



SOCIAL CAPITAL NETWORKS (SCNS) REDUCING THE POVERTY ON COCOA PRODUCING HOUSEHOLDS: EVIDENCE FROM OSUN AND ONDO STATES OF SOUTHWESTERN NIGERIA †

[REDES DE CAPITAL SOCIAL (SCNS) REDUCIENDO LA POBREZA EN PRODUCTORES DE CACA O: EVIDENCIA DE LOS ESTADOS OSUN Y ONDO DEL SUDOESTE DE NIGERIA]

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SUMMARY

Background. Poverty is a state or condition in which a person or community lacks the capital required to meet their needs. Whereas, social capital has been described as a vital asset for poverty alleviation since it can provide access to that which is lacking; capital. This study suggests evidences that the poor farmers could benefit more from social capital. **Objective.** This study was conducted to assess the impact of social capital on poverty alleviation among cocoa producing households in Southwestern, Nigeria. **Methodology.** A multi-stage sampling procedure was employed to select 300 cocoa-producing households for the study. Data were analyzed using social capital indices, FGT index, the Probit model and two-stage least square model. **Results.** The results revealed that cash contribution (0.478), labour contribution (0.556), decision-making (0.882), meeting attendance (0.920), heterogeneity (0.659) and density of membership (0.661) are the major dimensions of social capital available to cocoa-producing households. The results of the Probit model revealed that age of household head, gender, household size, years of experience, farm income, and farm size were the main determining factors of participating in SCNs. The Foster, Greer and Thorbecke index revealed that 65% of the sample households are poor. Out of the poor households, 42% are moderately poor and 23% are core poor. The results further revealed that factors including age, square of age, household size, years of education, farm income, farm size, cash contribution, labour contribution, decision making, meeting attendance, aggregate social capital and instrumented social capital significantly influenced cocoa-producing households' expenditure. **Implications.** The paper adds evidence for a better understanding of nexus between social capital networks and poverty alleviations. **Conclusions.** The study concluded that social capital alleviates poverty among cocoa-producing households. This means that policy strategy aimed toward alleviating poverty among cocoa-producing households must consider their social capital.

Key words: Social capital; Poverty; Cocoa producing households; Southwestern Nigeria.

RESUMEN

Antecedentes. La pobreza es un estado o condición en la que una persona o comunidad carece del capital necesario para satisfacer sus necesidades. Considerando que, el capital social se ha descrito como un activo vital para los que viven en la pobreza, ya que puede proporcionar acceso a lo que falta: el capital. Este estudio sugiere evidencias de que los agricultores pobres podrían beneficiarse más del capital social. **Objetivo.** Este estudio se realizó para evaluar el impacto del capital social en el alivio de la pobreza entre los hogares productores de cacao en el suroeste de Nigeria. **Metodología.** Se empleó un procedimiento de muestreo de varias etapas para seleccionar 300 hogares productores de cacao para el estudio. Los datos se analizaron mediante índices de capital social, índice FGT, el modelo Probit y el modelo de mínimos cuadrados de dos etapas. **Resultados.** Los resultados revelaron que la contribución en efectivo (0.478), la contribución laboral (0.556), la toma de decisiones (0.882), la asistencia a reuniones (0.920), la heterogeneidad (0.659) y la densidad de membresía (0.661) son las principales dimensiones del capital social disponible para el cacao. Hogares productores. Los resultados del modelo Probit revelaron que la edad del jefe de hogar, el género, el tamaño del hogar, los años de experiencia, el ingreso de la finca y el tamaño de la finca fueron los principales factores determinantes para participar en SCNs. El índice de Foster, Greer y Thorbecke reveló que el 65%

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de los hogares de la muestra son pobres. De los hogares pobres, el 42% son moderadamente pobres y el 23% son pobres centrales. Los resultados revelaron además que factores como la edad, el cuadrado de la edad, el tamaño del hogar, los años de educación, los ingresos de la finca, el tamaño de la finca, la contribución en efectivo, la contribución del trabajo, las decisiones, la asistencia a las reuniones, el capital social agregado y el capital social instrumentado influyeron significativamente en los gastos de los hogares productores de cacao. **Implicaciones.** El documento agrega evidencia para una mejor comprensión del nexo entre las redes de capital social y el alivio de la pobreza. **Conclusiones.** El capital social alivia la pobreza entre los hogares productores de cacao. Esto significa que la estrategia de política dirigida a aliviar la pobreza entre los hogares productores de cacao debe considerar su capital social. **Palabras clave:** capital social; pobreza; hogares productores de cacao; suroeste de Nigeria.

INTRODUCTION

Nigeria is that the most populous (205 million people) African's nation in 2018 and endowed with abundant natural and material resources (World Bank, 2018). As an example, Nigeria is among the key exporters of petroleum and maintains 6th position in World as at 2019. Additionally, Nigeria is among the large exporters of agricultural products (Chauvin *et al.*, 2012). Tree crops notably cocoa, Oil palm and rubber, largely led agricultural exports in Nigeria. Over years, petroleum and agricultural sectors provide sustainable and equitable pathways for growing Nigeria's Gross Domestic Product (GDP) (World Bank, 2016). For instance, Nigeria features a GDP of US\$376 billion and per capita GDP of nearly US\$ 2,000 in 2018 alone (World Bank, 2018). Despite, Nigeria is still ranked among the poorest countries in the world. Poverty and inequalities statistics in 2019 show that about 100 million people in Nigeria subsist below \$1.90 per day, (World Bank, 2017), while nearly 90 million people live in abject poverty representing nearly 41% of its estimated population (Adekola, 2017; Elem 2018; Dauda, 2019; NBS, 2019). These statistics further revealed that poverty is serious in rural areas of Nigeria, where cocoa producing households reside. A lot of factors, for instance, recent EU pesticides regulations, have adversely affected the livelihood of cocoa producing households and subsequently, led to changes in their welfare condition (Adeyemo *et al.* 2020; Kehinde and Tijani, 2021). Cocoa producing households have, in recent time, witnessed a continuing increase within the level of poverty and this situation is worrisome (Oseni and Adams, 2013; Lawal *et al.*, 2015). In 2019, nearly 52% of the households in Southwestern including Osun and Ondo States are experiencing extreme poverty (Lawal *et al.*, 2015; NBS, 2019).

