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INCOME DISCRIMINATION-A MANIFESTATION OF INTERNATIONAL FUND FOR AGRICULTURAL DEVELOPMENT (IFAD) RICE PROGRAMME IN NIGERIA'S NIGER STATE: INVISIBLE OR INVINCIBLE

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ABSTRACT

The present study evaluated the income inequalities between IFAD and non-IFAD rice farmers in Nigeria's Niger state. Undated data of 2018 cropping season elicited through structured questionnaire coupled with interview schedules from a total of 296 rice farmers (111 IFAD rice farmers and 185 non-IFAD rice farmers) through a multi-stage sampling technique. Tools *viz.* descriptive statistics, censored regression, Chow F-test statistics, Average treatment effect (ATE) and Oaxaca-Blinder decomposition model were used for data analysis. The findings showed that the programme had effect on the farmers' income in the short-run; while in the long-run, the non-remunerative product's price has diffused the impact of the programme on the farmers' income. However, it was observed that participation in the programme made the average income accumulation of the participated farmers to higher than that of the non-participants. The discrimination difference called programme participation accounts for more than 75% of the income gap, while endowment or characteristics difference accounts for less than 24% vis-à-vis the non-treated groups. Therefore, the programme should link the farmers with the appropriate off-takers in order to insulate them from adverse effect of market imperfection which tends to dampen the rice price during the boom season. Also, the farmers should engage in co-operative marketing and monitor price behavior using market information and intelligence. The scope of programme coverage should be expanded beyond the target group so as to enhance the farm families' livelihoods; the rural, state and the national economies.

Keywords: discrimination, IFAD programme, income, Nigeria, rice farmers

INTRODUCTION

Earnings inequality and poverty are today parts of the greatest challenges facing humanity, as they affect every nation in the world. The World Bank Group (2015) announced that, while nearly all other regions of the world have been able to achieve the MDG1 aim of halving poverty by 2015, South Asia met the target by approximately 25% and sub-Saharan Africa has failed to reach the target. One important consensus regarding poverty in literature is that, it is a rural phenomenon (Fields, 2000; Akinlade *et al*., 2015). In this regard, it is understood that rural communities are the worst affected by poverty where there are poor or non-existent social services and infrastructure. Most of the people living in the rural areas of Nigeria are poor and rely on agricultural production and allied activities for food and income (Omonona, 2008; Akinlade *et al*., 2015). The bulk of food production in the country comes from these farmers cultivating tiny uneconomic small holdings under rainfed conditions rather than irrigation. Similarly, Nigeria's rapid economic growth between 1965 and 1974 created a significant income gap, which is assumed to have expanded substantially (Oyekale *et al*., 2006; Akinlade *et al*., 2015). In addition, levels of inequality have been compounded in Nigeria as a result of the new causes associated with technological change, lack of good governance, corruption, weak democratic institutions, and past military rule that did not allow free discussion of issues or the creation of truly representative governance bodies in the society. Research efforts have confirmed that Nigeria's income inequality is still on the rise. The issue of income inequality and poverty has been a concern of the Nigerian government for a long time. Initial emphasis focused on rural development as well as town and country planning as a realistic way to tackle the problem.

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The government's emphasis on promoting community-based poverty reduction programmes has recently been reoriented using a community-driven development strategy. Several programs were implemented in Nigeria under this approach, and some are still going on. Examples of the ongoing programmes are Community and Social Development Project (CSDP), National Fadama Project (III-AF), the International Fund for Agricultural Development/ Value Chain Growth (IFAD/ VCD) etc. According to Osinubi and Gafaar (2005); Akinlade *et al.* (2015), incidence of poverty remains very high, the presence of the numerous poverty alleviation programs suggests that the policies and programs are unsuccessful.

In recent years, development economists and macroeconomists have devoted much attention to the consequences of economic disparity (Akin-Olagunju and Omonona, 2013). A great interest in assessing inequality in the distribution of income between different groups of society has being developed. Ouedraogo and Ouedraogo (2015) cited that since Kuznets (1955) pioneering work on the relationship between economic development and income inequality, attention has been focused on the sources of income inequality in the developing world. Thus, new methodologies for decomposition of sources of income inequality have grown with a greater insight.

In the study area in particular and the country in general, the effectiveness of IFAD/VCD on farmers' income as a precursor towards poverty alleviation has been conducted by different researchers using different methods, especially viz. Theil and Gini indexes, and ATE. But to the best of our knowledge, none has used a technique that determined the contribution of the IFAD programme to the farmers' income independent of the idiosyncratic and covariates factors. Therefore, in the light of the above fact that, this study evaluates farmers' income inequality by IFAD rice programme in Nigeria's Niger State. The specific objectives were to determine the effect and impact of the programme on farmers' income; and, to evaluate farmers' income discrimination by the IFAD programme.

RESEARCH METHODOLOGY

The study was conducted in Niger state of Nigeria situated on latitudes 8°20'N and 11°30'N of the equator and longitudes 3°30'E and 7°20'E of the Greenwich Meridian time. The vegetation of the state is northern guinea savannah with sparse of southern guinea savannah. Agriculture is the major occupation in the study area and complemented with civil service jobs, artisanal, craftwork, Ayurveda medicines and petty trade.

The present study relied on cross sectional data obtained from 296 rice farmers drawn viz. multi-stage sampling technique using sampling frame obtained from IFAD-VCDP, NAMDA and reconnaissance survey. In the state, only five (5) Local Government Areas (LGAs) were involved in the IFAD rice programme with Agricultural Zone A (Bida) and C (Kontagora) having two LGAs each, namely Bida and Katcha; and, Wushishi and Kontagora respectively, while Zone B has one participating LGA viz. Shiroro. In the first stage, for Agricultural Zone A, one LGA viz. Katcha LGA was randomly selected; for Zone B, the only participating LGA viz. Shiroro LGA was automatically selected; while for Zone C, Wushishi LGA was purposively selected based on its' comparative advantage given that rice is produce throughout the year owing to the presence of Tungan Kawo irrigation dam. The sample size used for the study was composed of three groups of respondents viz. treatment group (IFAD participating farmers), exposed/ spill-over group (non-IFAD participating farmers but living within the radius of 50km of IFAD site as adopted by Irshad *et al*. (2016) and the control group (neither IFAD participants nor living within the radius of 50km). In the same vein, the exposed group emanates from the selected IFAD participating LGAs while one LGA from each of the Agricultural zones *viz.* Lapai (Zone A), Gurara (Zone B) and Mariga (Zone C) were selected as control units.

