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INFLUENCE OF SOCIAL CAPITAL ON THE USE OF LAND MANAGEMENT PRACTICES AMONG SMALLHOLDER FARMERS IN NIGERIA

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Abstract: Traditional and obsolete farming systems employed by farmers have resulted in poor agricultural output, low income and vicious cycle of poverty among the resource poor farmers. This has a spill-over effect on the availability and distribution of food among the growing population in Nigeria. However, past studies in developed world on social capital advocate its significant role in enhancing the use of modern agricultural practices and as well its capacity to improve the well-being among the populace. Therefore, this study examined the influence of social capital on land management practices among smallholder farmers in Nigeria; specifically Oyo State.

A multistage sampling procedure was employed in the selection of respondents and a sample size of two hundred and thirty-five (235) smallholder farmers was used for the study. Primary data on socio-economic factors and participation in social groups as well as various land management practices were obtained. The data was analyzed with the use of descriptive statistics, Foster and Two-stage least square regression. Then, post-hoc estimation tests were also conducted to validate the fitted model. The results obtained revealed that majority of the farmers belong to at least three local social groups and crop farmers association is the most important. The results further showed that membership density score (1%), collective work participation index (1%), farmers' income level (1%) and aggregate social capital index (5%) used as instrumental variables for social capital significantly influence the use of land management practices in the study area. Therefore, the study concludes that indeed social capital stock has a significant influence on the use of land management practices in the study area. Therefore, it was recommended that there is urgent need for policy institutions to promote and support functioning social capital networks among the agrarian communities in Nigeria.

Keywords: Social capital, Land management practices, Smallholder farmers, 2SLS, Nigeria

INTRODUCTION

Land management practices (LMP) are modern techniques used by the farmers to improve the quality of soil structure and fertility of the farmland in order to enhance the crop yields. Land management is a complex process, which involves the interaction of biophysical and social variables for improvement of soil properties. It could also be seen as a process by which the land resources are put into good use. Asuming-Brempong (2009) affirmed that different land management practices impact crop yields differently in the different ecological zones and the types of land management practices farmers use differ across different ecological zones. The situation is not different in other agrarian countries such as Nigeria. As a result, many agronomic factors are necessary to put into consideration when selecting the farm site for agricultural purposes, particularly for sustainable production of staple food and export crops as well as

economic gains. More so, profitable crop production can only thrive if the elements of climate, soil nutrients and soil micro-organisms are available in the soil in adequate quantity and quality; other important factors include age of farm plot/fallow period, farmland topography and land degradation effects among others (Titilola, 2000).

Despite the crop requirement for proper farmland management practices, a lot of farmers especially the smallholders still make do with the old farming practices. They keep cultivating the same piece of land area for annual planting without adequate soil conservation practices (USDA-NRCS, 2010). This consequently leads to degraded or unproductive soil condition as well low crop yield and by extension, low income. Getting out of this negative web has become priority and subject of discourse among many governments across sub-Sahara Africa and policy makers. In lieu of this, there is increasing campaign on the ability of social capital to aid in the uptake and use of modern land management practices. The reason adjudged for this according to Nyangena (2009) is that social networks foster cooperative behavior and collective action especially on individual farms through labour exchange, credit provision and risk sharing. It also raises awareness of new technologies and provides farmer led group-based training in new practices and further maintains the link with government agencies. According to the World Bank (1998), social capital refers to the institutions, relationships, and norms that shape the quality and quantity of a society's social interactions.

Social capital can also be conceptualized as a non-monetary form of capital, which is created from formal and informal relationships among people within a community. It is widely agreed that social capital operates through social networks built by influences and relationships existing between or among people. The affirmation of this was reflected in Putnam (1995) who viewed social capital as the features of social organization such as networks, norms, and social trust that facilitate coordination and cooperation for mutual benefits. This is also supported by Adepoju and Oni (2012) who submitted that social capital emerges in relationships in many areas of life such as those involving families and friends, neighbourhoods, religious groups, school communities, ethnic and community groups, occupational groups, firms, governments and other institutions.

Social capital is understood as an asset like other forms of capital. It has the potential to yield stream of benefits that make future productive processes more efficient, effective, innovative, or simply expanded, just like physical, financial, human and natural capital. However, unlike other reproducible capitals, social capital is not embodied in one person, rather it is in the relations a person has with other individuals and with the socio-economic institutions within which an individual operates (Coleman, 1988). Social capital is often the only capital the poor have, even if they are deprived of basic social services, at least they have each other. Therefore, social capital manifests in a commitment to a cause that allows people to work together for a common goal, though this may not maximize their personal self-interest. Therefore, it is evident that social capital is an element for sustainable development due to the role it plays in managing risks, shocks, and opportunities.

