

DOES SOCIAL CAPITAL PLAY A ROLE IN CLIMATE CHANGE ADAPTATION AMONG SMALLHOLDER FARMERS FOR IMPROVING FOOD SECURITY AND LIVELIHOODS?

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ABSTRACT

The African continent is hampered by low adaptive capacity and is therefore vulnerable to climate change. This impact of climate change presents a significant challenge to regional agricultural development. Sub-Saharan Africa is faced with a range of climate risks, which include rapid and uncertain changes in rainfall and temperature patterns that threaten food production, and could lead to an increase in food prices and food insecurity. Several studies have assessed the impact of food insecurity in South Africa, more especially in the light of periodic droughts. South Africa is known as a food secure nation but food insecure at household level. Climate change is among the factors influencing food security status in rural households. South African smallholder farmers are no different since they also face the challenges of adapting to climate change and building resilience. Social capital can be a resource for building adaptation by farmers. This study explores the role of social capital in climate change adaptation for improving food security and livelihoods among smallholder farmers. The study was conducted in Appelsbosch, Kwa-Zulu Natal province. Random sampling was used to obtain a sample of 135 active and long-term smallholder farmers, who were interviewed using questionnaires and focus group discussions. Key informant interviews were held with group leaders and extension officers. Descriptive statistics was utilised in analysing the demographics of the respondents and the chi-square test was used to test the relationship between social capital dimensions and the adaptation strategies employed by farmers. It was found that social capital has a positive impact on the coping strategies used by households on food insecurity and adaptation strategies. Social capital can improve rural livelihoods, although the capital is not fully exploited by farmers. Farmers should be stimulated to expand their social groups to share farmer-to-farmer agricultural knowledge and increase participation and networks with the view of strengthening their adaptive capacity.

Extension services and rural leaders can also play a role in strengthening such networks and influence policy on strengthening local and extension systems.

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ARTICLE INFO

Article history

Received 12 July 2016

Revision 11 April 2017

Keywords

climate change, livelihoods, social capital, adaptation, food security

INTRODUCTION

Sub-Saharan Africa (SSA) is faced with multiple crises, such as ensuring food and nutrition security, alleviating poverty and mitigating the impact of climate change (FAO, 2011). SSA has one of the highest rates of poverty, which largely

affects the rural populations that rely on farming for their livelihoods. Moreover, the negative impact of climate change increases the rate of poverty, especially in rain-fed agriculture. Agriculture in SSA employed 62% of the population and generated 27% of the GDP (FAO, 2009). Poverty among rural farmers in the region can be attributed to small and marginal land holdings, with limited use of improved inputs and low levels of irrigation, etc. Thus, the strong dependence on farming, especially in rain-fed agriculture, contributes to the food insecurity and poverty in the face of climate change (FAO, 2011; IPCC, 2014). South Africa is known as a food secure nation but food insecure at household level (STATS SA, 2012). About 14 million people in South Africa are estimated to be vulnerable to food insecurity. Food security is a crucial issue in South Africa, especially in droughts affected regions (STATS SA, 2012). In 1996, South Africa adopted a right-based approach to food security and this approach is entrenched in the constitution (STATS SA, 2012). The government recognised the importance of enabling people to feed themselves and provide security safety nets and strategies where possible i.e. social grants.

The Intergovernmental Panel on Climate Change report (IPCC, 2014) stated that agriculture is affected and will continuously be affected by high temperatures, less and late rainfall and shortened seasons of growth. South Africa is predominantly vulnerable to climate change because of its high dependence on climate-sensitive economic sectors, such as agriculture, fisheries and forestry (International Institute for Environment and Development, 2013; Turpie and Visser, 2013/14). Farmers have developed adaptation strategies. Adaptation is an important way in which farmers respond to climate change (FAO, 2012). However, the way that the affected farmers will adapt, depends on the climate change impacts of their farming production and livelihoods. Previous studies had focused on the determinants of households' adaptation behaviour and perceptions of the impacts of climate change (Deressa et al., 2011). However, not much has been done on social capital, which is rooted among smallholder farmers which are highly affected by climate change. The role of social capital in adaptation behaviour has still not been investigated broadly. Researchers have pointed out the need to focus on processes and capacities of adaptations rather than specific actions and strategies in adaptations (Marshall, 2010). This study focuses