In the second stage, two villages were randomly selected from each of the chosen participating LGAs, exposed sites and the control LGAs. Thereafter, two active co-operative associations from each of the selected participating; exposed and control villages were randomly selected. It is worth to note that Microsoft excel inbuilt random sampling mechanism was used for the random selections of the villages and the co-operative associations. In the last stage, using the sampling frame obtained from IFAD/VCD office in Niger State and developed from reconnaissance survey (Table 1), Cochran's formula was used to determine the representative sample size. Thus, a total of 296 active rice farmers form the sample size for the study. However, only 295 questionnaires were found valid for analysis. Structured questionnaire complemented with interview schedule was used to elicit information

from the respondents during the 2018 production season. The objectives in synchronizing order were achieved using censored regression in conjunction with Chow F-statistics test and ATE; and, censored regression in conjunction with Oaxaca-Blinder decomposition model. The Cochran's formula used is shown below:

$$n_a = \frac{n_r}{1+\frac{(n_r-1)}{N}} \quad \text{..... (1)}$$

$$n_r = \frac{(1.96)^2 pq}{e^2} \quad \text{..... (2)}$$

Where:

n_a = adjusted sample size for finite population

n_r = sample size for infinite population

N = population size

p = proportion of population having a particular characteristic

$q = 1 - p$

e^2 = error gap (0.07)

Thus, p = 0.40 and q = 1 – 0.40 = 0.60

Table 1. Sampling frame of participating and non-participating farmers

Groups	LGAs	Villages	Co-operative Associations	SF	SS
Treatment	Katcha	Baddegi	Managi Badeggi Farmers CMPS	24	10
			Aminci EbantiTwaki CMPS Ltd	25	10
		Edostu	Edotsu Co-Operative Credit & Marketing CMPS	25	10
			Edotsu Jinjin Wugakun Yema CMPS	25	10
	Shiroro	Baha	Baha Abmajezhin Cooperative Multi-Purpose Society Ltd	15	7
			Abwanubo Najeyi Development Association	18	8
		Paigado	Paigado Achajebwa Development Farmers Soc.	25	10
			Paigado Farmers Cooperative Society Ltd	25	10
	Wushishi	Bankogi	Bankogi Alheri Farmers Coop. Multipurpose Soc Ltd	22	9
			Bankogi Gwari Nasara CMPS	16	7
		Kanko	Kanko Arewa Farmers	25	10
			Kanko Unguwar Ndakogi Cooperative Multipurpose Society Ltd	25	10
SUB-TOTAL				270	111
Spill-Over/ Exposed	Katcha	Kangi Toga	Kangi Toga Farmers Cooperative	20	9
			Kangi Toga Youth farmers cooperative society ltd	15	8
		Sheshi Dama	Sheshi-Dama Farmers Cooperative	18	8
			Shinkafamana Multipurpose farmers cooperative Sheshi-Dama	15	8
	Shiroro	Farin Doki	Ayenaje multipurpose Development Association Farin-Doki	20	9
			Farindoki Youth Farmers Cooperative Society ltd	15	8
		Zhikuchi	Genuko Farmers Cooperative society Ltd	10	6
			Zhikuchi Rice Farmers Cooperative Society Ltd	12	7
	Wushishi	Gwarijiko	Gwarijiko Farmers Cooperative	16	8
			Kyadyafu Cooperative Society Gwariji	10	6
		Fugangi	Fugankpan Farmers Cooperative Society	13	7
			Fugan Youth Farmers Cooperative Society	10	6
SUB-TOTAL				174	90
Control	Lapai	Gbage	Gbage Youth Farmer Cooperative Society	15	8
			Gbage rice farmer Cooperative Society Ltd	20	9
		Puzhi	Puzhi Shinkafamana Farmers C.S. Ltd I	12	7
			Puzhi Shinkafamana Farmers C.S. Ltd II	18	8
	Gurara	Tufa	Yanga Multipurpose Cooperative Association	19	9
			Abawa Rice Farmers Association	10	6
		Lambata	Lambata Rice Farmers Cooperative Multipurpose Society Ltd	15	8
			Boku/Sarki Gbadagu Development Association.	14	8
	Mariga	Kahigo	Kahigo Fadama User Cooperative Society	17	8
			Young Farmers Cooperative Multi-Purpose Society Limited	20	9
		Bobi	Respect Cooperative Association Cooperative Society	13	7
			Bobi Himma Irrigation Cooperative Society	20	9
SUB-TOTAL				193	95
Grand Total				637	296

Source: IFAD-VCDP farmer database and Niger State Agricultural Mechanization Development Authority (NAMDA), 2018
Note: SF and SS means sampling frame and sample size respectively.

Empirical model

Tobit regression model

The Tobit regression model is shown below (Tobin, 1958):

$$Y_i^* = \alpha + X\beta + \varepsilon_i \quad \text{..... (3)}$$

$$Y_i^* = \alpha + X_1\beta_1 + X_2\beta_2 + X_3\beta_3 + X_4\beta_4 + X_5\beta_5 + \cdots . + X_n\beta_n + \varepsilon_i \text{ .(4)}$$

Where:

Y_i*= Income (Logarithm) Index value for i[th] household; X_1= Commercialization index (CI) (Gross value of output sold/Gross value of total output); X_2= Marital status (married=$_1$, otherwise= 0); X_3= Education (years); X_4= Sickness of household member (yes=$_1$, otherwise=0); X_5= Extension visit (number); X_6= Access to credit (yes= $_1$, otherwise= 0); X_7 = Seed variety (improved= $_1$, local=0); X_8= Gender (male=$_1$, otherwise=0); X_9= Age (year); X_{10} = Household size (number); X_{11} = Farm size (hectare); X_{12}= Farming Experience (year); X_{13}= Non-farm income (yes=$_1$, otherwise = 0); X_{14}= language spoken (number); X_{15}= Security threat (yes= $_1$, no = 0); β_0 = Intercept; β_{1-n}= Vector of parameters to be estimated; and, ε_i = Stochastic term.

Chow F-statistics test

Following Onyenweaku (1997); Amaefula *et al.* (2012), the F-statistics tests for Test for Effect of the programme, Test for Homogeneity of slopes and Test for Differences in intercepts are given below:

To isolate the effect of the programme, Equation 4 was used to estimate for: (i) for participating farmers (ii) non-participating farmers (iii) pooled data without a dummy variable (iv) pooled data with a dummy variable (participants=1, otherwise =0)

Test for Effect of the programme

$$F^* = \frac{[\sum \varepsilon_3^2 - (\sum \varepsilon_1^2 + \sum \varepsilon_2^2)]/[K_3 - K_1 - K_2]}{(\sum \varepsilon_1^2 + \sum \varepsilon_2^2)/K_1 + K_2} \text{ ... ... (5)}$$

Where $\sum \varepsilon_3^2$ and K_3 are the error sum of square and degree of freedom respectively for the pool group (both treated and untreated), $\sum \varepsilon_1^2$ and K_1 are the error sum of square and degree of freedom respectively for the treated group, and, $\sum \varepsilon_2^2$ and K_2 are the error sum of square and degree of freedom respectively for the untreated group.

If the F-cal is greater than the F-tab, it implies that the programme had effect on the participation attitude of the treated group.

Test for Homogeneity of Slope

$$F^* = \frac{[\sum \varepsilon_4^2 - (\sum \varepsilon_1^2 + \sum \varepsilon_2^2)]/[K_4 - K_1 - K_2]}{(\sum \varepsilon_1^2 + \sum \varepsilon_2^2)/K_1 + K_2} \text{ ... ... (6)}$$

Where $\sum \varepsilon_4^2$ and K_4 are the error sum of square and degree of freedom respectively for the pooled group (both treated and untreated) with a dummy variable. If the F-cal is greater than the F-tab, it implies that the programme brought about a structural change or shift in the participation behaviour parameter.

