Effect of Membership of Group-Farming Cooperatives on Farmers Food Production and Poverty Status in Nigeria

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Abstract:

The problems of agriculture affect mostly the smallholder farmers who have small fields in different places. Group-farming cooperatives serves as good alternative to boost food production as well as lifting people out of poverty. In this study we used a recent survey data in Nigeria to examine the effect of membership of group-farming cooperatives on food production and poverty status. Probit regression model estimate is used to analyse the decision to join group-farming cooperatives and the effect of membership of group-farming cooperatives on poverty status and ordinary least square is employed to examine the effect of membership of group-farming cooperatives on food production and productivity of farmers. We find that, group-farming cooperatives have positive and statistically significant effect on food proction at 5% level of significance; prevalence of poverty is higher among non-members of group-farming cooperatives. Being a member of other forms of cooperative also helps to reduce poverty among the farming households. Therefore, we recommend that both the government and non-governmental organization should develop strategies that will encourage participation in group-farming cooperatives and also create more awareness among farming households, which can motivate more farmers to partake in this form of farmers organizations.

Acknowledegment: I acknowledge the effort of Dr R.O. Babatunde in this project.

JEL Codes: Q18, Q18

#307

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Key words: Group-farming, cooperative, food production, poverty status, probit regression, OLS.

1. Introduction

Global agriculture will face multiple challenges over the coming decades. It must produce more food to feed an increasingly affluent and growing world population that will demand a more diverse diet, contribute to overall development and poverty alleviation in many developing countries, confront increased competition for alternative uses of finite land and water resources, adapt to climate change, and contribute to preserving biodiversity and restoring fragile ecosystems (IRMP, 2012). The growing global demand for food, feed and biofuel is well established. It is estimated that the world population will be 9.1 billion persons by 2050, up from the current population of 7 billion. More importantly, income growth will increase the quantity and change the composition of agricultural commodity demand. The use of agricultural commodities in the production of biofuels will also continue to grow (FAO, 2009). The secular downward trend in agricultural prices ended in the early 1990s; growing incomes in Asia and Africa, combined with continued rapid population growth, are fueling food demand, which is expected to lead to a gradual upward trend in international real agricultural prices (Binswanger-Mkhize, 2009). The productivity of smallholder agriculture and its contribution to the economy, food security and poverty reduction depend on the services provided by well functioning ecosystems, including soil fertility, freshwater delivery, pollination and pest control. Smallholder farming practices, in turn, affect the condition of ecosystems. These impacts are not always negative, but poverty and immediate needs can drive smallholders to put pressure on ecosystems, for example through habitat modification, over extraction of water and nutrients, and use of pesticides (Sabo *et al*, 2017).

However, the problems of agriculture affect mostly the small scale farmers who have small fields in different places. Moreover, the farmers usually hire the land or cooperate with the land owner in each crop season. The owners do not live on the land, but lease it out setting difficult conditions for tenant. The other production factors such as modern technology, credit possibility and cooperation mentality do not exist (Engindeniz and Yercan, 2002). Smallholder farmers are characterized by marginalization, in terms of accessibility, resources, information, technology, capital and assets, but there is great variation in the degree to which each of these applies (Odoemenem and Obinne, 2010 and Venerakumaran, *et al*, 2005). Small holder farming mostly utilizes family labour often augmented with minor hiring of labour and labour exchanges with other farmers at peak seasons. The essential factors of production – land, labour, and capital are provided by the family. The system does not make adequate use of modern farming techniques, capital input, advisory services and market information. There are inadequate infrastructural facilities for maximum production. Peasant agriculture takes care mainly of the food needs of the farm family and produces little surplus for sale (Oni, 2008; Mohamed, 2004 and Yamusa and Adefila, 2014). Sub-Saharan Africa is the only region of the world where hunger is projected to worsen over the next two decades unless some drastic measures are taken to ensure peace, improve governance and achieve the economic development required to reverse the current trend (FAO, 2011). Food insecurity continues to be a key development problem across the globe, undermining people's health, productivity, and often their very survival (Smith and Subandoro, 2007).

Furthermore, over the past three decades, Nigerian government had initiated a plethora of policies and programs which were aimed at restoring agricultural sector to its pride of place in the economy. However various efforts at promoting investment and export diversification in the agricultural sector have not yielded appreciable dividends (Oni, 2012). Majority of the populace are still living in hunger and poverty. Nigeria faces huge food security challenges. About 70% of the population lives on less than N100 (US$ 0.70) per day, suffering hunger and poverty. Despite its reputation as petroleum resource-dependent, Nigeria remains an agrarian economy, the sector provides over 40% of gross domestic product (GDP) with between 60 and 70% of the population productively engaged in farming (Nwajiuba, 2011). There is a high level of malnutrition among children in rural Nigeria; the figures differ with geopolitical zones, with 56% reported in a rural area of South West and 84.3% in three rural communities in the northern part of Nigeria. Nationally, the overall prevalence of stunting, wasting, and underweight is 42%, 9% and 25%, respectively (Akinyemi, 2009). Achievement of food security in any country is typically an insurance against hunger and malnutrition, both of which hinder economic development (Davies, 2009).

