EISSN: 2707-0425

*East African Journal of Science, Technology and Innovation,* Vol. 1 (3): 2020.



# Access to livelihood resources and choices of development strategies: implications for the development of conservation strategies

[1*] SHITIMA C., [1]DIMOSO R.

[1]Department of Economics Mzumbe University P. O. Box 5 Mzumbe – Morogoro Tanzania.
*__Corresponding author__: cshitima@mzumbe.ac.tz

**Abstract**

This study engages with the debate in the literature on access to livelihood resources and livelihood diversification to show how differences in people's access to resources result in differences in the choices of development strategies (DST) that people pursue for livelihoods' enhancement. It uses a multinomial logit model to analyse how access to social and financial capitals affects people's choices of DST in the rural river basin areas of Tanzania. Further to that, the study links the findings with policy initiatives related to the conservation of river basin resources (RBR). The study uses survey data which were supplemented by qualitative data gathered through focus group discussions. Findings show that both access to social and financial capitals affect the choice of secondary DST, though access to social capital seems to be more important in Kilombero, and access to financial capital more important in Meatu. In Kilombero, access to social capital is an important factor for people to diversify their activities away from traditional pastoralism, an activity that is not environmentally friendly. In Simiyu, access to financial capital raises the likelihood of people to participate in off-farm activities instead of other activities that make enormous use of RBR, for example, traditional pastoralism and irrigated farming.

**Keywords**: *Access to Financial Capital; Access to social capital; Development strategies; River basin; Rural Tanzania*

***Cite as:*** *Shitima and Dimoso, 2020* ***Access to livelihood resources and choices of development strategies: implications for the development of conservation strategies*** *East African Journal of Science, Technology and Innovation 1(3)*

*Received:* *06/06/19*
*Accepted:* *12/03/20*
*Published:* *24/06/20*

## Introduction

### *Livelihood resources and development strategies*

Agriculture provides an important source of livelihoods for many people residing in Sub-Saharan Africa (SSA). In particular, agriculture employs more than 50% of the labour force in the region, with 80% of that figure engaged in subsistence farming (OECD, 2016). Despite the importance of agriculture to the livelihoods of people in SSA, agricultural productivity remains low compared to developing countries of Asia and South America (OECD, 2016). Like many other countries in SSA, farming in Tanzania does not offer sufficient means of livelihoods to majority of the populace, as the performance of agricultural sector is lower than that of other sectors of the economy (UNDP, 2015). Farming is labour intensive, depending largely on rain and family labour: even the use of technological inputs is low compared to many countries in SSA (UNDP, 2015).

Low agricultural productivity together with the limited opportunities for non-farm employment create little incentive for those in the rural areas to remain in agriculture. The literature shows that people in rural areas react to the challenge of low agricultural productivity by engaging in more than one development strategy (DST) i.e. by being multi-occupational (see for example Ellis, 2000; Jamal & Weeks, 1988). Thus, they depend on a diverse portfolio of activities and income sources, e.g. farm and off-farm income sources (de Haan, Brock, & Coulibaly, 2002; Ellis, 2000). In the literature,

this is what is referred to as livelihood diversification, whereby households as a whole or some household member(s) opt to engage in multiple DST to improve their livelihood situations. By reviewing empirical literature on diversification to non-farm livelihood strategies, Gautam and Andersen (2016) showed that in developing countries, diversification from farming to non-farm activities has several advantages including the increase of household's income, enhancement of food security and increase of agricultural production among others. Even in developed countries, where agricultural activities are subject to minimal risks, rural farmers diversify for the purpose of improving their financial returns (Barbieri & Mahoney, 2009).

Despite the importance of diversification to rural livelihoods, empirical evidence shows that livelihood diversification is not an option that is easily available to all groups of people. Some people lack access to resources that are required to engage in other DST apart from subsistence farming (see for example studies by Gautam & Andersen, 2016; Ibrahim & Mazancova, 2014). Diversification away from farming requires investment in financial resources as start-up capital and also social capital (Fang, Fan, Shen, & Song, 2014; Gautam & Andersen, 2016). For instance, because of access to financial capital, during off-farm seasons, men in Tanzania tend to migrate to urban/ semi urban areas where they are involved in informal business and irrigated farming (Maliyamkono and Bagachwa, 1990; Mshote, 2016). A study by Mshote (2016) shows that the brewing of local alcohol in the Iringa region of Tanzania is considered as the DST which is easily available to people with access to social capital. She pointed out that trading of local beer was done normally on credit arrangement commonly known as *jumua,* whereas trust and established social capital were most binding. Under this arrangement, a local brewer supplies the local beer to sellers on credit, and the buyer is tied with consent to repay her/his debt after selling. Therefore social relations and trust between a brewer and seller(s) were crucial" (Mshote, 2016, p. 90).

On the basis of the above arguments, this paper argues that access to social and financial capital is important for people to diversify their livelihood activities. In particular, access to these forms of capital is important for people to choose activities that make less/ sustainable use of natural resources, which have further implications on the sustainability of RBR. From this vantage point, this study aims to investigate the impact of social and financial capital on the choice of DST among people who live along river basin areas of Tanzania. Moreover, the study also links the choice of DST and its implications for the sustainability of RBR. In doing this, the research adds to the literature on livelihood analysis by showing how an individual's possession of social and financial resources impact on their occupational choices in rural areas where the majority of people depend on subsistence farming. The study will be of interest for developing policies/ strategies targeted at creating more opportunities for livelihood enhancements in rural communities but also for establishing natural resources based conservation strategies. Since majority of Tanzanians reside in rural areas depending and agriculture and natural resources, sustainable conservation strategies are important to ensure the security of rural livelihoods.

