Determinants of Adoption of Downy Mildew Resistant Maize by Small-Scale Farmers in Kwara State, Nigeria.

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***Abstract*- This study examined the determinants of adoption of Downy mildew resistant maize by small-scale farmers in Kwara state. The study employed both primary and secondary data. Primary data were collected from the maize farmers with the use of well-structured questionnaire. The analytical tools used include descriptive statistics and logit model.**

The result of this study showed that 62.5% of the farmers have already adopted the Downy mildew resistant maize showing a relatively high rate of adoption of the technology in the study area.

The logistic model explains that 84.79% of the variability in total adoption status of households who are maize farmers was accounted for by the independent variables. Farm size and extension contact were found to be significant at 5% level of significance.

Finally the study recommends that farm expansion and intensification of extension visit would be an incentive to adoption decisions by small-scale farmers in the study area.

Keywords: Adoption, Downy Mildew, Maize, Farmer, Logistics model.

I. INTRODUCTION

Agriculture is considered the largest sector in Nigeria's economy. "It is the second largest source of national wealth, after oil" (National Planning Commission, 2004). In addition to its contribution to the Gross Domestic Product, agriculture also accounts for 88% of the non-oil foreign exchange earnings (Ajekigbe, 2007) and since independence, it has been the most important economic sector in terms of its contribution to the Gross Domestic Product (Adegeye, 1993). The sector contributes about 41% of the country's GDP, employs about 65% of the total population and provides employment to about 80% of the rural population (Abdullahi, 1986). It was revealed from statistics that total food production increased from 54.76million grain equivalent in 1997 to 57.70 million grains equivalent in 2001 (Akinyemi,1998). Agricultural growth rates increased modestly from 4.25% in 1997 to 4.5% in 1999, 4.7% in 2004 (CBN, 2005). Naturally, Nigeria is blessed with abundant human (140 million people) and land resource (98.3 million hectares). About 72 million hectares are actually cultivable. But only 34 million hectares are presently under use.

According to Ajekigbe (2007), the Federal Government's budget on agriculture has increased by 20% per annum since 2003. He noted that the Federal Government allocated #8.7 billion to agriculture from debt relief savings in 2006, and increased the Capacity of the National Agricultural Credit and Rural Development Bank by 5 billion naira. He stated further that Federal Government extended the Agricultural Credit Guarantee Scheme Fund (ACGSF) with about 2.5 billion naira credit line since 2003, and the ACGSF guaranteed over #500 million loans to farmers (Jan-Jun, 2006). According to Ajekigbe 2007, the latest Federal government's support for Agriculture comprises the Establishment of Agric Credit Support Scheme (ACSS), which includes provision of 50 billion naira lines to farmers at 14% per annum, rebate of 6% granted farmers with timely payments reducing interest to 8%, African Development Bank (ADB) and 32.8m loan (to improve food security in Ekiti, Ondo and Cross River State), Presidential initiatives on grains, cassava, vegetable oil, etc (Nigeria is presently the leading producer of cassava in the world involving about 45 million metric tonnes annually) and the Provision of land for use at reasonable terms (Zimbabwean farmers in Kwara State).

Adekunle (2004) noted the dominant pattern in Nigeria's agriculture as the small-scale farmers, who are often characterized by the use of unimproved farm implements and traditional production tools that are capable of generating only very small income to farmers. Their output is little, but when combined, supplies the lion share of the food consumed in the nation. Their major aim of productions is to feed themselves and their families with little or no sale. The total lands cultivated by small-scale farmers, at any time, is below 10 hectares, and /or have less than 500 poultry birds, goats, cattle, pigs; with little or no externally sourced inputs. This could be as a result of non-availability or inadequate supply of credit to the farmers.

With all the contributions of the Federal Governments to ensure availability of credit, it is unfortunate that the credit has not reached the majority of rural poor or small-scale farmers as a result of complexity of the condition that must be met before these farmers could obtain the credits, although, since the political and economic reform of 1993, individual small-scale farmers have started to benefit from hiring agricultural machineries and planting of improved seed varieties bred and developed by Agricultural Research Institutes such as the International Institute of Tropical Agriculture, Ibadan. (IITA), National Centre for Agricultural Mechanization (NCAM), etc., this also was in short supply and short-lived.