Identification of the development constraints in the agricultural sector is a necessary step to unlock the factors inhibiting performance of the sector toward designing policy strategies that would create conducive climate for promoting accelerated commercialization and growth of the sector. Hence, social networks may indirectly affect agricultural productivity by influencing farming practices and the household' propensity to adopt newer technologies via the supply of information through these networks (Katungi, 2007). Evidence shows that both measures of social capital improve several aspects of social welfare, particularly poverty reduction, in addition to influencing technology adoption (Liverpool-Tasie 2011). There is a renewed interest from donors, governments and researchers in cooperative producer organizations as an

institutional vehicle to improve smallholder agricultural performance, particularly through improved market participation (Bernard and Spielman, 2009).

Many of the available studies have shown the importance of farmers' cooperatives- accessing market information, credit facilities, joint procurement of production input and providing social protection (Yamusa and Adefila, 2014; Persson, 2010, and Toluwase and Apata 2013). However, those studies failed to address group-farming category of farmers' cooperatives and it is not yet certain whether the benefits of farmers' cooperatives affect food production of the group members and it remains unclear the welfare impact of the group-farming cooperatives. For resource poor farming households' welfare effect of a program is very important. The literature reveals the pervasive inefficiency of Nigerian farmers as most smallholder farmers produce significantly below their production frontiers. As a result, they produce less than optimal levels of output as revealed by studies of productivity (Liverpool-Tasie 2011). Generally, study on group-farming is lacking in Nigeria, most of the impact studies on farmers cooperatives have concentrated on their effect on credit facilities accessibility and loan repayment, marketing of farm produce and procurement of farm inputs. No studies have concentrated on food crop productivity and welfare impact of membership of group-farming cooperatives. Moreover, group-farm cooperatives provide farmers with guaranteed sale of their farm produce and agro-business industries with a supply of agricultural produce needed in the market. For instance, agro industries provide additional necessities needed by the farmers including improved farm inputs, loans, mechanical support, accreditation of inputs, and assistance to farmers in group formations. Hence, the question of interest in this research was whether membership automatically translates to high food productivity and has significance effect on the farmer's poverty status.

The main objective of this paper is to examine the effect of membership of group-farming cooperatives on food production and poverty status in Nigeria. The specific objectives are to; identify the determinants of decision to join group-farming cooperatives; analyze the effect of membership of group-farming cooperatives on poverty status of the farmers; examine the effect of membership in group-farming cooperatives on food production and productivity of farmers in the study area. We use survey data collected in 2016 from five local government areas in Osun State to examine the impact of membership of group farming cooperatives on food production and poverty status in Nigeria. We hypothesize that group-farming cooperative membership translates to high food productivity and has significant effect on the farmer's poverty status. This paper contributes to the growing body of knowledge on the value of group-farming cooperatives in Nigeria. The result of this study is useful for policy formulation by government at all levels. It will serve also as a reference material to researchers and students alike.

The paper proceeds as follows. Section 2 provides a brief discussion of the theoretical framework and review of literature on the effect of group-farming cooperatives on production and livelihood. Section 3 describes the Osun state agriculture and rural institution, while section 4 outlines the data and methods used to estimate the effect. Results and their discussion are presented in section 5. Section 6 concludes with policy implications of the findings.

2. Theoretical Framework and Literature Review

2.1 Theoretical Framework

Group farming is based on jointly used productive factors and performances making better than the individual farming system (Engindeniz and Yercan 2002). Group farming might be called as

well a special kind of cooperative or a collective farming in literature. The group farming is characterized by jointly using land and agricultural inputs. Group farming is a production unit which is voluntarily formed by the farmers in order to get more benefits than individual farming (Inan, 1984). Galeski, (1987) distinguishes among four types of collective farms: (1) collective farms created by believers in an ideology which puts a higher value on non-economic than on economic goals; (2) collective farms created by landless families who were able to acquire the land but not to start individual family farms; (3) collective farms organized by governments in order to reach national economic and social goals; and (4) collective farms organized by farmers in order to get the ad-vantages of larger operations – lower costs of production, more effective use of land, manpower, and capital, etc. – and consequently higher economic returns. According to Infield (1945), we can distinguish three basically different types of cooperative communities: (1) the religious; (2) the socio-reformistic; and (3) those predominantly motivated by economic considerations. It is generally accepted that the group farming increases productivity. Group farming can promote more efficient use of resources in terms of greater farmer participation, more effective delivery of inputs and other support services such as extension and credit, better utilization of farm machinery and agricultural facilities, and improved marketing of farm products (Atkin and Thirtle, 1995).