on the farmers' capacity, using social capital, in building adaptation strategies against climate change. The study argues that different dimensions of social capital affect the choice of adaptation measures utilised by smallholder farmers. This is crucial because adaptation to climate change is created by a social component, through interacting with others, networking to gain information, the sharing of resources and creating collective norms to build resilience against climate change. This will be beneficial for agricultural extension officers, government agencies and policymakers, to achieve effective strategies for smallholder farmers.

Climate change has affected national food security and the national economy (Knight et al., 2015). The International Institute for Environment and Development IIED (2013) report argues that climate, as a factor of life, is more prevalent in low-income rural communities, whose livelihoods heavily depend on rain-fed subsistence agriculture (FAO, 2012). Food security is defined as a situation when all people, at all times, have physical and economic access to sufficient, safe and nutritious food, enabling them to meet their dietary needs and food preferences for an active and healthy life (FAO, 2009; IFPRI, 2010). The definition indicates that food security is a broader concept, involving more than just food production and food accessibility (CFS, 2012). The FAO (2012) report outlines the four main features of food security, which are food availability; food accessibility; food utilisation, and food system stability or affordability (IFPRI, 2010; FAO, 2009, 2012). The definition of food security emphasises the availability of physical supplies of food to the people, the household access to those food supplies, i.e. markets and the utilisation of those food supplies to meet their daily dietary requirements (CFS, 2012). However, Bryan et al. (2013) identify socioeconomic characteristics and resources of the individual as factors which influence the food security status of their household. Climate change is among the factors influencing food security status in rural households (FAO, 2012).

The contribution of agriculture to the gross domestic product (GDP) is about 2.5%, and the contribution to formal employment is about 5% (STATS SA, 2012). With the current level of production, South Africa is a net exporter of food, however climate change would affect food security in the Southern African regions. About 4 million South Africans are engaged in

smallholder agriculture, and most of these farmers are situated in the rural areas (Jacobs and Baiphethi, 2009). Agriculture is a core sector in ensuring food security as it provides households with food, employment and a livelihood (Baird and Gray, 2014). Most smallholder farmers are affected by a total reliance on rainfall. Tibesigwa and Visser's (2015) study indicated that, in South Africa, about 20.7% of households participate in agriculture and 65% of these households use agriculture to meet the household's food demand. The National Income Dynamics Study (NIDS, 2009) showed that about 4.6% of the adult population participate in the agricultural production. Further showed that the participating rates are highest in the age group of 60-69 years of age, with 10% of this group engaged in agricultural production (NIDS, 2009). The province of Kwa-Zulu Natal accounts for 60% of the total number of subsistence producers (STAT SA, 2012).

Social capital can contribute to how smallholder farmers respond and adapt to climate change, assist to ensure food security, and the resilience of livelihoods. Gbetibouo et al. (2010), describes social capital as important for a communities' adaptation to climate change. A high degree of social capital promotes self-organization and a capacity for learning and adaptation among smallholder farmers (Thomas et al., 2007). Social capital has the potential to enhance people's livelihoods and transfers knowledge and information among people (Tenzin et al., 2015). Social capital is very important in rural communities and where people rely on co-operating and cooperatives for alternative responses to external shocks (Nieman, 2006).

Rural people have developed livelihood strategies, which satisfy their need for water, food other goods and services which benefit them, from their climate (FAO, 2012; Callaghan and Colton, 2008). The Food and Agricultural Organisation (2009) defines 'livelihood' as the various ways in which households acquire the necessities of life in favourable and stressful times. Rural households are heavily engaged in land-based livelihood strategies, such as livestock husbandry, farming and trade in natural resources (Naidoo et al., 2013). South African households employ several dynamic livelihood strategies, and these differ monthly and annually, depending on factors such as timing, rainfall, labour availability, input costs, access to public services, credit, remittance income and transport costs (STATS SA, 2012).