In efforts to alleviating poverty among these households, Nigerian government initiated numerous programmes. Such programmes, consistent with Girei *et al.* (2013), include: Operation Feed the State, Green Revolution, Structural Adjustment Programme, Better Life Programme, Family Support Programme, National Directorate of Employment, Directorate of Food, Roads and Rural Infrastructure, National

Poverty Eradication Programme, National Special Food Security Programme, National Economic Empowerment and Development Strategy, Special Programme on Food Security, National Fadama II Programme, National Fadama III Programme. Other recent programmes, consistent with Elem (2018), include: Vision 2020, You Win Program, Subsidy Reinvestment and Empowerment Programme (SURE-P), Need for empowerment (N Power). Unfortunately, though a number of the programmes are still on, the efforts of poverty alleviation within the country still remain day-dream (Abbas, 2013; Arisi-Nwugballa *et al.*, 2016; Dauda, 2017). Over 93 million Nigerians still live in poverty, with a minimum of three million sliding into extreme poverty between November 2018 and February 2019 (Olayinka, 2019). This is often a clear indication of the ineffectiveness of those policies and programmes, which is due to a number of factors including lack of self-help mechanisms.

Currently and interestingly, attention is shifting towards the utilization of self-help mechanisms including social networks of individuals for poverty reduction. Social networks allow people with similar interest to come together and share information to resolve financial problems among them resulting to alleviating poverty among the households. The social networks include networks of families and friends, local groups, farmers' associations, religious associations, descendant union among others. SCNs empower people to take charge of their destinies and make social capital. Social capital is a feature of social network that facilitates social trust, cooperation and coordination for mutual benefits (Imandoust, 2011). The mutual benefits generated through social capital could alleviate poverty among people, if it's properly coordinated or marshalled through a proper channel. Social connection, one among the benefits, reduces poverty through joint efforts of poor households contributing other capitals like financial, human and physical to enhance their welfare condition (Adepoju, 2019). Although many researchers suggested that social capital networks could be a key instrument to reduce poverty (Adepoju and Oni, 2012; Adepoju, 2019; Ogunleye *et al.*, 2020), the pathway in which social capital networks contribute to poverty reduction haven't been systematically researched. Whereas, the

prevailing economic situation in Nigeria attaches importance to social capital as a solution for poverty reduction. In view of this fact, a study focusing on understanding the contribution of social capital to poverty alleviation and its pathway, has the potential to accelerate poverty reduction in Nigeria.

In this regard, an attempt was made to characterize the various dimensions of social capital available to cocoa producing households in order to provide required evidence to sustain the existing the group-based farmers support programmes. Consequently, this study therefore analytically investigates the impact of social capital on alleviating poverty among cocoa producing households. Specifically, it examines the dimensions of social capital available to cocoa producing households, investigates the main determinants of cocoa producing households' participation in SCNs; determines the incidence, depth and severity of poverty among cocoa producing households, and determines the impact of social capital on poverty alleviation among cocoa producing households. The rest of the paper is structured as follows: section two provides methodology and data source, section three present and interpret result while conclusion and recommendations are contained in the last section.

MATERIALS AND METHODS

Study area

This study was conducted in Osun and Ondo States of Southwestern Nigeria. The geographic area covers latitude $6^{\circ} 21'N$ and $8^{\circ} 37'N$ and longitude $2^{\circ} 31'E$ and $6^{\circ} 00'E$. The entire population in Ondo State is about 4,671,695 while in Osun State, the population is 4,705,589 (NBS, 2017). They're majorly Yoruba speaking areas, although there are different dialects even within an equivalent State. It characterized by two climatic seasons; wet season and dry season. The wet season runs from March to October, while the dry season which is shorter, is from November to March. The temperature ranges between $21^{\circ}C$ and $34^{\circ}C$ while the annual rainfall ranges between 1500mm to 3000mm. The favourable climatic and soil condition of the States encouraged about 70 percent of the inhabitants to engage in farming (NBS, 2017). The climate is ideal for the cultivation of crops like maize, yam, cassava, millet, rice, plantain, cashew and cocoa.

Sampling technique

A multi-stage sampling procedure was employed to select respondents for this study. The first stage involved purposive selection of three (3) Local

Government Areas (LGAs) each from Osun and Ondo States. In Osun State, Ife Central, Ife East and Ife North LGAs were selected while, Ondo East, Idanre and Ile Oluji/Okeigbo LGAs were selected in Ondo State based predominance of cocoa production within the LGAs. At the second stage, there was proportionate sampling of SCNs in each LGA based on their availability. The number of selected social capital networks was a function of the number of SCNs available in a particular LGA. The proportionality factor that was utilized in the selection of SCNs is stated as follows:

$$X_i = \frac{n}{N} \times 30 \quad \dots \quad (1)$$

X_i is that the number of SCNs sampled from LGAs; n is number of SCNs within an particular LGAs; N is total number of SCNs altogether the LGAs. About 30 out of 244 SCNs were selected to ensure equal representation of SCNs within the LGAs. Finally, simple random sampling was employed to select ten (10) cocoa-producing households in each of the chosen SCNs. In all, a total of 300 cocoa-based farming households were selected for the study.

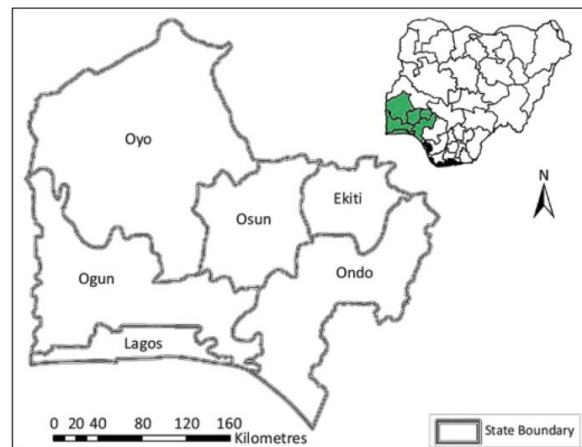


Figure 1. Map of Southwestern Nigeria.