Test for differences in intercepts

$$F^* = \frac{[\sum \varepsilon_3^2 - \sum \varepsilon_4^2]/[K_3 - K_4]}{\sum \varepsilon_4^2/K_4} \text{ ... ... (7)}$$

If the F-cal is greater than the F-tab, it implies that the participation attitudes of the treated farmers differ from that of the untreated group.

Average Treatment Effect (ATE)

It show the average difference in outcome between units assigned to the treatment and units assigned to the placebo (control). Following Lokshin and Sajaia (2011); Wang *et al*. (2017) the equation is given below:

Income of participants is given by: $E(y_{1i}|I = 1; X)$ ... ... (8)

Income of non-participants is given by: $E(y_{2i}|I = 0; X)$ ... ... (9)

Income of participants if they had not participated is denoted by: $E(y_{2i}|I = 1; X)$ ... . (10)

Income of non-participants if they had participated: $E(y_{1i}|I = 0; X)$ ... ... (11)

Where:

$E(.)$ = Expectation operator

y_{1i} = income of participants (dependent variable)

y_{2i} = income of non-participants (dependent variable)

I= Dummy variable (1= participant, 0= non-participant)

X= Explanatory variables that is common to both participants and non-participants.

$$\text{ATT} = E(y_{1i} \mid I = 1; X) - E(y_{2i} \mid I = 1; X) \ldots\ldots (12)$$

$$ATU = E(y_{1i} \mid I = 1; X) - E(y_{2i} \mid I = 1; X) \ldots\ldots (13)$$

$$\text{Average Treatment effect on Treated} = \text{ATT}$$

$$\text{Average Treatment effect on Untreated} = \text{ATU}$$

Equations (12) and (13) were further simplified as:

$$\text{ATT} = \frac{1}{N_1}\sum_{i=1}^{N_1}[p(y_{1i} \mid I = 1; X) - p(y_{2i} \mid I = 1; X)] \ldots (14)$$

$$\text{ATU} = \frac{1}{N_2}\sum_{i=1}^{N^2}[p(y_{2i} \mid I = 0; X) - p(y_{1i} \mid I = 0; X)] \ldots (15)$$

Where, $N_1$and N_2 are number of participants and non-participants respectively and p= probability.

Oaxaca-Blinder Decomposition model

Following Marwa (2014); Revathy *et al.*(2020) the extent to which the income gap between the treated and untreated farmers can be explained by differences in observed human capital characteristics estimated using the standard Oaxaca-Blinder procedure (Oaxaca 1973; Blinder 1973) is as follows:

$$ln\bar{Y}_T = \beta_{T0} + \beta_{Ti}\sum_{i=1}^{i} X_T + \varepsilon_T \ldots\ldots\ldots\ldots (16)$$

$$ln\bar{Y}_{NT} = \beta_{NT0} + \beta_{NTi}\sum_{i=1}^{i} X_{NT} + \varepsilon_{NT} \ldots\ldots (17)$$

Where,

$\bar{Y}_T = average\ income\ of\ treated\ group$;

$\bar{Y}_{NT} = average\ income\ of\ non-treated\ group$;

$X_{i-n} = explanatory\ variables;$

$\beta_0 = intercept$;

$\beta_{i-n} = parameter\ estimates$; and,

$\varepsilon_i = stochastic\ term$.

The Oaxaca-Blinder decomposition as cited by Revathy *et al*. (2020), equations 16 and 17 can be explained as follow:

$$(ln\bar{Y}_T - ln\bar{Y}_{NT}) = (\beta_{T0} - \beta_{NT0}) + [\beta_{T1}(\bar{X}_{T1} - \bar{X}_{NT1}) + \beta_{T2}(\bar{X}_{T2} - \bar{X}_{NT2}) + \beta_{T3}(\bar{X}_{T3} - \bar{X}_{NT3}) + \beta_{T4}(\bar{X}_{T4} - \bar{X}_{NT4}) + \beta_{Tn}(\bar{X}_{Tn} - \bar{X}_{NTn})] + [\bar{X}_{NT1}(\beta_{T1} - \beta_{NT1}) + \bar{X}_{NT2}(\beta_{T2} - \beta_{NT2}) + \bar{X}_{NT3}(\beta_{T3} - \beta_{NT3}) + \bar{X}_{NT4}(\beta_{T4} - \beta_{NT4}) + \bar{X}_{NTn}(\beta_{Tn} - \beta_{NTn}) + (\varepsilon_T - \varepsilon_{NT}) \ldots\ldots\ldots\ldots (18)$$

The income gap is divided into two segments: one is the proportion attributable to differences in the endowments of income-generating activities $(\bar{X}_T - \bar{X}_{NT})$ evaluated at the treated group returns (β_T). This is taken as a reflection of endowment differential and it's termed endowment/ characteristics/ explained effect. The second segment is attributable to the difference in the returns $(\beta_{Tn} - \beta_{NTn})$ that the treated and untreated groups get for the same endowment of income-generating activities $(\bar{X}_{NT})$. This segment is often taken as a reflection of discrimination or income differential and its termed discrimination or unexplained effect.

RESULTS

Income Determinants vis-à-vis treatment and non-treatment groups

The Tobit regression, a generalized linear model (GLM) was found to be the best fit for all the specified equations as indicated by the significance of their respective Chi-square test statistics which were within the acceptable margin of 10% degree of freedom. In addition, the significance of the Chi-square statistics implies that the predictor variables are different from zero, thus have influence on the predict variables (Table 3). There is no evidence of multicollinearity between the predictors for all the categories under consideration as evidenced by the variance inflation factors (VIF) of the predictors which were within the plausible margin of 10.0. In addition, the censored regression for all the categories considered failed the test of normality i.e. their residuals were not normally skewed as revealed by their respective Chi-square test statistics which were different from zero at 10% degree of freedom. However, a non-normality of the residual is not considered a serious problem as data in their natural form are mostly not normally distributed. Thus, the estimated predictors are reliable for prediction with certainty and accuracy.

For the treatment group, their income level is determined by CI, marital status, access to credit and household size as indicated by their respective coefficients which were different from zero at 10% degree of freedom. The positive significant of the CI implied that farmers with high marketed surplus generated high annual income. Thus, the probability of farmers with high marketed surplus having remunerative income would be 0.086% higher than those farmers with low marketed surplus; while the marginal effect of high marketed surplus would increase income by 1.43. The negative significant of the marital status showed the disadvantage of poor capital pooling *viz*. social and economic capitals associated to being single, thus decrease in the income accumulation of unmarried farmers. Thus, the probability of non-married farmers generating better income would be 0.034% less than that of the married farmers; while the marginal effect of being unmarried would decrease income by 0.47. The significance of access to credit implied that farmers with access to credit had better income owing to the catalytic effect of capital accumulation viz. credit. Therefore, the income's probability of farmers with access to credit would

be 0.010% higher than those with no access to credit; while the marginal effect of having access to credit would increase income by 0.31. The positive significant of the household size coefficient implied that the farmers with large household composed of a viable labour force benefitted from members' remittances from different income sources, thus increasing their income accumulations. Therefore, the probability of farmers with a viable large household size having remunerative income would be 0.023% higher than those with small household size; while the marginal effect of having a large household size would increase income by 0.038.