Smallholder farmers and subsistence farmers, particularly women, play an important role in the construction of livelihoods and household food security among the rural poor (Ziervogel and Frayne, 2011; STATS SA, 2012). Gbetibouo et al. (2010), highlighted that the climate has changed in the past years and continues to change. Thus, there is a need to adapt and enhance the resilience of farming to secure food security and livelihoods (Deressa et al., 2011). A farmer's understanding of climate change is essential for them to make knowledgeable decisions on local adaptation (Bryan et al., 2013). Hence, the understanding of climate change by farmers would support decision-making based on which adaptive strategies can be employed to secure their livelihoods and food security (Deressa et al., 2011; Bryan et al., 2013).

Furthermore, Gbetibouo et al. (2010) indicated that some farmers have adapted to climate change to reduce the negative impact posed by these changes. However, Bryan et al., (2013) argue that the success of adaptation depends on the availability of necessary resources, such as finances, knowledge, assets and natural resources. The capacity to adapt and build resilience directly depends on households' ability to access and utilise capital (Cooper et al., 2008; Marshall, 2010).

Connolly-Boutin and Smit (2016), indicated that farmers have adapted to changing climate conditions by using a variety of production methods, soil conservation strategies, soil input substances and water conservation. Some adaptive measures which they identified include switching to drought-tolerant crop varieties, introducing more suitable crops, using manure and fertiliser, the use of contour line and no tillage and shifting from crops to livestock (Connolly-Boutin and Smit, 2016). Although some of these strategies were achieved using social capital (Bryan et al., 2013), not much is written about the quality of the social capital and where to begin to strengthen them. In South Africa, despite a largely food secure national record, the ultra-poor at a household level in rural areas still depend on agriculture for obtaining food, particularly women who are often responsible for household food security, (STATS SA, 2012), this research is relevant in identifying significant causal relationship between variables to guide extension and capacity programmes aimed at adapting to climate change amongst-resource poor farmers. Some communities use cooperative, self-help and collective action to

adapt and build resilience in their livelihoods. Social capital is one of the many resources available to individuals within a community. Aldrich and Meyer (2014) argue that social capital fosters community engagement, cooperation and participation which are essential in addressing community challenges.

Lang and Roessl (2009) explained that the social capital of rural people and farmers include family, friends, trust, norms, gatherings and networks of farmer associations, as well as other factors, such as agricultural extension officers. Social capital has the potential to enhance people's livelihoods and transfers knowledge and information among people (Tenzin et al., 2015). Social capital is very important in rural communities and where people rely on cooperatives for alternative responses to external shocks (Nieman, 2006). A study by Gbetibouo et al. (2010) describes social capital as important for a communities' adaptation to climate change. A high degree of social capital promotes self-organization and a capacity for learning and adaptation among smallholder farmers (Thomas et al., 2007). Strong social capital benefits groups by enabling the flow of information and resources (Nieman, 2006; Tenzin et al., 2015). Strong social capital is enhanced by leadership. However, leaders also benefit from social capital through their ability to influence others, to collect information that is essential to the group, and to create communication on association barriers.

Agricultural practices do not only depend on the appropriate biophysical and climatic stimuli for success, but also for other non-climatic variables, such as social networks, particularly in rural communities where social connectivity is a way of life (Neves, 2013; Wood et al., 2014). Social networks play distinct roles in the adoption of agricultural technologies; they act as a mediator for financial transfers that may ease farmers' credit constraints, they provide information about new technologies, and they facilitate cooperation among farmers to allow the different dimensions of social capital, which include membership density, meeting attendance and cash contributions. This study was conducted to address the existing gap in understanding the relationships of selected variables of social capital and climate change in the adaptation strategies used by smallholder farmers in Appelsbosch, South Africa. Further, the study seeks to understand the role of this relationship on household food security and livelihoods.