***Analytical framework***

The analytical framework that this study uses is adopted and modified from the concept of livelihood framework (Ellis, 2003). The livelihood framework (LF) is designed to explain how DST (natural resources -based and non- natural resources -based activities) depend on access to resources, and how these strategies have implications on the status of RBR. In river basin areas, DST can be either environmentally friendly or non-environmentally friendly depending on the impact they have on the conditions of RBR. Environmentally friendly DST are those that make less/ sustainable use of RBR and thus they are assumed to lead to RBR conservation.

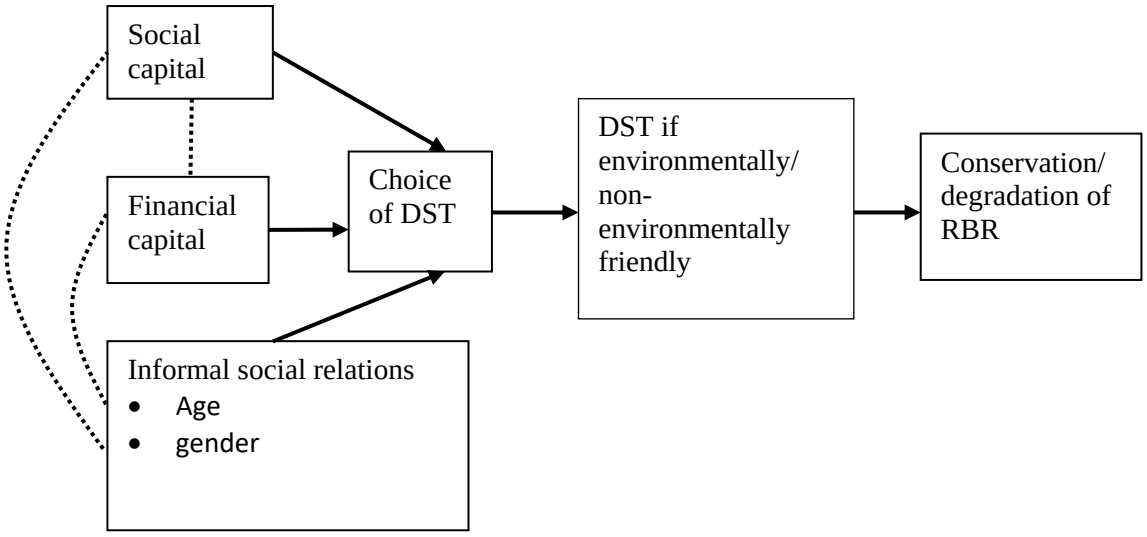


*Figure 1:* Relationships between social and financial capitals and sustainability of RBR
*Note*. Adopted and Modified from Ellis (2003)

From our analytical framework (Figure 1), people are assumed to use their social and financial capital to engage in different DST. In the literature, the assessment of social capital occurs at both individual level, the level that is also used in this study, and on a wider scale such as the community and/ or organization level (Schuurman, 2003; Titeca & Vervisch, 2008; Woolcock & Narayan, 2000). At the community level, social capital depends on factors such as political, legal and institutional environments to which the community/ organization belongs, but at the individual level, social capital is mostly taken as an independent variable (Woolcock & Narayan, 2000). At the individual level, social capital includes the relationships that are based on norms, kinships and/ trust that a person has accumulated in her/ his lifetime, and the possession of a lasting network that can enable her/ him to gain social support and resources. To gain access to social capital, people in local communities usually form social clubs or associations and act collectively with the aim of managing risk and vulnerabilities (Woolcock & Narayan, 2000).

Financial capital is an important resource for people to venture into new DST or to finance an already existing DST. The latter, for instance shifting from subsistence farming to large-scale farming requires the use of sophisticated machines and other agricultural inputs such as fertilizers, pesticides, etc., all of which require access to financial resources (Chandio, Jiang, Wei, Rehman, & Liu, 2017). The former, for example investment in non-farm DST, also involves access to financial capital in terms of cash or access to credits (Ibrahim & Mazancova, 2014). One of the sources of access to financial resources is through borrowing from financial intermediaries. However, most rural people access credits through borrowing from informal social groups, and through borrowing from people (Girabi, Mwakaje, & Elishadai, 2013). A study by Lindvert, Yazdanfar, and Boter (2015) found out that people in Tanzania consider semi-formal capital from informal groups as the easiest way to access credits compared to loans from formal banks. Thus, an assumption is made in this study that financial capital in terms of credits are largely accessed through the informal groups of savings and borrowing. On the other hand, access to financial capital can be seen as a form of wealth, something which can enable the owner to easily access memberships in different groups. In this case, the study assumes that there could be a correlation between the variables that measure social capital and financial capital due to the interdependence between them.

The analytical framework also shows that the choices of DST are affected by informal relation factors in terms of the age and gender of respondents. The literature shows that informal practices, grounded in norms, taboos and values, conventions, and customs, shape people's behaviour/ ways of doing things in society, including the way resources are

accessed (see for example Cleaver, 2001; Leach et al., 1999). Leach et al. (1999) argued that the livelihoods of some people in society might be affected because of socio cultural factors which restrict those people's engagement in certain activities. These socially constructed practices create differences in the occupational choices between different groups of people in society. According to LF, access to resources is also affected by informal social relation factors that are the products of socially constructed practices. Thus, apart from its direct influence on DST, age and gender might also have an indirect influence on DST (via access to social and financial capitals) as shown by the dotted line in Figure 1.

To analyse the impact of social capital, financial capital and informal social relation factors on the choices of DST, the following two hypotheses are tested:

i) *differences in access to social and financial capital affect people's choices of DST.*

ii) *differences in informal relation factors in terms of age and gender affect the choices of DST.*

**Materials and methods**

***Study areas and data sources***

The study is based on a survey conducted among the households residing along Kilombero River (KR) in Kilombero district and Simiyu River (SR) in Meatu district between March and June 2016. The two study areas are similar in terms of DST: the major DST in both areas is agriculture, where both seasonal and irrigated farming are practised.

