

*Full Length Research Paper*

# **Impact of Olam organisation extension programme on socio-economic life of cocoa farmers in Ondo State, Nigeria**

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**The study was undertaken to assess the impact of Olam organization extension programmes on socio-economic life of cocoa farmers in Ondo state, Nigeria. Data were collected from 60 respondents made up of 30 Olam farmers and 30 non-Olam farmers through the use of structured interview schedule. Multistage random sampling technique was used in selecting respondents. Data were analyzed using mean statistics, standard deviation, t-test, chi-square, performance index and propensity score matching technique. The findings showed that the net income per capital of Olam farmers was significantly different from that of non-Olam farmers with a gain of ₦16, 466.47. Also, the project made some appreciable socio-economic impact on cocoa farmers in the following areas: ease of selling cocoa products; knowledge on cocoa production and marketing; increase in number of farmers with knapsack sprayers and other basic assets. Based on the findings of this study, Olam organization extension programmes have the potential to boost cocoa production in Ondo State. It is therefore recommended that Olam organization should involve more farmers in her programme to compliment the effort of government in cocoa resuscitation programme in Nigeria.**

**Key words:** Impact, programme, Olam, cocoa farmers, Ondo State.

## **INTRODUCTION**

The relevance of cocoa to most developing economies cannot be overemphasized as cocoa is produced by more than fifty developing countries across Asia, Africa and Latin America; all of which are in tropical or semi-tropical areas (Ogunleye and Oladeji, 2007). In Nigeria, cocoa has been the main agricultural stake of Nigeria economy until early 1970's when the crude oil was discovered in the country in commercial quantity. However cocoa has remained a valuable crop and a major foreign exchange earner among agricultural commodity exports of the country. The contribution of the cocoa sub-sector to Nigeria's total agricultural export earnings averaged 70.6% between 1971 and 1975, 89.8% between 1976 and 1980, 84.6% between 1985

and 1987, 76.8% between 1986 and 1990, and 53.3% between 1992 and 1996 (Agboola, 2005). Although these figures indicated a declining trend, a lot of factors have been attributed to the decline in cocoa production. These include: over-dependence on oil exports, the problem of depleted soil fertility, poor control of pests and diseases, use of poor planting materials, poor maintenances of cocoa farms, lack of credit facility to support production practices, defective methods of harvesting and poor handling of post harvest processes and inefficient agricultural extension services.

Recent years have seen a renewed commitment by a number of West African governments and their development partners to promoting a healthy cocoa sector based on the recognition of the significant role cocoa can play in the fight against poverty and in promoting rural economic growth. The Federal Government of Nigeria has embarked on various resuscitation strategies which now appear to be yielding

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desired fruits. According to Tunde (2007), the inability of the government to cope with the development of agriculture in the country alone, has led to her deliberate efforts of encouraging private individuals and organizations to participate maximally in agricultural development process. Among these are the Olam Nigeria Limited (ONL), Saro Agro Allied Limited and Sustainable Tree Crops Programme (STCP) - Nigeria. However, this study focused on Olam Nigeria Ltd (ONL).

Olam, a private, commercial and multi-product company was established in 1989 by the Kewalram Chanrai Group (KCG), with its headquarters in Singapore and principal office in Lagos, Its regional offices are found in Kano and Akure. It provides what could be called specialized extension services and uses specific agricultural products (such as cocoa, coffee, cashew, sheanuts, sesame, rice and teak wood) as industrial materials. Its cocoa business began in Nigeria in 1992 and has participated in all aspects of cocoa business like production, marketing and processing, in the cocoa-producing states such as Ondo, Osun, Ekiti, Edo, Ogun, Cross River, Taraba and Adamawa (Olam, 2007). Available records revealed that ONL had implemented model farming concept under the nucleus estate initiatives; an out grower's programme, by reviving old farm settlements and model farms in all cocoa growing states. Besides, it has launched training and awareness programmes, covering about 6,000 farmers and capacity buildings across the cocoa producing states. The farmers' plots are taken as demonstration plots on which the practical trainings are done in demonstration farms being managed in Ondo, Osun and Ekiti states (Akinngbe, 2008).

From the foregoing and after years of existence of the programme, the activities of this organization needed to be evaluated to confirm the acclaimed performances and impact on socio-economic life of the cocoa farmers. According to Horton et al. (1993), evaluation is the act of judging, appraising or determining the value or quality of a programme, whether it is on-going or completed. It is also a process of providing reliable, valid, relevant and useful information to decision makers about the operation and effects of social programme. Impact evaluation assesses changes in the well-being of individuals, households, communities or firms. It also deals with the effects of the intervention programmes outputs on the target beneficiaries. An evaluation model called targeting outcomes of programme (TOP) presented by Bennett and Rockwell (1995), as an integrated approach to planning and evaluation was used in this study. TOP uses a single model to target outcomes, track the extent they have achieved and evaluate programme performance towards achieving them. It measured impacts by collecting information on people reaction, changes in knowledge, attitude, behaviours and ultimately the social, economic and environmental condition, which are targets of the social impact

approach used in this study.

