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LABOUR PRODUCTIVITY AND SUSTAINABLE YAM PRODUCTION IN NIGERIA

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Abstract

Labour is the most limiting factor in yam production in Nigeria. The problem of low productivity from labour persists throughout the country. Governmental and private agencies have tried to deal with this problem by implementing such research recommendations as the use of labour-saving devices (herbicides, minimum tillage techniques, and tractorization schemes), but to no avail. Lack of capital and unfavourable climatic and soil factors encourage low labour productivity in yam production; but other household and farm factors may also be important. This paper examines the effects of such factors on labour productivity on yam farms and discusses their implications for sustainable production in Nigeria. Data used in the study were obtained through a field survey of 242 yam-growing households carried out during the 1990/91 cropping season. Multiple regression analysis was used. Results showed that the most important determinant of labour productivity is farm size. Others, in order of importance, are labour skills of employed workers, household size and composition, farming experience of household head, and labour availability within the household. For increased labour productivity and sustainable yam production in Nigeria, government extension programmes should advise farmers to use labour with requisite skills in various yam operations. Policies that promote medium- to large-scale yam farms should be promoted.

Introduction

Yam is an economically important staple food crop in the tropics and subtropics of West Africa, South-East Asia, and the Pacific and Caribbean islands. Annual world production was about 23.9 million t in 1991, of which 93% was produced in the 'yam belt' of West and Central Africa (Nigeria alone accounted for 78%). On a daily basis, yams contribute more than 200 dietary cal/person for an estimated 60 million people in this region (Asiedu 1993; Ezeh 1991; Hahn et al. 1987).

The low productivity from labour is well known to be the most limiting factor in yam production in Nigeria (Diehl 1982; Nweke 1980; Okorji and Obiechina 1985; Onyenwaku and Ukegbu 1987; Ugwu 1990). Efforts have been made by both governmental and private

agencies to deal with this problem by implementing labour-saving research recommendations such as the use of herbicides, minimum tillage techniques, and tractorization. Despite these efforts, low labour productivity persists (Lawani 1991).

Lack of capital input and unfavourable climatic and soil conditions are factors that encourage low labour productivity on yam farms. Other factors such as household, farm, and farmer's characteristics (e.g., farmer's age and experience, household size and composition, skills of labour employed, labour availability within the household, farm size) are believed to be important influences. This paper examines the effects of such factors on labour productivity and discusses their implications for sustainable yam production in Nigeria.

Methodology

The data

The data used in the study were obtained through a field survey of 242 yam-growing households in seven south-eastern states of Nigeria (Abia, Akwa Ibom, Anambra, Cross River, Enugu, Imo, and Rivers), carried out during the 1990/91 cropping season (Ezeh 1993). These data include household size and composition by age and sex, farming experience of household head, whether the household head employed skilled labour, farm size, labour use in yam operations, labour availability during the crop year, wages paid to hired workers, and household income.

Data analysis

Hypotheses. To guide the study, we hypothesized that the sex and farming experience of the household head, skills of workers employed, household members' income and availability for labour over the year, wages paid to hired workers, and farm size are positively related to labour productivity in yam-based household farms. In contrast, age of household head, and household size and composition are negatively related.

The model. A multiple regression model (stepwise procedure) was used to analyse the data and test the hypotheses. The functional form of the model is specified as:

$$Y = F(X_1, X_2, ..., X_9) \quad (1)$$

In equation form (1) becomes:

$$Y_i = b_1X_{1i} + b_2X_{2i} + b_9X_{9i} + E_i \quad (2)$$

where

Y_i = actual value of labour productivity in ith household (gross value of output per person- day)
X_{1i} = age of ith household head (y)
X_{2i} = sex of ith household head (male = 1, female = 0)
X_{3i} = farming experience of ith household head (y)
X_{4i} = household size and composition (consumer-to- worker ratio)
X_{5i} = annual labour availability in the ith household (person-days)
X_{6i} = annual income of ith household (Naira)
X_{7i} = consideration of labour skills by ith household head (yes = 1, no = 0)
X_{8i} = wages paid by ith household head (Naira per person-day)
X_{9i} = farm size of ith household (ha)
b = partial regression coefficients
E_i = error term

According to our nine hypotheses, the expected signs of the partial regression coefficients are:

b_1 = -	b_4 = -	b_7 = +
b_2 = +	b_5 = +	b_8 = +
b_3 = +	b_6 = +	b_9 = +

Results and Discussion

The nine household and farm variables hypothesized as influencing labour productivity on yam farms are described in Table 1. The parameter estimates and corresponding T ratios are presented in Table 2.

In descending order of importance, the statistically significant factors affecting labour productivity are farm size, labour skills of employed workers, household size and composition, farming experience of the household head, and household annual labour availability (Tables 3 and 4).

The positive and highly significant relationship between farm size and labour productivity is as expected. With increased farm size and a given amount of labour, production and productivity would increase. Thus, a 1% increase in farm size of a household results in a 0.0188 increase in labour productivity. The positive and significant relationship between household head's consideration of labour skills and labour productivity is also as predicted. This implies that the more often household heads (or farm operators) employ labour with the requisite skills for yam operations, the more labour productivity would increase. Thus, a 1% increase in the ability of household heads to employ skilled labour results in a 0.032 increase in labour productivity on yam farms.

