Effects of Social Capital on Forest Management Practices among Food Crop Farmers in Oyo State Forest Reserves, Nigeria

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ABSTRACT

Forest management is essential to Nigeria's economic and ecological development. Decline and desertification are results of the difficulties farmers faced. Social capital fortifies the cooperative approach to mitigating these associated problems. This study looked into how Oyo State food crop producers' social capital affected their ability to manage their forests. In order to gather data, standardised questionnaires were used to choose 223 respondents using multistage random selection techniques. The objectives were examined using both descriptive and inferential statistics. Farm size, agricultural experience, distance from the farm, number of years spent in school, and use of extension services all affected the adoption of forest management practises (FMP). Gender, the heterogeneity index, the collective labour participation index, meeting attendance, and membership index density are all instruments that have a combined positive and substantial effect on FMP. FMP is favourably and strongly correlated with each of these variables. According to this study, an average respondent's influence on farm management increases with the size of the association to which he belongs. In the meanwhile, it was discovered that the Decision Making Index and the Meeting Attendance Index, which have positive and negative relationships with farm management, respectively, were not statistically significant in explaining this influence on farm management.

Keyword: Social Capital, Forest Management Practices, Crop Farmers, Forest Reserves, Two Stage Least Square.

INTRODUCTION

Its contributions to Nigeria's growth and development include the supply of raw materials and food, employment opportunities, and foreign exchange profits. It is impossible to overstate the importance of agriculture, particularly in emerging countries like Nigeria. Because woods continue to play a significant role in the ecology and economics of the nation, agroforestry is a vital component of agriculture. In addition to being essential to the planet, our economy, and our entire way of life, trees and forested ecosystems also provide wood for structures, pulp for a variety of industries, including paper manufacture, and lower carbon

emissions and cleanse groundwater (NCSU, 2018).

According to literature, social networking may be used to find resources in the close ties that families maintain. It has also been noted that these social resources are crucial for agricultural productivity and can be clearly seen in the methods used in forest management (Mawejje and Holden 2014). The nature and economy of our state still rely heavily on forests. Clean water and air, animal refuges, stunning landscapes, areas for leisure, and more—all provided under proper management. However, poor management can cause forests to become unhealthy and unproductive because of disease, pests, overpopulation, and competition for water, nutrients, and light. The forester uses a variety of management practises, such as harvesting, burning, and replanting, among others, to preserve the health and productivity of forests and meet landowner goals for the same (NCF, 2018). Nonetheless, farmers must work together to implement forest conservation practises by exchanging labour, providing funding, sharing risks, and using other strategies. Furthermore, it has been demonstrated that social capital maintains farmers' training groups' links to respectable government agencies and keeps them updated about new techniques and technologies (Wilfred, 2013). But because social capital is hard to measure in monetary terms, it appears that its significance has been intentionally overlooked (Wool cock, 2001).

Oyo is one of the states faced with a rapid desert encroachment, with notable effect on reduction of food crop and forest. Desert encroachment is moving so fast to other part of the state. The impact is intense because agro-economy of Nigeria is dependent on rainfall and hence affected by fluctuating weather. Desert encroachment assumed increasing proportion and it a threat to Oyo state crop farmers and the nation's economy at large (Okoli and Ifeakor, 2014). As emphasized by Medugu (2009), a lot of policies and programmes have been implemented by Nigerian government to combat desertification, yet the problem is rather aggravating because of the problem that has been treated as a sectoral issue instead of an integrated approach that will bridge the gap between the formation of policy and strategies of combating drought and desertification. To address this problem is the need for collective action, needed to implement forest conservation practices on individual farms through labour exchange, credit provision, risk sharing etc. This will raise awareness of new technologies and provides farmer led group-based training in new practices and further maintains the link with government agencies (Wilfred, 2013). Yet the significance of social capital has been overlooked purposely because it has not been easily accounted for monetarily (Wool cock, 2001). This study therefore aimed at investigating the effect of social capital on forest management among food crop farmers in Oyo State.

RESEARCH METHODOLOGY AND DATA ANALYSIS

The investigation was carried out in Oyo State. Oyo State was created in February 1976, taking up around 28,454 square kilometres when Osun State was included. It used to belong to the western area. Oyo State is an inland state in southwest Nigeria that has its capital in the city of Ibadan. Its boundary is also divided to the west, where it separates partly with Ogun State and the Republic of Benin, and to the east with Osun State. To the south, the state borders Ogun State; to the north, it borders Kwara State. In Oyo State, there are thirty-three Local Government Area Councils. Oyo State's population is expected to be 6,617,720 people based on the 2006 census (NPC 2006). The capital may be found in longitude 7.38778^{o} N and latitude 3.89639^{o}S. Most people in the state are employed as farmers, cultivating arable crops and engaging in other agricultural activities. The Yoruba people comprise the bulk of the state's population, making it a homogenous community. The Yoruba people are predominantly farmers, although they also tend to reside in heavily crowded urban areas. There are several ethnic minority groups that the state also accepts. Of the indigenous people of the state, the majority were Oyos, Ogbomosos, Oke-Oguns, Ibadans, and Ibarapas.