For the control group, their income level is influenced by CI, marital status, seed variety, household size, farm size and security threat as indicated by their respective coefficients which were within the acceptable margin of 10% degree of freedom. The positive significant of the CI implied that farmers with high marketed surplus made high returns from sales; thus increased their income accumulations. The marginal and elasticity implications of having a high marketed surplus would lead to an increase in the income of highly commercialized farmers by 1.56 and 0.094% respectively, over their counterparts with low marketed surplus. The positive significant of the marital status implied that access to additional capital *viz*. social and economic capitals by been married enabled married farmers to have high income than their counterparts who are unmarried. Therefore, the marginal and elasticity implications of a farmer being married would make his/her income to be 0.38 and 0.020% respectively, higher than that of their unmarried counterparts. The negative significant of the seed variety implied that the farmers who used local seed variety had low income due to low productivity. Therefore, the marginal and elasticity implications of a farmer using a local seed variety would make his/her income to be 0.23% and 0.01% respectively, lower than those who use improved variety. The positive significant of the household size implied that the farmers with a large household size, having little or no dependency ratio benefitted from multiple income streams, thus increased their income accumulation. Thus, the marginal and elasticity implications of a farmer having a productive large household would make his/her income to be 0.072 and 0.043% respectively, higher than that those with a slim household size. The positive significant of the farm size showed that the large-scale farmers' generated high income owing to pecuniary advantages viz. economies of scale. Therefore, the marginal and elasticity implications of a farmer cultivating rice on a large scale would make his/her income to be 0.33 and 0.03% respectively, higher than that of the small-scale producers. The negative significant of the security threat coefficient implied that farmers who were affected by conflicts *viz.* communal and farmers/herders clashes had their income affected. Thus, the marginal and elasticity implications of a farmer facing security challenges would make his/her income to be 0.006 and 0.27% respectively, lower than those with no security threat.

In the case of the spill-over group, the income level was influenced by extension visits, access to credit and security threat as evidenced by their respective parameter estimates which were different from zero at 10% degree of freedom. The positive significant of the extension visits and access to credit implied that the technical and financial supports increased the income of the farmers that accessed these services. Thus, the marginal and elasticity implications of farmers with many extension visits and access to credit would make their income to be 0.04 and 0.015%, respectively for the former; and, 0.53 and 0.014% respectively for the latter, high than that of their counterparts who have no access to these facilitating services. In addition, the positive significant of the security threat coefficient implied that the farmers with no security challenges viz. communal and farmers/herders conflicts had high income accumulation. Therefore, the marginal and elasticity implications of a farmer facing no security threats would make his/her income to be 0.56 and 0.004% respectively, higher than those affected with security challenges.

For the pool (non-treatment) group, the income level was influenced by CI, sickness challenge, farm size and non-farm income as evidenced from their respective coefficients which were different from zero at 10% degree of freedom. The positive significant of the CI implied that the farmers with a high marketed surplus had high income accumulation owing to returns which accrue from surplus sales. The marginal and elasticity implications of a farmer with high marketed surplus would make his/her income to be 2.14 and 0.13% respectively, greater than that of his/her counterpart with low marketed surplus. The positive significant of the sickness challenge coefficient showed that the farmers who had a healthy household i.e. no medical cost incurred had sufficient capital

investment, thus increased income accumulation. Therefore, the marginal and elasticity implications of a farmer's household being healthy would make his/her income to be 0.09 and 0.012% respectively, higher than those who encounter health challenges in their households. The positive significant of the farm size revealed that large-scale farmers benefitted from pecuniary advantage, thus increase in their income. The marginal and elasticity implications of an increase in a farm size would lead to an increase in a farmer's income by 0.26 and 0.03% respectively. It was observed that farmers with alternative sources of income had increased income as indicated by the non-farm income coefficient which is within the acceptable margin of 10% and positively signed.

Effect of IFAD on participating farmers' income

A cursory review of the results showed that the programme had effect on the income of the participating farmers when compared with the non-treatment groups as indicated by the significance of the Chow F-test statistics which were within the plausible margin of 10% degree of freedom (Table 4). Thus, it can be inferred that the programme made the income of the treated group to be higher than that of the non-treated groups. Furthermore, the significance of the Chow F-test statistics between the treatment and non-treatment groups confirms the presence of heterogeneity in the slopes of the income functions. The heterogeneity of the slopes indicates that the income functions are factor-biased. Therefore, it can be inferred that the programme brought about a structural change in the income of the participating farmers. The test for differences in the intercepts between the treated group vis-à-vis spill-over and pooled (non-treated) groups were within the acceptable margin of 10% probability level, while that of the treated group against the control group was not different from zero at 10% degree of freedom. Thus, implying that participation in the programme made the behaviours of the treatment group to be different from that of the former and indifferent from that of the latter. Similar results on the effect of agricultural programmes on farmers' livelihood were reported by (Adesiji *et al*., 2015; Adewumi *et al*., 2015) and in their various studies in Nigeria's Kwara State. Besides, Danso-Abbean *et al.* (2018) in their study discovered that agricultural extension has effect on farm productivity and income in Ghana.

Impact of IFAD Programme on participating farmers' income

The impact of the programme on the farmers' income between the treated group and the non-treated groups *via* three different methods of estimations viz. regression adjustment, nearest-neighbor matching and propensity score matching are presented in Table 5.

A perusal of the results for the treated group versus control group showed that the programme had no impact on the income of the participating farmers as indicated by the non-significant of the Average treatment effect (ATE) coefficients of all the three methods of estimations at 10% probability level. In addition, even within the treated group, the programme had no impact as indicated by the non-significant of the average treatment effect on treated (ATET) coefficients for all the three estimation methods at 10% probability level. This occurred owing to the fact that the income of the control group is greater than that of the treated group by ₦60721.4 as indicated by ATE coefficient of the regression adjustment.

Between the treated group and the spill-over group, the ATE and ATET coefficients for all the estimation methods were within the plausible margin of 10% degree of freedom, thus indicating that the programme had impact on the treated group both between and within for the former and latter respectively. Therefore, it implies that the income of the treated group differed from that of the spill-over group due to programme participation by the former; likewise within the treated group, their incomes differed due to intensity of participation in the programme. The impact of the programme made the income of the treated group to be higher than that of spill-over group by ₦152722.4 as indicated by the regression adjustment ATE coefficient. Between the treated group and the pool (non-treated) group, the ATE and ATET coefficients for all the estimation methods were not different from zero at 10% degree of freedom, thus revealing that the programme had no impact on the income of the participating farmers both between and within for the former and latter respectively. However, the ATET of the PMS was significant at 10% degree of freedom, indicating difference within the income of the participating group. Inspite of the non-impact of the programme on the income of the participating farmers, their average annual income is slightly higher by ₦23475.85 than that of the pool (non-treated) group.