Consistently, social and human capital variables favour choice of more sustainable practices as opined by Scott and Roberto (2003). It therefore, holds a strong position to address poverty and vulnerability issues (Narayan and Pritchett, 1997), resolve disputes (Schafft and Brown, 2000), and share beneficial information (Isham and Kabkonen, 1999). In other words, it is more recognized as an important factor in facilitating the development process. There is increasing evidence to show that when people are well organized in groups whose knowledge is sought, incorporated and built upon during planning, implementation, then the productivity of agriculture and natural resources can manifest in the long-term (Pretty, 2008). In essence, there is need to promote the role played by social network capital in enhancing rural households welfare, optimum growth in agriculture and the level of development of communities and the nation as a whole.

MATERIALS AND METHODS

The Study Area

This study was carried out in Oyo State, Nigeria. The state is located in the Southwestern part of the country

and it consists of thirty-three (33) Local Government Areas (LGAs)/Blocks. The state is predominantly agrarian and covers total land areas of about 28,454 square kilometers with the total populations of about 6.6 million (National Population Commission, 2006). The state is located between latitudes 7^0 32 and 9^0 122 north of the equator and longitudes 2^0 472 and 4^0 232 east of the Meridian (Olasanmi and Bamire, 2010). The climate is equatorial, notably with dry and wet seasons and relatively high humidity. The dry season lasts from November to March while the wet season starts from April and ends in October.

The Yoruba ethnic background constitutes the majority of the population living in the state. The primary occupation of the people is farming and the farms are subsistence and semi-commercial units which depend mostly on rainfall as the chief source of water supply. The prevailing vegetation type of Oyo State is that of Guinea Savanna woodland, which is characterized by species of Derived Savanna especially in the Ogbomoso, Oyo and Saki zones and Tropical rain forest in Ibadan/ Ibarapa zone (Agboola, 1979; Odebode, 2008). The soil type is sandy loam, which supports the growth of food crops such as maize, cassava yam, cowpea, melon, sorghum, groundnut, vegetables and tree crops such as orange, mango and cashew.

Sampling Units and Procedure

A multi-stage sampling procedure was used for the selection of respondents. Oyo State has four Agricultural Development Programme (ADP) zones which include Ibadan/Ibarapa zone, Oyo zone, Saki/Iseyin zone and Ogbomoso zone. Explicitly, Ibadan/Ibarapa zone has fourteen (14) LGAs/Blocks, Oyo zone has five (5), Saki/ Iseyin zone consists of nine (9) and Ogbomoso zone has five (5) LGAs/Blocks respectively. In the first stage, two agricultural development zones were randomly selected (Ibadan/Ibarapa and Ogbomoso zones) and this represents about 50% of the ADP zones in the state. The second stage involves random selection of about 30% of the Local Government Areas (LGAs) in each ADP zone selected. Ido, Lagelu, Egbeda and Ibarapa Central (LGAs) were selected from Ibadan/Ibarapa ADP zone while Surulere and Oriire (LGAs) were selected from Ogbomoso ADP zone. The third stage represents random selection of 30% of the villages/cells from each of the selected LGAs/Blocks. The last stage then involves selection of about 5% of the registered maize-based food crop farmers from each village/cell. A total of 257 questionnaires were administered during the survey. At the end, only 235 copies of the questionnaire were used for the final analyses while the rest were dropped due to inadequate and inconsistency information.

Data Collection and Analytical Techniques

A well-structured questionnaire administered through oral interview was employed to collect the necessary information. Some of the basic data obtained include the socio-economic factors, existing local social groups and social interaction among them, different land management practices and cropping patterns adopted by the respondents in the study area.

Descriptive statistics such as percentage and mean was used to: describe the socio-economic characteristics of the respondents and the prevalent land management practices as well as various dimensions of social capital existing among the smallholder farmers in the study area. Two stage least square model (2SLS) was also used to estimate the influence of social capital on the use of land management practices among the smallholder farmers in the study area.

RESULTS AND DISCUSSION

The results as shown in Table 1 revealed the distribution of social capital dimensions among the sampled respondents in the study area. The findings revealed that, about 48.93% of the smallholder farmers belong to between 3-4 social groups while only 5.11% of them belong to between 7-8 social groups. On the average, a farmer belongs to at least three (3) social groups and the most important one is farmers association. This finding agrees with Osuji *et al.* (2013). Majority of the respondents (40.85%) have between 61-80% participation index in the decision making within the various social groups, while just 3.95% of the respondents, had less than or equal to 20% participation index in decision-making. The mean farmers' index of participation in decision making was estimated as 68.98% while the average heterogeneity index

of association to which an individual farmer belongs is very low (approximately 29.1%). However, majority (55.32%) of the smallholder farmers belong to social group with 21-40% heterogeneity index, while the average meeting attendance was put at 79.82%. This finding is in line with the Salman and Ekong (2015). Likewise, about 46.4% of the farmers contributed₦ 50,000 -₦ 100,000 and 38.72% of them contributed less than₦ 10,000 annually to the associations. On the average, the annual cash contribution to various social groups was estimated as₦ 30,535.4k. This suggests that the cash contribution is at the lowest ebb and as such, put the farmers at a disadvantaged position to obtain credit facilities from their respective social groups to expand the farming operations.