The research employed a multistage random sampling technique to choose its respondents. In the initial phase, three agricultural zones—Ibadan, Ogbomoso, and Shaki zones—were selected at random. Using purposive sampling, six agricultural blocks in the Ibadan zone and one in each of the Ogbomoso and Shaki

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zones were selected for the following phase, accounting for the presence of forest reserves in those areas. In the pre-selected blocks spread over the forest zones, 223 farmers grow food crops.

In the research region, a structured questionnaire was given to the respondents. Age, gender, co-op memberships, residency status, age groups, marital status, religion, level of schooling attained, size of family, sex, and social groups were among the socioeconomic characteristics that the respondents disclosed. The influence of social capital on forest management practises was measured using a two-staged regression model that applies ordinary least square (OLS) twice in succession. To verify the OLS regression's premise—that there must be no connection between the variables and the error term—the 2SLS regression model is fitted. With the use of the two-stage least square (2SLS) method, we estimate the following system of equations to assess the impact of social network capital on forest management practises:

$$FMP = \beta_0 + \beta_1 SC + \beta_2 ZH + \beta_3 FC + u \quad (8)$$

$$SC = \alpha_0 + \alpha_1 ZH + \alpha_2 FC + v \quad (9)$$

where FMP is the chosen forest management practices index by the farmer,

SC is a measure of social network capital,

ZH is a farming household general characteristic,

FC is a measure of farm-level characteristics,

$\beta_{i,}$ and α_i, are the coefficient estimates in the models while

u and v are the error terms.

Equation (8) is the outcome function of interest and equation (9) is the first stage regression in which the measures of social capital are regressed on the instruments as well as all the other covariates in the outcome equation.

This study developed four models based on four outcomes: Model A is estimated with membership density score as a regressor; Model B is estimated with collective work participation index as a regressor; Model C is estimated with total farmers' income as a regressor and Model D is estimated with aggregate social capital index as a regressor.

Farming household general characteristics

X_1 = age of farmer in years

X_2 = sex (if male=1, female=0)

X_3 = marital status (if married=1, otherwise=0)

X_4 = household size

X_5 = years spent in school

X_6 = having Secondary occupation (if yes=1, no=0)

X_7 = years of farming experience

Farm- level characteristics

X_8 = farm size in hectares

X_9 = extension service (available=1, otherwise=0)

X_{10} = soil fertility (if fertile =1, otherwise=0),

X_{11} = farmland topography (if flat= 1, otherwise=0)

X_{12} = perception of land degradation (if land degraded=1, otherwise=0),

X_{13} = total farmers' income in naira

X_{14} = collective works participation index

Social capital networks

X_{15} = membership density score

X_{16} = heterogeneity index (HI)

X_{17} = decision making index (DMI)

X_{18} = meeting attendance index (MAI)

X_{19} = labour contribution score

X_{20} = cash contribution score

X_{21} = aggregate social capital index.

RESULTS AND DISCUSSION

Socio-Economics Characteristics of the Respondents.

The results in Table 1 showed that 83.50% of the forest management farmers are male while 16.50% of them are female. However, this is not in contrary with the belief that males are more involved in farming than their females' counterpart that adopted agroforestry farming practices. This is in line with work of Alfred (2001) and Adedotun (2010) which stated that male headed household usually out number female headed household in most communities in Nigeria. About 32.37% of the forest management farmers are under the age of 41-50 years and 23.19% of the respondents are within the age of 31-40 years, while 21.74% of them were within the range of 51-60 years, 11.59% of the respondents were within the age range of 61-70% also, 8.70% equal to or less than thirty years (≤30), and the rest (2.42%) of them are under age group of greater than seventy years (>70). The estimated average age was 47.16 years which implies that the farmers are still in their active age. This was not too far from the findings of Oyewole et al., (2015) who reported the average age of 46 years in their study on socio economic assessment of farmers' participation in agroforestry system of forest management in Ekiti State of Nigeria. As shown in the table 4.1, about 47.34% of the forest management farmers has less than or equal to 5 members in their household with an average of 6 people per household. This implies that the household size is fairly large. The implication of this is that there will be availability of family labour for agriculture and forest management operations among farmers in the study areas. This result is line with findings of Jamala et al., (2013) who reported that majority of their

respondents had more than 5 household members. The percentage of those that attended secondary education is 38.65%, and those that attended tertiary institution is 36.71% also, 24.64% has primary or no formal education. This means that the respondents had one form of education or the other. The implication of this is that the educated farmers will be willing to adopt modern approach to farm and forest management operations. Level of education could influence farmers access to any form information thereby increase the rate of awareness, hence, increases the rate and the use of forest management (Oyewole et al., 2015).