MATERIAL AND METHODS

Study site and sampling procedures

Appelsbosch is a community under the uMshwathi local municipality in the Kwa-Zulu Natal province (-29.398045, 30.863738). The area consists of 1,356 households with an average of 5–6 people per household (IDP, 2015/16). The livelihoods at Appelsbosch are largely derived from subsistence farming. Moreover, the farming system in the community includes crop and livestock farming, however, crop farming is dominant. Farmers in Appelsbosch mostly grow maize, beans, sweet potatoes and amadumbe, and a few of the farmers grow sugarcane. These crops grow well in Appelsbosch, which has a humid climate with an average rainfall of 500–800 mm/annum. However, the change in rainfall and high temperatures has had an impact on crop production, threatening the food security, economy and development of the area (IDP, 2015/16). Farmers in the area used to grow crops all year around, but due to climate change, farmers have diversified their livelihoods into non-farming and farming activities. Moreover, the current short-term drought had a significant impact on the farmers' production, i.e. crop failure. The community-level capacity is low. Farmers have been trained by the Department of Agriculture (Cedara College of Agriculture) and the University of Kwa-Zulu Natal School of Agricultural, Earth and Environmental Sciences (UKZN SAEES), in climate-smart agricultural techniques, such as integrated crop management, water conservation, storage and irrigation management, and minimum tillage practices (IDP, 2015/2016).

A mixed method approach was used to collect data for the study. The study utilised both qualitative and quantitative methods to outline and clarify characteristics, descriptions and measurements, to reveal information to address the research question. Random sampling was used to select 135 active and long-term smallholder farmers. During the process of the data collection, a survey questionnaire, focus group discussions and key informant interviews were conducted. Focus group discussions were conducted with 9 farming group leaders from each farmers group to understand the depth of social capital and social structures which exists at Appelsbosch. The researchers worked with the extension officer in the study area to identify the groups. A question guide with key questions

on social assets, climate change and food security was used to guide the discussions. The FGD's responses to extrapolate themes and common understandings to establish the in-depth understanding on social assets in the community. The FGD's results were used to explain and provide in-depth discussion of the descriptive stats and chi-square tests. The key informant interviews were held with extension officers and lead community farmers to establish in-depth knowledge on existing social capital across the farmer groups, the results of these interviews were also used to enrich the discussions.

Social capital measures

The social capital dimensions used in this study include membership density, meeting attendance and cash contribution (Gbetibouo et al., 2010). The density of membership was measured by the number of existing associations in the community where the household was a member. However, attendance at meetings is an important indicator of participation. Meeting attendance was measured based on the average number of times someone from a household attended group meetings or community meetings. With regards to cash contribution, the respondents were asked if they were contributing to the community-saving clubs.

DATA ANALYSIS

Quantitative and qualitative data were collected concurrently to allow for triangulation of results. Data was collected over one week in February 2016. The data were analysed using descriptive statistics as well as content and theme analyses. Descriptive statistics were generated, using the IBM SPSS 24 Statistical Package for Social Scientists (SPSS), to summarise the demographic data of the respondents. The frequency of quantitative data was generated to present the statistics that could be used to complement the qualitative data used in the presentation of the results. The qualitative data was analysed using content and theme analysis. The content and theme analysis involved two processes, coding questions and group themes. A chi-square test analysis was deemed an appropriate test of significance between variables. Given that not much is known about the quality of the intangible assets and effectiveness thereof amongst smallholder farmers in climate change mitigation and adaptation, testing for significant relationships

may help guide extension and capacity building of resource-poor farmers. The chi-square test was used to evaluate significant relationships between social capital and adaptation strategies by smallholder farmers.