Labour contribution was generally low in the study area with an annual average value of 12.86 man-days. 74.47% of the respondents contributed 10 man-days or less annually while 3.98% of them claimed to have contributed above 100 man-days annually. The reason for this is attributed to farmers' negligence on the importance of collective action and efforts on farming activities which is an important aspect of social capital.

Table 1
Summary statistics of social capital dimensions of the respondents

Social capital dimensions	*Frequency*	*Mean*	*Std Dev.*	*Min*	*Max*
Membership density score					
≤ 2	68(28.93)	3.33	1.69	0	8
3-4	115(48.93)				
5-6	40(16.52)				
7-8	12(5.11)				
Meeting attendance index					
≤ 50	17(7.25)	79.82	23.14	0	100
51-60	15(6.42)				
61-70	25(10.71)				
71-80	38(16.21)				
81-90	44(18.83)				
91-100	96(40.58)				
Heterogeneity index					
≤ 20	68(28.94)	29.07	13.21	0	70
21-40	130(55.32)				
41-60	35(14.89)				
>60	2(0.85)				
Decision making index					
≤ 20	10(3.95)	68.98	25.34	0	100
21-40	18(7.66)				
41-60	36(15.32)				
61-80	98(40.85)				
81-100	73(31.06)				
Labour contribution score					
≤ 10	175(74.47)	12.86	28.43	0	144
11-40	33(14.04)				
41-70	15(6.38)				
71-100	3(1.28)				
>100	9(3.83)				
Cash contribution score					
≤ 10,000	91(38.72)	30535.4	36488.92	0	217000
50,000-100,000	109(46.38)				
100,001-150,000	30(12.77)				
150,001-200,000	14(5.96)				
>200,000	2(0.85)				

Source: Data analysis, 2015

Cross-tabulation of Socio-economic characteristics and Social capital dimensions

Table 2 shows that the male respondents had a higher average membership density than their female counterparts, though the variation in the mean values is not much and it implies that the average membership density for both male and female respondents are nearly the same (that is, 3.40 and 3.21 respectively). The result of average meeting attendance index shows that the female respondents appeared more in meeting of the various associations to which they belong when compared with the male attendance in the meetings of their various associations. This may be due to the facts that females found attendance in their associations so much important than males and in most cases females are said to have more free time to attend meetings than the males because the male gender are saddled with family responsibilities, thus, spent more time at the work place. This result is in contrast with Salman and Ekong (2015), where it was reported that male household heads attended association meetings more than their female counterparts. Male respondents are above female in the cases of heterogeneity index and decision-making index. This implies that, males were involved more in decision-making than females and this is in tandem with the findings of Adepoju and Oni (2012). The results further revealed that male farmers have high annual cash and labour contribution than their female counterparts. This result agrees with Salman and Ekong (2015). Also, it was revealed that there is corresponding increase in the age of the farmers from (d"30, 31-40, 41-50, 51-60, 61-70 and >70) with the average membership density score in social groups (2.87, 3.41, 3.54, 3.01, 3.63 and 4.00 respectively). Exception was noticed in the case of farmers whose age ranges between 51-60 years that did not follow the trend. This result indicated that the older farmers belong to several local social groups than the younger ones, which may have to do with the ageing factor, as the older farmers may need to limit their involvement in tedious farming activities while the youths are expected to be very much active. The average meeting attendance indices were very high and the farmers with age of d"30 years had highest (86.51%) meeting attendance index followed by the meeting attendance index (82.28%) for farmers whose age ranges between 61-70 years. The average meeting attendance indices of the farmers with age range between 41-50 years, 31-40 years, 51-60 years and >70 years were 81.33%, 80.16%, 76.80% and 67.86%, respectively. It was observed that the average meeting attendance indices did not follow a definite pattern for all classes of the ages of the crop farmers in the study area. This result further indicated that the youths attend more meetings of their social groups than the older farmers. This is in contrast with Omonona *et al.* (2014) where the meeting attendance index of the older classes was higher than those of the younger ones are. The finding also showed that the older farmers with age range of 61-70 years and >70 years are widely heterogeneous within the social groups that they belonged when compared with the youth farmers whose ages were between d"30 years and 31-40 years. The farmers who are between age ranges of 51 -60 years had lower heterogeneity index than the respondents whose age ranges between 41-50 years. This generally implies that there are similar basic characteristics such as the same income level, religious, beliefs and norms/culture, educational class, behaviour and trust et cetera among the farmers who are in the same range of age groups but in term of all these, the older crop farmers in the study area are highly mixed or heterogeneous. Furthermore, the results revealed that the farmers with age range between 31-40 years, >70 years and 61-70 years had highest average decision making indices (75.08%, 75.0% and 70.54%) respectively. And, farmers who are between the range of 51 -60 years and 41-50 years had decision making indices of 68.14% and 67.70% respectively and the rest of them with age group of d"30 years had 48.61% average decision making index. It was observed that decision could be made by any members of the association regardless of age because the decision-making indices and the age of the farmers did not follow a specific pattern. However, the role of decision-making is shifting towards the elder members of the association groups in the study area. The result showed that the farmers whose ages are between 41-50 years and 31-40 years had highest cash contribution while those within the age group of 70 years and above contributed the least cash to their associations. This implies that the farmers within the youthful age brackets contributed more cash to their social groups than the older farmers and this is because the