### **Purpose of the study**

The overall purpose of this study was to assess the impact of Olam Organisation extension programme on socio-economic life of cocoa farmers in Ondo State. Specifically, the study was designed to:

- 1) Describe the socio-economic characteristics of the respondents;
- 2) Assess the performance of the Olam organization with respect to farm rehabilitation and distribution of inputs; and
- 3) Determine the impact of the programme on socio-economic life of the cocoa farmers.

### **Hypotheses**

- (1) There is no significant difference between the income of Olam farmers and non-Olam farmers.
- (2) There is no significant difference between the farm input and basic assets possessed by Olam farmers and non-Olam farmers.

### **THEORETICAL FRAMEWORK**

Impact studies aim to measure not only the reactions of the beneficiaries and the outputs generated by them, but also the proportion of any discernible change attributable to the project. In any project, and throughout the project cycle, there is need not only for routine collection of data through monitoring or continuous assessment, but also for evaluation and assessment of impact. The nature and purpose of a study determines the type of analysis that can be employed. Impact evaluation of this nature will rely on the construction of a counterfactual – an attempt to estimate what a given outcome would have been for the beneficiaries of a programme if the programme had not been implemented; impact evaluations thus address causality and allow result to be attributed to specific interventions (Rawlings and Schady, 2002). Normally, if the comparison group is correctly identified, the difference between the treatment and comparison groups isolates the effect of the intervention (Chase, 2002).

While calculation of the rates means, frequency distribution and percentages may be adequate for some exploratory studies, more detailed and higher level analysis will be required for case studies and sample surveys especially those that deal with quantitative data (Eboh, 1998) like impact analysis. For analyzing dependence, multiple regressions are used. For analyzing relationships whose dependent variables assume a discrete or dichotomous value, qualitative

choice models are used. In such relationships, the probability of an event occurring is a function of a set of non-stochastic explanatory variables and a vector of unknown parameter. Following Amemiya (1981), the general form of the univariate dichotomous choice model can be expressed as:

$$P_i = P_i (Y_i = 1) = G (X_i \Phi) \quad (i = 1, 2, \dots, n) \dots \quad (1)$$

The Equation 1 states that the probability of an outcome,  $P_i (Y_i = 1)$  is a function of the vector of explanatory variables  $X_i$  and unknown parameter vector  $\Phi$ . Because the functional form of  $G$  is unknown, practical applications of the model are not feasible (Amemiya, 1981). Then, an explicit functional specification of  $G$  is necessary. Three functional relationships often specified are the linear probability, probit and logit models. The dichotomous dependent variable model that will be used in the study is logit (the standard normal distribution function).

The model is specified in the general form thus:

$$\text{Log } P/1-P = \text{Log } O_i = a_i + \beta_1 X_{i1} + \beta_2 X_{i2} + \beta_3 X_{i3} + \dots + \beta_n X_{in} \quad (2)$$

Where  $\text{Log } P/1-p$  =  $\text{Log}$  of odds of participating in the intervention programme  
 $a$  = constant  
 $\beta$  = coefficients and  
 $X_n$  = socioeconomic characteristics of the respondents.

In most impact estimation, the problem is the issue of taking care of observables and unobservable factors that influence impact. Ordinarily, an OLS regression of the outcome indicator (for example per capita) on participation and other explanatory variables used in targeting participants can be determine by the effect of participation. However, the unobserved variables that influences participation conditional on some observables may also be influencing expenditure per capita, the outcome indicator, thereby making it difficult to isolate the effect of benefiting from the programme. In order words, the error term in participation equation may be correlated with the error term in expenditure/capita equation for example in

$$P_i + a + eZ_i + v_i \dots \quad (1) \text{ and}$$

$$E/C = a + cP_i + cxi + ei \dots \quad (2),$$

$v_i$  may be correlated with  $e_i$ .

Some methods, which can deal with these problems, have been identified. Hence, in rigorous estimation of impact, the methods normally used are randomization, propensity score matching, instrumental variables and double differences (Ravallion, 2001; Rawlings and Schady, 2002). Randomization assigns "treatment" through some sort of balloting or lottery allowing

researcher to construct treatment and control group. In order words, the selection into treatment and comparison groups is random in some well-defined set of people (Ravallion, 2001). Randomization is immensely appealing because if the sample is large enough, this method controls for all differences, observable and unobservable, between the treatment and control group; simple differences in changes in outcomes, can then be credibly interpreted as the impact of the treatment on the treatment on the treated (Rawlings and Schady, 2002).

Propensity score matching in its simplest form involves predicting the probability of treatment on the basis of observed covariates for both the treatment and the control groups' samples (Rawlings and Schady, 2002). In propensity score matching, one picks an ideal comparison group from a larger survey then matches the comparison group to the treatment group on the basis of set of observed characteristics on the predicted probability of participation given observed characteristics (propensity score). The observed characteristics are those used in selecting individuals but not affected by programme participation. Propensity score matching is a better method of dealing with differences in observables. However, a few tests that have been done suggest that with good data, propensity score matching can greatly reduce the overall bias and outperforms regression-based methods (Ravallion, 2001).