Despite this similarity, the two study areas differ in the types of secondary DST that are practiced by people who are predominantly originated from the study areas: Fishing and pastoral farming are considered to be the secondary DST in Kilombero and Meatu, respectively. Pastoral farming is recently practised in Kilombero mostly by migrants from the northern part of Tanzania, including people from Meatu. In addition, at the time of data collection, the government through the Lake Victoria Environmental Management Project (LVEMP II) was implementing a project to protect Simiyu River boundaries. LVEMP II supported the citizens to initiate DST that protect river banks.

Before survey, preliminary study visits were conducted between October and December 2015 to obtain prior information on the nature of livelihood situations and clarify some of the variables that are used in the analytical framework. Thus, in each study area, two wards were selected. To capture information on different DST that depend on RBR, Mofu and Signal wards were purposively selected in Kilombero district. A total of 5 villages were included in the survey. These villages are Ihenga (an agro-pastoralist community), Ikwambi (a fishing community) and Mofu (a multicultural community where different economic activities are practiced) in Mofu ward, and Sululu (the modern irrigator's and traditional irrigator's community) and Signal (a multicultural community) in Signal ward. In Meatu district, there are no differences in the nature of economic activities practiced in the wards. In each ward, we chose two villages based on the presence of secondary DST that are financed by the LVEMP project. These villages are Kisesa and Ntobo from Kisesa ward, and Mwabuma and Mwashata from Mwabuma ward.

A pre-tested questionnaire was the major tool of data collection during the survey. The survey covered 313 households: 148 in Kilombero district and 165 in Meatu district. For each ward, The formula below was used to calculate the sample size (see also Kothari, 2004).

$$n_{ward} = \frac{Z^2 pqNward}{e^2(Nward-1)+Z^2 pq}$$ ……Where:

- $n_{ward}$ = ward' sample size;
- $Nward$ = number of households in the ward: Mofu = 1680, Signal = 721, Kisesa = 1,121, and Mwabuma = 1,296;
- $p$ = 0.5 i.e. probability that each household in the ward has equal chance of being selected; (see also a study by Ekise et al. 2013: 34);
- $q = 1-p$;
- $Z$ = abscissa for 95% confidence level; and
- $e$ = the random error of 10%.

Thus, the wards' sample sizes were 91 and 84 households in Mofu and Signal wards respectively in Kilombero district, and 88 and 89 households in Kisesa and Mwabuma wards, respectively in meatu district.

For each ward, the following formula was used to calculate the sample size of the villages (Kothari, 2004).

$$n(village) = \frac{N(village) * N}{N}$$

The formula gives the distribution of sample sizes as follows: Mofu ward (30 households in Ihenga, 21 in Ikwambi and 40 in Mofu); Signal ward (47 and 37 households in Sululu and Signal villages, respectively). In Meatu district, the sample sizes were 49 and 39 for Kisesa and Ntobo villages, respectively, and 54 and 35 for Mwabuma and Mwashata villages, respectively.

In each village, a simple random sampling method was used to select households to be included in the survey. At the household level, data were collected from different members of households who are 18 years and above. Collecting data from each household member, separately, enabled us to capture intra-household dimensions on issues of access to social and financial resources and the choices of DST. The total number of respondents is 783, where 359 (46%) are from Kilombero district and 424 (54%) are from Meatu district.

After the survey, focus group discussions (FGD) were conducted between March and June 2017 with the aim of obtaining information to supplement the survey findings. The main topics of discussion included access to resources in terms of access to social and financial capitals and relationships between informal social relations and access to resources, and the choices of DST. 40 FGDs were conducted: 24 in Kilombero district and 16 in Meatu. During the FGD, four groups from 10 -15 surveyed households were formed in each surveyed village. Since the study considered intra-household data, groups were firstly separated according to sex of participants. Then from each group, two sub-groups were formed to separate heads of households from the other households' members.

***Models and the variables***

In this study, DST is a function of an individual's access to non-physical resources (social, and financial capital), and informal social relations factors in terms of age and gender. DST which were identified during the preliminary visits were listed and respondents were asked to rank them according to the order of importance in livelihoods. The first and second ranked activities are considered to be major DST, and the secondary DST, respectively. These activities were seasonal farming, irrigated farming, fishing, traditional pastoralism, bee keeping, modern livestock keeping (zero grazing), informal trading and other activities which were not on the list. Due to few number of respondents who practice the last four activities, the categories were grouped together called 'off-farm activities'.

Traditional pastoralism is considered as a non-environmentally friendly DST since it involves the free grazing of large numbers of cattle, which results to gully erosion and destruction of riverbanks (URT, 2014). Irrigation by the use of the modern irrigation schemes, normally takes place in areas that are located away from the riverbanks which means that it is a more environmentally friendly activity. Fishing can be both an environmentally and non-environmentally friendly DST because of the practice of illegal fishing using dynamite, poisons and small nets. Off-farm activities are also considered as the DST that makes less/ no use of RBR, and thus environmentally friendly DST.