RESULTS AND DISCUSSION

Demographic characteristics

The results show that many of the farmers were female (83.7%), with the highest number of individuals between the ages of 56–65 years of age (28.1%), followed by an older group over the age of 65 years. The study of Aliber and Hart (2009) had also showed that women were the main group participating in smallholder farming and further demonstrated that participation in farming was highly rejected by the youth group. Most of the farmers interviewed were married (57.8%), followed by a large group of single individuals (28.1%). The fact that the sample had married participants could have a positive impact on livelihood diversification of the respondents since married couples have more secure access to land, an important resource for farming and family labour. Several studies have shown that marriage can improve access to land, particularly for female farmers (Thamaga-Chitja et al., 2010). Most of the households interviewed had land areas between 1 and 2 hectares (51.1%), which Chitja and Morojele (2014), show as being typical among smallholder farmers. About 36.3% of farmer's own land areas between 3–4 hectares.

The results of the analyses showed that many of the farmers interviewed had completed their primary education (43%), followed by 18.5% who were illiterate. Only 12% of the respondents completed their high school education. In summary, the respondents interviewed showed a high percentage of individuals who had a formal education (69.7%). It was found that many of the respondents in Appelsbosch are literate, and this may increase their livelihood diversification because of human capital arising from high literacy and skills obtained from previous work, which includes farm working and mining. The results analyses showed that, of the farmers interviewed, 61.5% were engaged in crop farming and 34.1% were engaged in both crop and livestock farming. The most common incomes for respondents were government pensions (32.6%), farming harvest (32.1%) and other government grants (22.8%), i.e. social grants. According to the South African Social Security Agency (SASSA) report, a government

TABLE 1: SOCIAL CAPITAL DIMENSIONS AND FOOD INSECURITY COPING STRATEGIES

DIMENSION OF SOCIAL CAPITAL	STRATEGY	X ²	P=VALUE
Household member membership in social groups	Food insecurity coping strategies	119.72	0.000*
Household member attendance of meetings in a month	Food insecurity coping strategies	114.875	0.000*
Household member attendance in community meetings	Food insecurity coping strategies	95.49	0.000*

N= 135 *= significant at 5% level

pension is mainly for people are 60 years of age and above. Government grants in South Africa include foster child care, old age and disability.

FOOD SECURITY AND COPING STRATEGIES USED BY SMALLHOLDER FARMERS

Participation and coping strategies used by smallholder farmers

The results in table 1 showed that there was a significant relationship ($p=0.000$) between the participation of farmers in a social groups and food insecurity coping strategies employed by the farmer. The chi-square test indicated that the participation of farmers in a social group positively influenced their coping strategies with food insecurity. Hence, participating in social groups creates and develops social networks for the members and enhances relationships with other people in the community. Furthermore, in a focus group discussion (FGD), respondents indicated that the coping strategies which they use to survive the effects of climate change and to meet food security include borrowing food, working for food, receive food packages, food exchange, saving clubs, buying food and selling livestock. Based on the significance of the chi-square test, we can say that group participation is beneficial to members as a networking platform to access alternative options to cope with food insecurity for households.

Number of meetings attended in a month and food insecurity coping strategies

The results in table 1 showed that there was a significant relationship ($p=0.000$) between the number of meetings attended in a month by a farmer and the food insecurity coping strategies used by the household of the farmer. In summary, there is a positive influence from multiple meetings attended in a month by a farmer and the coping strategies used by the farmer during household food insecurity. This

means that, the more meetings that are attended by farmers, the most alternative options available to them, i.e. community ties, friends, information gained and resources. The attendance of several meetings allows for more interaction between the farmers.

Community meeting attendance by household and food insecurity coping strategies

The results in table 1 showed that there was a significant relationship ($p=0.000$) between community meeting attendance and the coping strategies employed for food insecurity by the household. The results indicated that the perceived coping strategies for food insecurity employed by a farmer had a positive influence through attendance of meetings on the effects of food insecurity.

SOCIAL CAPITAL AND ADAPTATION STRATEGIES ON CLIMATE CHANGE

Participation in social groups and adaptation strategies

Table 2 shows that there was a significant relationship ($p=0.012$) between the participation of a farmer in a social group and the strategies employed by the household to reduce and prevent soil erosion. The chi-square test results indicated that the participation of a farmer in social groups influenced the strategies used to reduce and prevent soil erosion. A study by Njiki et al. (2008) showed that participation in agricultural training and extension programs had a positive and statistically significant impact on the value of adaptation and increased production.