Instrumental variables (IV) are variables that matter to participation but not to the outcome given participation (Ravallion, 2001). Instrumental variable are correlated with the probability of treatment but correlated with unobserved determinant of outcomes. IVs estimates are predicted entirely on the validity of the instrument and unobserved determinant of treatment effects can result in serious biases. The instrumental variables are first used to predict programme participation, and then one sees how the outcome indicator varies with the predicted value conditional on other characteristics.

In double difference one compares treatment and comparison group (first differences) before and after a programme (second difference) (Ravallion, 2001). The method can be descriptive as a basis for assessing impact if there is no control group and only the treatment group is compared before and after interaction. Exploratory factor analysis will also be used for grouping constraining factors for informed policy recommendation. The step in propensity score matching for the programme included:

1) Pooling of two groups of individuals (that is, the treatment and comparison group as already indicated). After the pooling, a logit model of participation as a function of some socio-economic variables was estimated. The variables selected were those that were used in selecting participants and those that were not affected by participation. The socio-economic variables included were age, household size, number of years of schooling, gender. The equation was put thus:

$$P_i = \log \frac{P_i}{1 - P_i} = \log O_i = a_i + b_1 \text{age} + b_2 \text{housesize} + b_3 \text{school} + b_4 \text{gender}$$

- 2) From the logit regression, a predicted value of the probability of participation was created, these are propensity scores. Each individual had a propensity score. Non-participants with low propensity scores that were outside the range for participants were excluded.
- 3) For each individual participant, a non-participant that had the closest propensity score, as measured by the absolute difference in scores, referred to as nearest neighbour was obtained. For more precise estimate, the nearest five neighbours were used.
- 4) The mean value of the outcome indicators (per capital expenditures, income share spent on food, and income) for the nearest five neighbour was calculated. The differences between the mean and actual value for the participants (beneficiaries) was the estimate of the gain due to the programme.
- 5) The mean of individual gains was calculated to obtain the average overall gain.

## METHODOLOGY

### Study area

The study was carried out in Ondo State. The state lies between latitudes  $5^{\circ}45'$  and  $7^{\circ}52'$  north of the equator and longitudes  $4^{\circ}20'$  and  $6^{\circ}5'$  east of Greenwich Meridian. The State is bounded in the north by Ekiti and Kogi States; in the east by Edo State; in the west by Osun and Ogun States; and in the south by the Atlantic Ocean. Its land area is about 14,793 square kilometers (<http://www.ondostategovernment.com>). Ondo State has a population of 3,460,877 persons made up of 1,745,057 male and 1,715,820 female (NPC, 2007). The climate of the area is highly favourable for the agrarian activities of her teeming population who grow crops such as cocoa, kola nut, palm tree, rubber and arable crops like maize, yam and cassava. The annual rainfall is between 1000 and 1500 mm with a high daily temperature of about  $30^{\circ}\text{C}$  and relatively high humidity.

### Population and sampling procedure

All cocoa farmers in the Ondo State constituted the population for the study. Multistage sampling technique was employed in the selection of the cocoa farmers for the study. Firstly, the farmers in the state were grouped into 2; Olam farmers and non-Olam farmers. Olam farmers are those that participated in Olam Nigeria limited extension programme, while the other cocoa farmers in the state constituted the the second group that were not used by Olam, hence were regarded as non-Olam farmers. The second stage involved the selection of the community that produced cocoa and at the same time were used by Olam as a contact community. From the list of 70 communities used by Olam organization in Ondo State, 10 cocoa producing communities (Aponmu, Irese, Laagba, Bagbe, Oboto, Igbo-Ore, Igodo, Arogbo, Ago paanu and Agogo) were randomly selected. The third stage involved the selection of the cocoa farmers. A list of Olam's model farmers was obtained from the management of Olam organization. From the list, 3 farmers each were selected through simple random sampling

technique, from the 10 selected communities, making a total of 30 Olam farmers (OFs). The identification of OFs was done with the help of Olam staff.

Also from the same 10 communities, 3 Non-Olam farmers (NOFs) were randomly selected, making a total of 30 NOFs, this category served as a pipeline comparison (control) group to estimate the impact of the programme on the participant and non-participant farmers. Thus, the total sample size for this study was 60 cocoa farmers in the state.

### Instrument for data collection

Data for the study were collected from the respondents through the use of structured interview schedule. The interview schedule contains relevant questions based on each of the objectives of the study. Data on Olam extension programme were collected from the organization zonal office in Akure. The information needed was retrieved from the organization's publication and report. Since majority of the farmers were not used to keeping records of events, their responses were purely on memory-recall. However, Casley and Lusy (1982) and Ladele (1991) maintained that any memory-recall data, collected as satisfactory as possible, are valid for use in social research. Face validity was carried out to ensure that the instrument collects the data it is meant to collect. This was done by lecturers in the Department of Agricultural Extension, University of Nigeria, Nsukka before field administration.

### Measurement of variables and data analysis

To assess the performance of the organization's programme, a performance index model, used by Ajieh and Ajayi, 2007 was used.