To engage in any sensible dialogue with the rest of society, farmers need their representative organizations, the farmers' organizations, structured from grassroots to the international level, as their legitimate voice. This is why farmers' movement gives a lot of importance to farmers' organizations, organizations by farmers and for farmers, as an important pillar of today's society (Pertev, 1994). According to Nguyet (2002), farmer groups make it easier for the government to provide services to the farmers; Part of the government's tasks can be taken over by the FGs, like transfer of information, distribution of fertilizers, production and distribution of seeds, vaccination of animals, etc. When farmers work together in groups, important new skills are developed within the hamlets, like technical skills, skills in group management, problem solving, economic cooperative, bookkeeping, verbal expression and grassroots democracy, which all help the rural society to develop more quickly economically, socially, and politically. Smallholder producers' participation in market-oriented production holds potential for diversifying their incomes and increase agriculture productivity hence promoting food security and poverty eradication (Emmanuel *et al*, 2015). We address the question whether group-farming cooperative membership translates to high food productivity and has significance effect on the farmer's poverty status.

2.2 Literature Review

As we said earlier, impact of group-farming cooperative memberships on food productivity and the farmer's poverty status are rare. As a matter fact, such studies are not available in Nigeria. In this regard, Bruce and Zvi, 2006, Yamusa and Adefila, 2014, Gibson, 2005 and Bhuyan 2007 have presented excellent review of literature on farmers' cooperatives. From the available literature, we can conclude that farmers' cooperative membership generally provides the farmers with many benefits. It leads to empowerment of farmers; it assists farmers to gain access to market and sell their produce with better profit. It can also be deduced that, farmers take advantage of bulk purchase of farm inputs that helps them to reduce the cost of production and obtain standard quality products; group farming allows the farmers to attract government and donor agencies attention. In the remaining part of this section, we present a brief review of

empirical studies on impact of group farming cooperative on household farm productivity and their welfare.

Yamusa and Adefila (2014) in a study aimed at evaluating the influence of farmers' cooperatives on agricultural development, the socio-economic traits, perception of the members and the constraints to cooperation in Kwali area council, FCT Abuja, Nigeria. Chi square (Z^2) statistics was used to measure the effects of cooperatives on agricultural development. The study showed that farmer cooperatives influence agriculture to some certain extent in terms of employment generation and boosting the condition of living of the members. The level of educational attainment is crucial to the performance of the farmers' cooperatives. The study concluded that the concept of farmers' cooperatives as a tool to address market failure leaves much to be desired in the area of agricultural development. Interestingly, it offers a framework for small-holder famers to come together as a formidable entity to gain collective bargaining power. Wollni and Zeller (2006) used a two-stage model to analyze farmers' marketing decisions and their effect on the prices received and other benefits at a time when low prices in the conventional coffee market have caused financial and social hardship among coffee farmers in Costa Rica. The study found that, participation in specialty coffee marketing channels and participation in cooperatives both serve to increase prices received by producers. Additionally, access to specific market information is associated with better marketing performance**.** In a study by Emmanuel *et al*, (2015) to investigate the determinants and effects on farm income of group members of smallholder potato producers in Middle Guinea. A probit model was used as a selection equation to identify factors that influence group membership decision by smallholder potato farmers. The result revealed positive farm income effects of group membership. It was also found that farm income is predominantly determined by labor used, the size of the cultivated potato area, share of potato sold and potato market price.

In a study to investigate impacts of agricultural resource management that result from the pooling of human, land, and capital resources in group farming arrangements in Canada. Gertler (1981) found that group farming can facilitate a relatively high level of resource management in the context of large and relatively diversified farm operations. In terms of impact farmers' cooperatives on agricultural productivity in Nigeria, Toluwase and Apata (2013) found that farmer's cooperative is a viable tool towards improving farmers' productivity. It was also observed that farmers' participation and attitude toward farmers' cooperative can lead to increased productivity

However, the review of literature tends to suggest that group farming cooperatives have many positive impacts on the livelihood of the members. The results on the distribution of benefits are somehow mixed. In a study on an empirical survey carried out in Poland with leaders of farmer organizations called producer groups, Banaszak (2005) found that, for the associated farmers the critical problem appears not to be production or finding purchasers but to come together, understand each other, trust each other and avoid of free riding and self profit maximization behaviour. Blekking (2017) in a study that views the relationship between government-initiated smallholder cooperatives; improved agricultural inputs, and rural households due to the government's longstanding support of subsidized input distribution through cooperative in Zambia. He found that cooperatives seldom operate with the goal of diffusing knowledge and educating members. In conclusion, socioeconomic characteristics such as age, education, wealth and gender matter in distribution of benefits of group farming cooperatives.

