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**WELFARE TRANSITIONS AND ITS CORRELATES AMONG COCOA
FARMING HOUSEHOLDS IN NIGERIA: AN APPLICATION OF ORDERED
PROBIT APPROACH**

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Abstract

This study determined the correlates of welfare using panel data collected in heavy and light cocoa seasons through multistage sampling techniques from 366 cocoa farming households. Data collected were subjected to descriptive and Ordered Probit model of analysis using STATA. Welfare categories were based on the relative poverty line constructed from the mean per capita household expenditure for each season. Results revealed that male-headed households were more among the cocoa farming households, with mean age of 54 ± 12.64 years, household size of 7 ± 3.19 persons, farming experience 28 ± 14.41 years and mean age of the cocoa trees were 30 ± 19.21 years and this shows that the farmers and their cocoa trees are old, there by affecting the productivity and the welfare of the farmers. The ordered probit result corroborates this results because age of household head ($p < 0.5$), gender of household head ($p < 0.1$), age of cocoa ($p < 0.1$), poor access to credit ($p < 0.1$), poor collateral status ($p < 0.01$) and unfavourable government policy ($p < 0.5$) on cocoa production negatively affects welfare of Cocoa Farming Households while literacy ($p < 0.1$), type of land tenure system used on cocoa farm ($p < 0.01$), price stability of produce ($p < 0.01$) and good harvest from plantations ($p < 0.01$) enhanced cocoa farming households' welfare.

Keywords: Welfare transition, seasons, ordered Probit, cocoa farming households, Nigeria

Introduction

Cocoa (*Theobroma cacao*) is a tropical species with a narrower geographical range than coffee. Cocoa trees grow between 20° North and South of the equator, majority of production is concentrated at low elevations below 300m or 1000feet and within 10° North and South of equator (Purseglove, 1968; Ajayi *et al*, 2010; www.icco.org). Cocoa trees yield well under relatively high temperatures, with maximum and minimum mean annual temperatures of 30–32 °C and 18–21 °C, respectively (Lawal and Emaku, 2007). Cocoa is sensitive to soil water deficiency and yields are more affected by rainfall than by any other environmental factor (Lawal and Omonona, 2014). Cocoa is produced mainly in 14 states of the federation and with a total planted area of 640, 000 hectares. The National Cocoa Development Committee (NCDC) made up of the 14 cocoa producing states in the country distributes high yielding cocoa seedlings to farmers, while Cocoa Research Institute of Nigeria (CRIN) contributes in the areas of research needs and development of the crop along the value chain, distributing high yielding, disease resistant and improved varieties to farmers, training of growers in modern agricultural practices as well as in business development skills. Nigeria produces 280, 000 metric tons of cocoa (GAIN-USDA, 2011). The south-western part of Nigeria is regarded as the cocoa belt of the country accounting for 70% of the country's annual production. The Nigerian cocoa year is divided into two harvests, with the main one beginning in October and ending in January; while the light harvesting season usually begins in February and ends in September.

The Cocoa Association of Nigeria projected in September 2012 that the Nigerian cocoa output would rise by 20% to 336, 000MT from 280, 000MT as new farms had started producing but with the incessant rainfall and flooding of the cocoa farms in the year 2012,

there were growing cases of Black pod, a fungal disease that thrives in wet conditions. This adversely affected the yields of cocoa, the prices and the livelihood of CFHs.

The changes in the livelihood of CFHs brought about by change in income and expenditure could lead to changes in their welfare status; which could be a rise or an unchanged situation. These changes are referred to as Transitions in Welfare.

This study sets to find what the determinants of being in the different welfare categories are and the proffers targeted recommendations for each group.

Methodology

This study was carried out in the South Western part of Nigeria. The South Western Nigeria consists of six states which are Oyo, Osun, Ogun, Ondo, Lagos and Ekiti. These states fall under the high and medium cocoa producing categories in Nigeria. One state each was selected at random from the two categories. The states lies within latitude 4°- 14°N and longitude 3° - 14°E and exhibits the typical tropical climate of averagely high temperature and high relative humidity.

A multistage sampling technique was used. Following the list of cocoa producing Local Government Areas (LGAs) by the States' Agricultural Development Programmes (ADP), eight local governments were chosen from the states in the first stage proportionate to number of LGAs producing cocoa per state. In the second stage, five villages were randomly selected from each of the chosen LGA using the ADP list of villages. The last stage involved the random selection of cocoa farmers for interview from the list of cocoa farming households within the villages. This selection was done proportionately to the size of the village population. To give a total of 400 respondents from the study areas. This study made use of two point's data that is data collected during the cocoa on-season/heavy harvest (August-

January) and cocoa off-season/light harvest (February-June). After the first round of data were collected, 381 of the questionnaire were fit for analysis and recording but after the second round of data was collected among the same cocoa farming households that were used in the first round, only 366 of the household were available for the second round either due to migration, fitness of questionnaire for analysis and total disappearance of respondents. 19 respondents were lost due to attrition.