aged farmers are expected to be somewhat cash constrained because they are unable to do more farm activities to source for money as the youths are expected to do. Likewise, annual labour contribution was high among the farmers within the ages of 31-50 years and 51-70 years and considerably low among the crop farmers who are within the age of d"30 years as shown in the table below. This is because the younger farmers participate more in other income generating activities apart from farming; this is expected to make to take over the time which could have been used for collective work/ activities within their associations. It was observed that the married respondents had higher average membership density than those who are not married while the meeting attendance and heterogeneity index of the married farming households are lower than those who are not married. This further shows that the married farmers did not have enough time to attend more meetings of their associations as the non-married will do and similarity was also observed in terms of occupation, sex, age group, income group, religion, trust and educational qualification. In the same vein, the result revealed that the married farmers had a higher annual cash and labour contribution scores than those who are not married. The import of this is that married respondents benefited from their family members in terms of cash and labour contributions as expected; this is in line with Omonona *et al.* (2014).

Use of Land Management Practices among the Smallholder Farmers

The result on Table 3a showed that 96.6% of the smallholder farmers use land management practices while only 3.4% of the farmers did not use any of the identified practices. This indicates a high level of awareness on the use of the land improvement practices among the farmers in the study area. In the same vein, Table 3b shows that 89.36%, 75.74%, 68.09%, 55.32%, 51.59%, 51.49%, 48.51% of the smallholder farmers use fertilizer application, minimum tillage, crop rotation, mulching, cover cropping, ridge across slope, multiple cropping as a method of land improvement measures, respectively. Similarly, 39.57%, 25.53%, 23.83%, 22.55%, 18.72%, 11.91%, and 8.94% of them use shifting cultivation,

Table 2
Cross-tabulation of respondents' selected socio-economic characteristics in relation to social capital dimensions

Socio-economic variables	*Membership density*	*Meeting attendance index (%)*	*Heterogeneity index (%)*	*Decision-making index (%)*	*Annual cash Contribution (Naira)*	*Annual labour contribution (manday)*
Sex						
Male	3.40(1.69)	79.13 (25.09)	29.17 (12.97)	69.67(26.09)	32522.7(38688.4)	13.54(29.71)
Female	3.21 (1.63)	81.92 (15.68)	28.79 (13.99)	66.85 (22.94)	24470.69(28187.8)	10.75(24.24)
Age (yr)						
≤ 30	2.87(2.17)	86.51(14.26)	25.42 (10.83)	48.61 (24.44)	26212.5 (38463.9)	1.13 (2.10)
31-40	3.41(1.42)	80.16 (21.22)	27.39 (14.47)	75.08 (22.89)	34197.3(36494.0)	10.76(22.11)
41-50	3.54 (1.72)	81.33 (20.34)	30.74 (13.77)	68.14 (22.95)	35286.8 (39431.3)	9.22(20.22)
51-60	3.01 (1.45)	76.80 (27.38)	27.69 (12.22)	67.70 (28.78)	28202.7 (40032.7)	16.77(35.77)
61-70	3.63 (2.07)	82.28 (19.29)	29.61 (11.96)	70.54(24.47)	26449.2 (24740.8)	16.26(32.86)
>70	4.0 (1.15)	67.86 (47.51)	44.17(20.07)	75.0 (10.64)	12200.0 (6545.74)	7.5 (8.69)
Marital status						
Married	3.38 (1.71)	79.42 (23.35)	28.37 (12.51)	69.24 (25.17)	31873.5 (37504.3)	14.29(29.96
Otherwise	3.18 (1.49)	82.78 (21.64)	34.29(16.92)	67.06(26.96)	20642.9 (26312.5)	2.18 (4.63)

Source: Data analysis, 2015
Notes: Tabulated are the regressions coefficients while figures in parentheses are t-values
*, **, *** - Significant variables at 10, 5 and 1 percent probability levels respectively.

terracing, green manure, agro forestry, bush fallow, compost and contour bund respectively. This is in line with Babalola and Olayemi (2013).