Table 3. Socio-economic correlates of the farmers

Items	Mean	Min	Max	STD (±)	Mean	Min	Max	STD (±)
	Treated Group				Control Group			
CI	0.764569	0.6	0.923077	0.062334	0.776476	0.5	0.9	0.083331
Marital status	0.945455	0	1	0.22813	0.677083	0	1	0.471355
Education	9.054545	0	16	4.767698	8.395833	0	16	5.931973
Sickness	2.236364	0	10	1.477211	2.75	0	8	1.841842
Extension visit	7.872727	1	20	3.035294	3.197917	0	10	3.001034
Credit Access	0.445455	0	1	0.499291	0.260417	0	1	0.443766
Seed Variety	0.963636	0	1	0.18805	0.520833	0	1	0.502152
Gender	0.972727	0	1	0.163622	0.916667	0	1	0.29028
Age	40.58182	25	65	8.243298	40.67708	22	63	9.550733
HHS	7.909091	2	25	3.546663	7.791667	2	18	3.718701
Income (₦)	5.6883e+5	80000	3700000	410627.1	5.2366e+5	30000	2000000	359160.8
Farm size	1.33	0.5	3	0.48473	1.295313	0.2	3	0.634183
Experience	19.87273	2	38	8.039021	19.89583	2	40	10.20983
NFI	0.718182	0	1	0.451944	0.708333	0	1	0.458801
LS	2.463636	2	4	0.553177	2.479167	1	5	0.840286
Security threat	0.045455	0	1	0.209252	0.302083	0	1	0.463251
	Spill-over Group				Pooled (Non-Treated) Group			
CI	0.776476	0.4167	0.833333	0.085633	0.74635493	0.4167	0.9	0.087491
Marital status	0.677083	0	1	0.106	0.82702703	0	1	0.37925
Education	8.395833	0	16	4.174806	8.59459459	0	16	5.121669
Sickness	2.75	0	7	1.671274	2.79459459	0	8	1.713429
Extension visit	3.197917	0	12	3.368006	3.83243243	0	12	3.209874
Credit Access	0.260417	0	1	0.47539	0.2972973	0	1	0.458309
Seed Variety	0.520833	0	1	0.376465	0.35135135	0	1	0.478688
Gender	0.916667	0	1	0.181499	0.94054054	0	1	0.237124
Age	40.67708	28	60	7.052046	40.7351351	22	63	8.201942
HHS	7.791667	4	17	3.069297	8.67027027	2	18	3.447499
Income (₦)	3.6473e+5	18000	950000	177065.6	2.7608e+5	18000	2000000	276082.9
Farm size	1.295313	0.5	2	0.432868	1.24783784	0.2	3	0.530838
Experience	19.89583	7	31	5.561638	19.9459459	2	40	8.112477
NFI	0.708333	0	1	0.451985	0.71351351	0	1	0.453346
LS	2.479167	1	4	0.554027	2.43243243	1	5	0.689224
Security threat	0.302083	0	1	0.27072	0.19459459	0	1	0.396963

Source: Field survey, 2018

Note: HHS= Household size; NFI= Non-farm income; LS= Language(s) spoken

Table 3. Income determinants

Variable	Treated Group				Control Group			
	Coefficient	t-stat	ME	VIF	Coefficient	t-stat	ME	VIF
Intercept	10.9659 (0.8147)	13.46***			10.3979(0.82529)	12.60***		
CI	1.43428(0.8076)	1.776*	.08554	1.302	1.55759(0.82129)	1.897*	.094099	1.394
Marital status	-0.46666(0.2457)	1.89*	-.03392	1.614	0.380574(0.14464)	2.631***	.02033	1.559
Education	0.00527(0.0103)	0.510^{NS}	.00407	1.245	0.003034(0.01247)	0.243^{NS}	.00207	1.816
Sickness	0.01943(0.04237)	0.458^{NS}	.00292	2.013	0.074612(0.04608)	1.619^{NS}	.01579	2.218
Extension visit	0.013528(0.0172)	0.785^{NS}	.00818	1.404	0.017286(0.02543)	0.679^{NS}	.00397	1.877
Credit access	0.312252(0.0994)	3.140***	.01038	1.266	-0.15712(0.13653)	1.151^{NS}	-.00315	1.224
Seed variety	-1.13E-05(0.2456)	$4.6e\text{-}5^{NS}$	-.00027	1.097	-0.23287(0.12392)	1.879*	-.00959	1.307
Gender	0.156449(0.3242)	0.482^{NS}	.01099	1.446	0.221758(0.23302)	0.951^{NS}	.01686	1.414
Age	0.013888(0.00951)	1.459^{NS}	.04303	3.163	-0.01571(0.01003)	1.566^{NS}	-.05022	2.860
HHS	0.038441(0.01827)	2.104**	.02338	2.158	0.072267(0.02538)	2.848***	.043006	2.753
Farm size	0.046142(0.1132)	0.407^{NS}	.00505	1.549	0.334009(0.10765)	3.103***	.03316	1.437
Experience	0.005024(0.0108)	0.465^{NS}	.00764	3.875	0.004309(0.0091)	0.472^{NS}	.00682	2.775
NFI	0.117998(0.1091)	1.082^{NS}	.00643	1.248	0.089914(0.12585)	0.714^{NS}	.00486	1.116
LS	-0.05318(0.0905)	0.587^{NS}	-.01098	1.287	0.1378(0.08546)	1.612^{NS}	.02695	1.555
Security threat	-0.29956(0.2297)	1.304^{NS}	-.00104	1.187	-0.26922(0.16138)	1.668*	-.00635	1.872
Chi^2	71.66[2.2e-9]***				73.54[1.04e-9]***			

