

## The Influence of Technological Changes on Labour Availability: A Case of Cocoa Farming Households in Ogun State, Nigeria.

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**Abstract:** This study examined the effects of technological changes on labour availability. Primary data was collected using structured questionnaires administered to a purposive sample of eighty cocoa farmers in Ogun state of Nigeria. The data collected was analyzed using descriptive statistics, Analysis of Variance (ANOVA) and Multi-variate regression analysis. Descriptive analysis revealed that some technologies such as improved spacing and fertilizer application require the employment of more labour while some technologies like mechanization and herbicide application displace labour. The result of the ANOVA shows that there is significant difference in the magnitude of labour used in different technological groups. Multi-variate regression analysis revealed that availability of labour is influenced by the extent of cultivation as well as the expenditure on improved technologies ( $P < 0.01$ ). The study recommended that small scale processing industries should be established in the rural areas to take the advantage of the available excess rural labour resulting from the displacement by some technologies thereby eliminating the problem of unemployment that is likely to be generated as a result of the adoption of the technologies.

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**Keywords:** Effects, technological changes, labour availability, cocoa farming households, Nigeria, Analysis of Variance, multivariate regression analysis.

### 1. Introduction

Nigerian agricultural sector is dominated by small scale farmers whose farms vary between 0.10 and 5.99 hectares and constitute about 80.35% of all the 29.800 million holdings in Nigeria (Olayide *et al*, 1980; Ogunwale, 2005). Their farmers used traditional technologies called hoe-cutlass culture. Their capital structure is in form of small tools and predominant usage of family labour (Adegeye, 1995). Among the other problems that are associated with small scale farming are the problems of low productivity due to the problems of pest and diseases infestation and the problems of aged crop trees (cocoa trees) (Adegeye, 1995). Giving the increasing population pressures and consequent increase in food demand, government found it imperative to search for ways by which agricultural sectors could be improved. In line with this, a lot of programmes have been embarked upon and some institutions have been established. Such institutions include the National Seed Service (NSS), National Accelerated Food Production Programme (NAFPP), Agricultural Development Project (ADP) and others. It shall be noted that the main objective among others of these programmes is revolving around the development and dissemination of improved technologies in farming practice.

Improved technologies are the various new “technical know-how” for the promotion and development of agriculture. It alters the structure of agricultural production process through acting as a sure value for changing physical and value productivity of farm resources (Olayide, 1982). Some of these improved technologies are the use of tractors, application of fertilizers and insecticides, adoption of improved spacing, treatment of seed before planting, improved storage techniques and a host of others (Oluyole, 2005). These have taken over from the use of traditional technology which is characterized with the problems of deterioration in the vigour and stability of human labour in a stand environment of high and humidity (Olayide, 1980).

In Nigerian agriculture, hired labour is predominantly used. In fact it carries 88% of total labour used on farms (Okuneye, 2000). But apart from hired labour, the other type of labour that could be employed are family labour and cooperative labour. The availability of labour has been found to have impact on planting precision, better weed control, timely complete harvesting and crop processing (Oluyole, *et al* 2007). Therefore, labour is a major constraint in peasant production especially during the early planting, weeding and harvesting (Gocowski and Oduwale, 2003).

However, there is a strange relationship between the technological changes and labour. The classical economists such as Richado, Mathus, Stuart Mill and Marx were particularly concerned with the problem of employment implications of technological change. The introduction of improved technologies (such as machines) by making production more efficient can lead to the reduction in the employment of labour.

The need for this study is the persistent high demand for labour for most farm operations and to determine the extent to which agricultural innovations has relieved the shortages of labour force in farm operations and subsequent improvement of farm operations as well as standard of living of small scale farmers. This study will be undertaken through the following objectives: To investigate the pattern of adoption of improved technologies in the study area; to determine the magnitude of labour requirements by different improved technologies; to determine whether there is significant change in labour use among the different technological combinations and to determine the factors that affect the availability of labour in the study area.

**Hypothesis testing**

There is no significant difference in the means of labour used among the different technological groupings.

**METHODOLOGY**

The study was carried out in Ogun state of Nigeria. The state is one of the fourteen cocoa producing states in Nigeria (NCDC, 2006). Four cocoa producing Local Government Areas (LGAs) were chosen for the study. The LGAs are Abeokuta North, Abeokuta South, Odeda and Owode. Twenty respondents were purposively randomly selected from each LGA making a total of eighty respondents in all for the study.

Respondents were classified into three technological groups depending on the number of technologies adopted by the respondent. The technological groups are Low Technology (LT), Medum Technology (MT) and High Technology (HT). Low Technology is the adoption of a maximum of two technologies; Medium Technology is the adoption of between two and five technologies while High Technology is the adoption of more than five technologies. Information was collected from the respondents with the aid of structured questionnaires and the data collected was analysed using Descriptive Statistics, Analysis of Variance (ANOVA) and Multi-variate Regression analysis.

Descriptive Statistics was used to analyse the pattern of adoption of technologies as well as the

magnitude of labour requirements by different technologies. ANOVA was used to assess whether there is significant difference in the amount of labour used among the three technological groups. Multi-variate Regression analysis was used to evaluate the effects of the income of farmer, extent of cultivation, wage rate as well as expenditure on improved technologies on the availability in the study area.

$$\ln\text{LAB} = \ln \text{ }_0 + \text{ }_1\ln\text{INC} + \text{ }_2\ln\text{EXT} + \text{ }_3\ln\text{WAG} + \text{ }_4\ln\text{EXP} + e_i$$

Where:

LAB = Avaiability of labour (Mandays);

INC = Income of farmers (₦);

EXT = Extent of cultivation (Ha);

WAG = Wage rate (₦);

EXP = Expenditure on improved technologies;

$e_i$  = Stochastic random error.