Table 3a
Distribution of respondents according to adoption of land management practices

Adoption of land management practices	*Frequency*	*Percentage (%)*
No	8	3.4
Yes	227	96.6
Total	**235**	**100**

Source: Field Survey, 2015

Table 3b
Distribution of respondents based on various land management practices used

Practices adopted	**Frequency*	*Percentage (%)*
Terracing	60	25.53
Contour bunds	21	8.94
Ridge across slope	121	51.49
Crop rotation	160	68.09
Multiple cropping	114	48.51
Cover crops	121	51.59
Mulching	130	55.32
Agro-forestry	53	22.55
Bush fallow	53	22.55
Shifting cultivation	93	39.57
Fertilizer application	210	89.36
Green manure	56	23.83
Compost	28	11.91
Conservation tillage	44	18.72
Minimum tillage	178	75.74

Source: Field survey, 2015 * Multiple responses

Empirical Estimation of First-stage Regression Model on Social Capital Instruments

The analysis of the first stage regression model estimated the variables that significantly determine social capital formation among the smallholder farmers in the study area. From the findings as shown in Table 4a, membership density score of farmers was significantly determined by years of education (10%), primary occupation (5%), meeting attendance index (1%), decision making index (1%), cash contribution score (1%). The results revealed that membership density is inversely related to the years of schooling and primary occupation; suggesting that the number of social groups to which individuals belong reduces as they acquire higher educational status, and as the farmers intensify more efforts on their farming activities, their membership density level in some of social organizations reduces especially those that may not bring agricultural incentives to them.

However, meeting attendance index, decision-making index and cash contribution score exhibit positive relationship with the individual membership density that is, the individual association density increases with the ability of individual members to increasingly attend meetings, make reasonable decisions and contribute cash within the social groups they belong. This is in agreement with earlier work by Katungi (2007).

Also, it was revealed that, age of farmer (10%), household size (5%), years of schooling (1%), primary occupation (5%), extension services (1%), age of farm plot (10%), meeting attendance index (5%), cash contribution score (10%) and labour contribution (10%) are significant exogenous variables which influence the extent of collective work participation within the farmer groups. Willy and Holm-Muller (2013) had also buttressed this earlier. Of the fitted variables, only age of the farmer and meeting attendance index negatively influenced collective work participation while all other significant variables have positive impact on collective work participation among the respondents in the study area. This result is consistent with a-priori expectations.

In addition, the result showed that total annual income earned by the farmers is dependent on age of farmer (5%), sex (10%), years of schooling (1%), farm size (5%), decision-making index (10%) and heterogeneity index (1%). This result implies that as age of farmer, year of schooling, farm size and decision making index increase, the total income of the farmers would increase while the degree of diversity of farming households' characteristics reduces their total annual income. On the other hand, it was further revealed that the more heterogeneous the farmers are in the associations the less the total annual income they realized. The variable sex, which is positively significant, means that being male gender will cause income to increase because of the level of involvement of male gender in farming occupation.

Lastly, primary occupation (5%), decision-making index (1%) and heterogeneity index (1%) significantly complement aggregate social capital stock among the farmers in the study area. The results further revealed that both the decision making index and heterogeneity index strongly determine the aggregate social capital stock with positive influence whereas the coefficient of practicing farming as the primary occupation is negative and significantly influences the aggregate social capital stock in the study area.

2SLS-Instrumental Variables (IVs) Regression Estimation

Two-stage least square (instrumental variables (IVs) regression model) was run to examine the influence of social capital (social networks) on the use of land management practices. The results as shown in Table 4b revealed that the variables instrumented (membership density score, collective work participation index, farmers' income level and aggregate social capital index) for social capital have the expected signs and were consistent with theoretical expectations. The study thus developed four models (models A, B, C and D) based on the four proxies used for social capital by adopting the methods earlier used by Mawejje and Holden (2014).

The result for model A revealed that membership density score, age of farm plot, meeting attendance index, decision making index, cash contribution and labour contribution are significant exogenous variables which influenced the use of land management practices. From