3. Study Area

Osun state was carved out of the old Oyo State in 1991. It is located in the south- western part of Nigeria, covers a land area of approximately 14,875 square kilometers. In terms of location, Osun State lies between longitude 0400'E and 05 05' and latitude 05 558" and 08 07". The state is bounded in the south by Ogun state; in the North by Kwara state; in the west by Oyo state; and in the East by Ondo and Ekiti states. The population of Osun State is 3,423,535 (NPC, 2006) census. Osun State is home to several of Nigeria's most famous landmarks, including the campus of Obafemi Awolowo University, Nigeria's pre-eminent institution of higher learning. The university is also located in the ancient town of Ile-Ifẹ, the historical cultural and traditional headquarters of the Yorubas and centre of political and religious development for Yoruba culture.

There are two seasons annually in Osun state and Nigeria in general, the wet and dry seasons. The wet season generally starts from April and extends till October. The dry season lasts from November to March. The dry season starts with Harmattan – a dry chilly spell that lasts until February and a dusty atmosphere is brought about by the northeast winds blowing from the Arabian Peninsula across the hot Sahara desert. The second half of the dry season (February-March) is the hottest part of the year with temperatures getting to as high as 38degree Celsius. The mean annual rainfall varies from 231.75 cm in the southern part to 206 cm in Osun State, and highest rainfall is usually recorded in the months of July and August. Mean maximum ambient temperature values range between 33.84°C in February and 28.8°C in August, while mean minimum temperatures range between 25.18°C in March and 23.0°C in August. Higher temperatures were recorded at the peak of the dry season, between November and May, while lower temperatures were recorded in the rainy season. Relative humidity is usually in excess of 70%, especially during the peak of the wet season. Highest values of 78% occur in June to October and the lowest value of 57% was recorded in February.

4 Methodology

4.1 Data

For this study two samples were selected from 5 local government areas in Osun state, Nigeria. A random sampling technique was used to select 122 farmers; first is the treatment group which comprises of 51group farmers and the second group is control, this consists of 71 non-group farmers. Primary data was collected by focus group discussion and administration of structured questionnaires to the selected non-group farmers in the state. Information was collected using a structured questionnaire administered by interviewing the household heads and other family members in the controlled group. The questionnaire includes information on demographics, household expenditure, assets, education attainment, marital status, age, farmers' occupations, membership of cooperative societies, household size, farm size, access to credit.

4.2 Analytical Technique

Descriptive statistics which include frequency and percentages was used to analyse socioeconomic characteristics of the respondents. Probit regression model and ordinary least square (OLS) estimate were used to achieve objective i, ii, and iii respectively. A formal probit model allows estimation of probabilities, marginal effects, and a host of ancillary results, but at the cost of imposing the normal or logistic distribution on the data (Angrist, 2001). According to

Lewbel (2000) probit model is based on the normal distribution, with Prob[$yi = 1 \mid xi$] = Prob[$xi\beta + \varepsilon i > 0$] where $\varepsilon i \sim N[0, 1]$.

4.3 Model Specification

The models used to achieve the objectives of the study are given below:

4.3.1 Probit model

To identify the determinants of decision to join group farming cooperatives, the model is expressed explicitly as;

$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, e_i)$

Where,

Y= membership of group farming cooperatives (member=1, non-member= 0)
X_1= farm size (Ha)
X_2= year of schooling (years)
X_3= household size (AE)
X_4= gender (male= 1, 0 otherwise)
X_5= farming experience (year)
X_6= member of other forms of cooperatives (member= 1, nonmember= 0)
e_i is the error term and consists of unexpected random variables.

Probit regression model was used to analyze the effect of membership of group farming cooperative on poverty status. It is expressed implicitly as:

$W = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, e_i)$

Where

W= poverty status of household (Non-poor= 1, poor= 0)
X_1= farm size (Ha)
X_2= year of schooling (years)
X_3= household size (AE)
X_4= gender (male= 1, 0 otherwise)
X_5= farming experience (year)
X_6= member of other forms of cooperatives (member= 1, nonmember= 0)
X_7 = membership of group farm cooperatives (member= 1, non-member= 0)
e_i is the error term and consists of unexpected random variables.

4.3.2 Ordinary least square regression analysis

This was used to examine the effect of membership of group farming cooperatives on food production and productivity of farmers.

This

$V = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, U_i)$

Where;

V = farm output (GE)
X_2= year of schooling (years)
X_3= household size (AE)
X_4= gender (male= 1, 0 otherwise)
X_5= farming experience (year)
X_6= member of other forms of cooperatives (member= 1, nonmember= 0)
X_7 = membership of group farm cooperatives (member= 1, non-member= 0)

U = error term

5 Results

5.1 Sample Characteristics

The socioeconomic characteristics of the individual farmers and group farmers were discussed in Table 1 below. This describes the socioeconomic characteristics of the respondents by segregating them by their group membership status. The result shows that majority (98.04%) and (85.92%) are male for the group and non-group members respectively. This implies that farming is predominantly practiced by males in the study area.