Effect of Social Capital on Forest Management. (Two Stage Least square)

Table 2 presents the summary of the regression analysis (OLS) results for the first column. The estimated results indicate that there is a positive correlation between farm management practise and sex, heterogeneity index, and collective work participation index. These associations are statistically significant at 5%, 1%, and 10%, respectively. This implies that an increase of one unit in any of these variables will result in a positive rise of 0.15, 0.035, and 0.002 units, respectively, in the influence of social network capital on farm management. This agrees with Balogun *et al.* (2018) where heterogeneity index was found to have direct impact on farmers' level of productivity. Additionally, the aggregate social capital index shows a negative association, meaning that an increase of one unit in this explanatory variable will result in a 0.002 unit decrease in the effect of social capital on farm management, and vice versa. The aggregate social capital index is statistically significant at 10%. The aggregative social capital index was used as an endogenous variable, and meeting attendance, heterogeneity index, and decision-making index were used as instrumental factors.

The findings of the instrumental variable analysis were summarised in the table. This was determined after examining several potential instruments (such as labour contribution, secondary occupation, and total contribution), all of which were eliminated after showing only a modest correlation with farm management. A further unit of the respondent's heterogeneity index will increase the effect of social network capital on farm management by 0.075 units, according to the findings of the study when it was used independently as an instrument to aggregate the social capital index. Heterogeneity index was found to be statistically significant at 1% and positive with FMP. This implies that an average respondent's influence on farm management increases with the extent of his membership in the group. The heterogeneity index, meeting attendance index, and density of membership index taken together had a positive and statistically significant pool effect of 1% on farm management in the study area. This suggests that adding one more instrument will positively increase the effect of social network capital on farm management by 0.21 units. The influence of social capital on farm management is positively correlated with farm size, household size, farming experience, and collective labour participation index, all of which are statistically significant at 5%, 10%, 5%, and 5%, respectively. This indicates that an increase of one unit in each of these variables will result in a positive rise of 0.008, 0.022, 0.008 and 0.003 units, respectively, in farm management. The outcome supports Atagher's (2013) theory that, if family members help out on the farm, a larger family size corresponds to higher productivity. Contrary to Ajani and Tijani (2009) and Balogun and Yusuf (2011), who suggested that a cash contribution to the association is likely a sign of greater interest in the association and, as such, serves as a serious commitment to farm management practises, the results show a non-significant relationship between the effect of social capital on farm management.

Tests of Endogeneity, weak instruments and over-identifying restriction

The Hausman test was utilised to assess the exogeneity of explanatory variables and determine the presence of endogeneity issues. Only under homoscedasticity is the Hausman test valid, and it frequently requires the laborious generalised inversion of a non-singular matrix (Wooldridge 2010). The results of the Durbin (score) and Hausman test in Table 3 indicate that the null hypothesis—that the Aggregate Social Capital Index (ASCI) is exogenous—is rejected since the P-value is statistically significant at $P \leq 0.05$. The ASCI is endogenous, which is why instrumental variable regression analysis was used. Weak instruments are also

those that have little association between the endogenous explanatory variables. Weak instruments were examined according on the model that was offered, and the findings show the contrary. Additionally, the F = 34.27 value, which was larger than 10, indicating strong instruments, and the partial R^2 statistic, which indicated the percentage of variance explained by the inclusion of the instrumental variables in the model, were indicative of the first-stage regression summary statistics (Stock, Wright and Yogo, 2002). As a result, the Aggregate Social Capital Index was not negatively impacted by the Membership Attendance Index, Heterogeneity Index, or Density of Membership. To determine the need for more instruments to estimate the parameter estimates—that is, whether some of the instruments are connected with the error—test for over-identification restriction was applied. Consequently, the over-identifying constraints test:

Sargan (score) chi2(2) = 0.310948 (p = 0.8426)

Basmann chi2(2) = 0.310601 (p = 0.8411)

The null hypothesis is taken that the model is accurately defined, and the instrument set is valid. This is because of the p-values being below the 0.05 or 0.1 significance level. Consequently, at all significant levels, the hypothesis that there are no over-identification limits was accepted.

CONCLUSION AND RECOMMENDATION

The respondents were chosen for the study using multistage random sampling procedures. To assess the goals, descriptive statistics and the Two Stage Least Square Model were employed. There is a positive correlation between farm management practice and sex, heterogeneity index, and collective work participation index. The aggregative social capital index was used as an endogenous variable, and meeting attendance, heterogeneity index, and decision-making index were used as instrumental factors. The heterogeneity index, meeting attendance index, and density of membership index positive and statistically significant pool effect on farm management in the study area. The study therefore recommends collective work and collaborative labor participation for better forest managements.