The individual choice of DST i.e. the major DST and the secondary DST are used as measures of livelihood strategies. Both major DST, and the secondary DST are categorical variables, taking values of 1 if an activity chosen is seasonal farming, 2 if irrigated farming, 3 if fishing, 4 if traditional pastoralism, 5 if off-farm activities. Alternative options of DST are not ranked in any particular order: they rather explain the characteristic of an individual in terms of what he/she does in life. In this case, the multinomial logit model is used to estimate the equation. The equation is modelled as in Hill, Griffiths, & Lim (2011, pp. 599-601).

$$Z_{ij}^{*} = Y_i^{*} \alpha_{ij}^{*} + u_{ij}$$

where $Z_{ij}^{*}$ shows the choice that an individual $i$ makes among $j$ alternatives ($DST$). Explanatory variables $Y_i^{*}$ are identical across alternatives i.e. each one describes the DST that an individual pursues (and not the alternatives that an individual is facing). The vector of parameters

to be estimated, $\alpha_{ij}^{*}$, is specific to a certain alternative. As the dependent variable in a multinomial logit model takes the value of 1 to 5, the observed choice $Z_i$ is defined as:

$$Z_i = \begin{Bmatrix} 1\ if Z_{i1}^{*} \geq Z_{ij}^{*} \\ 2\ if Z_{i2}^{*} \geq Z_{ij}^{*} \\ 3\ if Z_{i3}^{*} \geq Z_{ij}^{*} \\ 4\ if Z_{i4}^{*} \geq Z_{ij}^{*} \\ 5\ if Z_{i5}^{*} \geq Z_{ij}^{*} \end{Bmatrix}$$

The probability that individual $i$ chooses alternative $j$, whereby $j = 1, 2 \ldots 5$ becomes

$$P_{ij} = P(Z_i = j) = \frac{e^{\propto_{ij}^{*} Y_i^{*}}}{\sum_{n=1}^{j} e^{\propto_{in}^{*} Y_i^{*}}}$$

one of the reference alternatives, in our case alternative 1, and is set equal to zero to solve the identification problem and to make probability equal to one.

Social capital is measured in terms of social relationships that an individual person can have through being a member of social formal or informal organizations. A group member is a dummy variable that takes the value of 1 if a person is a member of a social group and 0 if a person is not a member. The assumption is that, by being a member of groups such as resources user groups, savings and credits groups etc. people can mobilize both financial and other kinds of resources that can enable them to smoothly participate in different DST. A membership in a group is expected to increase the likelihood of an individual participating in other DST compared to seasonal farming. An individual's access to credits is used as the proxy for financial capital. Access to credit is expected to increase the likelihood of an individual participating in different non-farm DST compared to seasonal farming. Based on the analytical framework, the variables that measure social capital and financial capital were expected to be dependent on each other. Thus, the Spearman's rank correlation test, $r_s$, was run to assess whether there are correlations between the variables. The variables were not strongly correlated: thus, we continue with the analysis that includes both variables in the model.

Two variables, age and gender are used to measure factors that relate to informal social relations. These factors are considered to create differences in social status and thus some form of power to some members of the societies. Age, a continuous variable, is measured by number of years. An increase in age by one year is expected to increase the likelihood of people engaging in traditional pastoralism, fishing, irrigated farming, and off farm activities versus seasonal farming as the old people are assumed to accumulate more wealth (Simoes, Crespo, & Moreira, 2016) that can be invested in these activities. However, the study assumes further that the impact of 'age' on the dependent variable may not be similar along all ages, i.e. there exists a threshold where the impact of age is reversed and thus we expect an inverse U-shaped relationship between age and the choice of a certain DST (see also Simoes *et al.*, 2016). Therefore, we add another variable age square to capture the change in slope as the number of years (age) increases. Since the impact of age on the dependent variable is assumed to be positive, we expect age square to have a negative sign, as its coefficient (given by the first derivative) will be less than one. Based on the analytical framework, age was expected to indirectly affect DST through its impact on social and financial capitals. The correlation coefficients measuring the interdependence between age and membership in a group, and age and access to credit give the results of $r_s$,= 0.21 and $r_s$,= 0.11, respectively. The coefficients are significant at less than the 1% level which implies the presence of a weak positive correlation between the variables. Thus, only the direct impact of age on DST was included in the analysis.

The variable female is used to capture the influence of 'gendered' social relations. Female is a dummy variable taking the value of 1 if a person is a woman and 0 if a man. Men are reported to have a wide range of social networks, which are also more business/ work oriented (Koellinger, Minniti, & Schade, 2013), something that is assumed to ease their journey of becoming multi-occupational. Limited access to financial resources to venture into other activities is also a barrier to women to participate in different activities as women are reported to prefer to use their own money, rather than borrowing (Carter & Shaw, 2006; Sena, Scott, & Roper, 2012). The relationships between a variable that measures gender i.e. female and different secondary DST can be positive or negative depending on the nature of DST. Females are less likely to practice fishing and traditional pastoralism since these DSTs are

considered men's activities. On the other hand, females are more likely to practice irrigated farming and off-farm activities as they are expected to help their households in pursuing these activities (see also Warner & Campbell, 2000). While the correlation test between female and membership in a group shows no correlation between the two variables, the correlation between female and access to financial capital indicates the presence of a weak association between the variables, thus only the direct impact of female on DST was included in the analysis.

The study also tries to determine whether there are differences in results that are due to river basin (location) factors. Locational variables may capture factors such as infrastructural and market development and other institutional factors that are specific to the study area (Sesabo & Tol, 2005). Thus, to capture these effects, a dummy variable that shows river basins differences was added in the models. The variable takes the value of 1 if the basin is Kilombero and 0 if the basin is Meatu.

**Results**

***Development strategies***

Table 1 shows the distribution of respondents according to their choices of the major DST, and the secondary DST. Majority of our respondents (70% in Kilombero and 89% in Meatu) are involved in seasonal farming as the major DST, followed by irrigated farming. While fishing and traditional pastoralism are ranked third DST in Kilombero and Meatu, respectively, off-farm activities is not ranked in both areas. The significant Fisher's Exact Test shows that there is an association between the choice of the major DST and the location of the river basin.