Majority of the group farmers and non-group farmers were married with 84.31% and 88.73% respectively. This implies that they have family needs to meet up with and that they will utilise family labour. Also, 45.09% of the group-farmers had up to secondary education while, 42.25% of the non-group farmers had up to primary education. This implies that most of them attained one level of formal education or the other. This is acceptable on the ground that education affects the way farms are managed as well as overall crop production (Nkang *et al.,* 2009). Educational level plays a good role in adoption of new and innovative production methods and undertaking risks. Also, 41.18% of the group farm members fall within the ages of 41-50. This implies that, the farmers are active and fit in carrying out operations on the farms effectively. Majority of the group farmers (52.94%) and non-group farmers (54.93%) had farming as their major occupations. This implies that the study area is a farming dominated area. 29% of the group farmers had no other occupation except farming; 19.72% of the non-group farmers had no other occupation except farming. A higher percentage of group farmers (50.98%) and non-group farmers (56.33) have farming experience which ranges from11-20 years. The result implies that most of the cooperative society members have acquired reasonable years of experience in farming which have spread effects on agricultural development. It is essentially an indication that farmers with more experience would likely adopt innovative ideas and techniques that would enhance increase in agricultural productivity (Trechter, 1996). Majority of the group farmers (57.74%) belong to a cooperative society, while a larger percentage (74.63%) of the non-group farmers belongs to a cooperative society.

Majority of the group farmers (63.62%) and non-group farmers (59.15%) had access to credit facilities. A larger number of group farmers (41.17%) and non-group farmers (49.29%) had their farm sizes not more than 2 ha; this suggests that most of the respondents are small scale farmers. This buttresses CTA (2000) assertion that the agricultural sector has been left largely in the hands of poor and subsistence farmers. These are farmers whose average holding is about 1.0-2.0 ha who cannot benefit from economies of scale hence resort to farmer group cooperative organization. Majority of the group farmers (80.39%) and non-group farmers (87.32%) had assets above ₦400,000, while only 19.6% and 12.67% of each group respectively had assets below ₦400,000. Majority of the group farmers (60.78%) and non-group farmers (60.56%) comprises of household size not greater than 4 people. This implies the farmers have a medium household size. Also majority of the group (39.21%) and non-group farmers (39.43%) had their monthly expenditure ranging from ₦20,001- ₦40,000. This is an indication that income earnings by the farmers' cooperatives are still less in amount for meaningful agricultural development.

Table 1: Socioeconomic characteristics of group farmers and individual farmers

Socioeconomic variables	Group-farm members (N=51)		Non-group members (N=71)		Pooled (N=122)	
	Freq	%	Freq	%	Freq	%
Gender						
Male	50	98.04	61	85.92	111	98.98
Female	1	1.96	10	14.08	11	9.02
Marital status						
Married	43	84.31	63	88.73	106	86.89
Single	5	9.80	3	4.23	8	6.56
Widowed	1	1.96	2	2.82	3	2.46
Divorced	1	1.96	3	4.23	4	3.28
Cohabiting	1	1.96	0	0.0	1	0.82
Year of schooling						
0-6	15	29.41	30	42.25	45	36.9
7-12	23	45.09	24	33.8	47	38.54
13-18	6	11.76	8	11.26	14	11.48
>18	7	11.72	9	12.68	16	13.12
Age (years)						
30-40	17	33.33	9	12.68	26	21.31
41-50	21	41.18	36	51.43	57	46.72
51-60	13	25.49	25	50.70	38	31.15
61-70	0	0.00	1	36.62	1	0.82
Primary occupation						
Farming	27	52.94	39	54.93	66	54.10
Trade	3	5.88	3	14.08	13	10.66
Artisan	14	27.45	14	21.13	29	23.77
Civil servant	4	7.84	4	7.04	9	7.38
Livestock farming	3	5.88	3	2.82	5	4.1
Farming experience (year)						
≤10	20	39.21	15	21.13	35	28.7
11-20	26	50.98	40	56.33	66	54.11
21-30	5	9.8	9	12.67	14	11.48
>30	0	0.0	7	9.86	7	5.74
Secondary occupation						
None	15	29.41	14	19.72	27	23.77
Farming	24	47.05	31	43.66	55	45.08
Trade	3	5.88	16	22.54	19	15.57
Artisan	3	5.88	5	7.04	8	6.56
Civil servant	2	3.92	1	1.41	3	2.46
Livestock farming	4	7.84	4	5.63	8	6.56
Membership of other cooperative society						
Member	41	57.74	53	74.63	94	77.05
Non-members	10	42.25	18	25.35	28	22.95
Access to credit						
Yes	35	63.62	42	59.15	77	63.11