Analytical techniques

Following Durlauf and Fafchamps (2004), Adepoju and Oni (2012), Iyanda (2015), Ige and Adeyemo (2019), social capital indices, Probit regression model, Foster, Greer and Thorbecke Index, and two-stage least square model were used to analyze the collected data.

Table 1. Distribution of households across the selected social groups.

State	LGAs	No. of functional SCNs in the LGAs	No. of selected SCNs in the LGAS	No. of Selected households in the SCNs	No of Selected households in the LGAS
Ondo	Ondo West	31	4	10	40
	Idanre	38	5	10	50
	Ile Oluji/Okeigbo	44	5	10	50
Osun	Atakumosa East	43	5	10	50
	Atakumosa West	42	5	10	50
	Ife North	46	6	10	60
Total		244	30	-	300

Source: Sampling frame for this study.

Social capital indices

This study employed the social capital indices proposed by Balogun *et al.* (2011), Adepoju and Oni, (2012), Iyanda (2015), and Balogun *et al.* (2017) to construct the social capital dimensions for this study. Cash contribution index is obtained by summing the entire cash contributed by the households to social capital networks and rescaled by dividing the quantity by the utmost value within the dataset. Labour contribution index is obtained by calculating the quantity of days that farmer worked for his or her networks and rescaled by dividing the amount by the utmost value within the dataset. Decision making index is obtained by summing households' participation in the decision of three most vital networks to them. Their responses are scaled from very active, to very passive and therefore the average of the rank for the three networks is calculated. Heterogeneity index is rated according to twelve criteria: neighborhood, kin group, occupation, economic status, religion, political affiliation, sex, age group, level of education, cultural practices, belief and trust. It had been calculated for 3 most vital networks to the households. The utmost value for this dimension is 36 which represents complete heterogeneity. Membership density index is obtained by dividing the household membership in networks by the entire number of networks available in the study area. Meeting attendance index is obtained by summation attendance of household members at meetings and rescaled to the number of scheduled meetings during a year. Aggregate social capital index is that the multiplication of density of membership, heterogeneity index and decision-making index of cocoa-based farming households in their various SCNs.

Probit Model

Probit regression model was used to analyze the determinants of participation of cocoa producing households in SCNs. The dependent variable features a binary outcome; a cocoa producing households either participate or to not participate. Probit model was employed because it assumes Gaussian distribution of error terms. The model also has the power to resolve the matter of heteroscedasticity and satisfy the idea of cumulative normal probability distribution (Kehinde and Adeyemo, 2017).

Generalized probit model is specified as follows;

$$Pr\left(Y = \frac{1}{x}\right) = \phi(X'\beta) \quad (2)$$

Pr represents the probability that a cocoa producing household will participate in SCNs, ϕ represents the cumulative density distribution of the normal distribution.

Therefore, the model is expressed as

$$Y^* = X'\beta + \varepsilon \quad (3)$$

Y^* is the latent dependent variable, X' is the explanatory variable of the regression, β is the parameter estimated and ε is the error term which is independently, identically distributed with zero mean and constant variance. However, Y^* is the random variable (dichotomous), it can be assumed that Y_i takes on the value 0 or 1, where 0 denotes the non-occurrence of the events in question and 1 denotes the occurrence. The binary response in this study is whether or not cocoa producing household participate in SCNs.

Therefore, binary probit model for this study is specified as follows;

$$Y^* = \beta_0 + X_i\beta + \mu_i \tag{4}$$

Y^* = Dependent variable, X_i = Explanatory variable, β = Coefficient to be estimated, and μ_i = Random disturbance term.

The marginal effect of the variables is calculated using the formula:

$$\text{Marginal effects} = \beta_i \phi(z) \tag{5}$$

Where, β_i are the coefficients of the variables and $\phi(z)$ are the cumulative normal distribution value associated with the mean dependent variable from the probit estimation.

The empirical model is implicitly expressed as

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \dots + \beta_{10} X_{10} + U_i \dots \tag{6}$$

Y = Participation in SCNs (1=Yes; 0=No)

The explanatory variables are: X_1 = age of respondent (years); X_2 = Gender (1=male; 0 = female); X_3 = marital status (1=married; 0= otherwise); X_4 = household size (actual number); X_5 = years of formal Education; X_6 = Years of farming experience; X_7 = farm income (₦); X_8 = non-farm income (₦); X_9 = farm size (hectare); U_i = error term. This study incorporates the independent variable based on review of existing literature

Foster, Greer and Thorbecke (FGT) Index

This study employed FGT index proposed by Foster *et al.* (1984) to estimate the occurrence, depth, and severity of poverty among the households. The poverty level is set at two-thirds of the average monthly per-capita food and non-food expenditure. The poverty line is a line that divides poor and non-poor households. The FGT index is expressed as follows:

$$FGT_\alpha = \frac{1}{n} \sum_{i=1}^R \left(\frac{Z - X_i}{Z} \right)^\alpha \tag{7}$$

Where Z is the poverty line; n is the population of the study; R is the number of households below poverty line (estimated to be 2/3 of the mean per capita expenditure); X_i is the per capita expenditure of households; α is a poverty parameter of FGT and it takes values between 0 and 2. The value of α implies

as follows: when α is 0, it implies the incidence of poverty, α equals to 1, implies the depth of poverty while α equals to 2, implies the severity of poverty.