Table 4a
Results of first-stage regression on social capital instruments

	Dependent Variables			
	Membership density	*Collective work index*	*Farmers' income*	*Aggregate social capital*
Age of farmer (year)	0.0093(0.92)	-0.00006(-1.79)*	3245.197(2.13)**	0.192(1.32)
Sex (dummy)	0.1761(0.85)	-0.00036(-0.53)	60392.52(1.95)*	2.034(0.69)
Marital status (dummy)	0.0781(0.30)	0.00135(1.53)	-15304.8(-0.39)	4.960(1.31)
Household size (actual)	-0.0365(-1.12)	0.00029(2.67)**	-5440.39(-1.11)	-0.324(-0.69)
Years of schooling (year)	-0.0266(-1.63)*	0.00028(5.07)***	7923.29(3.23)***	-0.106(-0.45)
Primary occupation	-0.5196(01.94)**	0.00133(1.97)**	21910.59(0.72)	-5.618(1.94)*
Farm size (ha)	-0.0100(-0.27)	0.000015(1.23)	12397.13(2.26)**	-0.661(-1.26)
Extension services	-0.1292(-0.79)	0.00164(3.01)***	5517.49(0.22)	-0.348(-0.15)
Fertility of farmland	0.1466(0.05	-0.00279(-3.06)***	3820.96(0.09)	3.2378(0.82)
Slope of farmland	-0.2914(-1.48)	0.00033(0.55)	6992.97(0.24)	-1.049(-0.37)
Perceived land degrad.	0.1109(0.54)	0.00084(1.22)	-18834.5(0.60)	-3.967(-1.34)
Age of farm plot (year)	-0.0004(-0.04)	0.00006(1.88)*	-1494.57(-0.99)	-0.64(-0.44)
Meeting attendance index	0.0190(4.36)***	-0.000029(-2.00)**	561.26(0.86)	-0.038(-0.61)
Decision-making index	0.0298(6.52)***	2.81e-06(0.18)	1533.92(2.22)**	0.618(9.38)***
Heterogeneity index (%)	-0.0005(0.06)	0.000037(1.49)	-4279.338(3.83)***	0.601(5.64)***
Cash contribution (Naira)	8.11e-06(3.09)***	1.48e-08(1.68)*	0.632(1.60)	1.85e07(0.00)
Labour contribution (Day)	-0.0026(-0.81)	0.000024(2.21)**	-326.475(-0.67)	-0.013(-0.27)
Constant	0.097(0.13	0.00105(0.43)	-23820.35(-0.22)	-23.304(-2.21)
Number of observations	235	235	235	235
R^2	0.5128	0.3563	0.2487	0.5910
F-value	13.44(0.0000)	7.07(0.0000)	4.23(0.0000)	18.44(0.0000)

Source: Data analysis, 2015 Notes: Tabulated are the regressions coefficients, figures in parentheses are t-values,
*, **, *** Significant at 10, 5 and 1 percent probability levels respectively.

this finding, it indicates that density of membership of farmers in some of the local level social groups was significant at 5% and has a negative implication on the use of land management practices. This finding is contrary to the findings by Munasib and Jordan (2011) who stressed that association membership has positive effects on both the decision to use sustainable land management practices and the extent to which farmers use these practices. It was also not in agreement with the findings of other investigators who affirmed a positive correlation between organization membership and technology uptake (for instance, Nwakwo *et al.* 2009; Odomenem and Obinne, 2010). This result therefore implies that the density of memberships is inversely covariate with the use of land management practices. Age of farm plot was found to have a positive and significant influence on the use of land management practices among the smallholder farmers, which implies that the more the usage of farm plots by the farmers, the higher the use of land management practices since the farmland fertility status becomes used up as the farmers cultivate continuously or intensively on a farm plot for a very long periods. Coupled with this, the meeting attendance index and decision making index are statistically significant and directly related to the use of land management practices; these results are in tandem with the a-priori expectations and also corroborated the findings by (Katungi, 2007; Birungi and Hassan, 2011). It was also found that average annual cash contribution significantly influences the use of land management practices with positive implication. As expected, this result thus indicates that increase in average annual cash contribution by the farmers in their respective local social groups will increase the use of land management practices in the study area.

Conversely, the average labour contribution negatively and significant (10%) influences the use of land management practices. This is not in line with a-priori expectation because sharing of labour/workforce among the farmers within the same locality is expected to strongly complement the use of land improvement practices, which is meant to enhance soil fertility and crop yields. This reason for this could be because majority of the farmers prefer family and hired labour to work on their farms rather than employing the labour of other people within their associations as a participatory collective work action. This is also evidenced with the low average amount of labour being shared per annum among the sampled farmers in the study area.

In the model B as shown in Table 4, the findings revealed that collective work participation index, age of farm plot, meeting attendance index, decision-making index and labour contribution are influencing factors on the use of land management practices among the smallholder farmers in the study area. The findings revealed that collective work participation index has a positive influence on the use of land management practices and it is significant at1%, which thus implies that the collective work participation facilitates the farmers' decision on the use of land management practices. This is in consonance with the findings of Willy and Holm-Muller (2013); Nyangena, (2009). Therefore, the farmers are encouraged to consider this benefit and take the advantage of association groups work participation for their farming activities.

In addition, the age of farm plot was positive and statistically significant at 1% which implies that the more the year of cultivating a farm site, the more the use of land improvement measures just to conserve the loss soil nutrients because of long cultivation effects on such farm plots. The coefficient of meeting attendance index was positive and significant at 5% indicating that the higher the attendance score of individual farmer in their local group meetings, the higher the use of land management practices.