Table 3. Continued

Normality test	30.7[2.1e-7]***				6.86[0.032]***			
Intercept	10.3012(1.1024)	9.344***			9.99352(0.7750)	12.89***		
CI	0.975278(0.8142)	1.198^{NS}	.05689	1.334	2.13505(0.7192)	2.969***	.12559	1.298
Marital status	-0.43391(0.7401)	0.586^{NS}	-.03385	1.688	0.147588(0.1758)	0.839^{NS}	.00950	1.522
Education	0.001419(0.0164)	0.086^{NS}	.001247	1.284	-0.00346(0.01046)	0.331^{NS}	-.00226	1.389
Sickness	0.020115(0.0535)	0.375^{NS}	.00408	2.196	0.086587(0.0382)	2.265***	.01863	1.891
Extension visit	0.04268(0.0246)	1.732*	.015418	1.889	0.019465(0.0176)	1.104^{NS}	.00588	1.705
Credit access	0.530704(0.1795)	2.956***	.01397	1.999	0.012771(0.1071)	0.119^{NS}	.00033	1.309
Seed variety	-0.13261(0.1801)	0.736^{NS}	-.00177	1.262	-0.00805(0.1104)	0.072^{NS}	-.00019	1.118
Gender	0.492882(0.4638)	1.063^{NS}	.03807	1.944	0.14369(0.2095)	0.685^{NS}	.01050	1.304
Age	0.002063(0.0119)	0.173^{NS}	.00729	1.938	-0.00854(0.0082)	1.030^{NS}	-.02681	2.221
HHS	0.038649(0.0282)	1.373^{NS}	.03022	2.048	0.023536(0.0222)	1.059^{NS}	.01617	2.161
Farm size	-0.06833(0.1769)	0.386^{NS}	-.006674	1.610	0.259243(0.1067)	2.428**	.02496	1.419
Experience	0.010942(0.0143)	0.767^{NS}	.017648	1.723	0.009676(0.0084)	1.140^{NS}	.01497	2.105
NFI	-0.00289(0.1655)	0.017^{NS}	-.000268	1.536	0.152289(0.0908)	1.676*	.00845	1.132
LS	0.229779(0.1428)	1.609^{NS}	.04424	1.718	0.080549(0.07804)	1.032^{NS}	.01533	1.298
Security threat	0.55834(0.2618)	2.133**	.003477	1.378	-0.0074(0.1550)	0.047^{NS}	-.00009	1.608
Chi^2	30.45[0.010]**				88.3[1.9e-12]***			
Normality test	30.0[3.0e-7]***				18.5[9.4e-5]***			

Source: Field survey, 2018
Note: *** ** * ^{NS} means significant at 1%, 5%, 10% & Non-significant, respectively.
Figures in ( ) and [ ] are standard error and probability level, respectively

Table 4. Effect of IFAD rice programme on farmers' income

Items	**ESS**	**DF**	**Test**	**F-stat**	**ESS**	**DF**	**Test**	**F-stat**
	Treated group vs. Control group				**Treated vs. Spill-over**			
Treated	23.34154	109			23.34154	109		
Non-treated	28.04588	95	I	25.0***	28.54789	88	I	18.3***
Pooled	57.67623	205	II	15.7***	56.70712	198	II	6.89***
Pooled with dummy	57.63907	205	III	0.132^{NS}	54.68927	198	III	7.31***
	Treated vs. Pooled (Non-treated)							
Treated	23.34154	109						
Non-treated	69.09696	184	I	16.7***				
Pooled	97.70905	294	II	10.1***				
Pooled with dummy	96.62862	294	III	3.29***				

Source: Field survey, 2018
Note: ESS, DF, I, II & III means Error sum of square, Degree of freedom, Test for Effect of the programme, Test for Homogeneity of slope and Test for differences in intercepts, respectively.
Note: *** ** * $^{\& NS}$ means significant at 1%, 5%, 10% & Non-significant, respectively.

Table 5. Impact of IFAD rice programme on farmers' income

Items	**Regression Adjustment**		**Nearest –neighbor matching**		**Propensity score matching**	
	Treated group vs. Control group					
ATE	-60721.4(68013.5)	0.89^{NS}	-39388.81(51255.44)	0.77^{NS}	-54379.87(89539.89)	0.61^{NS}
ATET	-37497.42(80829.7)	0.46^{NS}	-12208.47(78751.87)	0.16^{NS}	-80353.93(145237.8)	0.55^{NS}
Treated (Mean)	507082.4(48838.44)	11.24***				
Untreated (Mean)	567803.8(50513.06)	10.38***				
	Treated vs. Spill-over					
ATE	152722.4(63020.62)	2.42***	194842.1(32989.4)	5.91***	235397.3(18724.87)	12.57***
ATET	216285.3(50608.3)	4.27***	228018.8(39938.12)	5.71***	284509.7(40860.78)	6.96***
Treated (Mean)	510717(59862.79)	8.53***				
Untreated (Mean)	357994.6(23779.22)	15.05***				
	Treated vs. Pooled (Non-treated)					
ATE	23475.85(69701.7)	0.34^{NS}	43607(33816.13)	1.29^{NS}	95059.07(61242)	1.55^{NS}
ATET	79171.7(56188.17)	1.41^{NS}	88818.8(54975.44)	1.62^{NS}	178098.4(51396.27)	3.47***
Treated (Mean)	486510.5(65607.14)	7.42***				
Untreated (Mean)	463034.6(25943.94)	17.85***				

Source: Field survey, 2018
Note: ATE and ATET means Average treatment effect and Average treatment effect on treated, respectively.
Note: *** ** * $^{\& NS}$ means significant at 1%, 5%, 10% & Non-significant, respectively.
Figure in ( ) is standard error

Table 6. Income differentials between ifad participants and non-participants

Items	Treated	Control	Spill-over	Pool (NT)	$\bar{X}_T$	$\bar{X}_C$	$\bar{X}_S$	$\bar{X}_P$
Intercept	10.9659	10.3979	10.3012	9.99352				
CI	1.43428	1.55759	0.975278	2.13505	0.764569	0.776476	0.713865	0.74635493
Marital status	-0.46666	0.380574	-0.43391	0.147588	0.945455	0.677083	0.988764	0.82702703
Education	0.00527	0.003034	0.001419	-0.00346	9.054545	8.395833	8.808989	8.59459459
Sickness	0.01943	0.074612	0.020115	0.086587	2.236364	2.75	2.842697	2.79459459
Extension	0.013528	0.017286	0.04268	0.019465	7.872727	3.197917	4.516854	3.83243243
Credit Access	0.312252	-0.15712	0.530704	0.012771	0.445455	0.260417	0.337079	0.2972973
Seed variety	-1.13E-05	-0.23287	-0.13261	-0.00805	0.963636	0.520833	0.168539	0.35135135
Gender	0.156449	0.221758	0.492882	0.14369	0.972727	0.916667	0.966292	0.94054054
Age	0.013888	-0.01571	0.002063	-0.00854	40.58182	40.67708	40.79775	40.7351351
HHS	0.038441	0.072267	0.038649	0.023536	7.909091	7.791667	9.617978	8.67027027
Farm size	0.046142	0.334009	-0.06833	0.259243	1.33	1.295313	1.196629	1.24783784
Experience	0.005024	0.004309	0.010942	0.009676	19.87273	19.89583	20	19.9459459
NFI	0.117998	0.089914	-0.00289	0.152289	0.718182	0.708333	0.719101	0.71351351
LS	-0.05318	0.1378	0.229779	0.080549	2.463636	2.479167	2.382022	2.43243243
Security	-0.29956	-0.26922	0.55834	-0.0074	0.045455	0.302083	0.078652	0.19459459
Income					568827.9	523664.6	364733	447205.6
LnIncome					13.079	12.958	12.646	12.808
Income Gap						45163.31	204094.9	121622.3
LIncome Gap						0.120882	0.433425	0.27124

Source: Field survey, 2018

Table 6. Continued ……..