Table 2. Description of variables in Probit model

Variables	Unit	Expected sign	Description
Age	Year	+	Measured in years
Gender	Dummy	+	1= male 0= female
Marital Status	Dummy	+	1= if farmer is married 0= otherwise
Household size	Number of persons	+	Measured in number of household members
Education	Years spent in school	+	Measured in years spent in school
Farming experience	Years spent in farming	+	Measured in years spent in farming
Farm income	Naira	+	Measured in Nigeria currency (Naira)
Non-Farm income	Naira	+	Measured in Nigeria currency (Naira)
Farm size	Hectares	+	Measured in hectares

Two stage least square model

The major econometric issues in assessing the impact of social capital on poverty alleviation is the fact that there is bi-causality, otherwise known as endogeneity in the connection between social capital and monthly per capita expenditure which is used as proxy for poverty alleviation. This is premised on the fact that SCNs’ activities are not random. For example, Individuals choose who they want to associate with and what groups they want to join (Darlauf and Fafchamps, 2004). Secondly, the formation of SCNs is costly in terms of time and other resources. This implies that individuals might invest more resources into social capital network formation in order to acquire more social capital (Grootaert *et al.*, 2004). The above-mentioned facts established the presence of bi-causality between social capital and any economic outcomes (Balogun *et al.*, 2011; Adepoju and Oni,

2012; Iyanda, 2015; Balogun *et al.*, 2017), which could cause biasedness in estimating the effect of social capital. Therefore, it is necessary to solve the problems of endogeneity associated with social capital. One of the standard ways to solve the endogeneity problem is to apply Two-stage least square model using instrumental variable (IV) estimation procedure. Period of household stay in the community, household charity donation in the previous year, membership in a religious group and membership in ethnic group(s) were considered as potential IV for the social capital variable. The household charity donation in the past year was selected because it was highly correlated with social

capital and uncorrelated with poverty alleviation. Two stage least square model was used to analyze the effect of social capital on poverty alleviation among the households. This study adopts the analytical framework used by Adepoju and Oni (2012) and Ogunleye *et al.* (2020) This model was based on household economic behaviour under constrained utility maximization which relates to the quantity demand of household endowments (assets) which describes the environment in which decisions are made.

The models are specified as follows:

Model 1:

$$Y_i = \beta_0 + \beta_1 \text{AGEHHED} + \beta_2 \text{AGEHHED2} + \beta_3 \text{FFEDU} + \beta_4 \text{FAMEXP} + \beta_5 \text{HHSIZE} + \beta_6 \text{FARMCOM} + \beta_7 \text{NFARMCOM} + \beta_8 \text{GENHHED} + \beta_9 \text{FAMSIZE} + e_i \quad (8)$$

Model 2:

$$Y_i = \beta_0 + \beta_1 \text{AGEHHED} + \beta_2 \text{AGEHHED2} + \beta_3 \text{FFEDU} + \beta_4 \text{FAMEXP} + \beta_5 \text{HHSIZE} + \beta_6 \text{FARMCOM} + \beta_7 \text{NFARMCOM} + \beta_8 \text{GENHHED} + \beta_9 \text{FAMSIZE} + \beta_{10} \text{ATTEND} + \beta_{11} \text{DECID} + \beta_{12} \text{CASHID} + \beta_{13} \text{LABORID} + \beta_{14} \text{HETEROID} + \beta_{15} \text{MEMID} + e_i \quad (9)$$

Model 3:

$$Y_i = \beta_0 + \beta_1 \text{AGEHHED} + \beta_2 \text{AGEHHED2} + \beta_3 \text{FFEDU} + \beta_4 \text{FAMEXP} + \beta_5 \text{HHSIZE} + \beta_6 \text{FARMCOM} + \beta_7 \text{NFARMCOM} + \beta_8 \text{GENHHED} + \beta_9 \text{FAMSIZE} + \beta_{10} \text{AGGRAGATE} + e_i \quad (10)$$

Model 4:

$$Y_i = \beta_0 + \beta_1 \text{AGEHHED} + \beta_2 \text{AGEHHED2} + \beta_3 \text{FFEDU} + \beta_4 \text{FAMEXP} + \beta_5 \text{HHSIZE} + \beta_6 \text{FARMCOM} + \beta_7 \text{NFARMCOM} + \beta_8 \text{GENHHED} + \beta_9 \text{FAMSIZE} + \beta_{10} \text{INSTRUMENTAL} + e_i \quad (11)$$

Model 5:

$$Y_i = \beta_0 + \beta_1 \text{AGEHHED} + \beta_2 \text{AGEHHED2} + \beta_3 \text{FFEDU} + \beta_4 \text{FAMEXP} + \beta_5 \text{HHSIZE} + \beta_6 \text{FARMCOM} + \beta_7 \text{NFARMCOM} + \beta_8 \text{GENHHED} + \beta_9 \text{FAMSIZE} + \beta_{10} \text{DIRECTINTERATION} + e_i \dots \quad (12)$$

Model 6:

$$Y_i = \beta_0 + \beta_1 \text{AGEHHED} + \beta_2 \text{AGEHHED2} + \beta_3 \text{FFEDU} + \beta_4 \text{FAMEXP} + \beta_5 \text{HHSIZE} + \beta_6 \text{FARMCOM} + \beta_7 \text{NFARMCOM} + \beta_8 \text{GENHHED} + \beta_9 \text{FAMSIZE} + \beta_{10} \text{INDIRECTINTERATION} + e_i \dots \quad (13)$$

Where;

Y_i is natural logarithm of households' per capita expenditure

The explanatory variables are: GENHHED is Gender of household head (1=for male; 0=for female); AGEHHED is Age of household head (years); AGEHHED2= age square of farmers (proxy for threshold age) (years); HHSIZE is Household size (actual value); FFEDU is Years of formal education; FAMEXP is Farming experience (years); FAMSIZ is Farm size (hectare); FARMCOM is farm income (Naira); NFARMCOM is non-farm income (Naira); ATTEND is Meeting attendance index (percent); DECID is Decision making index (percent); MEMID is Density of membership (percent); CASHID is Cash contribution of households to associations (percent); LABORID is Labour contribution of households to associations (percent); HETEROID is Heterogeneity index of associations (percent), AGGRAGATE is

Aggregate Social capital (index), INSTRUMENTAL is Instrumental variable (charity donation); DIRECTINTERATION is Direct interaction of social capital variable with unobservables' INDIRECTINTERATION is Indirect interaction of social capital variable with unobservables; e_i = error term. This study incorporates the independent variable based on review of existing literature.