On the other hand, decision making index and labour contribution score are both negative and significant at 1% which means that the higher the level of participation in decision making by the farmers in their local groups, the lesser the use of land management practices. This finding can be buttressed with the fact that the older farmers lack ability to engage largely in farming activities and there is tendency to involve much in the decision making process within their local groups. So this result is expected. Meanwhile, the coefficient of average labour contribution is inversely correlated with the use of land management practices and has a significant influence. This might be because of the low level of labour contributed, since most of the farmers did not rely on collective work actions as explained previously.

In model C, total farmers' income, age of farmer, sex of farmer, perceived land degradation, age of farm plot, decision-making index and heterogeneity index are significant exogenous variables that also influence the use of land management practices. It was evidenced from the results that the total farmers' income had positive relationship with the use of land management practices at 1% level of significance implying that an increase in farmers' income will lead to an increase in the use of land management practices. However, the coefficient of age of farmer was found to be negative and significant at 1%, implying that the more the farmers' age the lower the use of land management practices. It agrees with a-priori expectation, because as the ageing farmers do not always have the capacity needed for most farming activities.

The coefficient of sex variable was negative and significant at 5% indicating that the more the male gender, the less the use of land management practices, though the result is not in line with expectation. All things being equal, one would have expected a positive relationship between farmers being males (75.3%) and the use of land management practices because farming activities require more energy which is associated with male gender as compared to the female counterparts.

The findings also showed that the perceived effect of land degradation was positive and significantly affected the extent of use or adoption rate of land management practices. This means that the more the perception about of land degradation, the more the use land management practices by the farmers in the study area because necessary awareness would have been raised. This result satisfied a-priori expectation and corroborated the finding by Abate (2016).

Also, the coefficient of age of farm plot was positive and statistically significant at 1% level, implying that the more the years of cultivating a farm site the more the land improvement measures so as to enrich the soil nutrients which might be declining as a result of prolonged cultivation effects. Moreover, the decision making index was significant at 1% and has a negative relationship with the use of land management practices among the respondents while the coefficient of heterogeneity index was positive and has a significant influence on the use of land management practices among the farmers in the study area. This implies that the more the degree of participation in decision making by the farmers in their local level groups, the lesser the use of farmland management practices, but the widely heterogeneous they are within the associations, the higher the adoption rate of farmland management practices.

Lastly, in the model D, aggregate social capital index, age of farm plot, decision making index and heterogeneity index significantly influence the use of land management practices among the farmers in the study area. The aggregate social capital index has a negative influencing on the use of land management practices and significant at 5% level. It is evident that an increase in aggregate social capital index will cause a decrease in the use of land management practices. Age of farm plot has a positively and significant (10%) influence on the use of land management practices, while both decision-making and heterogeneity indices are both positive and significant at 5% probability level. This indicates that an increase in the level of these two variables respectively could enhance the use of land management practices in the study area.

On a general note, the findings revealed that social network capital influences adoption rate of land management practices in the study area. These findings are consistent with earlier studies which showed that social capital facilitates the adoption rate of sustainable agricultural practices (Katungi, 2007; Munasib and Jordan, 2011; Birungi and Hassan, 2011), facilitates participation in collective action initiatives which then influence individual farmer soil conservation efforts (Willy and Holm-Muller, 2013). Finally, a number of diagnostics tests were carried out in order to test the validity of the specified models. Thus, endogeneity test, first stage instruments F-statistic test and over identifying test are the basic econometric tests used to validate the specification of the four fitted models. Durbin-Wu-Hausman test was used to check for endogeneity concerns; the condition is that the variable is endogenous iff $p < 0.05$. Thus, the Durbin and Wu Hausman tests for each of the models indicate that indeed the measures of social capital are actually endogenous as shown in Table 4. The first stage F-statistic test was used to test the strength of the instruments in the models, which shows

whether the exogenous instruments are weak or not. The results revealed that the instruments used are good ones. Sargan and Basmann over-identifying restriction test for model specification and instrument exogeneity. These tests were used to examine if the residuals are uncorrelated to some set of instrumental variables and also to ascertain the validity of the models specification. It is worthy of note that a statistically significant test statistic indicates that the instruments may not be valid; but the finding says otherwise, thus, the orthogonality condition is met and not being violated. This therefore validates the use of instrumental variable estimation approach.