Items	$\beta_T(X_T - \bar{X}_C)$	$X_C(\beta_T - \beta_C)$	$\beta_T(X_T - \bar{X}_S)$	$X_S(\beta_T - \beta_S)$	$\beta_T(\bar{X}_T - X_P)$	$\bar{X}_P(\beta_T - \beta_P)$
Intercept		0.568		0.6647		0.97238
CI	-0.017078219	-0.09574723	0.072723	0.327665	0.026123	-0.52302
Marital status	-0.125238647	-0.57364938	0.020211	-0.03239	-0.05527	-0.508
Education	0.003471683	0.018774427	0.001294	0.033923	0.002424	0.075071
Sickness	-0.009979903	-0.1517505	-0.01178	-0.00195	-0.01085	-0.18768
Extension	0.063241305	-0.01201713	0.045399	-0.13167	0.054658	-0.02275
Credit Access	0.057778448	0.122233333	0.033841	-0.07364	0.046262	0.089035
Seed variety	-5.00066E-06	0.121281618	-9E-06	0.022349	-6.9E-06	0.002825
Gender	0.008770626	-0.05986658	0.001007	-0.32509	0.005036	0.012
Age	-0.001323033	1.204118953	-0.003	0.482449	-0.00213	0.913488
HHS	0.004513941	-0.26356014	-0.06569	-0.00199	-0.02926	0.129237
Farm size	0.001600565	-0.37287721	0.006154	0.136981	0.003791	-0.26591
Experience	-0.000116075	0.014222338	-0.00064	-0.11837	-0.00037	-0.09279
NFI	0.001162102	0.019893046	-0.00011	0.086931	0.000551	-0.02447
LS	0.000825832	-0.47346009	-0.00434	-0.674	-0.00166	-0.32528
Security	0.07687572	-0.00916672	0.009945	-0.06748	0.044676	-0.05685
Endowment Difference	0.0645		0.1050		0.0839	
Discrimination Difference		-0.5116		-0.3363		-0.7851
Overall income diff.	0.5761		0.4413		0.8691	
%	11.20	-88.80	23.79	-76.21	9.66	-90.34
Contribution to Gap (₦)	5056.68	-40106.63	48564.73	-155530	11753.14	-109869
Without Discrimination		563771.21		520263.2		557074.7
% of Discrimination in NI		7.66		42.64		24.57
Firm Discrimination				-0.175		

Source: Field survey, 2018
Note: NI= Nominal income

The ineffective of the programme in the long-run between the treated versus both the control group and the pool (non-treated) group, may be attributed to market shock *viz.* poor remunerative product price that largely owed to market imperfection, thus affecting the income of the treated group; as it was observed that the programme had impact on the yield of the target group (findings not reported here).

Generally, to certain extent, market imperfection due to non-remunerative output price has deprived the target group from the benefit of the programme on their livelihoods in the long-run; while on the other side, to a large

extent the programme had improved the rice food security of the treated group. Therefore, the study recommends that the programme should link the participating farmers with the appropriate off-takers in order to get remunerative price for their products, thus generating better returns.

Income differential between the treated group and non-treated groups

A perusal of Table 6 showed that between the treated group and the control group, the endowment or characteristics related factors viz. education level, extension visit, access to credit, gender, household size, farm size, non-farm income, language(s) spoken and security threat favoured the income of the treated group; while commercialization index (CI), marital status, sickness of household's member, seed variety, age and farming experience favoured the income of the control group. Furthermore, the difference between the coefficients of the explanatory variables between the two group income-equations was the *de facto* which contributed to the income gap between the groups. Thus, discrimination related factors viz. educational level, access to credit, seed variety, age, farming experience and non-farm income favoured the income accumulation of the treated group; whereas, CI, marital status, sickness of household's member, extension visit, gender, household size, farm size, language(s) spoken and security threat favoured the income level of the control group.

The empirical evidence reveals that 88.80% of the income differential between the two groups was due to discrimination difference called programme participation; while 11.20% was due to the endowment difference called idiosyncratic factors. Given an average annual income of ₦568828 and ₦523665 for the treated and control groups, the income gap is ₦45163.30. Of the total income gap, the difference due to superior characteristics of the treated group was ₦5056.68 while the difference due to participation in the programme was ₦40106.63. This implies that due to discrimination, the control group farmers received ₦40106.63 less in terms of their real income. Thus, without discrimination against the control group, their annual income should be ₦563771.21. The value of the discrimination represents 7.67% of the average actual income they received. In addition, the results showed the income gap to be 12.09% (i.e. $ln\bar{Y}_T - ln\bar{Y}_C = 0.1209$), the characteristics effect to be 6.5% [i.e. $(\bar{X}_T - \bar{X}_C)\hat{\beta}_T = 0.06449$], and the discrimination effect to be -51.16% [i.e. $(\hat{\beta}_T - \hat{\beta}_C)\bar{X}_C = -0.5116$] (Figure 1).

Between the treated and spill-over group, characteristics related factors viz. CI, marital status, educational level, extension visit, access to credit, gender, farm size and security threat favourably contributed to the income accumulation of the participating farmers; while sickness of household's member, seed variety, age, household size, experience, non-farm income and language spoken contributed to the income level of the spill-over group. Furthermore, the contribution of the explanatory variables towards the income differential between the two groups was due to the differences in the estimated coefficients. Thus, the discrimination effect viz. CI, educational level, seed variety, age, farm size and non-farm income favoured the income accumulation of the treated group; while marital status, sickness of household's member, extension visit, access to credit, gender, household size, experience, language(s) spoken and security threat favoured the income level of the spill-over group.

It was observed that 76.21% of the income gap owes to discrimination effect called programme participation while 23.79% in the income gap is attributed to characteristics effect called idiosyncratic factors. The income gap between the two groups is ₦204095 as evidenced by the average annual incomes of ₦568828 and ₦364733 for the treated and spill-over groups respectively. Out of the overall difference, participation in the programme by the treated group accounted for ₦155530 while the superior endowment of the treated group accounted for ₦48564.70. Thus, due to the discrimination against the spill-over group, the spill-over group lost ₦155530 annually. The value of the discrimination represents 42.64% of the average annual income of the spill-over group. Thus, without discrimination, the spill-over average annual income should be ₦520263. In addition, it was observed that the income gap is 43.34% (i.e. $ln\bar{Y}_T - ln\bar{Y}_S = 0.4334$), the characteristics effect is 10.5% [i.e. $(\bar{X}_T - \bar{X}_S)\hat{\beta}_T = 0.105$], and the discrimination effect is -33.63% [i.e. $(\hat{\beta}_T - \hat{\beta}_S)\bar{X}_S = -0.3363$] (Figure 1).

Between the treated group and the pool (non-treated) group, it was observed that endowment related factors viz. CI, educational level, extension visit, access to credit, gender, farm size, non-farm income and security threat favoured the income level of the treated group;

while marital status, sickness of household's member, seed variety, age, household size, experience and language(s) spoken favoured the pool (non-treated) group. The discrimination effect owing to the differences between the parameter estimates of the independent variables contributed majorly to the income differential between the two groups. Therefore, the structural related factors viz. educational level, access to credit, seed variety, gender, age and household size contributed favourably to the income accumulation of the treated group; whereas for the pool (non-treated) group, their income level was favoured by CI, marital status, sickness of household's member, extension visit, farm size, experience, non-farm income, language(s) spoken and security threat.