RESULTS AND DISCUSSION

Socioeconomic characteristics of cocoa-producing households

The socio-economic characteristics of cocoa-producing households are presented in Table 4. The average age of the respondents is 51.3 years. This shows that the majority of respondents are older although still in the economically active age compared to the UNDP report (2011) according to which the life expectancy of Nigerians is 51.9 years. while the square of the average age of the respondents, which is a

Table 3. Description of variables in Two-stage least square.

Variable	Unit	Expected signs	Description
Age	Continuous	+	Measured in years
Age ²	Continuous	-	Measured in years
Gender	Dummy	+	1= male 0= female
Education	Continuous	+	Measured in years spent in school
Household size	Continuous	+	Measured in number of household members
Farming experience	Continuous	+	Measured in years spent in farming
Farm size	Continuous	+	Measured in hectares
Farm income	Continuous	+	Measured in Nigeria currency (Naira)
Non- Farm income	Continuous	+	Measured in Nigeria currency (Naira)
Meeting attendance index	Continuous	+	Generated index (Percent)
Heterogeneity index	Continuous	+	Generated index (Percent)
Labour contribution index	Continuous	+	Generated index (Percent)
Decision making index	Continuous	+	Generated index (Percent)
Density of membership	Continuous	+	Generated index (Percent)
Cash contribution index	Continuous	+	Generated index (Percent)
Aggregate social capital	Continuous	+	Generated index (Percent)
Instrumental social capital	Continuous	+	Generated index (Percent)
Direct interaction of social capital variable with unobservables	Continuous	+	Generated index (Percent)
Indirect interaction of social capital variable with unobservables	Continuous	+	Generated index (Percent)

representation of old age, is 2722.12. This confirms that farmers are relatively older. This could be attributed to the fact that older people generally stay in villages to farm, while relatively younger people go to the city to study, learn trades or look for administrative jobs. The average household size is around seven members. This implies that family labor in these peasant homes would be readily available for cocoa production. This is in agreement with the findings of Kehinde *et al.* (2018). The average cocoa-producing household's in the study area spent nine years in school. This is in line with the minimum nine-year basic education requirement under the Universal Basic Education Program in Nigeria. Thus, literate farmers participated in the production of cocoa. The result is in line with Kehinde and Adeyemo (2017) and Adeyemo *et al.* (2020). The average years of farming experience is 24 years, which indicates that farmers have many years of experience in cocoa cultivation. This is in line with the findings of Kehinde and Adeyemo (2017) and Adeyemo *et al.* (2020). The average farm size is 5.7 hectares, which means that the farmers are smallholders. This result is supported by Alao *et al.* (2020). The majority (89 percent) of cocoa producing heads of households are male. This finding suggests that male cocoa farmers dominate cocoa production in the Osun and Ondo states. This could be attributed to the fact that cocoa production requires physical strength and the study agrees with Adeyemo *et al.* (2020). Farm income is the main source of capital for the purchase of agricultural inputs and other household consumer goods. The average farm income in the study area is ₦ 373,773(\$910.09) (note: USD \$1= ₦ 410.89). The result suggests that there is capital available to make the purchase of agricultural inputs feasible. The average non-farm income of the respondents in the study area is ₦107,429.9(\$261.58). This implies that farmers in the study area are engaged in economic activities other than agriculture.

Participation in SCNs

Participation in SCNs is presented in Figure 2. About 70 percent of the respondents participated in social capital networks. This implies that the farmers in the area had organized themselves into social capital networks. This study supports the general assumption that individuals affiliated to these networks primarily because of their perceived economic benefit. Economic benefit is regarded as one of the key elements in alleviating poverty among the farmers (Ogunleye *et al.*, 2020; Ogunleye and Adeyemo, 2020).

Table 4. Socio-economic characteristics of cocoa producing households.

Variables	Cocoa producing households
Gender (%)	
Male	89.33
Female	10.67
Age (years)	51.30 (± 9.48)
Age square (years)	2722.12(± 960.29)
Household size (#)	7.05 (± 2.12)
Formal education (year)	8.89 (± 4.38)
Years of farming experience	23.98 (± 9.25)
Farm size (ha)	10.68 (± 8.89)
Farm income (₦)	373 773 (± 331 338.6)
Non-Farm income (₦)	107 429.9 (±132 132.7)

Source: Field survey, 2020; Data in brackets () represent the standard deviation.

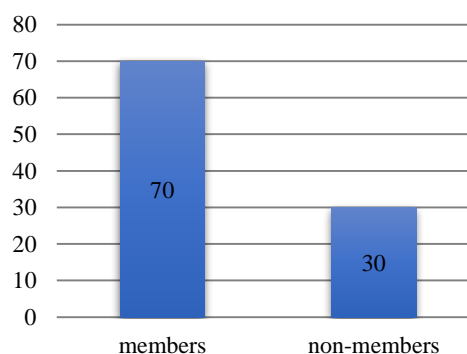


Figure 2. Participation in SCNs. Source: Field survey, 2020.

Dimensions of social capital available to cocoa-producing households

The summary statistics of dimensions of social capital available for cocoa-producing households are presented in Table 5. These include Cash Contribution (CC), Labor Contribution (LC), Decision Making (DMA), Meeting Attendance (MA), Heterogeneity (HI) and Density of membership (DM). DM has a value of 0.661 units. This means that cocoa producing households are members of about 7 out of 10 associations. HI has 0.459 units. This suggests that the networks of cocoa producing households is made up of people with similar characteristics such as the same ethnic origin, the same occupation, the same religion, the same neighborhood, among others. The DMA value (0.882 units) is high among cocoa producing households in associations. This implies that household members actively participate in decision

making in associations, they belong. The GA has 0.920 units which show that the households attend association statutory meetings as per schedule. The CC value (0.478 units) is low, which means that households are not committed to contributing cash to associations. Also, the LC value (0.558 units) is low. This implies that the households contribute with work in about 56 days a year to the associations. The aggregate social capital is 0.695 units. The result shows that there is a high level of social capital among cocoa producing households in the study area. This result collaborates with the studies by Balogun *et al.*, (2017; 2018) and Adepoju (2019).

Table 5. Dimensions of social capital available to cocoa producing households.