Table 1: Primary Development Strategy

| | Kilombero | | Meatu | | Total | |
|---|---|---|---|---|---|---|
| Primary DST** | Freq. | % | Freq. | % | Freq. | % |
| Seasonal farming | 252 | 70% | 376 | 89% | 628 | 80% |
| Irrigated farming | 78 | 22% | 35 | 8% | 113 | 14% |
| Fishing | 29 | 8% | 0 | 0% | 29 | 4% |
| Traditional Pastoralism | 0 | 0% | 9 | 2% | 9 | 1% |
| Total | 359 | 100% | 424 | 100% | 783 | 100% |
| Secondary DST** | Freq. | % | Freq. | % | Freq. | % |
| Seasonal farming | 85 | 47.2% | 38 | 15.7% | 123 | 29% |
| Irrigated farming | 44 | 24.4% | 78 | 32.2% | 122 | 29% |
| Fishing | 26 | 14.4% | 0 | 0.0% | 26 | 6% |
| Traditional Pastoralism | 17 | 9.4% | 109 | 45.0% | 126 | 30% |
| Off-farm | 8 | 4.4% | 17 | 7.0% | 25 | 6% |
| Total | 180 | 100% | 242 | 100% | 422 | 100% |

*Note.* ** Pearson chi-square is significant at less than 1% level.

Results shows that only 422 (54%) of 783 respondents practise secondary DST: 50.1% of all respondents in Kilombero and 57% in Meatu. In addition, secondary DST differ between the two study areas. While seasonal farming is ranked as the secondary DST in Kilombero, traditional pastoralism is ranked in Meatu. In both study areas, irrigated farming is ranked as the second DST, followed by fishing and traditional pastoralism in Kilombero and Meatu, respectively. Few respondents in both study areas rank off-farm activities as their Secondary DST. The highly significant Fisher's Exact Test shows a strong association between the nature of the secondary DST and River basin.

***Access to social and financial capital***

Table 2 shows the distribution of respondents according to the memberships of different groups and access to credit. 132 (17%) out of 783 respondents in both study areas are members of

the groups: 20% of all respondents in Kilombero and 14% in Meatu. The significant Pearson chi-square result shows an association between an individual's access to social capital and river basin.

The data reveals the presence of different types of social groups. In both study areas, there are informal groups of money saving and borrowing, commonly known as village community banks (VICOBA). In VICOBA groups, members deposit money in every agreed period (usually once a week). The deposited money is lent to the members as loans, which are returned after an agreed period, with the agreed interest rates. At the end of the term, usually after a year, the group is demolished and the members get back the money they deposited plus the profits from the interest payments. In addition, while the groups of modern livestock keepers, irrigators and farmers are found in both study areas, beekeepers and fishers groups are only found in Meatu and Kilombero, respectively.

The descriptive results on access to credit show that while 22% of all respondents have access to credit, results from each study area show that 28% and 16% of respondents in Kilombero and Meatu, respectively, have access to credit. The significant Pearson chi-square shows that there is an association between access to financial capital and river basin. Social groups provide loans in terms of cash or inputs and other forms of material support, for instance providing help during the preparation of the farms or when harvesting the crops. Microfinance banks provide loans to people with collateral for example civil servants and large-scale farmers. People without collateral and/ or access to social groups reported to obtain credit informally, from their friends or relatives.

Table 2: Membership in a Group(s) and Access to Credit

| | | Kilombero | | Meatu | | Total | |
|---|---|---|---|---|---|---|---|
| | | Freq | % | Freq | % | Freq | % |
| Member of a group"* | No | 287 | 80% | 364 | 86% | 651 | 83% |
| | Yes | 72 | 20% | 60 | 14% | 132 | 17% |
| | Total | 359 | 100% | 424 | 100% | 783 | 100% |
| Access to credit** | No | 259 | 72% | 355 | 84% | 614 | 78% |
| | Yes | 100 | 28% | 69 | 16% | 169 | 22% |
| | Total | 359 | 100% | 424 | 100% | 783 | 100% |

*Note.* * Pearson chi-square is significant at less than **5**% level; ** Pearson chi-square is significant at less than 1% level.

***Regression model***

The study analysed the determinants of an individual's participation in the major (primary) DST and secondary DST. Results at the level of impact of explanatory variables on the choice of major DST show that neither informal social relation factors nor accesses to social and financial capital affect the choices of major DST. Descriptive also show that majority of respondents (80.2%) practice seasonal farming as the primary DST. This implies that, seasonal farming is available to and accessible by everyone, regardless of the differences in access to social and financial capitals and informal social relations factors. Thus, the study opts to continue with the analysis of secondary DST.

Table 3 presents the summative findings of the multinomial logit model focusing on the factors affecting the individual choice of secondary DST. Three models that use the data from both study areas and data that are disaggregated by river basins are estimated. The goodness-of-fit test results show the significant results for the model that combines data from the two study areas and the model that use Meatu data. These results are shown on the last row of Table 3.

Variables that capture access to social and financial capitals reveal that both a membership in a group and access to credit affect the choice of secondary DST. However, when the analysis is conducted using the data from each study area separately, access to social capital is a significant factor in both Kilombero and Meatu, and access to financial capital is only significant

in Meatu. Thus, these findings lead us to not reject our first hypothesis.

The model that combines all data (Model 1) shows that the odds for individuals who are members of a formal and/or informal group (as compared to non-members) to participate in traditional pastoralism relative to irrigated farming are lower by a factor of 0.392. The results from the model that uses the data from Meatu (Model 3) are in line with the findings of Model 1. The odd ratio in Model 3 shows that being a member of a social group in Meatu decreases the likelihood of participating in traditional pastoralism relative to irrigated farming by a factor of 0.412. The model that uses Kilombero data shows a person who is a member of a group is more likely to participate in off-farm activity versus traditional pastoralism by a factor of 15.56. Both results are significant at less than 5%. Findings from the FGD show that there are different formal and informal groups of resource users, VICOBA groups and groups of good neighbourhoods in both study areas. Most of the groups that are formally registered by the government receive support from government agencies and provide loans and other forms of support to their members. However, informal groups are important sources of finance for people wishing to invest in off-farm activities such as informal trading and modern livestock keeping. Furthermore, informal groups also provide important financial capital for those who practise irrigated farming, enabling them to buy inputs such as fertilizer and pesticides. While social groups assure an easy form of finance to the members, borrowing from friends and/ or relatives is a major source of finance to most people, both group and non-group members. One important finding from the FGD is that the majority of the group members are the heads of the households and/ or their spouses. A young man in Ihenga village said:

"Young man like me cannot be allowed in the VICOBA because of lack of enough money to contribute as deposits. Furthermore, for us who still live with our parents, we cannot be trusted to join the groups because we do not have our own household farms that can function as a guarantee that we cannot migrate from the village. However, those young men with their own households and other properties such as farms, they have the opportunity to join the groups."