The model is given as: 
$$I_A = \frac{Q_A}{Q_o} \times 100$$

Where:  $I_A$  = Availability index

$Q_A$  = Quantity actually available

$Q_o$  = Optimum quantity at crucial period

When  $I_A \geq 0.50$  or  $\geq 50.0\%$  shows that the performance is on the average or high.

To determine the impact of Olam organization programme on socio-economic life of the farmers, 'before' and 'after' comparison, recommended by Gittinger (1982) as one of the approaches used to isolate the changes arising from an intervention, was used to compare farmers well being before inception of the Olam and afterwards. He has recommended the 'with' and 'without' comparison as the more appropriate tool for this purpose because of its ability to take care of the changes inherent in a project and those identified by Maitima et al. (2007) as arising out of external factors that are not related to the project. To determine the impact of Olam organization on income of cocoa farmers, propensity scores matching was used to determine the differences in their net income.

### Data analysis

Data were analyzed using frequency, percentage, mean, t-test and Chi-square statistics. Statistical Package for the Social Science (version 11) and STATA were the software packages used for the analysis.

**Table 1.** Distribution of respondents according to personal and socio-economic characteristics.

Variable	Olam farmers		Non Olam farmers		T-test value
	Mean $\bar{x}$	Standard deviation	Mean $\bar{x}$	Standard deviation	
Age (years)	58.03	12.57	57.03	12.41	0.31
No of years spent in school	6.63	4.64	8.60	3.79	-1.79
Household size (number)	5.83	3.01	5.30	1.91	0.81
Age of cocoa farm (years)	36.10	13.56	32.83	11.70	0.99
Farming experience (years)	36.57	10.49	30.37	11.28	2.20*
Total farm size in 2007 (hectare)	7.67	3.57	6.93	11.10	0.34
Cocoa output in 2007 (bags)	8.97	190.96	7.20	3.59	1.54
Estimated income from the sale of cocoa product in 2007 (naira)	219556.00	172246.08	101632.00	59174.19	3.54*

\* Significant ( $P \leq 0.05$ ).

## RESULTS AND DISCUSSION

### Socio-economic characteristics of the respondents

The result of descriptive statistics of the socio-economic variables used in the analysis of propensity score matching technique is presented in Table 1. Some of the variables were included in logistic regression of the estimation of the propensity score. The average age of the respondents for OFs and NOFs were 58 and 57 years, respectively. The results further show that there was no significant different ( $t = 0.31$ ;  $p \leq 0.05$ ) between their ages. The average number of years spent by OFs and NOFs in school were 6 and 9 years, respectively. This shows that there was no significant different ( $t = -1.79$ ;  $p \leq 0.05$ ) between the number of years spent in school for both OFs and NOFs. The average household sizes were 6 and 5 persons and the mean ages of cocoa plantation were 36 years and 32 years, respectively. Also, there was no significant different ( $t = 0.81$  and  $0.99$ ;  $p \leq 0.05$ ) between household size and age of cocoa farms of both OFs and NOFs, respectively. The average farming experiences were 36 and 30 years showing a significant different ( $t = 2.20$ ;  $p \leq 0.05$ ). The total farm size in 2007 for both OFs and NOFs was put at 7.67 and 6.93 ha respectively, showing no significant difference ( $t = 0.34$ ;  $p \leq 0.05$ ), while the total cocoa output was about 9 bags for OFs and 7 bags for NOFs. There was also no significant difference ( $t = 1.54$ ;  $p \leq 0.05$ ) between the total farm size of OFs and NOFs. The average income of the cocoa farmers were ₦219556.00 and ₦101632.00 for OFs and NOFs respectively. There was a significant difference in the estimated mean income from the sale of cocoa products for both OFs and NOFs. The implication of these findings is that, the project made an appreciable impact on annual income of the OFs.

### Performance of the ONLs as regards rehabilitation of cocoa farms and distribution of inputs to cocoa farmers

A performance index model was used in assessing the

performance of the ONL as regards rehabilitation of farms and distribution of inputs to farmers in Ondo State. Like every organization, Olam set a target of activities in 2007 for rehabilitation of farms and distribution of inputs. Available record shows that, Olam proposed to achieve the following activities in 2007. These include; regular visit to cocoa farmers for dissemination of innovation on cocoa, regular training programmes on pre-planting, planting and post planting operations of cocoa, rehabilitation of cocoa farms and distribution of cocoa hybrid seedlings.

At the end of 2007, results in Table 2 show the target level of the organization, its achievement level and performance index. At the end of 2007, Olam revive 70 old farm settlements and model farms out of the proposed 70 old farms. The index score was 100.0%. This implies that, Olam performance as regards reviving of old farm settlements, model farms was high. Seventy (70) demonstration plots were targeted and achieved with an index score of 100.0%. This was also high. Olam proposed to train 1750 cocoa farmers. As at 2007, 1355 farmers were trained on improved agronomic practices (for example nursery preparation and maintenance, transplanting, weeding, chemical application, harvesting, fermentation and drying). Hence, the index score was 76.3%. This implies that the performance of the organization as regard training was high. About 70 farmers were given agrochemicals at a subsidized rate out of the proposed 80 farmers targeted. This represents an index score of 85.7%.