Variables	Mean	Standard deviation
Cash contribution	0.478	0.230
Labour contribution	0.558	0.360
Decision making	0.882	0.428
Heterogeneity	0.459	0.276
Density of membership	0.661	0.348
Meeting attendance	0.920	0.533
Aggregate Social capital (Multiplicative)	0.695	0.265

* Obs =300 **Source:** Field survey, 2020

Determinants of cocoa producing households' participation in SCNs

The determinants of the participation of cocoa-producing households in SCNs were analyzed using

Table 6. Determinants of participating in SCNs.

Explanatory Variables	Probit Regression model		
	Coefficient	T statistics	Marginal effect
Age	-0.041***	-3.65	-0.013***
Gender	-0.787**	-2.12	-0.195**
Marital Status	-0.521	-1.12	-0.139
Household size	0.173***	3.36	0.055***
Education (years)	0.007	0.38	0.002
Experience (years)	0.022**	2.00	0.007**
Farm Income	-1.046**	-3.46	-0.337**
Non-Farm Income	4.837	0.70	1.557
Farm Size	0.039***	3.25	0.012***
Constant	2.075***	3.13	
Number of Observation	300		
LRChi2(9)	74.96		
Prob>Chi2	0.0000		
Pseudo R2	0.2045		
Loglikelihood	-145.781		

***, **, and * rep Statistically significant at 1% ,5%, and 10%, respectively. **Source:** Field survey, 2020.

the probit regression model. The marginal effect was used to interpret the result because it shows the magnitude and direction of the effect of the explanatory variables on the dependent variable. The likelihood ratio test indicates that the general goodness of fit of the probit model is statistically significant at 1% probability level. The probit model was fitted with ten explanatory variables, however six of them are significant (Table 6). These variables include age, gender, household size, experience, farm income and farm size. The negative signs of the coefficient of the significant variables reduce probability of household participation in SCNs while positive signs increase the probability of participation. Age of the household head negatively and significantly affects the probability of participating in SCNs. A year increase in age of household head decreases the decision to participate in SCNs by 1.3 percent. This could be attributed to the risk adverse nature of older farmers which makes them to be more conservative than the younger ones to joining new social networks. Similarly, gender of the household head negatively and significantly affects the probability of participating in SCNs. An additional effective contact with female headed household increases the decision to participate in social capital networks by 19.5 percent. This study negates the general notion that male farmers have more freedom to participate in different social groups compared to the female farmers. This corresponds to the findings of Awotide *et al.* (2015) and Alao *et al.* (2020) who also found the percentage of females belonging to farmer related associations to be higher than the males. Also, farm income of the household negatively and significantly

affects the probability of participating in SCNs. A naira increase in farm income of household decreases the decision to participate in social capital networks by 33.7 percent. This could be attributed to the fact that farmers that earn substantial income from farm would less likely source for external funds in SCNs. However, household size positively and significantly affects the probability of participating in SCNs. A member increase in household size increases the decision to participate in SCNs by 5.5 percent. This could be attributed to the fact that dependency and consumption pressure from household members may push household head to join a SCN. Likewise, years of farming experience positively and significantly affects the probability of participating in SCNs. A year increase in years of farming experience increases the decision to participate in social capital networks by 0.7 percent. This could be ascribed to the fact that farming experience gives farmers access to unlimited information about general benefits of joining SCNs. Correspondingly, farm size positively and significantly affects the probability of participating in SCNs. A hectare increase in farm size increases the decision to participate in SCNs by 1.2 percent. This could be ascribed to the fact that the production on large farms is big enough to justify the decision to join SCNs.

Poverty indicators among surveyed households

The results of the FGT index for incidence, depth and severity are presented in Table 7. The poverty line was calculated to be equal to ₦ 20704 (\$50.30). The poverty line was calculated as an average of two thirds of per capita household expenditure (food and non-food) of households. The incidence, depth, and severity of poverty in the study are estimated at 0.65, 0.44, and 0.23, respectively. This implies that 65 per cent of the households included in the sample are poor. Among poor households, 42% of the households included in the sample are moderately poor. This implies the percentage of poor families who can afford only two thirds of the poverty line. While, about 23% of the poor families in the sample are core poor. It implies that this percentage of poor families who can afford only one third of the poverty line. This shows that this group of households are living in extreme poverty and they spend a greater part of their income on family expenses. In summary, poverty is somewhat chronic among cocoa-producing households in the States of Osun and Ondo. Therefore, in order to successfully alleviate poverty in the study area, comprehensive and sustainable alleviation policy approaches should be fashioned to lift the farming household out of their poverty trap. This result is in line with other African estimates reported by

Ogwumike and Akinnibosun (2013) and Ige and Adeyemo (2019).

Table 7. Poverty Indicators among surveyed households.

Poverty indicator	Frequency	Percentage
Non-poor	0.35	35
Poor	0.65	65
Poverty depth	0.43	43
Poverty severity	0.23	23

Source: Field survey, 2020.

Poverty status by participation in SCNs

The poverty status was further classified by participation in SCNs, as shown in Figure 3. Based on the monthly mean per adult equivalent expenditure, ₦26098.31 (\$63.82) and ₦ 15509.26 (\$37.68) are the poverty lines for the participants and non-participants of SCNs, respectively. The percentage of participants of SCNs categorized as being poor constituted about 35%. In the case of non-participants of SCNs, the percentage of the poor is about 61%. The result showed that social capital networks have made an appreciable impact on poverty reduction among cocoa households in the study area. This finding is in line with the findings of Adepoju and Oni (2012), Ogunleye and Adeyemo (2020) and Ogunleye *et al.* (2020) that SCNs help in alleviating poverty among cocoa households in Nigeria.

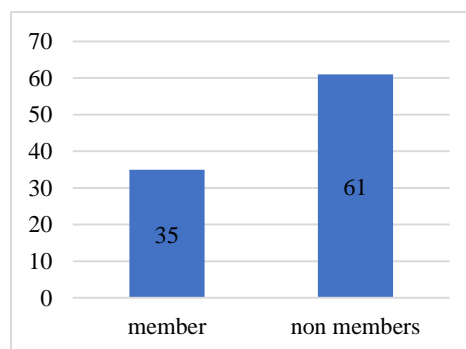


Figure 3. Poverty status by participation in social capital networks (Percentage of people below poverty line). Source: Field survey, 2020.