In Nigeria, the major grains produced are maize, rice, cowpea, soybean, sorghum, millet and groundnut (Adekunle and Nabinta, 2000). The greater proportion of these grains is maize because of its ability to thrive under different ecological condition. FAO (1989) figures show a consistent increase in production of these crops in Nigeria. Adekunle (2004) also reported sustained increase in their output.

Maize is the most important staple food in Nigeria. It accounts for about 43% of calorie intake (Nweke *et al*, 1983). Maize has consumption quantity of 53.20g/capital /day (FAOSTAT, 2007). The other major food crops in Nigeria are roots, tuber and other grains.

According to FAO data, the area planted to maize in West and Central Africa alone increased from 3.2 million in 1961 to 8.9 million in 2005. This phenomenal expansion of the land area devoted to maize resulted in increased in production from 2.4 million metric tonnes in 1961 to 10.6 million metric tonnes in 2005. While the average yield of maize in developed countries can reach up to 8.6 tonnes/ha. Production per hectare is still very low (1.3 tonnes per ha). From tassel to root, the maize plant is valuable. The stalk, leaves, silk, cob and kernels all have a commercial value, that of kernel being the largest (Kochhar 1986).

Commercial or traditional products of maize are based on some properties of the maize's endosperm and quality parameters. Some of the quality parameters or factors which influence the suitability and choice of maize varieties for various uses include chemical, bio-chemical, physico-chemical, organoleptic and ecological properties (Okoruwa, 1997).Maize is used mainly as a staple human food, a feed for livestock, as a raw material for many industrial products and for medicinal purposes.

Comparing the increase in maize production per hectare with the uncontrollable increase in the population of Nigeria, it is sill very clear that the production is not enough to meet the demand of the growing population. Considering the great demand for maize, research stations have developed means by which maize production can be increased to meet up with the demand for maize. The reduction in yield per hectare could be as a result of some constraints, which include; pests and diseases, mineral deficiency or as a result of the effect of weed. One of the diseases is the downy mildew disease of maize, which has become a serious threat to maize production in parts of Nigeria, The Democratic Republic of Congo, Mozambique and Uganda (Kling *et al*., 1994).

Development of Downy mildew-resistant varieties has been a major priority in the breeding programme at IITA since the early 1980's. Working with national researchers, a number of widely adopted downy mildew-resistant varieties of maize have been developed and released by IITA.

Resistance to both downy mildew and streak had been bred into maize (DMRESR varieties) through the effort of Research institutions in Nigeria. The adoption of these varieties has led to the production of more than 3 tonnes/hectare under severe downy mildew pressure during which susceptible varieties gave very low yield of about I tonne / hectare (Korede *et al*., 1993).

Rural farmers have been able to enjoy the benefits from the research stations through the adoption of this technology. Adoption however, can be described as a decision to make full use of an innovation or technology as the best course of action available (Rogers, 1995). This process requires a great mental effort by the farmers before they could decide, on whether to use the innovation or not. The farmer is not certain about the profitability of the technology. Rogers (1969) observed that prior to the adoption of new technology by an individual farmer, he or she will follow an adoption process like awareness, interest evaluation, trial and adoption, for an innovation to be acceptable to the farmers, it must be economically profitable, socially acceptable and technologically visible. But most of these farmers show different attitude towards the adoption of these agricultural technologies and this has greatly affected the availability of food in the economy, farmers' income as well as their standard of living.

A study of the determinant of adoption in populations undergoing acculturation could help measure the changing weight of human capital, village, institutions, ethnicity and market in the decision to adopt new technologies and so contribute to the debate about economic and non-economic determinant of behaviours as indigenous people modernize.

Also, because of low level of adoption of improved agricultural technology among the small-scale farmers as the nations agriculture had always been dominated by them. In general, this study is required to determine constraints to adoption at farm level and to develop a better means of transferring the innovation to them as the understanding of adoption behaviours of the farmers could inform policy makers how best to improve farm productivity of the population

II. METHODOLOGY

The study was conducted in Kwara state, Nigeria. The area covered by the state was divided into 16 local Government Areas. Based on the ecology and the major crops produced, the sixteen local Government Areas were grouped into four (4) agro ecological zones.