South Africa has recently been experiencing recurrent droughts, low and late rainfall. These experiences, together with other extreme climatic events, are expected to continue. Deressa et al. (2009), expresses more of an

TABLE 2: SOCIAL PARTICIPATION AND CLIMATE CHANGE ADAPTATION STRATEGIES BY SMALLHOLDER FARMERS

ADAPTATION STRATEGIES	DF	X ²	P-VALUE
Soil erosions methods	18	34.119	0.012*
Water harvesting strategies	20	15.505	0.747
Soil input substances	16	32.336	0.009*

N= 135 *= significant at 5% level

emphasis on the importance of collective action, and the building of social capital in rural areas, as an adaptive tool. In the focus group discussions (FGDs), farmers at Appelsbosch mentioned water shortages, soil erosion and poor soil quality, to be the major crises regarding climate change. With these challenges to their farming, they were introduced to coping and adaptation strategies to maintain their livelihoods. Although those coping strategies are labour intensive, costly and time-consuming.

Table 2 shows that there was an insignificant relationship ($p=0.747$) between the participation of a household member in a social group and the water harvesting strategies employed by members. This means that the participation of a household member in a social group had no effect on the water harvesting strategies employed by household.

However, the results in table 2 also showed that there was a significant relationship ($p=0.009$) between the participation of a household member in a social group and the soil quality strategies employed by members. This included the use of fertilisers, manure, lime and opening fallows. The chi-square test indicated that the participation of household members in a social group had a positive effect on the strategies employed by the household to improve soil quality. The study by Njiki et al. (2008), also showed that social capital influenced the adoption and use of different soil fertility management options. This means that social capital has an influence on the household's adaptation strategy for climate change.

During the focus group discussions the farmers mentioned that participating in groups helped in sharing information, knowledge and methods for farming. However, the challenge in implementing coping strategies against soil erosion was labour, since these strategies were considered labour intensive. Farm sizes differ, some farmers had small areas (less than a hectare), while other farmers had more than 1 hectare, and therefore, labour and input

resources would differ if labour was to be shared. This resulted in farmers working individually when implementing actions, although learning and sharing through groups. However, the options for solving the mentioned challenges, such as using the average size (1 hectare) as a guide, seemed to be unconsidered. The researcher observed that the farmers did not seem to have a strategy on how to share labour and labour costs. This implies the absence of a strong leadership among group members, as there seems to be limited farmer-to-farmer innovation, with the farmers being largely dependent on support from extension officers.

Community meeting attendance and adaptation strategies

Table 3 shows that there was significant relationship ($p=0.000$) between the attendance of community meetings and the water harvesting strategies employed by household members. This means that the attendance of community meetings had a positive influence on the water harvesting strategies employed by households. The results show that the information gained from attending a community meeting by a member, had a positive influence on the water harvesting strategies used by the household. Wossena et al. (2015) study also showed that the attendance and interaction of farmers had a significant determinant to the adoption of improved land management practices by farmers.

Then again, the results in table 3 showed that there was a significant relationship ($p=0.01$) between the attendance of community meetings and the strategies employed by households to prevent and reduce soil erosion. The results indicated a positive effect on the strategies employed by a household member attending community meetings to prevent and reduce soil erosion. The FAO (2012) report showed that, through cooperation and interaction, farmers increase their social capital, access to information and learning about new strategies for increasing productivity under climate change.