In 2007, 2050 hybrid cocoa seedlings were distributed free to farmers as against 2000 targeted. This represents an index score of 102%. This implies that the performance of ONLs with respect to provision of cocoa seedlings distribution was high. From the foregoing, the following extension activities/programmes of Olam to cocoa farmers were high. These include training programmes on pre-planting, planting and post planting operations of cocoa, rehabilitation of old cocoa farms and distribution of cocoa hybrid seedlings free to their target farmers. Hence, Olam organization extension programmes

**Table 2.** Performance indices of ONL as regards farm rehabilitation and distribution of inputs.

Activities	Target level (No)	Achievement level (No)	Performance index (%)
Reviving of old farm settlements and model farms (No / ha)	70	70	100.0*
Training of farmers on improved agronomic practices (for example nursery preparation and maintenance, transplanting, weeding, chemical application, harvesting, fermentation, drying etc)	1750	1355	76.3*
Demonstration plots (No)	70	60	100.0*
Distribution of agrochemicals at a subsidized rate	70	60	85.7*
Provision of hybrid seedlings to farmers (No)	2000	2050	102.0*

\*Above average.

have the potential to boost cocoa production in Ondo State thereby contributing to reduction in the poverty of the state.

#### **Impact of Olam organization extension programme on the net-income of the cocoa farmers**

The impact of the organization's programme on net-income of the cocoa farmers was ascertained using propensity score matching technique (steps indicated in methodology). The logit result was significant at the Chi-square value of 9.67 at 0.05 level of probability (Table 3). Thus, at least one variable significantly influence participation in the programme. The analysis result in Table 3 shows that, farming experience was significant (2.57;  $P \leq 0.010$ ) at 0.05 level of significance.

The detailed result in Table 4 shows the average overall gain in net income per capita (total income (Bags of cocoa produced x selling price) / household size) due to Olam's intervention after the nearest neighbour matches of propensity score obtained after the logit analysis. The result shows that, the average gain in net income per capital was ₦16, 466.47. The t-value of 2.153 for the test of difference between the net income per

capita of the beneficiary (OFs) and non beneficiary (NOFs) with close propensity score from which the ATT was obtained, was significant at 0.05 level of probability. This shows that, the net income per capita of OFs was significantly different from that of NOFs with a gain of ₦16, 466.47. Thus, the programme of Olam had positively and significantly impacted on the Olam participation farmers in Ondo State.

#### **Impact of the programme on ease of accessibility to modern farm inputs**

Entries in Table 5 show that, majority (70.0 and 66.7%) of the Olam farmers (OFs) and Non Olam farmers (NOFs) do not have access to modern farm inputs (like herbicides and insecticides) in the years 2003. However, about 80% and 73% have easy access to these modern farm inputs. Further analysis show that there was no significant difference ( $\chi^2 = 5.00$ ;  $p \leq 0.05$ ) between the degree of accessibility to modern farm inputs by OFs before (2003) and after benefiting in Olam cocoa programme in 2007. Also, there was no significant difference ( $\chi^2 = 2.13$ ;  $p \leq 0.05$ ) between the degree of accessibility to modern farm inputs by NOFs between the year 2003 and 2007. The

data further show that there was no significant difference ( $\chi^2 = 0.59$ ;  $p \leq 0.05$ ) between the degree of accessibility to farm inputs by the OFs and NOFs in 2007.

#### **Impact of the programme on ease of selling cocoa products**

Entries in Table 5 show that, 86.7 and 70.0% of the OFs and NOFs find it easy in selling their cocoa products in the years 2003, respectively. However, about 90.0 and 93.3% find it easy in selling their cocoa products in 2007, respectively. Further analysis show that there was a significant difference ( $\chi^2 = 9.487$ ;  $p \leq 0.05$ ) between ease of selling cocoa products by OFs before (2003) and after benefiting in Olam cocoa programme in 2007. There was no significant difference ( $\chi^2 = 0.918$ ;  $p \leq 0.05$ ) between the ease of selling cocoa products by NOFs between 2003 and 2007. There was a significant difference ( $\chi^2 = 3.832$ ;  $p \leq 0.05$ ) between ease of selling cocoa products by OFs and NOFs in 2007. The observed change in ease of selling cocoa products is an indication of positive impact of the Olam farmers on the cocoa farmers.

**Table 3.** Logistic regression of the estimation of the propensity score.

Variable	Coefficient	Standard error	z	P> z	(95% Coefficient interval)	
Age	-0.0526131	0.0380617	-1.38	0.167	-0.1272127	0.0219866
Farming experience	0.1126725	0.0437844	2.57	0.010	0.0268566	0.1984884
Source labour	-0.0267601	0.8432545	-0.03	0.975	-1.679509	1.625988
Source of fund	0.7992571	0.8523841	0.94	0.348	-0.8713851	2.469899
Family size	-1.041005	1.604543	-0.65	0.516	-4.185851	2.103841

Log likelihood = -36.754763; Number of obs = 60; LR chi2 (4) = 9.67; Prob > chi2 = 0.0464; Pseudo R2 = 0.1162.