No	16	31.37	29	40.85	45	36.89
Farm size (ha)						
≤2	21	41.17	35	49.29	56	46.29
2.1-4.0	19	37.35	15	21.13	34	28.1
4.1-6.0	4	7.84	10	14.08	14	11.58
>6.0	7	13.72	11	15.49	17	14.07
Total asset (₦)						
≤100,000	2	3.92	1	1.41	3	4.10
100,001-200,000	3	5.88	3	4.22	6	4.92
200,001-300,000	2	3.92	1	1.41	3	2.64
300,001-400,000	3	5.88	4	5.63	7	5.74
>400,000	41	80.39	62	87.32	103	84.46
Household size						
≤4	31	60.78	43	60.56	74	50.68
5-8	20	39.21	26	36.61	46	37.2
>8	0	0.0	2	2.82	2	1.64
Total monthly expenditure (₦)						
≤20,000	7	13.72	14	19.71	21	17.22
20,001-40,000	20	39.21	28	39.43	48	39.36
40,001-60,000	15	29.41	17	23.94	32	26.34
60,001-80,000	4	7.84	9	12.68	13	10.66
>80,000	5	9.80	3	4.22	8	6.56

Source: Field Survey, 2006

5.2 Summary Statistics of Sample Farmers

Table 2 below shows the average estimation of socioeconomic characteristics. This includes the age, years of schooling, farm size, farming experience, household size, and value of their total assets and the farmer's total monthly expenditure.

The mean age of the farmers was 46 years, which implies that the farmers are still young, active, and are still fit to carry out agricultural activities on the farm which can help increase efficiency. Average years spent in school was 9 years which means they are educated enough to easily accept innovations training brought by the extension agents which can help improve productivity on their farms, also average farm size of the farmers is 3 ha, this implies that they are small scale farmers, the higher the farm size, the higher the output on the farm ought to be (other things being equal *ceteris paribus*) which means they tend to produce more.

With an average of about 16 years of farming experience, this connotes that the farmers are well experienced and have gained enough knowledge about farming and its technique which will help in production. Experience goes a long way with skill acquisition, which is fundamental to efficiency and effectiveness in any job operation. The result implies that most farmers have acquired reasonable years of experience in farming which have spread effects on agricultural development. It is essentially an indication that farmers with more experience would likely adopt innovations and techniques that would enhance increase in agricultural productivity (Trechter, 1996). The average total asset was ₦2,520.70 which implies that the farmers have sufficient

asset to liquidate in case the farm needs financial stability. The average household size of the farmers was 3.7 people; this indicates that the farmers have an average household size.

Table 2: Summary Statistics of Sample Farmers

Variable	Mean	Standard Deviation
Age (years)	46.20	15.54
Year of schooling (years)	8.85	1.23
Farm size (ha)	3.43	3.22
Farming experience (years)	15.60	8.57
Household size (AE)	3.7	1.55
Total asset (thousand Naira) (₦)	2,520.70	3,040.67
Total monthly expenditure (₦)	43304.92	27006.33

Source: Field Survey, 2016

5.3 Determinants of Decision to Join Group Farming Cooperatives:

In this section, the factors that determine decision to join group farming cooperatives were examined. Table 3 explains the factors that influence membership of group farm cooperatives in the study area. Out of the independent variables modeled, gender, farming experience, membership of other form of cooperatives were found to influence the decision of the farmers to join group farm cooperative. The result shows that the farming experience has a negative relationship with membership of group farming cooperatives. This implies that farmers with lower farming experience have higher probability of being a member of a group farm. This can be attributed to the fact that farmers who have lower farming experience are likely to limited knowledge in the production of some crops, and also not likely to have access to sufficient farm inputs, they therefore join group farming to help in access to inputs and trainings by the government or interaction and activities on the farm by the group members. This finding also agrees with literature that most of the participants of group farming cooperatives are the farmers who are new to the profession (Inan, 1984). This can be attributed to the fact that farmers who have high farming experience are usually older and are more resistant to change than new entrants.

Gender is significant at 5% which implies that there is the likelihood that the higher the chance of being a male farmer, the higher the probability of being a member of group farm cooperatives. This indicates that the male farmers have the tendency of working in groups compare to female farmers due to man-power of male farmers and time consumed in group farming that female farmers will not be able to spare because of the time needed to raise their families. This may also be as a result of the previous findings that male farmers are dominant in agriculture in the study area.

The result shows that other forms of cooperatives have a positive relationship with membership of group farm. This implies that, farmers who are members of other forms of cooperatives, have a higher likelihood of joining a group farm. This is probably because cooperative is a form of social network where ideas and innovations are being discussed. It is also a platform for connections among farmers, therefore there is a high tendency that a member of other forms of cooperative are likely to participate in group farming compared to non-member of any cooperative society. These results corroborate that of Prakash (2000) that cooperatives have even greater potential for coordinating self-help actions and platform group farmer's formation.

Table 3: Determinants of Decision to Join Group Farming Cooperatives

Variables	Coefficient	Z-value
Constant	-2.49	-3.12
Gender (male= 1)	1.57**	2.53
Household size (AE)	0.10	1.05
Farming experience (years)	-0.04**	-1.96
Year of schooling (years)	0.00	0.15
Farm size (ha)	0.02	0.39
Member of other cooperative (member= 1)	1.76**	6.03
LR chi square (6)	54.36**	
Log likelihood	55.19	

Note: ** indicates significance at 5%
Source: Field Survey, 2016

5.4 Analysis of Poverty

Table 4 shows that prevalence of poverty is higher among farmers who do not participate in group farming compare to farmers who participate in group farming cooperatives. This implies that members of group farming cooperative have other sources of income, which includes profits from their group farm activities which helps to increase their sources of income and their income in general, and this can help elevate them out of poverty.