Econometric model

The dependent variable in this study is the welfare categories which is categorical and ordinal with clear ordering. The categories of welfare are defined as Rise in Welfare and No change in Welfare. These were arrived at based on the welfare level of farming household in the heavy cocoa harvest season defined by the mean per capita expenditure of the household at that time and the level of their welfare still based on the mean per capita expenditure of the household in the light cocoa season. A statistical model which is appropriate to explain the ordinal variations of the welfare changes is ordered Probit (Loke, 2013)

The data collected were subjected to both descriptive and ordered Probit analysis.

The dependent variable also known as the outcome variables in Ordered probit model is characterized as follows:

Rise in Welfare: expenditure of cocoa farming household is greater than the relative poverty line constructed based on the mean per capita household expenditure (MPCHHE) of the household in both seasons (those who spent two-third or more of their MPCHHE in both seasons are classified as having Rise in Welfare)

No change in Welfare: expenditure of the cocoa farming household is lower than the relative poverty line constructed based on the mean per capita expenditure of the household in both

seasons (those who spent less than two-thirds of their MPCHHE in both season are classified as having No change in Welfare) (NBS, 2005)

The categories are given the score of 1 and 2 which indicates rise and no change in welfare.

The Ordered Probit is usually justified on the basis of a latent variable; variables are not directly observed but are rather inferred from other variables that are observed. It is written as :

$$y^* = \beta'x + \gamma \dots\dots\dots(1)$$

Where y^* = latent measure of welfare categories coded as 1 and 2; β' is the vector of estimated parameters and x is the vector of explanatory variables; γ is the error term.

y is determined from the model as $y^*=1$ (rise) if $y^* < u_i \dots\dots\dots(2)$

$$y^*=2 \text{ (no change) if } u_i < y^* \dots\dots\dots(3)$$

The maximum likelihood estimates are used to derive the marginal effects of explanatory variables which are derived by differentiation for the respective possibilities. Hence, the marginal effects of factor x on the probability of welfare categories was evaluated in STATA 11.

Results and Discussion

The socio-economic characteristics of the cocoa farming households reveal that majority are male-headed households with only 10.1 percent headed by female respondents. Also the most popular form of educational status attained by most cocoa farmer is the secondary education with 36.3 percent. The mean age of the household head is 54 ± 12.64 years indicating that the farmers are old and getting out of the active working age which may also affect their welfare. The mean household size of the farmers is 7 ± 3.19 persons while the mean year of cocoa farming experience span about 28 ± 14.41 years and the mean age of the cocoa trees are 30 ± 19.21 years; this shows the cocoa trees are old, and may also affect the productivity and the

welfare of the farmers who own them because the productivity of the trees might have dropped not yielding as much as the farmer desires and the income accruing from the farm may not be adequate enough to cater for the household size which the farmer has.

Table 1: Socio-Economic Characteristics of Household Heads

Socio-economic group	Frequency	%
Gender of House Head		
Male	326	89.1
Female	40	10.9
Education		
No formal education	75	19.4
Primary	117	32.0
Secondary	133	36.3
Tertiary	41	11.2
Age of Household Head MEAN=54		
25-35	25	6.8
36-45	89	24.3
46-55	90	24.6
56-65	100	27.3
66-75	52	14.2
>75	10	2.7
Household Size MEAN = 7		
1-5	86	23.5
6-10	229	62.6
11-15	25	6.8
>15	26	7.1
Years of cocoa farming experience MEAN=28		
1-10	45	12.3
11-20	97	26.5
21-30	92	25.1
31-40	66	18.0
41-50	49	13.5
51-60	10	2.7
Age of cocoa MEAN=30		
1-10	65	17.8
11-20	77	21.0
21-30	70	19.1
31-40	50	13.7
41-50	55	15.0
51-60	24	6.5
>60	25	6.8

Source: Field survey data 2013/2014

CORRELATES OF WELFARE TRANSITION

A number of variables were tested for significance as determinants of rise and no change in welfare among cocoa farming households; only ten of the variables were significant for rise in welfare while nine were significant for no change in welfare at different levels of probability. The statistics shows the likelihood ratio of -208.301 and Pseudo R^2 for Ordered Probit of 0.2077 indicates that the model fits well and is significant at 1 percent level of probability.