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Table 1: Socioeconomics Characteristics of the Respondents

Socio-economic Characteristics	Frequency	Percentage
Sex		
Female	34	16.50
Male	172	83.50
Age		
≤30	18	8.70
31-40	48	23.19
41-50	67	32.37
51-60	45	21.74
61-70	24	11.59
Above 70	5	2.42
Average	47.16	
Household Size		
≤5	98	47.34
6-10	94	45.41
Above 10	15	7.25
Year Spent in School		
≤5	51	24.64
6-10	80	38.65
Above 12	76	36.71
Farm Units		
0	68	33.01
1	138	66.99

Field Survey, 2019

Table 2: Parameter Estimates of Instrumental Variable Analysis

Variable	OLS	IV1 (DMI)	IV2 (HI)	IV3 (MAI)	IV4 (POOL)
Constant	0.24718 (0.370)	0.40555 (0.145)	1.04019 (0.016) **	-0.01117 (0.857)	0.63540 (0.020) **
Aggregate Social Capital Index	-0.00200 (0.088) *	0.00134 (0.379)	0.07570 (0.002) ***	-0.00275 (0.135)	0.21500 (0.005) ***

Age	0.00101 (0.750)	0.00127 (0.681)	0.00231 (0.600)	0.00059 (0.854)	0.00063 (0.848)
Sex	0.15329 (0.046) **	0.14037 (0.118)	0.08858 (0.485)	0.17430 (0.063) *	0.12627 (0.182)
Farm Size	0.00383 (0.313)	0.00490 (0.214)	0.00919 (0.079) *	0.00208 (0.615)	0.00773 (0.048) **
Extension Service	0.03023 (0.418)	0.02444 (0.506)	0.00122 (0.981)	0.03968 (0.300)	0.02515 (0.516)
Land Topography	-0.07097 (0.283)	-0.08462 (0.203)	-0.13934 (0.138)	-0.04870 (0.484)	-0.09845 (0.156)
Marital Status	0.00338 (0.996)	-0.01682 (0.824)	-0.08558 (0.430)	0.02833 (0.730)	-0.04689 (0.554)
Household Size	-0.01589 (0.192)	-0.01824 (0.118)	-0.02767 (0.103)	-0.01204 (0.343)	0.02162 (0.079) *
Level of Education	0.0459 (0.125)	0.02815 (0.400)	-0.04304 (0.377)	0.07489 (0.050) *	0.00866 (0.786)
Secondary Occupation	-0.04354 (0.162)	-0.03477 (0.281)	0.00039 (0.993)	-0.05786 (0.079) *	-0.02191 (0.486)
Farming Experience	-0.00540 (0.121)	-0.00729 (0.061) *	-0.01483 (0.008) ***	-0.00234 (0.561)	0.00790 (0.031) **
Labour Contribution	0.00020 (0.404)	0.00002 (0.380)	0.000023 (0.499)	0.00002 (0.423)	0.00000 (0.582)
Total Cash Contribution	0.00060 (0.883)	0.00010 (0.767)	0.02730 (0.580)	-0.00050 (0.989)	0.00000 (0.280)
Collective Work Participation Index % (CWPI)	0.00208 (0.088) *	0.002353 (0.047) **	0.003431 (0.035) **	0.001645 (0.168)	0.00253 (0.035) **

Density of Membership % (DMI)	0.00207 (0.349)		-0.00483 (0.097) *	0.003176 (0.122)	
Heterogeneity Index % (HI)	0.03592 (0.000)***	0.02874 (0.019) **		0.047025 (0.000) ***	
Meeting Attendance Index % (MAI)	-0.00324 (0.185)	-0.000522 (0.110)	-0.001319 (0.007) ***		
Instrumental Variables	–	Density of Membership Index %	Heterogeneity Index %	Meeting Attendance Index %	Pool
First Stage R^2	–	0.20	0.31	0.54	0.46
Hausman (P-Value)	–	0.015	0.002	0.0002	0.0023

Pool = Density of Membership Index, Heterogeneity Index, Meeting Attendance Index

Sargan (p-value) – – – – 0.8426

Basmann (p-value) – – – – 0.8411

Source: Field Survey, 2019 * significant at 10% ** significant at 5% *** significant at 1%

Table 3: First-Stage Regression Summary Statistics

Variable	R-sq.	Adjusted R-sq	Partial R-sq	F (3,189)	Prob>F
Aggregate Social Capital Index	0.4630	0.4175	0.3523	34.2723	0.0000
Source: Field Survey, 2019					