Table 4: Prevalence, depth and severity of poverty according to participation in group farming

Poverty Indicators	Group-farm members	Non-group members	All households
Prevalence of poverty (%)	25.49	40.81	34.42
Depth of poverty	0.4823	0.5212	0.5049
Severity of poverty	0.0179	0.1662	0.0092

Source: Field Survey, 2016

5.5 Effects of Group Farming Cooperative on the Poverty Status of Farmers

Table 5 shows the comparative analysis of poverty status between group farmers and non-group farmers. The figures in bracket show the percentage of the farmers who are poor and non-poor for group farmers and non-group farmers. Group farmers have 74.51% of farmers to be non-poor and 25.49% to be poor; the non-group farmers have 59.15% of farmers to be non poor and 40.81% to be poor, this implies that a larger number of group farmers are said to be non-poor, this might be due to additional income they earn from their group farm, or the experience gained from the group contribution, and experience from the group and the government support which they received on their individual farm for maximum productivity.

Table 5: Comparative analysis of poverty status between group farmers and non-group farmers

Group farm membership	Non poor (n= 80)	Poor (n= 42)	Total
Yes	38 (47.50%)	13 (30.95%)	51 (41.80%)
No	42 (52.20%)	29 (69.05%)	71 (58.20%)

Total	80 (100%)	42 (100%)	122 (100%)

Source: Field Survey, 2016

5.6 Probit Regression Estimation of the Effect of Group Farming Cooperatives on Poverty Status of the Farmers

Table 6 explains the relationship between membership of group farming cooperatives and the poverty status of the farmers in the study area. From the seven independent variables that were considered, three were found to be statistically significant. The coefficient of household size was found to be statistically significant at 5%, it has a negative relationship with the household size, and this indicates that the smaller the household of the farmers, the higher the likelihood of not being poor, this may be due to reduction in responsibility that the additional household members might bring. Larger household demands larger responsibility in terms of feeding, clothing, shelter, education etc. This is not different from the findings of Olorunsanya *et al*., (2011) that large household size contributes to high incidence of poverty, and this could result to the inability of the household head to adequately cater for the dependants.

The coefficient of other forms of cooperative is found to be significant, the higher the participation in other forms of cooperatives, the higher the probability of not being poor, this can be viewed from the point of the advantages of cooperatives, where they have easy access to loan for farm expansion, and easy access to farm inputs. In conclusion, the coefficient of farm size has a positive relationship, which shows that the larger the farm size, the higher the probability of not being poor. This implies that farmers who have large hectares of land have the probability of escaping poverty, because they tend to produce more. This is because, the larger the farm size, the larger the output ought to be (other things being equal), and when production is high poverty is eradicated.

Table 6: Effect of group farming cooperatives on poverty

Variables	Coefficient	Z-value
Constant	0.49	0.06
Gender (male= 1)	0.47	1.01
Year of schooling (years)	0.23	1.12
Household size (AE)	-0.34**	-2.81
Farm size (ha)	0.10**	1.92
Farming experience (years)	-0.16	-087
Membership of group farming (member= 1)	0.39	1.42
Membership of other cooperative (member= 1)	0.59**	1.74
LR chi square (7)	25.92***	
Log likelihood	-64.51	

Note: ** indicates significance at 5%, AE= Adult Equivalent

Source: Field Survey, 2016

5.7 Effect of Group Farming Cooperatives Membership on Food Production

The result in table 7 shows the farm output, labour productivity, land productivity, farm size, farm income, and total factor productivity of the group farmers and individual farmers. The mean farm output of the group farmers was 39804.36kg (39.8 ton) while that of non-group farmers is 7246.52kg (7.25 ton). This implies that the farm output of the group farmers is far more than that

of the individual with a difference of 32557.84kg (32.56 ton), also the mean labour productivity of group farm are1943.98kg/man-day while that of individual farmers is 281.66kg/man-day. This also shows that the labour productivity of the group farms is higher than that of individual farms with about 1662.32kg/man-day. It also shows that the difference between the productivity of land for group farmer and individual farmers is 18,018.03kg/ha. All the variables considered except the farm size were found to be significantly different for both members and non-members of group farm cooperatives. Therefore we reject the null hypothesis that the mean of group farmers and non-group farmers for output, land productivity, labour productivity, farm income, total factor product are equal. These findings are not too different from that of Mark (2015), whose labour productivity for group is higher than that of non-group farmers with 746.64/man-day.