Pertaining the analysis of financial capital, the model that combines data from two study areas shows that access to credits increases the likelihood of a person practising off-farm activities relative to other DST such as seasonal farming by a factor of 4.222, irrigated farming (5.009), traditional pastoralism (8.738), and fishing (5.403). All results are significant at less than 1% level. The data from Meatu shows that access to credits increases the likelihood of practising off-farm activities relative to other DST such as seasonal farming (by a factor of 8.067), irrigated farming (8.976) and traditional pastoralism (13.067). All results are significant at less than 0.1% level. During the FGD, the majority of respondents in Meatu mentioned that they do not have the guarantee of getting enough money to contribute to the social (VICOBA) groups on a weekly basis. Thus, they rely on informal borrowing from business persons or from colleagues. Business persons provide loans with the requirements of returning the loan with a 50% interest rate. However, borrowing from business people is accompanied by the risk of losing property/ assets. A man in Ntobo village said that: "*Borrowing from business people is very risky: if one fails to return the loan with the interest, the lender might take any asset that the borrower owns, ranging from the cattle to the land*". Borrowing from colleagues is based on trust, sometimes with interest and sometimes without interest, depending on the agreements between the two a lender and a borrower. People in Kilombero also mention that they normally borrow from individual people, particularly during the farming season. Unlike in Meatu where the loan is repaid in terms of cash, a borrower in Kilombero normally repays the loan in terms of crops (bags of paddy rice) after harvesting. These kinds of loans are expensive because the market price of the bag of paddy rice is three times than the borrowed amount.

Results that show that informal social relation factors in terms of age and gender are significant determinants of the secondary DST lead us to not reject our second hypothesis. The model that combines data from two study areas shows that an additional year of age increases the likelihood of a person to participate in traditional pastoralism rather than irrigated farming by 10%. Results on the variable age square show that as the age increases, the impact of each marginal increase in age on the participation in traditional pastoralism (vs

irrigated farming) is less than the previous impact by a factor of 0.99. By taking the first derivative of the estimated equation, the exact point at which the impact of age on the dependent variable starts to diminish is 49.15. Thus, with respect to engagement in traditional pastoralism versus irrigated farming, a person is considered to be old when he/ she is at age of 49 and above. However, these results are less significant. These findings were also confirmed during FGDs. In pastoralist communities, young people mentioned that traditional pastoralism is a job for old people. Old men, for example, need cattle to pay the bride price when they want to add more wives, or to pay for the bride price when a son gets married. Old women can also easily obtain cattle, particularly goats, as the bride price when their daughters get married.

Gender is also found to be an important factor that affects the choice of the secondary DST. In the model that combines all data, results show that the odds for females to participate in traditional pastoralism versus irrigated farming are lower by a factor of 0.556 compared to their male counterparts. Similar results are also found in Meatu where the odds for women to participate in traditional pastoralism versus irrigated farming are lower by a factor of 0.539 compared to men. Results in both models are significant at less than 5% level. In Kilombero, being a woman reduces the odds to participate in fishing versus irrigated farming by a factor of 0.15. In addition, women in Kilombero are 6.372 times more likely to participate in off-farm versus fishing farming compared to their male counterparts. These results were also confirmed in FGD. In pastoralist communities, all cattle belong to men, mostly to the heads of households. Women in these communities never use their earnings to buy cattle because they fear men can either sell them or use them to pay for the bride price when they add more wives. On the other hand, women in fishing communities of Kilombero are not allowed in the fishing areas/ camps. Women themselves said that they have never been to the fishing areas. These findings are consistent with Leach et al. (1999) who highlighted that livelihoods in some societies might be affected not only because the resources are unavailable, but also due to socio-cultural factors, which restrict the use of certain resources.

In sum, findings focusing on river basin differences show that people in Kilombero are more likely to practise seasonal farming, and less likely to practise traditional pastoralism as the secondary DST. During FGD, it was found that in Kilombero, some villages such as Sululu, people practise irrigated farming as their major DST by the use of modern irrigation schemes, thus seasonal farming becomes their secondary DST. In some other areas, where climatic conditions allow two seasons' cultivation of crops, people practise seasonal farming as both their major and secondary DST. During the rain seasons, only paddy rice is cultivated because of the wet nature of the areas. The land retains its wet character even when the rain season is over which allows the cultivation of maize and vegetables soon after the harvesting of paddy rice. On the other hand, in Meatu district, there is one farming season whereby almost everybody cultivates staple foods (mainly maize) and other cash crops such as cotton, sunflower and legumes. People rely mostly on seasonal farming as the major DST; irrigated farming is a subsidiary DST with people cultivating vegetables for petty informal trading. While mainly of those who have farms along the river practise irrigated farming, traditional pastoralism is also a subsidiary DST for the majority of people in Meatu.

**Discussion**

This study has empirically shown how differences in people's access to social and financial resources, and informal social relations factors result in differences in the choices of DST for the enhancement of livelihoods. The study also links the findings with the policy initiatives to conserve natural resources. Informal social relations factors in terms of age and gender show that, while old people are more likely to participate in traditional pastoralism, women are less likely to participate in traditional pastoralism and fishing activities. Findings also reveal that access to social capital helps people to participate in irrigated farming and off-farm activities instead of traditional pastoralism. Financial capital is important for people to diversify to off-farm activities away from all other activities that make use of RBR.