**RESULTS**

**Table 1: Distribution of farmers by the technologies used**

Technologies adopted Percentage	Number of farmers
Rehabilitation techniques	36
45	
Mechanization (mechanical clearing)	3
3.8	
Improved seedlings	64
80	
Fertilizer	40
50	
Improved spacing	63
79	
Herbicides	13
16	
Insecticides	15
19	
Fungicides	65
81	

Source: Field survey, 2006

**Table 2: Labour requirements per hectare in different farm operations**

Farm operations	Labour used (mandays)
Manual clearing	12
Mechanization (mechanical clearing)	2
Herbicides application	3
Planting with unimproved spacing	5
Planting with improved spacing	8

Fertilizer 6	application
Insecticides 3	application

Source: Field survey, 2006

**Table 3: Estimated regression coefficients for the determinants of the availability of labour**

Variables	Linear	Semi-log
Constant	11.71	157.18
2.21	(0.93)ns	(2.49)**
(5.48)***		
Income of farmer	-0.000083	14.51
0.0575	(-1.44)ns	(1.40)ns
(0.87)ns		
Extent of cultivation	44.6	143.08
1.16	(9.45)***	(5.92)***
(7.52)***		
Wage rate	0.0453	7.25
0.082	(-0.57)ns	(0.36)ns
(0.65)ns		
Expenditure on improved Technologies	0.00480	-57.83
-0.082	(-7.08)***	(-4.58)***
(-4.21)***		
R <sup>2</sup> value	0.640	0.569
0.734		
F- value	33.37	24.71
51.74		
Std. Error	25.28	27.68
0.1765		

Source: Computed from field survey data, 2006.

**Note:**

Figures in parentheses are t- values

\*\*\* Significant at 1% level

\*\* Significant at 5% level

ns = Not significant

**DISCUSSION AND CONCLUSIONS**

**Patterns of technological adoption by cocoa farmers**

The improved technologies that have been introduced into the study area are rehabilitation techniques, mechanization, improved seedlings, fertilizer application, improved spacing, herbicides, insecticides and fungicides.

From table 1, it could be observed that improved seedlings, fungicides as well as spacing are widely adopted in the study area. They have the

proportion 80 percent, 81 percent and 79 percent of the total sampled farmers respectively. This shows that the impact of extension personnel as regards the dissemination of information particularly on the improved technologies is greatly felt in the study area. As for mechanization, herbicides and insecticides, these are marginally adopted in the study area. They carry 3.8 percent, 16 percent and 19 percent of the total sampled farmers in the study areas respectively.

**Magnitude of labour requirements per hectare in different farm operations**

Table 2 shows that some operations require more labour. Such operations include manual clearing, planting with improved spacing and fertilizer application which requires 12, 8 and 6 mandays respectively. However, some operations such as mechanization, herbicide application and insecticide application require less labour (2, 3 and 3 mandays respectively). Hence, some improved technologies such as spacing and fertilizer application add labour, while other improved technologies such as mechanization, herbicides and insecticides application reduce labour requirements. It should be noted that spacing increases labour due to the fact that most improved spacings are aimed at maximizing the use of land, thus bringing in more crop stands and more crop stands would definitely require more labour.

**Variations in the quantity of labour used in different technological groupings**

In order to determine whether there is significant difference in the number of mandays used in different technological groupings, the computer result of the analysis of variance in the labour used among the three technological groupings was used. The result showed that F calculated is 44.42. Meanwhile, F tabulated at 1% is 4.88. Since F calculated is greater than F tabulated, the null hypothesis [Ho] which says that there's no significant difference in the amount of labour used in the three technological groupings is rejected while the alternative hypothesis is rejected. Therefore, there is significant difference in the amount of labour used among the three technological grouping. The differences might be due to the fact that some of the adopted improved technologies such as herbicides displaced labour. However, some technologies such as fertilizer and improved spacing added labour but their impact might not be as high as those of labour displacing improved technologies.

**Determinants of the availability of labour**

Multivariate regression analysis was used to determine the factors affecting the availability of

labour and the result of the analysis is presented in Table 3. The Table shows the result of the three functional forms of Ordinary Least Square Regression analysis. However, out of the three functional results, double log regression result was chosen based on the value of the standard error, value of the coefficient of determination and the number of variables that are significant. The result of the lead equation shows the coefficient of determination [ $R^2$ ] of 73.4%, that is, the independent variables are able to explain 73.4% of the total variations in dependent variable. Table 3 also revealed that out of the four factors regressed against the dependent variable, two were found to be significantly affected the availability of labour. These factors are extent of cultivation as well as expenditure on improved technologies [ $p < 0.01$ ]. The significance of the extent of cultivation could be attributed to the fact that size of farm determines the number of labour, that is, the larger the farm the more the number of labour that would work on such a farm and vice versa. As for the expenditure on improved technologies, as more money is spent on improved technologies, less labour will be employed since the improved technologies (such as herbicides) would displace labour thus requiring few labour to be employed.

Based on the findings, the study concludes that the introduction of improved technologies (like mechanization and herbicides) unequivocally reduce labour use thereby reduces the cost of employing farm labour thus reduces the overall cost of farm operations.

However, the study recommends as follows: Government should assist to make improved technologies available to farmers anytime they are needed and at subsidized prices. This will enable the farmers to adopt more improved technologies. Farmers should organize themselves into groups to enable them have access to credit facilities for them to be able to procure improved technologies.

Small scale processing industries should be established in the rural areas to take the advantage of the available excess rural labour resulting from the displacement by some improved technologies thereby eliminating the problem of unemployment that is likely to be generated as a result of the adoption of the improved technologies.

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