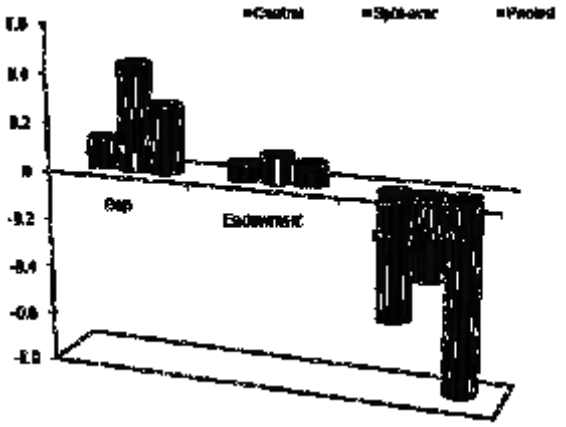

Figure 1. Income decomposition gap

Furthermore, the empirical evidence showed that 90.34% of the income difference is due to the structural difference called programme participation, while 9.66% owes to endowment difference. Given an average annual income of ₦568828 and ₦447206 for the treated and pool (non-treated) groups respectively, the income differential is ₦121622. Out of the income gap, the structural difference due to programme participation by the treated group accounted for ₦109869 while the superior endowment difference of the participating group accounted for ₦11753.10. Therefore, it can be inferred that due to non-participation in the programme, the pool (non-treated) group losses ₦109869 annually. The value of the discrimination effect represents 24.57% of the average annual income of the pool non-treated group. Thus, without discrimination against the pool (non-treated) group, the group average annual income should amount to ₦557075. Also, it was observed that the income gap between these groups is 27.12% (i.e. $ln\bar{Y}_T - ln\bar{Y}_P = 0.2712$), the characteristics effect is 8.4% [i.e. $(\bar{X}_T - \bar{X}_P)\hat{\beta}_T = 0.084$], and the discrimination effect is -78.51% [i.e. $(\hat{\beta}_T - \hat{\beta}_P)\bar{X}_P = -0.7851$] (Figure 1).

DISCUSSION

The cursory review of the socio-economic correlates showed that on the average, both the participants and non-participants have post-primary education, but the year of post-primary education of the participating group was found to be marginally higher (Table 2). This result is contrary to the findings of Adewumi *et al*. (2015) their study on the effect of rural programme on farmers' income in Nigeria's Kwara State. Likewise, Danso-Abbean *et al.* (2018) reported a contrary result viz. majority just had the basic educational certificate. It was observed that both the treatment and non-treatment groups had high commercialization index, an indication of high marketed surplus. This is expected as smallholder farmers are known to engage in distress or force sale all aimed at meeting their immediate credit requirement. On the average, most of the participating farmers had moderate access to credit facilities while access to credit was poor among the non-participating farmers. This result is contrary to the outcome of Danso-Abbean *et al*. (2018) in which both groups had poor access to credit facilities. However, these results are in tandem with the findings of Abiodun *et al*. (2017) who discovered moderate access to credit for the treatment group against poor credit access for the control group. Also, it was observed that the treatment group had more access to extension services and credit supply than their counterparts outside the treatment group. However, both the participants and non-participants were within their productive age i.e. young age which is a veritable asset for agricultural productivity, growth and development. Thus, it can be suggested that the rice food security in the studied area is not under threat as able-bodied men have key into the enterprise of rice production with vigor and passion. This result conforms to the findings of Adewumi *et al*. (2015); Danso-Abbean *et al*. (2018) who found a farming population dominated by youths in their various studies. However, Abiodun *et al*. (2017) found an aging farming population in their studied area. In addition, both groups had adequate years of experience in the production of rice which

enabled them to be efficient in rationalization of their productive resources. A similar result was reported by Adesiji *et al*. (2015) in Nigeria's Kwara State. In the same vien vis-à-vis other agricultural programmes, Adewumi *et al*., 2015; Abiodun *et al*., 2017 and Danso-Abbean *et al*., 2018) reported that, majority of the farmers to be experienced. Both groups have a large household size which makes them have access to cheap labour, thus a cost-cut in the cost of labour incurred in the production process. This conforms to the findings of Abiodun *et al*. (2017) who discovered a large household size across both groups. It was observed that there was high adoption of improved rice varieties by the treated group while it was low among the non-participants. Besides, the treatment group faced little security *viz*. communal conflicts, land tenurial problems and farmers/herders clashes as compared to that counterparts. Both groups are not much cosmopolitan, as on the average, the farmers can only speak and understand not more than two languages, thus affecting their global integration into the larger society beyond the sphere of their farming communities. This pose as a challenge particularly to the treatment group as diffusion of technologies will be hindered. Averagely, rice cultivation is done on small-scale basis across the group, thus indicating that rice is produced in subsistence quantity. This result is not different from that of the other scholars viz. Danso-Abbean *et al*. (2018); Abiodun *et al*. (2017); and, Adesiji *et al*. (2015) who in their various studies found all their respondents to be smallholder farmers. This small farm size of the participating farmers would hinder commercialization in spite of the technical and financial support given to the treatment groups, thus affecting capital accumulation and in turn the economic growth. Various scholars viz. (Sikwela and Mushunje, 2013; Omonijo *et al*., 2014; Abiodun *et al*., 2017; Adeyanju, 2019) in their various researches found agricultural programmes to have positive impact of farmers productivity and income.

CONCLUSION AND RECOMMENDATIONS

Generally, it can be concluded that the overall income gap between the participated group and non-participated groups is attributed to participation in the programme i.e. structural difference. In addition, the income gap associated with the explained difference between the participated group and the non-participated groups is positive, meaning that the non-participated groups have fewer characteristics associated with higher income earnings. Furthermore, in absolute term, the unexplained difference of the control group is greater than that of the spill-over group by 0.175, thus, it can be concluded that the control group suffered from only non-participation discrimination, while the spill-over group suffered from both firm and non-participation discriminations. The positive difference-in-difference is quite expected, thus conforms to the a priori expectation.

The empirical findings showed that the programme in the short-run had effect on the participating farmers' income while the reverse was the case in the long-run. Furthermore, it was observed that income gap between the participating and non-participating farmers owed majorly to discrimination difference called participation as the characteristic difference contribution called idiosyncratic factors was marginal. In other words, it implies that the programme made the income of the participating farmers to be higher than that of their non-participating counterparts by more than 75%. Therefore, the study recommends that for the farmers livelihood and programme sustainability, the programme should be linked to the participating farmers with the appropriate off-takers so as to insulate them from the adverse effect of price dampening due to market imperfection. Also, effort should be made by the policymakers to extend the scope of coverage of the programme to reach the non-treated groups, thus enhancing the well-being of the farming families in particular, and engendering the rural, state and national economies in general.

AUTHOR'S CONTRIBUTION

M. S. Sadiq: Idea generation and write up.
I. P. Singh: Data collection and organization
M. M. Ahmad: Data analysis

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