Table 3: Multinomial logistic regression results on the Determinants of the choice of secondary development strategy

| | Model 1: All data | | Model 2: Kilombero | | Model 3: Meatu | |
|---|---|---|---|---|---|---|
| | z | RRR | z | RRR | Z | RRR |
| Age | | | | | | |
| Pastoralism vs Irrigated Farming | 2.05 | 1.10* | 0.80 | 1.10 | 1.55 | 1.09 |
| Age square | | | | | | |
| Pastoralism vs Irrigated Farming | -1.92 | 1.00 | -0.77 | 0.99 | -1.43 | 1.00 |
| Gender (if female = 1) | | | | | | |
| Pastoralism vs Irrigated Farming | -2.11 | 0.56* | -0.50 | 0.72 | -1.97 | 0.54* |
| Off-farm vs Fishing | 2.12 | 6.37* | 1.86 | 7.24 | | |
| Fishing vs Irrigated Farming | -2.43 | 0.15* | -2.36 | 0.15* | | |
| Social Capital (group member = 1) | | | | | | |
| Pastoralism vs Irrigated Farming | -2.40 | 0.39* | -1.48 | 0.49 | -1.96 | 0.41* |
| Off-farm vs Pastoralism | 1.66 | 2.61 | 209 | 15.56* | 0.14 | 1.11 |
| Financial Capital (access to credit = 1) | | | | | | |
| Off-farm vs Seasonal Farming | 2.73 | 4.22** | 1.01 | 2.28 | 2.77 | 8.07** |
| Off-farm vs Irrigated Farming | 3.10 | 5.01** | 1.07 | 2.46 | 3.25 | 8.98** |
| Off-farm vs Pastoralism | 3.91 | 8.74** | 1.81 | 7.21 | 3.84 | 13.07** |
| Off-farm vs Fishing | 2.49 | 5.40* | 1.22 | 2.99 | | |
| River basin (1 if river is Kilombero) | | | | | | |
| Seasonal vs Irrigated Farming | 4.09 | 3.24** | | | | |
| Seasonal farming vs Pastoralism | 7.64 | 13.91** | | | | |
| Seasonal farming vs Off-farm | 2.85 | 4.25** | | | | |
| Irrigated Farming vs Pastoralism | 4.26 | 4.29** | | | | |
| Off-farm vs Pastoralism | 2.17 | 3.27* | | | | |
| Number of observations: | 422 | | 180 | | 242 | |
| LR $\chi^2$ | 184.78** | | 28.21 | | 34.55** | |

*Note.* Dependent Variable is the secondary development strategy that an individual pursues (DSTSE). DSTSE is a categorical variable, taking values of 1 if an activity chosen is seasonal farming, 2 if irrigated farming, 3 if fishing, 4 if traditional pastoralism (pastoralism) and 5 if off-farm activities. All three models are estimated by using multinomial logit model. RRR is a short form for the relative risk ratio, which shows the factor change in odds of a person to participate in a certain (specified) DST relative to another DST for unit change in an independent variable. Z score are reported to show the directions of changes of the independent variables. A 'z' coefficient is the z-score for test of $\beta = 0$. LR $\chi^2$ is the value of a likelihood-ratio of chi-square for the test of the null hypothesis that of the coefficients associated with independent variables are simultaneously equal to zero (Long & Freese, 2003, p. 76). ** Significant at 1% level; * Significant at 5% level

In particular, access to social capital is important for people in Kilombero to engage in off–farm activities instead of traditional pastoralism. In Meatu, those with financial capital are more attracted to engage in off-farm activities. These findings imply that people without access to these forms of capital have to rely on the RBR and other natural resources for their survival. This has implications for people's wellbeing and the status of natural resources that are used.

Incentivized by the poor performance in traditional rural activities, particularly seasonal farming, rural people look for new/ alternative opportunities to raise their livelihoods. Irrigated farming and off-farm activities are some of these opportunities. However, these opportunities are not easily available to all groups of people, as they need access to some resources to finance them. For example, cultivating in a well-organised irrigation scheme requires timely planting, the application of inputs such as fertilizers and pesticides and timely harvesting. Those who have either the money to finance the activities directly or membership of organizations that supply credit in terms of cash/ material inputs, can easily meet the requirements of cultivating in irrigation schemes. Furthermore, investing in off-farm activities such as beekeeping, modern livestock keeping or informal trading also requires some sort of initial investment to finance the activities.

Informal groups are important sources of rural finance. The majority of rural people access credit through informal VICOBA groups that their establishment is based on trust between the members. Access to credit through VICOBA requires no collateral in terms of physical assets, thus the majority of poor people easily access the loans. Despite the usefulness of these groups to the rural population, these kinds of loans are not easily available to all groups of people. Findings show that membership to most of these groups belongs to the households, and is mainly accessed by household heads or their spouses. This implies that other members of households such as children who are above 18 cannot easily access social capital and credit, until they are married and have their own households.

**Conclusion**

This study has analysed how informal social relations factors and access to resources affects the choices of DST that people pursue for the enhancement of their livelihoods. The study links the findings with policy initiatives related to the conservation of natural resources. Data from the households residing alongside Kilombero River and Simiyu River in Tanzania are used in the analysis.

The Findings show that both access to social and financial capital and informal social relation factors affect the choice of secondary DST. Our study sheds light on the importance of social and financial capital for the diversification of rural livelihoods and the conservation of RBR base. The findings highlight that in Kilombero, those with access to social and/ or financial capital are less likely to practice traditional pastoralism (non-environmentally friendly DST); a finding that conveys important information to policy makers and other practitioners dealing with river basins conservation. For instance, investment in irrigation schemes in areas with permanent rivers has the potential to increase agricultural outputs while at the same time conserving the natural resources base.