Table 7: Descriptive evidence of the effect of group farming cooperative on food production and productivity

Variables	Member of group-farm (N= 51)	Non-member of group farm (N= 71)	T-Statistics
Farm output (GE)	39804.98	7246.52	-6.10**
Labour productivity (output/man-day)	1943.98	281.66	5.48**
Land productivity (output/ha)	20426.19	2408.16	-4.94**
Farm size (ha)	3.56	3.34	-0.9
Farm income (thousand naira) (₦)	1,891.55	410.56	-9.30**
Total factor productivity	14.99	5.22	-4.37**

Note: ** indicates significance at 5%, GE= Grain Equivalent
Source: Field Survey, 2016

5.8 Profit Function Model

Table 8 shows that 49% of the variation that exist in the dependent variable was explained by the independent variables modeled. The remaining 51% was as a result of non-inclusion of some explanatory variables. Out of all the 7 independent variables in the model, the coefficient of membership of group farming cooperatives and household size was found to be statistically significant at ($p<0.01$). This may be due to the fact that farmers who participate in group farming cooperatives have their individual farms to help increase production, with the effort of joint participation, increased farm size, sharing of skills and experience, reduction in cost labour, and production of more than one crop, and mechanization. The coefficient of household size was found to be statistically significant at 5% level of significance, this may be as a result of the following factors; the larger the household size, the cheaper the farm labour. This is because household members are more likely to constitute a larger percentage of the labour used on the farm. The cost of labour also has been said by several literature to represent the largest share of the cost of production, and when cost of labour is reduced, the capital can be diverted into other cost of inputs such as fertilizer, seeds, pesticides, etc. These can help improve crop production on the farm. This is not different from the findings of Afolabi (2008) who found a positive relationship between family size and farm output and attributed it to respondent's extensive utilization of family labour in the farming activities.

Table 8: Profit function estimates of the effects of group farm cooperatives on food production

Variables	Coefficient	T-Statistics
Constant	-469399.7	-1.31
Membership of group-farm (member = 1)	1336932**	7.13
Gender (male)	332161	1.19
Years of schooling (years)	1186.51	0.11
Membership of other cooperative (member= 1)	252292.90	1.39
Farming experience (years)	-2645.78	-0.27
Household size (AE)	14645**	2.76
R-squared	0.49	
Adjusted r-square	0.47	

Note: ** indicates significance at 5%, AE= Adult Equivalent
Source: Field Survey, 2016

6. Conclusion

In this study, we have analyzed the effect of membership of group farming cooperatives on farmers' food production and poverty status using cross-sectional survey data collected from Osun state, Nigeria. Group farming is based on jointly used productive factors and performances making better than the individual farming system. In this study, we used probit regression model estimate to analyse the decision to join group farming cooperatives and the effect of membership of group farming cooperative on poverty status. Ordinary least square (OLS) was used to examine the effect membership of group farming cooperatives on food production and productivity of farmers.

The results of the analysis show that gender, farming experience and membership of other forms of cooperatives were significant in decision to join group farming cooperatives. Gender is positively significant, which means the higher the probability of being a male, the higher the chance of being involve in group farming cooperative. Farming experience is negatively significant; it implies that the lower the years spent in farming the higher the tendency of joining a group farm. Membership of other forms of cooperative society have a positive relationship with group farming cooperatives, it implies that, farmers who are members of other forms of cooperative have higher probability of joining a group farm cooperative.

The descriptive statistics for poverty status shows that members of group farming cooperatives with the years of schooling, membership of other forms of cooperative and farming experience have tendency of not being poor. The coefficient of household size, farm size and membership of other forms of cooperative are significant; this implies that the lower the household size, the higher the likelihood of not being poor because it is negatively significant. The results of the mean difference between land productivity; labour productivity, farm output, total factor productivity and farm income for group farmers and non-group farmers show that they are significantly different and those of group farmers are higher than those of non-group farmers. The OLS shows that the coefficients of group farm cooperative and household size are significant on the effect of group farming cooperatives on food production. This implies that farmers who are members of group farm cooperative have likelihood to produce more; this might be due to the fact that they have an additional farm managed by the group and this will help increase farm yield.

However, based on the findings of this study; those that really engage in group farming cooperative are men, members of other forms of cooperative society and farmers who have few years of farming experience. Membership of group farming cooperative can help increase food production in the study area and in Nigeria as a whole. Prevalence of poverty is higher among non-group farmers; and being a member of other forms of cooperatives helps to reduce poverty in the farming household.

Finally, both the governments and non-governmental organization should develop strategies that will encourage participation in group farming cooperatives and also create more awareness among farming households, which can motivate more farmers to partake in this form of farming techniques. Government agencies should focus on improving the output of the participants through provision of some inputs such as capital, improved seeds, fertilizer and chemicals at subsidised rate to help increase productivity. Some regulations should be reformed making easy group activities in Nigeria and reduce the requirements for joining the group. The most important reason for group farming is to increase production by using the economies of scale. Group farming should be introduced wherever possible.

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