Effect of social capital on poverty alleviation among cocoa-producing households

Table 8 describes the effect of social capital on poverty reduction among cocoa-producing households in

southwestern Nigeria. The monthly per capita household spending of cocoa-producing households was used as a proxy for poverty alleviation in the study. The basic model is shown in the first column of the Table. The reason is to evaluate household spending when they are not participating in social capital activities. The level of household spending was reflected in the R^2 and F values of the model. Age, square of age, household size, years of education, farm income and farm size significantly impacted the expenses of cocoa producing households. However, the coefficients of the years of education, farm income and farm size showed positive signs. This implies that for each unit of increase in any of these variables, the expenditure of cocoa-producing households increases by the magnitude of its coefficients; year of education (0.340), farm size (0.830) and farm income (0.020). On the other hand, the age², age and household size showed negative signs. This implies that for each unit of increase of this variable, there is a reduction in the expenditure of cocoa producing households due to the size of its coefficients; 0.409 units for age², household size (0.436) and 0.427 units for age.

As shown in the result, age and the square of age, which is a representation of old age, have negative relationships with the expenses of cocoa-producing households. The result shows the lower spending power of elderly household heads. This implies that older respondents tend to be poorer than younger ones and the square of age shows that elderly farmers have a higher risk of being poor after they have reached a certain age threshold, probably old age. This could be attributed to the fact that older people tend to abstain from active farming activities due to health problems and other aging problems without any pension system. Furthermore, farmers' strength for farming activities decreases as they age, increasing the risk of poverty for older farmers. The findings are consistent with those of Adepoju and Okunmadewa (2010) and Adeoti (2014) that a person's age has a negative effect on households' well-being. Furthermore, the increase in the household size coefficient has a diminishing effect on the expenditure of cocoa producing households. The finding indicates that household size reduces per capita household spending. This result suggests that larger household members are likely to be poorer than those of the smaller ones. This could be attributed to the fact that families with large family members will spend a large portion of their income on basic household needs, such as food, medicine, clothing, among other necessities. In this sense, large families require a greater part of the limited family income and, for the most part, require additional income to meet the basic needs of the family, which in most cases are unattainable. This could push them lower on the

poverty level scale, especially when they are not of working age. This result clearly shows that the African culture of polygamous family subjects them to poverty and hunger. This result is in line with the work done by Tenzin *et al.* (2013) and Nasution *et al.* (2015).

However, the years of education of the cocoa-producing households have a positive relationship with the expenses of the cocoa-producing households. In other words, with appreciable years of formal education in the study area, cocoa-producing families are less likely to become impoverished. This indicates that longer years of formal education have played an important role in poverty reduction. This could be attributed to the fact that the average respondents have spent many years in school, showing that they have the ability to undertake any economic activity. Hence the respondents' ability to work and earn an income can be used to meet their basic needs. This is consistent with the findings of Lam and Biu (2014). Farm income also has a statistically significant positive effect on the expenses of cocoa-producing households. This indicates that farm income increases the chances that cocoa-producing households will be able to get out of poverty. This could be attributed to farm income increasing the family resource base. This is consistent with the literature on the relationships between income and expenditure according to Keynes' psychological laws of consumption (Jhingan, 2009; Ogunleye and Adeyemo, 2020). The study also found that farm size has a positive influence on cocoa-producing households' spending. This shows that expanding the size of the farm is a means of improving income generation and this will have a positive effect on the standard of living of families. This is because the size of the farm is a form of physical resource that farm families possess, which will improve their standard of living. The finding is consistent with the findings of Diao *et al.* (2010). This shows that as the size of the household -owned farm increases, the probability of being poor decreases.

The second column of Table 8 shows the inclusion of six additional forms of social capital variables identified in this study. The reason is to examine household spending while participating in social capital activities. This new model has a better value, as evidenced by the R^2 and F value of the model. This suggests that household spending improves as households become involved in the affairs of their social groups. This model shows that the effect of social capital on household spending can be attributed to cash contributions, labor contributions, decision making and meeting attendance. Contribution in cash, contribution to labor, decision-making and participation in meetings showed positive signs. This

Table 8. Impact of social capital on poverty alleviation among the cocoa-producing households.

Variables	Basic model		Additive model		Multiplicative model		Model with instrumented variable		Model with interaction of social capital with unobservable			
	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat
Age	-0.427***	-2.61	-0.240	-0.54	-0.425***	-2.59	-0.384**	-2.36	-0.428***	-2.73	-0.426***	-2.69
Age ²	-0.409**	-2.53	-0.187	-0.41	-0.485**	-2.52	-0.342**	-2.39	-0.408**	-2.52	-0.426**	-2.53
Household size	-0.436**	-2.53	-0.271	-0.98	-0.426***	-3.86	-0.476***	-4.76	-0.422***	-3.86	-0.421***	-3.87
Years of education	0.340***	6.56	0.125***	7.92	0.342***	6.58	0.347***	6.68	0.342***	6.58	0.314***	6.60
Years of experience	0.260	1.00	0.154*	1.67	0.254	0.97	0.916	0.34	0.254	0.97	0.248	0.95
Farm size	0.830***	3.06	0.336*	1.82	0.797***	2.88	0.862***	3.20	0.796***	2.88	0.714***	2.90
Gender	-0.389	-0.54	-0.501	-1.30	-0.368	-0.51	-0.364	-1.50	-0.366	-0.66	-0.511	-0.61
Farm income	0.020***	2.88	0.038*	1.94	0.020***	2.84	0.205***	2.92	0.201***	2.84	0.195***	2.81
Non- farm income	-0.028	-1.53	-0.410***	-2.78	-0.038	-1.52	-0.024	-1.32	-0.290	-1.59	-0.029*	-1.71
Cash contribution			0.671**	2.10								
Labour contribution			0.103**	2.17								
Decision making			0.210***	3.21								
Heterogeneity			0.309	0.79								
Membership density			0.628	0.24								
Meeting attendance			0.244***	3.78								
Aggregate social capital					0.764***	2.62						
Instrumented social capital							1.038***	2.67				
Direct									0.222***	3.65		
Indirect											0.409***	2.88
Constant	1.225***	2.94	1.172***	2.95	1.220***	2.92	1.111***	2.67	1.350***	2.96	1.073***	2.94
Adjusted R ²	0.314		0.842		0.461		0.505		0.623		0.731	
F	9.66***		21.37***		9.93***		9.94***		9.96***		9.98***	