The negative and significant relationship between household size and composition and labour productivity is as predicted: the greater the number of consumers versus workers within the household, the more productivity decreases. Consequently, a 1% increase in household size and composition results in a 0.0477 decrease in labour productivity. The negative and significant relationship between farming experience and labour productivity does not conform to a priori expectations. However, if increased farming experience is synonymous with ageing of the household head, then rationality dictates that the greater the farming experience of the household head (that is, the more aged), the less the efficiency in managing labour; consequently, labour productivity decreases.

The positive and significant relationship between household annual labour availability and labour productivity is also as expected. If a readily available household farm labour force is available, the transaction costs of obtaining non-household labour will be much reduced and productivity will increase.

The value of the coefficient of multiple determination (R^2) is 0.2023; the adjusted R^2, 0.1749. This means that the nine dependent variables in the regression model explain from 17%-20% of the variation in labour productivity in yam-based household farms. The very low R^2 value suggests that the explanatory power of the model is low, but for survey work of this nature, involving households, an R^2 value of 0.2023 is not surprising (Kmenta 1971). This is because labour productivity is affected by numerous macro-economic, environmental, and psychological variables, many of which are unquantifiable and not easily incorporated into the regression model.

Furthermore, precise measurement in sample surveys, as opposed to controlled experiments, which are associated with high R^2 values, is diluted because of their nature, that is:

Responses are approximations.

Respondents (household heads) are prone to memory lapses.
Some respondents tend to hide information, especially on sensitive questions relating to, for example, age and income.
Questions are sometimes misunderstood by respondents or wrongly put by interviewers.
Numerous respondents are handled.

Because of these shortcomings associated with survey work, a model's strength of prediction (as measured by the value of R^2) is usually low because errors act in opposite directions. According to Kmenta (1971), the R^2 value in most household surveys does not exceed 0.20.

Conclusions and Recommendations

The results of our study suggest that the most important determinant of labour productivity is farm size, followed by labour skills of employed workers. These results shed new light on issues of interest to policymakers. Increases in farm size and educating farmers on the importance of labour skills could lead to improved labour productivity in yam-based household farms. Thus, for sustainable yam production in Nigeria, government extension programmes should advise farmers to employ labour with requisite skills in various yam operations. Policies that promote medium- to large-scale yam farms should be promoted.

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Table 1. Variables considered as determinants of labour productivity in yam production, Nigeria.

Explanatory variable[a]	Description
SEXHH	Sex of household head (male = 1, female = 0)
AGEHH	Age of household head (y)
FEXPHH	Farming experience of household head (y)
HSACI	Household size and composition index (consumer-to-worker ratio)
CLSHH	Consideration of labour skills by household head (yes = 1, no = 0)
ALABAV	Annual labour availability (person-days)
GHI	Gross household income (Naira)[b]
FSIZE	Farm size (ha)
WRM	Wages per person-day (Naira)[b]

a. The dependent variable is LABRPOD (labour productivity).

Table 2. Parameter estimates of the 9-variable model of the determinants of labour productivity in yam production in Nigeria.

Variable[a]	Parameter estimate	T ratio
Intercept	0.0313	0.4359
SEXHH	0.0208	0.6245
AGEHH	0.0007	0.7550
FEXPHH	-0.0018	2.098**
HSACI	-0.0477	1.664*
CLSHH	0.0332	1.926**
ALABAV	0.0001	1.536+
GHI	0.0004	0.7937
FSIZE	0.0188	3.471***
WRM	0.0008	0.7348
R^2	0.2023	
R^2 (adjusted)	0.1749	
F	4.450***	
Number	242	

a. The dependent variable is labour productivity.
For explanation of terms, see Table 1.

+ = Significant at 15% level
* = significant at 10% level
** = significant at 5% level
*** = significant at 1% level.

Table 3. Relative importance of the individual explanatory variables in the model used to explain low labour productivity in yam production in Nigeria.

Explanatory variable[a]	Standardized estimate	Rank
FSIZE	0.3087	1
CLSHH	0.1604	2
HSACI	0.1381	3
FEXPHH	0.1366	4
ALABAV	0.0967	5
WRM	0.0935	6
AGEHH	0.0837	7
GHI	0.0607	8
SEXHH	0.0508	9

a. For explanation of terms see Table 1.

Table 4. Relative contribution of the five statistically significant explanatory variables to *R* in model used to explain low labour productivity in yam production in Nigeria.

Step	Variable entered[a]	Partial R^2[b]	Cummulative	F[c]	$P > F$
1	FSIZE	0.1191	0.1191	22.45	0.0001
2	CLSHH	0.0320	0.1511	6.216	0.0136
2	HSACI	0.0153	0.1664	3.002	0.0850
4	FEXPHH	0.0157	0.1820	3.120	0.0792
5	ALABAV	0.0118	0.1938	2.369	0.1257

a. For explanation of terms, see Table 1.

b. Contribution to total R^2.

c. $F = T^2$