TABLE 3: SOCIAL PARTICIPATION AND CLIMATE CHANGE ADAPTATION STRATEGIES BY SMALLHOLDER FARMERS

ADAPTATION STRATEGIES	DF	X ²	P-VALUE
Soil erosions methods	20	50.84	0.000*
Water harvesting strategies	18	37.74	0.01*
Soil input substances	18	31.09	0.013*

N= 135 *= significant at 5% level

Moreover, the results in table 3 showed that there was also a significant relationship ($p=0.013$) between the attendance of community meetings and the soil quality strategies employed by members, indicating a positive effect on the strategies employed by households to improve soil quality. Wossena et al. (2015) also showed that social capital played a significant role in enhancing the adoption of improved farmland management practices, such as land degradation and low productivity. Farmers mentioned that, in community meetings, government officials and agencies are often present to discuss challenges faced by the community at large. At this level, the agreement on a solution and actions could be supported at the government level, local authority level (Nkosi and Nduna) and community level.

Number of meetings per month and adaptation strategies

Table 4 showed that there was an insignificant relationship ($p=0.781$), between the number of meetings a household member attends a month and water harvesting strategies employed by members. This shows that the number of meetings a household attends has no effect on water harvesting strategies employed by the household.

However, the results in table 4 showed that there was a significant relationship ($p=0.013$), between the number of meetings a household member attends a month and the strategies employed by the household to avoid and limit soil erosion. The chi-square test indicated that the number of meetings a household member attends a month, influences the strategies employed by that household to prevent and limit

soil erosion. The FAO (2012) report emphasise that adoption is strongly influenced by members of the same social group. Moreover, new innovations are more easily adopted by members when they come from a familiar member. This may be the result of the different skills of farmers. Some farmers might be opinion leaders and others might have leadership roles that are limited to other issues.

Again, the results in table 4 showed that there was also a significant relationship ($p=0.004$), between the number of meetings a household member attends in a month and the soil quality strategies employed by members. The chi-square test indicated that the number of meetings a household member attends a month, influences the strategies employed by that household to improve soil quality. Farmers mentioned that, by attending a meeting, they gain more information shared in the meetings. Ngidi et al. (2004) had indicated that communities with good social networks and associations are in a better position to tackle poverty and minimise vulnerability.

From the focus group discussions (see Table 5) it can be seen how participants explained social group formation and how social capital differed. Participants engaged in multiple groups to sustain and improve their livelihoods and remain socially connected. These groups consist of community members who have other relationships through church, culture, friendships and being a neighbour. The most dominant social groups in the community were farmers' groups and savings clubs, which had an impact on how farmers adapted to climate change.

TABLE 4: SOCIAL PARTICIPATION AND CLIMATE CHANGE ADAPTATION STRATEGIES BY SMALLHOLDER FARMERS

ADAPTATION STRATEGIES	DF	X ²	P-VALUE
Soil erosions methods	18	33.83	0.013*
Water harvesting strategies	20	14.91	0.781
Soil input substances	16	34.99	0.004*

N= 135 *= significant at 5% level

TABLE 5: FOCUS GROUP DISCUSSION ON SOCIAL CAPITAL AT APPELSBOSCH

THEME/S	CONCEPT/S	RESPONSES
Level of participation	Norms and society's behaviour	"Appelsbosch, there are many social groups formed. This includes burial societies, <i>stokvel</i> (a saving club for distributing money and buying food), church groups and farmers' groups".
Diversity of groups	Norms and society's behaviour	"We form groups as friends, neighbours and wards".
		"The most driving social groups are the farmers' group and saving clubs as they improve our livelihoods and generate income".
Participation	Cultural expectations and society norms	Farmers' groups were encouraged by extension officers, with the purpose of working together, sharing information, acquiring resources and reducing labour costs". And, to discuss farming challenges towards farmers, i.e. drought, high temperature, late rainfall, pesticides and fertilisers to use.
	Society's behaviour	In past years, farmers had been struggling with water for irrigation purposes and poor soil quality. Farmers mentioned that it has been difficult to access resources individually and information about improving farming with regards to pesticides to use, climate change and obtaining a high yield.
Participation		Participating in farmers' groups has introduced them to the knowledge (training and workshops) provided by extension officers and the Department of Agriculture". Farmers mentioned the training which they attended, they were taught the importance of making contour lines in the field and understanding the slope of the land (field) to know which direction the soil would be overturned (tilling) to avoid soil erosion and seed loss.
Collective action		Farmers mentioned that in 2012, the government provided the groups with fertiliser, lime and a tractor, which led to good harvests. The groups had been following the same strategies (purchasing seeds, fertiliser and pesticides) introduced to them. Although there have been individuals pulling out due to contribution fees required by the groups. <i>Umuntu umuntu ngabantu meaning I am because of you.</i>
		Farmers mention that they save money through farmers' groups and in savings clubs. The saving clubs have a positive impact on their livelihoods as it assists in saving money to buy food products and agricultural input, although some months they skip contribution due to monthly cost challenges and other responsibilities.
Networking	Norms and society's behaviour	Churches are another social platform which sustains people's livelihoods through spiritual support and promoting peace, trust and safety in the community. Respondents also indicated that they form (groups) to fight crime in their communities. This community involvement allows people to know each other and build positive relationships.

