

## **DETERMINANTS OF THE OCCURRENCE OF BLACK POD DISEASE OF COCOA IN EDO STATE, NIGERIA: A MULTIVARIATE PROBIT ANALYSIS APPROACH**

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### **ABSTRACT**

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This study was conducted at Edo state of Nigeria during July 2007 to determine factors that favor the infestation of black pod disease of cocoa in the study area. Cocoa is a very important cash crop in Nigeria. In fact, cocoa is the second main source of income to Nigerian government after petroleum. One of the major threats to cocoa production in Nigeria is the infestation of Black Pod Disease (BPD). A simple random sampling technique was used to collect information from fifty respondents in seven cocoa producing local government areas in the state and the information was collected with the aid of structured questionnaires. The data collected was analyzed using the multivariate probit model. The result of the probit analysis showed that price of fungicides ( $P < 0.05$ ), price of spraying pump ( $P < 0.1$ ), educational level of the farmers ( $P < 0.05$ ), price of cocoa beans ( $P < 0.1$ ) and the quantity of cocoa pod husk on the farms ( $P < 0.1$ ) were significant factors in determining the probability of the occurrence of black pod disease in cocoa farms in the study area.

**Keywords:** Cocoa, blackpod disease, multivariate probit model

### **INTRODUCTION**

Nigeria as a developing country was rated the second largest world producer of cocoa in the 1960's (Adegbola and Abe, 1983) and for a long time the crop has been generating substantial foreign exchange earnings for the country. However, the production of this important cash crop for export has suffered a reduction in recent years in the country owing to a number of factors. Villalobos (1989) identified some of these factors as low yield, ageing of trees, inconsistent production pattern, use of simple farm tools and of course disease and pest attack. Anonymous (1979) reiterated the main problem confronting cocoa production in Nigeria as very low yield due to attacks of pests and disease which are capable of destroying more than half of the little production.

Many diseases affect cocoa on the field. Some of them are *Phytophthora* Black pod disease, *Phytophthora* canker, *phytophthora* seedling blight, *Thielaviopsis* pod rot, *Cocoa swollen shoot virus (CSSV)* disease, Cherelle wilt, Charcoal pod rot and Collar crack disease (Adegbola, 1972). But those of economic importance in Nigeria are three: Black pod disease, Swollen shoot virus and Cherelle wilt (Opeke, 1987).

In economic terms, black pod disease is the most serious disease of cocoa in Nigeria. It is caused by a soil-borne fungus, *Phytophthora palmivora* and is prevalent only during the wet season. The disease is therefore worse in areas of heavy rainfall. Major damage from the disease is the rotting of both small and large pods. Coupons, seedlings (in the nursery) and leaves of trees are attached and killed under specially severe disease conditions following long periods of cool and rainy weather. Losses due to black pod disease vary from place to place and from variety to variety. Adegbola (1972) put the average at about 40 percent over several parts of West Africa and up to 90 percent in certain places in Nigeria. Deduction from analysis of data from the Cocoa Research Institute of Nigeria (CRIN) indicates that pod loss due to black pod disease infection varies with variety of cocoa. The average percent pod loss over the years 1962-1993 was 7.56 for Amazon I, 6.56 for Amazon II, 7.01 for Amazon III and 13.03 for Amelonado (Tijani, 2005). Babcock *et al* (1992) noted that those yield losses could be reduced through the use of chemical control agents (synthetic pesticides) have been favoured because of their effectiveness (although in many cases, this diminishes with time), their relative shelf life (when properly stored), and the ease with which they can be transported, stored and applied. Eguagie (1974) and Idachaba and Olayide (1976) have indicated a possible loss in yields of between 50% and 70% in cocoa production if no chemical measures were applied. It should however be noted that much money is being spent on the procurement of these chemicals thus draining the income of the farmers. From the foregoing, it is therefore essential to conduct a study of this nature which determines the factors that favour the spread of black pod disease in the study area.

### **METHODOLOGY**

The study was carried out in Edo state. Edo state is in the southern part of Nigeria and is one of the cocoa producing states in the country. By National Cocoa Development Committee (NCDC) rating, Edo state is a medium cocoa producing state in the country.

A simple random sampling of fifty respondents was carried out in seven Local Government Areas (LGAs) in the state. The LGAs were Ovia North East, Ovia South, Esan West, Owan West, Owan East, Etsako West and Akoko Edo. The respondents were interviewed with the use of well-structured questionnaire. The questionnaire was structured to elicit information on socio-economic and demographic characteristics of the respondents. Prevalence of black pod disease in their farms and the control measures on black pod disease in their farms. The data collected was analysed using probit model which is a regression technique that is used with categorical dependent variables. It is most commonly used with binary dependent variables that can assume only the values 0 or 1, such as the occurrence of a specific event. The independent variable may be either continuous or binary. The parameters of a probit model are estimated by maximum likelihood estimation rather than by Ordinary Least Square.

The model can be stated as:

$$C_i = \Theta X_i + \varepsilon_i$$

Where,

$C_i$  = Variable that indexes the prevalence of black pod disease on farms ( $C=1$  if there's presence of black pod disease on farm;  $C=0$  if there's no black pod disease on farms).

$\Theta$  = Vector of unknown coefficients

$X_i$  = Vector of explanatory variables

$\varepsilon_i$  = Stochastic error term

The explanatory variables ( $X_i$ ) included in the probit model are:

AVF = Availability of fungicides (Available =1, Not available = 0).

