The survey results revealed that most (86.8%) of the respondents were males, while 13.2% were females. This showed that the household heads were predominantly males (Table 1).

Data in Table 1 also revealed that the mean age of respondents was 55.5 years, showing that there were relatively, a high proportion of middle-aged respondents. Furthermore, 96.2% of the respondents were married while one person each were single and widowed, respectively.

About half of the respondents (49.1%) had household sizes of between 6 and 10 persons with an average household size of 8 persons. This relatively large household size is obviously an advantage since it enabled the household to use family labour.

Years of formal education of the respondents revealed that 22.6% of them had no formal education. 43.4% had primary education, 26.4% had secondary education, while 7.6% of them had tertiary education, The study further showed that 43.4% of the respondents had primary education, 26.4% secondary, whereas 7.6% had tertiary education.

Table 1: Distribution of respondents according to their socio-economic characteristics

Socio-economic characteristics	Respondents	Percentage
<b>Sex</b>		
Female	7	13.2
Male	46	86.8
<b>Position</b>		
Household head	49	92.5
Non-household head	4	7.5
<b>Social status</b>		
Titled	18	34
Non titled	35	66
<b>Age</b>		
<30	2	3.8
31-40	11	20.8
41-50	13	24.5
51-50	9	17.0
61-70	9	17.0
>70	9	17.0
<b>Marital status</b>		
Single	1	1.9
Married	51	96.2
Widowed	1	1.9
<b>Household size</b>		
1-5	7	13.2
6-10	26	49.1
11-15	14	26.4
16-20	3	5.7
>20	3	5.7
<b>Educational attainment</b>		
No formal education	12	22.6
Primary	23	43.4
Secondary	14	26.4
Tertiary	4	7.6

**Table 2: Distribution of respondents according to their preference for the hybrid plantain**

Attributes	Preference			
	Hybrid		Local	
	Frequency	Percentage	Frequency	Percentage
Yield (bunch size)	41	77.36	12	22.64
Length of fingers	7	13.21	46	86.79
Girth of fingers (fatness)	18	33.96	35	66.04
Pulp/peel ratio	40	76.92	12	23.08
Taste of product	24	45.28	29	54.72
Shelf life (length)	16	30.19	37	69.81
Resistance to diseases	43	81.13	10	18.87
Number of fingers/bunch	51	96.23	2	3.77
Tolerance to drought	45	84.91	8	15.09
Early maturing	38	71.70	15	28.30
Market price	6	12.00	44	88.00

**Response to agronomic and physical qualities:** The farmers were requested to compare the hybrid plantain to the local type in respect of their attributes. These are the attributes of the hybrid plantain:

Yield	17.3 kg
Length of fingers	19.0 cm
Girth of fingers	11.6 cm
Pulp/peel ratio	1:7
Shelf life	16 days after ripening
No of fingers/bunch	112
Tolerance to draught-	More tolerant, it's tetraploid
Early maturing--	has short growth cycle

From Table 2 respondents preferred the hybrid plantain to the local type in terms of attributes like the number of fingers per bunch (96.23%), tolerance to drought (84.91%), resistance to diseases (81.13%), high yield (77.36%), pulp/peel ratio (76.92%) and early maturing (71.70%) in that order. In the same vein, the local type was preferred to the hybrid with regard to these other attributes: Market price (88%), length of fingers (86.79%), shelf life (length of days) (69.81%), girth of fingers (fatness) (66.04%) and taste of the commonest product with 54.72%.

In an attempt to find out the most preferred between the hybrid and local type, a t-test comparative analysis was carried out and result showed no significant difference between the 2 plantain cultivars (hybrid and local).

The implication of these findings is that respondents saw little difference between the hybrid and local plantain type and as such would prefer their local type.

Furthermore, the 88% preference to market price for the local type revealed that farmers still strongly prefer their local type to the hybrid since it is profitable in terms of marketability. This confirms that profitability is one of the qualities that can endear an innovation to adoption.

**Table 3: Percentage distribution of farmers according to agronomic management practices of the hybrid plantain technology**

Agronomic/Management percentage	Practices	Respondents
Pruning	28	52.8
Desuckering	42	79.3
Weeding	52	98.1
Manuring	50	94.3
Spacing	10	18.9
Earthening-up	12	22.6
Propping-up	7	13.2
Watering	1	1.9
Mulching	1	1.9

This finding is not surprising since the hybrid plantain is still very new in the market. It will take the consumers some time to adapt to the new taste or the researcher developing a variety that will be appealing to the taste of the consumers. However, this will adversely affect the market price of the new variety. The preference for local type by farmers in terms of market price was a major constraint to the adoption of the hybrid in South Eastern, Nigeria. It is also in consonance with apriori expectation that farmers will normally be propelled to produce more if the market demand is high and on the contrary will refuse to produce if there is no market. Onyenwaku (1991) reported that profitability was responsible for the adoption of the yam miniset technique by farmers in Anambra and Imo States, Nigeria, respectively. Akele *et al.* (2000) have indicated that the success in the adoption of this black stigatoka resistant variety will depend on creating public awareness and encouraging the planting of variety.

The general implication of this finding is that researchers did not take into consideration the compatibility of the technology and the values of the farmers in terms of taste as recommended by Rogers (2003).

Therefore, in spite of the fact that the hybrid plantain was resistant to the black stigatoka disease and high yielding, farmers still preferred the local variety.

#### **Agronomic management practices adopted by farmers:**

The extent to which the farmers adopted the management practices recommended to them was studied (Table 3). Results showed that 52.8% of the farmers practiced pruning, 79%, desucked and 98.1% weeded as recommended. Also, almost all the farmers (94.3%) applied fertilizer as recommended. However, other practices received very low adoption rate. Only about a quarter adopted the recommended spacing, 23% practiced earthening-up, 13% practiced propping up and only 2% each, practiced watering and mulching, respectfully. Hence, 53% of the respondents were high adopters of the agronomic practices. It was not surprising to see those practices with low adoption rate since they would require more funds to practice. The constraint on available farmland forced the farmers to disregard the recommended spacing. Propping-up, watering and mulching would require the hiring of additional labour. With the absence of irrigation facilities, the labour cost would be above the reach of the farmers.

#### **CONCLUSION**

The t-test comparative analysis showed no significant difference in preference between the hybrid and local plantain type. While, the hybrid plantain showed high quality in terms of higher number of fingers per bunch, tolerance to drought, resistance to disease, early maturing and high yielding; it has many drawbacks, like poor taste, low market price, shorter length of fingers and low shelf life. This implied that the researchers did not involve the farmers in developing the resistant variety.

#### **RECOMMENDATIONS**

To further increase the level of adoption of the hybrid plantain, in order to harness fully its potentials in the zone, the following deserve consideration:

- Efforts should be made by the Research Institute towards improving upon the palatability of the hybrid plantain, in order to improve on the market demand of the hybrid plantain.
- The low shelf life, which affected the acceptance level of the hybrid plantain, should be improved upon by teaching the farmers how to control ripening stage through agronomic practices.
- Researchers should involve farmers in designing technologies that are intended to solve farmers problems.

This will ensure that farmers' actual needs are put into consideration.

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