Focus group discussions included the role played by these social groups to bring awareness to farmers in adapting and coping with climate change. Farmers expressed the view that in their farmers' groups, they attend training from department of agriculture (e.g. extension officers and Potato SA) that operate in the area. The training and workshops taught them about planting strategies to earn high-yield crops and the requirements to sell at markets. Farmers explained that they are encouraged to form groups and engage in cooperative farming, as they would get benefits which include resources, credit and have a higher collected

production, and buying in large quantity as cooperatives, e.g. purchasing seeds.

The farmers have experienced similar challenges and had received group training however, little emphasis on building and creating capacity for farmers to resolve their own problems without depending only on extension officer. The group power was not being fully exploited to foster capacity and leaders to lead various initiatives. Farmers could initiate methods of sharing labour and create solutions without waiting for government and extension assistance. Non-agricultural groups,

such as church groups and burial societies, were important in building trust, safety and a harmonious relation which was positive for group dynamics. Social capital has a positive impact on the coping strategies used by households for food insecurity and their adaptation strategies. Social capital can improve rural livelihoods, although this is not yet fully exploited by farmers.

CONCLUSIONS AND RECOMMENDATIONS

The relationship between social capital and the adaptation strategies employed by smallholder farmers is presented with supporting evidence from other studies in the literature and results. It is argued that farmers with more social capital are better at adopting adaptation strategies. This is possible because of the created networks and ties during the interaction of people. It emerged that many farmers are using social capital as a platform to acquire agricultural resources, information, knowledge and credits. Membership in groups increases the likelihood that members will have access to agricultural inputs, technical advice and agricultural practice and management strategies which help farmers adapt to climate change. The results showed that the participation of household members had a positive impact on the coping and adaptation strategies employed by households. Although, social capital is not fully utilised to benefit all challenges related to farming activities and this may be due to lack of leadership among farmers and training related to social aspects. Based on the significant relationships found, this research can assist smallholder farmer support programmes in taking advantage of their numbers, organise themselves and harness, strengthen social and human assets amongst themselves to actuate the established strategies to mitigate and adapt to climate change. Based on the findings, it is emerging that meeting attendance provides a bridge between accessing information on the technical strategies of adapting to climate change and of harnessing social capital to actuate these strategies and thus achieve household food security and cope better with food insecurity.

Thus, this calls for further research to study ways to strengthen the use of social capital among smallholder farmers based on adaptation strategies and to facilitate more farmer participation in meetings. There is a need for igniting capacity among extension services to facilitate the empowerment of community leaders and government agencies, particularly agricultural, environmental and rural

development extension services to translate community social platforms into supportive channels to empower farmers and leaders among themselves and translating information across all levels. Information and appropriate platforms for sharing information and capacity to apply information are important. Community meetings have shown to be an important avenue for information, raising awareness and adaptation strategies. However, transforming the information into adaptive behaviour required a greater understanding of farmers' connectivity, showing weakness in the approach of the current top-down extension system that does not seem to be rooted in the process of empowerment. Finally, interventions to improve the capacity of smallholder farmers need to be developed to use social groups and community meetings as a channel and platform to build bottom-up strategies for adaptation to climate change.

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