PRP = Price of spraying pump (N)

PRF = Price of fungicides (N)

EDL= Educational level of farmers (no formal education=0, primary education= 1, secondary = 2, tertiary = 3, adult education = 4).

CRA= Credit accessibility of the farmer (accessibility = 1, not accessibility = 0)

ASS = Farmers' membership of association (member =1, non-member =0)

PRC= Price of cocoa beans (N)

QPH= Quantity of cocoa pod husk on the farm (Ton)

LAB= Labor availability (available =1, not available = 0)

## RESULTS AND DISCUSSION

Probit analysis showed that the following variables significantly affected the occurrence of blackpod disease (Table 1)

Price of fungicides (PRF) = significant at 5% level;

Price of spraying pump (PRP) = significant at 10% level;

Educational level of farmers (EDL) = significant at 10% level;

Farmers' membership of association (ASS) = significant at 5% level;

Price of cocoa beans (PRC) = significant at 10% level;

Quantity of cocoa pod husk (QPH) = significant at 10% level.

The following variables did not affect the occurrence of blackpod disease significantly according to the probit analysis results (Table 1)

Availability of fund (AVF);

Credit accessibility of the farmers (CRA);

Labour availability (LAB).

Price of fungicide (PRF) was a significant determinant of the probability of a farm having black pod disease ( $P < 0.05$ ). This means that price of fungicides significantly influence the probability of the occurrence of black pod disease in cocoa farm in the study area. It could also be observed in Table 1 that Price of fungicides (PRF) positively influenced the probability of the occurrence of black pod disease. This however means that the higher the price of fungicides, the higher the probability of the occurrence of black pod disease. Price of spraying pump (PRP) was also

a significant factor of the probability of the occurrence of black pod diseases ( $P < 0.1$ ) (Table 1). Meaning that price of spraying pump significantly determine the probability of the occurrence of black pod disease. Educational level of the farmers' (EDL) was a significant determinant ( $P < 0.1$ ) of the probability of the occurrence of blackpod disease on the farmers' farm (Table 1). This implies that educational level of the farmers has significant effect on the probability of the occurrence of blackpod disease. Educational level however negatively influenced the probability of the occurrence of blackpod disease. This means that the higher the educational level of the farmers, the lower the probability of the occurrence of blackpod disease. However, farmers' membership of association negatively influenced the probability of the occurrence of the disease. Meaning that the higher the involvement of a farmer in the association, the lower the occurrence of BPD.

Price of cocoa beans (PCB) was a significant factor ( $P < 0.1$ ) of the probability of the occurrence of BPD (Table 1). It could also be observed from the table that PCB negatively influenced the occurrence of BPD. Hence, the higher the PCB, the lower the probability of the occurrence of BPD. Quantity of cocoa pod husk on the farm (QPH) also significantly and positively influenced the probability of disease occurrence ( $P < 0.1$ ). This implies that QPH significantly determine the probability of the BPD on the farms. The negative influence means that the higher QPH, the higher the probability of the occurrence of blackpod disease on farms.

Table 1: Probit Result for determinants of black pod disease

Variables	Coefficient	Probability
Constant	0.5319	0.6805
AVF	1.7032	0.1457
PRF	0.0001**	0.0395
PRP	-0.0003*	0.0923
EDL	-0.5559*	0.0879
CRA	-5.8631	0.9999
ASS	-1.7155**	0.0225
PRC	-0.0132*	0.0822
QPH	0.0002*	0.0744
LAB	-0.2808	0.4393
Log likelihood	-14.74932012	

\*\* Significant at 5%, \* significant at 10%

Source: Field survey, 2007

## SUMMARY AND CONCLUSION

The study concerned with the determination of the factors that favour the occurrence of blackpod disease in cocoa farms. Findings of the study however revealed that prices of fungicide (chemicals for controlling blackpod disease of cocoa) as well as the price of spraying pump were significant factors in determining the probability of farm having black pod disease ( $P < 0.05$  and  $P < 0.1$ ) respectively. The socio-economic and cultural factor of farmers such as educational level as well as membership of association were also found to be significant factor ( $P < 0.05$  and  $P < 0.1$ ) respectively. Also, prices of cocoa beans as well as the quantity of cocoa pod husk were found as determinants for the possibility of the occurrence of BPD. However, of all the factors investigated, availability of fungicides, credit accessibility as well as labour availability was found not to have significantly influenced the possibility of disease occurrence. It could therefore be concluded that the crucial determinant of the occurrence of BPD in cocoa farms in the study area are price of fungicides, price of spraying pump, educational level of the farmers, farmers' membership of association, price of cocoa beans and the quantity of cocoa pod husk on farms.

## RECOMMENDATIONS

Based on the findings from the study, the following recommendations are suggested:

1. Government should assist farmers in subsidizing some agricultural inputs, especially fungicides as well as spraying pumps. This will reduce the price at which farmers will be buying these inputs.
2. Farmers should be encouraged to be members of reliable crop association in their area. This will enable the farmers enjoy the benefits such as having access to credit facilities, getting genuine inputs at reduced

prices as well as opportunity of being exposed to training being organized for farmers organizations from time to time.

3. Farmers should also be encouraged to attain a reasonable level of education. This is very important in as much as the farmers' level of education influenced the occurrence of blackpod disease as found in this study.
4. Farmers should be enlightened on the need for them to reduce the quantity of cocoa pod husk on their farms. This can be achieved through finding alternative use for them to earn the farmers other source of income. This is very important because the presence of this pod husks on the farms aid blackpod disease spread on the plantations.

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