Table 4b
2SLS Estimates of Social Capital and Use of LMPs

	Dependent Variable: Rate of use of LMPs (index)			
	Model A	*Model B*	*Model C*	*Model D*
Membership density	-0.259 (3.19)***			
Collective work pat.		36.9748 (6.34)***		
Farmers' income level			8.71e-07(2.94)***	
Aggreg. social capital				-0.0154(-2.51)**
Age of farmer (year)	-0.002(0.064)	-0.0004(-0.27)	-0.0054(-3.03)***	-0.0021(-0.88)
Sex (dummy)	-0.011)-0.19)	-0.0397(1.44)	-0.1051(-2.44)**	-0.157(-0.32)
Fertility of farmland	-0.049(-0.67)	0.0519(1.20)	-0.0654(-1.33)	0.0001(0.02)
Slope of farmland	-0.047(-0.75	0.0163(0.58)	0.0438(1.24)	0.0185(0.36)
Perceived land degrad.	0.085(1.53)	0.0178(0.58)	0.0891(2.41)**	0.01550(0.27)
Farm-plot age (years)	0.006(2.17)**	0.0035(2.48)***	0.0080(4.48)***	0.00471(1.84)*
Meeting attendance index	0.0049(2.71)***	0.0012(1.95)**	-0.0001(-0.17)	-0.0007(-0.58)
Decision-making index	0.0065(2.36)**	-0.0018(2.86)***	-0.0031(3.18)***	0.0084(2.06)**
Heterogeneity index (%)	0.0013(13(0.17	-0.0002(-0.19)	0.0048(2.59)**	0.01072(2.48)**
Cash contribution (N)	2.52e-06(2.56)***	-2.20e-07(-0.58)	-4.67e-08(0.09)	4.86e-07(0.74)
Labour contribution	-0.0017(-1.91)*	-0.0019(-3.95)***	-0.0003(-0.60)	-0.0008(-1.05)
Constant	0.3842(2.15)	0.1991(1.95)	0.4329(3.66)	0.1525(0.73
No of observations	235	235	235	235
Durbin (score) chi2(1)	39.256(0.0000)	20.617(0.0000)	14.887(0.0001)	21.685(0.0000)
Wu-Hausaman F(1,221)	44.321(0.0000)	21.253(0.0000)	14.947(0.0001)	22.466(0.0000)
Partial R square	0.0509	0.2004	0.0731	0.0368
First stage instrument F-t	1.938(0.0759)	9.067(0.0000)	2.853(0.0107)	1.381(0.2234)
Sargan (score) chi2 (5)	2.323(0.8029)	6.234(0.3148)	19.653(0015)	8.604(0.1260)
Basmann chi2(5)	2.166(0.8257)	5.913(0.3148)	19.803(0.0014)	8.247(0.143)
Wald chi2(12)	28.35(0.0049)	107.77(0.0000)	49.83(0.0000)	27.96(0.0056)

Source: Data analysis, 2015 Notes: Tabulated are the regressions coefficients, figures in parentheses are t-values
*, **, *** Significant at 10, 5 and 1 percent probability levels respectively.

CONCLUSION AND RECOMMENDATIONS

The study used instrumental variables (IVs) method of parameter estimation that is 2SLS regression model and instrumented for social capital using memberships density score (1%), collective work participation index (1%), farmers' income level (1%) and aggregate social capital index (5%). The results show that the four instrumental variables were good proxies for social network capital based on econometric tests of endogeneity, first stage instruments test and over identifying test carried out on the fitted models.

Two-stage least square regression model was estimated on four social capital outcomes to examine the effect of social capital dimensions on land management practices. The first-stage regression analyzed the variables which significantly influence the stock of social capital in the study area while the second-stage regression examined the effects of the social capital instrumental variables on the use of land management practices in the study area. The study thus provides empirical evidence that stock of social capital has effects on the use of land management practices among smallholder farmers in the study area.

The test of endogenous, first-stage instruments test and over identifying restriction test or validity test were carried out in order to streamline the choice of instruments. Based on these tests, it was revealed that membership density score, collective work participation index, farmers' income level and aggregate social capital index have significant influence on the use of land management practices in the study area. The results therefore permit to conclude that investments in land management practices are driven by factors such as farm-level features (age of farm-plot, soil fertility, farmland topography, farm distance, land degradation effect and others), level of poverty and participation in community associations or farmer groups (social network capital). This thus confirms the earlier findings that social capital has significant and positive influence on achieving a sustainable land management practices.

Based on the findings of this study, the following recommendations are made:

- Investment in social capital is of paramount importance because it facilitates the decisions of farmers on the use of land management technologies. The policy implication here is that extension workers should understand the social and institutional fabric of the places where they work, and they need to articulate the relevance of promoting modern technologies to the local social context so that the farmers become more receptive to new agricultural techniques and methods. Therefore, development projects should not be designed in a blanket form, but be adapted to take advantage of existing social institutions and norms.
- Socio-economic factors such as age of farmer, gender, year of schooling, household size and farming practices as a primary occupation are found to impact significantly on the use of land management practices in the study area. It thus, worthy of note that these variables have economic implications on the use of land management practices and productivity output. It is recommended that adequate campaign on having moderate household size and youth involvement in farming should be promoted as well as development of human capital.

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