The positive coefficient estimates as depicted in table 2 shows that literacy ($p < 0.1$), type of land tenure system used on cocoa farm ($p < 0.01$), price stability of produce ($p < 0.01$) and good harvest from plantations ($p < 0.01$) drives/ increases the Rise in welfare among cocoa farming households. While on the other hand, the negative coefficient estimates such as Age of household head ($p < 0.5$), gender of household head ($p < 0.1$), age of cocoa ($p < 0.1$), poor access to credit ($p < 0.1$), poor collateral status ($p < 0.01$) and dominating effects of government policy ($p < 0.5$) on cocoa production negatively affects rise in welfare among CFHs.

Table 2: Marginal Effects estimates after Ordered Probit for Rise in Welfare of Cocoa Farming Households

Variables	dy/dx	Std. Err.	Z
age	-.0024851**	.00121	-2.05
gender*	-.1295149*	.0675	-1.92
hhsize	-.0019267	.00482	-0.40
literacy*	.0569391*	.03155	1.80
eduyear	-.0018522	.00325	-0.57
agecoc	-.0014034*	.00083	-1.69
farmsize	.0008868	.0023	0.38
secocc*	.0452974	.02913	1.55
ssomem*	-.0032357	.03434	-0.09
accesscredit	-.0603606*	.03192	-1.89
landtenure	.082812***	.02637	3.14
pricestability	.0868421***	.02552	3.40
insurance*	.0413205	.03475	1.19
poorcollateral	-.1019139***	.03482	-2.93
goodharvest	.1411922***	.03325	4.25
govtpolicy*	-.0545823**	.02745	-1.99
remittance*	.0406352	.05565	0.73
extension*	.0494274	.03248	1.52
illdeath*	.0154805	.03782	0.41
gdroadtomkt*	-.0375172	.02905	-1.29

Source: computer print out for Ordered Probit ***1%, **5% and *10%

The Determinants of No Change in Welfare status among cocoa farming households in South-western, Nigeria

The variables with negative coefficient estimates: literacy ($p < 0.1$), land tenure ($p < 0.05$), good harvest from plantations ($p < 0.01$) and access to extension services ($p < 0.1$) have shown as the determinants that can help change the welfare status of farming households for the better instead of just remaining stagnant, but variables with positive coefficient estimates like age of household head ($p < 0.1$), gender of household head ($p < 0.1$), poor access to credit ($p < 0.1$), poor collateral ($p < 0.05$) and government policy ($p < 0.1$) has shown as the factors that promote no better changes in welfare among cocoa farming households in South-western, Nigeria

Table 3: Marginal effects estimates after Ordered Probit for No Change in Welfare

Variables	dy/dx	Std. Err.	z
Age	.0015098*	.00081	1.87
gender	.101798*	.0608	1.67
hhsiz	.0011706	.00294	0.40
literacy	-.0306199*	.01652	-1.85
eduyear	.0011253	.00199	0.57
agecoc	.0008526	.00053	1.60
farmsize	-.0005388	.00141	-0.38
secocc	-.0261979	.017	-1.54
assomem	.0019742	.02104	0.09
poorcredit	.0362966*	.02047	1.77
landtenure	-.0318563**	.01383	-2.30
stabprice	-.0152333	.02277	-0.67
insurance	-.0270669	.02456	-1.10
poor collat	.0620986**	.02443	2.54
good harvest	-.066886***	.02303	-2.90
govtpolicy	.0317199*	.01674	1.89
remit	-.0280178	.04229	-0.66
extension	-.0240609*	.01319	-1.82
illdeath	-.009327	.02265	-0.41
gdroadtmar	.0219589	.0171	1.28

Conclusion and Recommendations

There are several correlates of both rise in welfare and no change in welfare categories of welfare among cocoa farming households in south-western, Nigeria. This study therefore recommends that for expected rise in welfare and exit of cocoa farming households from vicious cycle of poverty;

- Newly developed cocoa varieties should be planted to ensure good harvests, disease resistant and climate change tolerance; younger men and women should be encouraged into cocoa farming for better management of the plantations;
- Government should ensure that pro-cocoa farmers policies are enacted in the areas of price stabilization, land tenure system and credit access;
- Government should ensure that farmers can have better access to credit through their social capital;
- Research and extension officers should be mandated to train and give feedback on new technologies to farmers for adoption to improve their productivity.

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