***, ** and * represent significance levels at 1%, 5% and 10%, respectively

implies that for each unit of increase in any of these variables, the expenditure of cocoa-producing households increases by the magnitude of its coefficients; 0.671 units for cash contribution, labour contribution (0.103), decision-making unit (0.210) and participation in meetings (0.244). This suggests that household well-being will improve as households become involved in their social group affairs, such as contributing money and labour, as well as participation in decision making and meetings. This suggests that participating in the affairs of social group will further improve the subsistence status of the households and reduce the chances of households being in poverty. This is in line with the finding by Omonona *et al.* (2014). The introduction of the multiplicative variable of the social capital in the third column of the Table lays the foundations for further research on the endogeneity effect of the social capital. The inclusion of this variable led to a slight improvement in the value of R^2 and F. Together with some socio-economic variables, the aggregate social capital positively and significantly influences the spending of cocoa producing households. This implies that a unitary increase in share capital increases the spending of cocoa producing families by 0.764 units. This is likely due to the fact that social networks tend to promote the well-being of members. This result agrees with Adepoju and Oni (2012).

To take into account the bi-causality between social capital and poverty reduction, using the aggregate social capital model, the original social capital was replaced by an instrumental variable (charitable donation from home in the last year). The result of the instrumental variable showed an improvement in the value of R^2 and F compared to the original social capital model. The use of instrumental variables leads to a slightly higher coefficient (1.038). This confirms the exogenous nature of the social capital. A unit increase in the instrumented social capital would increase the expenses of cocoa producing household by 1.038 units. However, the coefficient (0.222) was reduced, while controlling the linear interactions of the social capital with the unobservables, and then increased (0.409) while controlling the non-linear interactions of the social capital with the unobservable. This implies that social capital is endogenous to the spending of cocoa-producing households and must be explored among people with similar characteristics to alleviate their poverty. It is evident from this finding that social capital plays an important role in alleviating poverty among cocoa-producing households in southwestern Nigeria. This result is in line with the work done by Tenzin *et al.*

(2013), Nasution *et al.* (2015), Kehinde *et al.* (2018) and Kehinde *et al.* (2021).

Sargan test of instrumental variables

Sargan's standard over-identification test was performed for instrument validation. The satisfactory condition is that the p-value of the instrument must exceed the significance values of 0.1 to be a valid instrument (Cawley *et al.*, 2018; Kehinde *et al.*, 2021). Sargan's result is presented in Table 9 and it is reported that the selected instrument (charitable donation in the last year) is a valid instrument, because its t-statistic is not statistically significant. Therefore, on this basis, the tool is sufficiently valid to address the endogeneity problems that may arise from participation in SCNs and therefore, our estimates would be unbiased and consistent.

Table 9. Sargan test of instrumental variables.

Variable	Poverty alleviation	
	OLS	IV (charity donation)
Social capital	0.764*** (2.62)	1.038*** (2.67)
Sargan Estimates		0.978 (0.281)

***, ** and * represent significance levels at 1%, 5% and 10%, respectively

CONCLUSIONS

This study investigated the impact of social capital on poverty alleviation among cocoa producing households in Southwestern, Nigeria. A multi-stage sampling procedure was employed to select 300 cocoa-producing households for the study. Data were analyzed using social capital indices, FGT index, the Probit model and two-stage least square model. The study concluded that the majority of the cocoa producing households' head are male, small scale and at their productive age. Furthermore, FGT index shows that the percentage of participants of SCNs categorized as being poor constituted 35%. While, in the case of non-participants of SCNs, the percentage of the poor is about 61%. The results of the Probit model revealed that age of household head, gender, household size, years of experience, farm income, and farm size are the main determining factors of participating in SCNs. Results from the two-stage least square model employed in the study revealed that factors including age, square of age, household size, years of education, farm income, farm size, cash contribution, labour contribution, decision making,

meeting attendance, aggregate social capital and instrumented social capital significantly influence poverty alleviation among cocoa-producing households. This study concluded that the majority of cocoa-producing households in southwestern Nigeria experience poverty and also that, social capital is an important variable for alleviating poverty among the households. This conclusion confirms the earlier findings that social capital is key to achieving a higher welfare status among members of SCNs. It is imperative that policies aimed at alleviating poverty among cocoa-producing households must take social capital and instrumented social capital (charity donation) into consideration. Therefore, it is recommended that the government and other agriculture-related organizations should encourage poor cocoa producing households to form and participate in SCNs of their kinds in terms of tribe, norms and belief system among others, where they have the opportunity to gather and access resources to alleviate their poverty. Furthermore, the households should be encouraged to participate more actively in decision making activities of the association, labour and cash contribution as well as attending designated meetings in order to gain more access to productive resources that could further enhance their standard of living. Meanwhile, education is a central factor that determines household expenditure, intervention in term of provision of education for rural households should therefore be incorporated into the poverty alleviation programmes. SCNs should organise evening classes training for their members and encourage or mandate them to go for the training. Large household size should be discouraged through education and others measures like family planning through SCNs. Single male household member should be discouraged from going into polygamous type of family while married households should stick to monogamous family type as it increases per capita expenditure of the household due to reduced number of family size, which enhances household welfare status

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Statement of informed consent. Verbal and written informed consent were obtained from the respondents for their anonymized information to be published in this article.

Data availability. Data are available with the corresponding author at: (kehindeayodeji8@gmail.com) upon reasonable request.

CRedit statement. **A. D. Kehinde:** responsible for conceptualization of the study, application of statistical, mathematical and techniques to analyse, project write up and editorials. **A. A. Ogundeji:** responsible for oversight and leadership responsibility for the research activity planning and execution, project write up and other editorials.

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