**Table 4.** Propensity score matching technique (PSMT) showing the overall gain in income per capital of OFs .

No of treatment	Number of control	ATT (Net income per capital)	Standard error	t-value
30	21	16466.476	7649.694	2.153*

\*Significant ( $P \leq 0.05$ ); the numbers of treated and control refers to actual nearest neighbour matches; ATT refers to average treatment effect on the treated using nearest neighbour matches.

### Impact of the programme on the knowledge of cocoa production and marketing

Entries in Table 5 show that, 50.0 and 46.7% of the OFs and NOFs have fair knowledge on cocoa production and marketing in the years 2003, respectively. However, about 73 and 53% have adequate knowledge on cocoa production and marketing in 2007, respectively. Further analysis show that there was a significant difference ( $\chi^2 = 20.50$ ;  $p \leq 0.05$ ) between the knowledge level by OFs in 2003 and after benefiting in Olam cocoa programme in 2007. Also, there was a significant difference ( $\chi^2 = 12.61$ ;  $p \leq 0.05$ ) between the knowledge level by NOFs between the year 2003 and 2007. The result of the findings further reveal that there was a significant difference ( $\chi^2 = 13.14$ ;  $p \leq 0.05$ ) between the knowledge level of the OFs and NOFs in 2007. A greater proportion of OFs had adequate knowledge about cocoa production and marketing. It is possible to conclude that the Olam programme had improved the knowledge of OFs through regular training.

### Impact of the programme on perceived standard of living

Data in Table 5 show that, 63.4 and 73.3% of the OFs and NOFs rated their standard of living as good as others in the years 2003, respectively. However, about 37 and 43% of OFs and NOFs rated their standard of living as better than others in 2007, respectively. Further analysis show that there was a significant difference ( $\chi^2 = 24.09$ ;  $p \leq 0.05$ ) between the rating of standard of living by OFs before (2003) and after becoming a project farmers in 2007. Also, there was a significant difference ( $\chi^2 = 18.938$ ;  $p \leq 0.05$ ) between the rating of standard of living by NOFs between the year 2003 and 2007. The result of the findings further reveal that, there was no

significant difference ( $\chi^2 = 20.411$ ;  $p \leq 0.05$ ) between the standard of living of the OFs and NOFs in 2007. It could be deduced from these findings that the OFs had a positive change in the perception of their standard of living after becoming project farmers. It is concluded that the standard of living of the OFs and NOFs due to the existence of Olam programme are not the same.

### Impact of the programme on basic assets of the cocoa farmers

Data in Table 6 show that, 60.0% of OFs and NOFs had knapsack sprayer in year 2003, respectively. On the other hand, about 80 and 67% of OFs and NOFs had knapsack sprayer, respectively in 2007. This implies that, the proportion of OFs and NOFs with knapsack sprayers increased over the year. Further analysis show that there was a significant difference ( $\chi^2 = 11.250$ ;  $p \leq 0.05$ ) between the number of OFs with knapsack sprayer before (2003) and after becoming a project farmers in 2007. There was no significant difference ( $\chi^2 = 2.500$ ;  $p \leq 0.05$ ) between the number of NOFs with knapsack sprayer between the year 2003 and 2007. Meanwhile, there was significant difference ( $\chi^2 = 3.750$ ;  $p \leq 0.05$ ) between OFs and NOFs with knapsack sprayer in 2007. The implication of these findings is that, more of OFs acquired knapsack sprayer after becoming a project farmer. This could be due to the importance of this tool for spraying cocoa farms for pest, diseases and weeds. The observed significances confirm the benefits of the project to the farmers.

Data in Table 6 show that, 60.0 and 63.3% of the OFs and NOFs had fan in year 2003, respectively. About 83 and 63% of OFs and NOFs had fan in 2007, respectively. This shows that the number of cocoa farmers that purchased fan increase in 2007. Further analysis show

**Table 5.** Chi-square analysis of the impact of the Olam extension programme on socio-economic life of cocoa farmers.

Socio-economic variable	Olam farmer (OFs) n=30			Non-Olam farmers (NOFs) n = 30			OFs	NOFs	X <sup>2</sup> -value
	2003	2007	X <sup>2</sup> -value	2003	2007	X <sup>2</sup> value	2007	2007	
Degree of accessibility to modern farm inputs									
Not access at all	70.0	13.3	5.000	66.7	26.7	2.131	13.3	26.7	0.597
Easy accessibility	30.0	80.0		33.3	73.3		80.0	73.3	
Very easy accessibility	-	6.7		-	-		6.7	-	
Ease of selling cocoa products									
Very easy	86.7	90.0	9.487*	70.0	93.3	0.918	90.0	93.3	3.832*
Difficult	10.0	10.0		30.0	6.7		10.0	6.7	
Very difficult	3.3	-		-	-		-	-	
Knowledge on cocoa production and marketing									
Poor knowledge	16.7	10.0	20.509*	30.0	30.0	22.65*	10.0	30.0	13.146*
Fair knowledge	50.0	16.7		46.7	16.7		16.7	16.7	
Adequate knowledge	33.3	73.3		23.3	53.3		73.3	53.3	
Rating of standard of living as compared with others in the community									
Worse than others	-	-		3.3	-		-	-	
As good as others	63.4	33.3	24.098*	73.3	50.0	18.938*	33.3	50.0	20.411*
Better than others	23.3	56.7		10.0	36.7		56.7	36.7	
Don't know	13.3	10.0		13.3	13.3		10.0	13.3	