Primary and secondary data were employed for this study.

The secondary data were collected from relevant journals and textbooks, the Kwara State Agricultural Development Project (KWADP) and the International Institute of Tropical Agriculture (IITA). The study covers four Local Government Areas where maize is majorly grown and where incidence of downy mildew was very noticeable during the period considered by this study. Two Local Government Areas were selected from each of the zones. Ilorin south and Ilorin west were selected from zone C while Ekiti and Oke-ero Local government areas were selected from zone D.

Maize farmers in Kwara state constitute the population for the study. Four villages were selected from all the selected zones. Finally one hundred questionnaires were administered.

Descriptive statistical technique such as percentage, frequency, mean, and mode were used to describe the socio-economic characteristics of maize farmers in the study area.

The logit model was used to identify factors influencing the adoption of downy mildew resistant maize technology.

$$\ln \{P(X)\} = \beta_o + \beta_1 X_1 + \beta_2 X_2 + \text{---} \beta_5 X_5 + \Sigma_I$$

(Gujarat ,1988)

(1- {P (X)}

Where X1 = farm size (ha)

X2 = Education (measured in dummy)

X3 = Extension contact

X4 =Farmer's asset

X5 = Family size (number of adults in the farming household),

Σi = Error term

III. DATA ANALYSIS AND DISCUSSION

The average age of the respondent is 53 years old and most of the farmers are between 51 and 60 years. About 92% of the respondents are married with members of the families constituting part of the farm labour. This had positive effects on adoption decisions by farmers. About 48.6% of the respondents had primary and secondary education 25% have tertiary education while only 15.3% had no formal education. The high literacy level may explain the reason for high level of adoption in the study area since the respondents who are literates will have better experience about the technology than their illiterate counterparts. 94.5% of the respondents have been into maize production for at least 10years. This could have negative effect on adoption of new technologies since more experienced farmers usually find it difficult to adopt new technologies and innovations. About 64% of the respondents inherited their land on which they farm. Land tenural arrangement may therefore not be a problem in the area. The average farm size of the respondent is 2.0ha.

The rate of adoption obtained was 62.5%. This implies that the adoption rate is high in the study area but much still needed to be done by the government and extension agents in motivating the farmers to adopt more of the technology. The percentage of non-adopters is 37.5.

Table 1: Factors Associated with Adoption of Downy Mildew Resistant Maize using logit model

Variables	β	S.E	Wald	Df	Sig	Exp (β)	t-value
Constant	-3.162	1.887	2.808	1	0.094	0.042	-1.676
X_1	1.209	0.544	4.948	1	0.026	3.351	2.222*
X_2	-0.109	0.103	1.112	1	0.292	0.897	-1.058
X_3	2.625	0.719	13.343	1	0.000	13.811	3.651*
X_4	0.453	0.747	0.368	1	0.544	1.574	0.606
X_5	0.012	0.040	0.093	1	0.760	1.012	0.300

Model Chi-square is 39.353

-2 log likelihood for model 55.912

Overall case correctly predicted 84.70%

Significant at 5% level of significance

Source: Field Survey (2008)

The logistic model explains 84.70% of the total adoption status of households. The result shows that farm size (X_1) and extension contact (X_3) are significant determinants of farmer's adoption of the downy mildew resistant maize (P=0.05). The farm size (X_1) and extension contact have positive effect on farmer's adoption. This implies that increase in the size of farmland owned by farmers will increase adoption decisions made by maize farmers in the area. As farm size increases, farmers will want to increase their production, thereby ready to adopt the new technology. If there is increase in the visits made by the extension agents there is likely to be an increase in the adoption decisions made by the farmers. Extension visits expose farmers to new information and technical skills about disease control in maize planted in the study area.

IV. CONCLUSION AND RECOMMENDATION

More than half of the farmers in the study area (62.5%) adopted the Downy mildew resistant maize. The determinants of adoption of this variety by the maize farmers are farm size and extension contact. Therefore farm expansion and more access to extension services are recommended for the study area.

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