\*significant.

that there was a significant difference ( $\chi^2 = 9.00$ ;  $p \leq 0.05$ ) between the number of fan owned by OFs before and after becoming a project farmers in 2007. Also, there was a significant difference ( $\chi^2 = 6.11$ ;  $p \leq 0.05$ ) between the number of fan owned by NOFs between the year 2003 and 2007. The result of the findings further reveal that there was no significant difference ( $\chi^2 = 0.02$ ;  $p \leq 0.05$ ) between the number of fan owned by OFs and NOFs in 2007. It is concluded that the number of OFs and NOFs that purchased fan are the same.

Data in Table 6 show that, majority (73.3%) of

the OFs and NOFs had radio in year 2003, respectively. About 80 and 77% of OFs and NOFs had radio in 2007, respectively. This implies that, the proportion of farmers with radio increase over the year for both OFs and NOFs respectively.

Further analysis show that there was a significant difference ( $\chi^2 = 20.625$ ;  $p \leq 0.05$ ) between the number of OFs with radio before and after becoming a project farmers in 2007. On the other hand, there was a significant difference ( $\chi^2 = 25.109$ ;  $p \leq 0.05$ ) between the number of NOFs with radio between the year 2003 and 2007. The

possible reason for increase in the number of people with radio among the NOFs could be as a result of significant roles radio played in disseminating information to the farmers. Significant difference ( $\chi^2 = 0.23$ ;  $p \leq 0.05$ ) existed between the number of OFs and NOFs with radio in 2007. Hence, as a result of the influence of the programme, a greater proportion of OFs had radio.

Data in Table 6 show that, 53.3% of OFs and 36.7% of the NOFs had television in the year 2003. On the other hand, about 56.7 and 58.6% of



**Table 6.** Chi-square analysis of the impact of the Olam extension programme on basic assets of cocoa farmers.

Basic assets of cocoa farmers	Olam farmer (OFs) n=30			Non-Olam farmers (NOFs) n = 30			OFs	NOFs	X <sup>2</sup> -value
	2003	2007	X <sup>2</sup> -value	2003	2007	X <sup>2</sup> value	2007	2007	
Knapsack sprayers									
Yes	60.0	80.0	11.250*	60.0	66.7	2.500	80.0	66.7	3.750*
No	40.0	20.0		40.0	33.3		20.0	33.3	
Fan									
Yes	60.0	83.3	9.000*	56.7	63.3	6.111*	83.3	63.3	0.029
No	40.0	16.7		43.3	36.7		16.7	36.7	
Radio									
Yes	73.3	80.0	20.625*	73.3	76.3	25.109*	80.0	76.3	15.093*
No	26.7	20.0		26.7	23.3		20.0	23.3	
Television									
Yes	53.3	56.7	13.274*	36.7	58.6	2.876	56.7	58.6	1.094
No	46.7	43.3		63.3	41.4		43.3	41.4	
Refrigerator									
Yes	30.0	43.3	16.813*	6.7	13.8	2.368	43.3	13.8	0.738
No	70.0	56.7		93.3	86.2		56.7	86.2	
Bicycle									
Yes	53.3	46.7	11.059*	50.0	36.7	1.292	46.7	36.7	0.741
No	46.7	53.3		50.0	63.3		53.3	63.3	
Motorcycle									
Yes	36.7	65.5	5.058*	20.0	43.3	4.887*	65.5	43.3	0.012
No	63.3	34.5		80.0	56.7		34.5	56.7	
Car									
Yes	23.3	30.0	7.462*	3.3	16.7	5.172*	30.0	16.7	0.286
No	76.7	70.0		96.7	83.3		70.0	83.3	
Wall clock									
Yes	86.7	96.7	6.724*	90.0	96.7	9.310	96.7	96.7	30.000*
No	13.3	3.3		10.0	3.3		3.3	3.3	

\*significant.

OFs and NOFs had television, respectively in 2007. This implies that, the proportion of OFs with television increased more than the proportion of NOFs with television. Further analysis show that there was a significant difference ( $\chi^2 = 13.27$ ;  $p \leq 0.05$ ) between the number of OFs with television before and after becoming a project farmers in 2007. On the other hand, there was no significant difference ( $\chi^2 = 2.87$ ;  $p \leq 0.05$ ) between the number of NOFs with television between the year 2003 and 2007. Meanwhile, there was no significant difference ( $\chi^2 = 1.09$ ;  $p \leq 0.05$ ) between the number of OFs and NOFs with television in 2007.

Data in Table 6 show that, 30.0% of OFs and 6.7% of the NOFs had refrigerator in the year 2003. On the other hand, about 43.3 and 13.8% of OFs and NOFs had refrigerator, respectively in 2007. This implies that, the proportion of OFs with refrigerator increased more than that of NOFs. Further analysis show that there was a significant difference ( $\chi^2 = 16.81$ ;  $p \leq 0.05$ ) between the number of OFs with refrigerator before and after becoming a project farmers in 2007. On the other hand, there was no significant difference ( $\chi^2 = 1.29$ ;  $p \leq 0.05$ ) between the number of NOFs with refrigerator between the year 2003 and 2007. Meanwhile, there was no significant difference ( $\chi^2 = 0.74$ ;  $p \leq 0.05$ ) between the number of OFs and NOFs with refrigerator in 2007. Hence, the numbers of people that purchase refrigerator during the programme intervention are the same.

Data in Table 6 show that, 53.3% of OFs and 50.0% of the NOFs had bicycle in year 2003. On the other hand, about 46.7 and 36.7% of OFs and NOFs had bicycle, respectively in 2007. This implies that, the proportion of OFs and NOFs with bicycle decreased over the year. Further analysis show that there was a significant difference ( $\chi^2 = 11.05$ ;  $p \leq 0.05$ ) between the number of OFs with bicycle before and after becoming a project farmers in 2007. On the other hand, there was no significant difference ( $\chi^2 = 1.29$ ;  $p \leq 0.05$ ) between the number of NOFs with bicycle between the year 2003 and 2007. Meanwhile, there was no significant difference ( $\chi^2 = 0.74$ ;  $p \leq 0.05$ ) between the number of OFs and NOFs with bicycle in 2007.

Data in Table 6 show that, 36.7% of OFs and 20.0% of the NOFs had motorcycle in year 2003. On the other hand, about 65.5 and 43.3% of OFs and NOFs had motorcycle, respectively in 2007. This implies that, the proportion of OFs and NOFs with motorcycle increased over the year. Further analysis show that there was a significant difference ( $\chi^2 = 5.05$ ;  $p \leq 0.05$ ) between the number of OFs with motorcycle before and after becoming a project farmers in 2007. On the other hand, there was a significant difference ( $\chi^2 = 4.88$ ;  $p \leq 0.05$ ) between the number of NOFs with motorcycle between the year 2003 and 2007. Meanwhile, there was no significant difference ( $\chi^2 = 0.01$ ;  $p \leq 0.05$ ) between the number of OFs and NOFs with motorcycle in 2007.

Data in Table 6 show that, 3.3 of OFs and 3.3% of the

NOFs had car in year 2003. On the other hand, about 3% of OFs and NOFs had car, respectively in 2007. This implies that, the proportions of OFs and NOFs with car are the same over the year. Further analysis show that there was a significant difference ( $\chi^2 = 30.00$ ;  $p \leq 0.05$ ) between the number of OFs with car before and after becoming a project farmers in 2007. On the other hand, there was a significant difference ( $\chi^2 = 30.0$ ;  $p \leq 0.05$ ) between the number of NOFs with car between the year 2003 and 2007. Meanwhile, there was no significant difference ( $\chi^2 = 0.03$ ;  $p \leq 0.05$ ) between the number of OFs and NOFs with car in 2007.

Data in Table 6 show that, 86.7% of OFs and 90.0% of the NOFs had wall clock in year 2003. On the other hand, about 97% of OFs and NOFs had wall clock, respectively in 2007. This implies that, the proportion of OFs and NOFs with wall clock increased over the year. Further analysis show that there was a significant difference ( $\chi^2 = 6.72$ ;  $p \leq 0.05$ ) between the number of OFs with wall clock before and after becoming a project farmers in 2007. On the other hand, there was a significant difference ( $\chi^2 = 9.31$ ;  $p \leq 0.05$ ) between the number of NOFs with wall clock between the year 2003 and 2007. Meanwhile, there was a significant difference ( $\chi^2 = 30.0$ ;  $p \leq 0.05$ ) between the number of OFs and NOFs with wall clock in 2007.

## CONCLUSION AND RECOMMENDATIONS

The findings of the study have shown that, there was a significant difference in the estimated mean income from the sale of cocoa products for both OFs and NOFs at the end of 2007. Also, the performance of ONL in terms of provision of farm inputs to OFs was encouraging; the highest score was recorded in distribution of agrochemicals at a subsidized rate and provision of hybrid seedlings to farmers. The result of the impact of Olam organization on socio-economic life of cocoa farmers showed that, the net income per capital of OFs was significantly different from that of NOFs. Also, significance differences existed between OFs and NOFs in the following: ease of selling cocoa products; knowledge on cocoa production and marketing; rating of standard of living; number of farmers with knapsack sprayers and radio. Thus, the Olam programme had positively and significantly impacted on the socio-economic life of the participating farmers (OFs) in Ondo State.

Based on the findings of this study, Olam organization extension programmes have the potential to boost cocoa production in Ondo State. It is therefore recommended that Olam organization should involve more farmers in her programme to compliment the effort of government in cocoa resuscitation programme.

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