In Meatu, both traditional pastoralism and irrigated farming are considered non-environmentally friendly DST. While cattle are freely grazed and taken to drink water along the river, irrigated farming is conducted in areas very close to the riverbanks. All these activities contribute to the widening of SR. Thus, the findings that show that people with access to financial capital are more likely to participate in off-farm activities are important for policies aimed at improving both the livelihoods and RBR conditions.

While informal groups are important sources of rural finance, they are not easily accessed by all groups of people. Thus, we recommend policies to consider establishing credit/ group lending programs that not only provide credit to people in rural areas but also policies that consider different groups of people in the community. For instance, our findings show that as people age they are more likely to participate in traditional pastoralism, which implies that a

loan that is provided to the household head who is aged, is more likely to be spent on adding more cattle. Unless modern methods of livestock keeping are used, this kind of investment has implications on the status of RBR.

This study has pooled data across villages in Meatu and across villages in Kilombero. However, the author recognizes that even among villages of the same area, there could be village-specific factors that affect household behaviours in terms of the uses of RBR and the choices of DST. Even the available opportunities on the choices of DST differ across the villages. Thus, even the policies that aim at improving rural livelihoods and natural resources conditions may not work similarly across all villages of the same area. Furthermore, households in the villages may differ in their willingness to accept those policies because of different interests that drive their preferences for the choices of DST and uses of natural resources. For instance, agro-pastoralist communities prefer cattle not only because livestock can easily be converted to cash, but also because they stand as a symbol of wealth in the society, and are used for other social activities such as bride prices. Therefore, the suggestion is made for future research to include in the analysis the role of village-specific factors on the choices of RBR.

**Acknowledgement**

This paper is based on the findings of PhD research on Access to river basins resources, development strategies and river basins resources degradation in Tanzania conducted from October 2014 to November 2018. The PhD was funded by the Belgian government through the VLIR-UOS under the Governance and Entrepreneurship through Education, Research, Access and Technology for Tanzania (Gre@t)programme.

**References**

Barbieri, C., & Mahoney, E. (2009). Why is diversification an attractive farm adjustment strategy? Insights from Texas farmers and ranchers. *Journal of Rural Studies, 25*(1), 58-66.

Carter, S., & Shaw, E. (2006). *Women's business ownership: recent research and policy development*. Retrieved from London.:

Chandio, A. A., Jiang, Y., Wei, F., Rehman, A., & Liu, D. (2017). Famers' access to credit: Does collateral matter or cash flow matter?—Evidence from Sindh, Pakistan. *Cogent Economics & Finance, 5*(1). doi:10.1080/23322039.2017.1369383

Cleaver, F. (2001). Institutional bricolage, conflict and cooperation in Usangu, Tanzania. *IDS Bulletin, 32*(4), 26-35.

de Haan, A., Brock, K., & Coulibaly, N. (2002). Migration, Livelihoods and Institutions: Contrasting Patterns of Migration in Mali. *The journal of development studies, 38*(5), 37-58. doi:10.1080/00220380412331322501

de Janvry, A., & Sadoulet, E. (2001). Income strategies among rural households in Mexico: The role of off-farm activities. *World Development, 29*(3), 467-480. Retrieved from <Go to ISI>://WOS:000168116100006

Ellis, F. (2000). *Rural Livelihoods and Diversity in Developing Countries*. Oxford: Oxford University Press.

Ellis, F. (2003). *A Livelihoods Approach to Migration and Poverty Reduction*. London: Department for International Development.

Fang, Y. P., Fan, J., Shen, M. Y., & Song, M. Q. (2014). Sensitivity of livelihood strategy to livelihood capital in mountain areas: Empirical analysis based on different settlements in the upper reaches of the Minjiang River, China. *Ecological Indicators, 38*, 225-235. doi:10.1016/j.ecolind.2013.11.007

Fisher, M. (2004). Household welfare and forest dependence in Southern Malawi. *Environmental and Development Economics, 9*, 135-154.

Gautam, Y., & Andersen, P. (2016). Rural livelihood diversification and household well-being: Insights from Humla, Nepal. *Journal of Rural Studies, 44*, 239-249. doi:10.1016/j.jrurstud.2016.02.001

Girabi, F., Mwakaje, A., & Elishadai, G. (2013). Impact of Microfinance on Smallholder Farm Productivity in Tanzania: The

Case of Iramba District. *Asian Economic and Financial Review, 3*(2), 227-242.

Hill, R. C., Griffiths, W. E., & Lim, G. C. (2011). *Principles of Econometrics* (4 ed.). United States of America: John Wiley & Sons, Inc.

Ibrahim, K., & Mazancova, J. (2014). ASSESSMENT OF LIVELIHOOD STRATEGIES IN SELECTED RURAL AREAS IN SYRIA. In L. G. Chova, A. L. Martinez, & I. C. Torres (Eds.), *Inted2014: 8th International Technology, Education and Development Conference* (pp. 1831-1838).

Jamal, V., & Weeks, J. (1988). The Vanishing of the Rural-Urban Gap in Sub-Saharan Africa. *International Labour Review, 127*, 271-292.

Koellinger, P., Minniti, M., & Schade, C. (2013). Gender differences in entrepreneurial propensity. *Oxford Bulletin of Economics and Statistics, 75*, 213–234.

Leach, M., Mearns, R., & Scoones, I. (1999). Environmental entitlements: dynamics and institutions in community-based natural resource management. *World Development, 27*(2), 225-247.

Lindvert, M., Yazdanfar, D., & Boter, H. (2015). Perceptions of financial sources among women entrepreneurs in Tanzania. *African Journal of Economic and Management Studies, 6*(2), 197-218.

Maliyamkono, T. L., & Bagachwa, M. S. D. (1990). *The Second Economy in Tanzania*. London: James Curry.

Mitra, A., & Mishra, D. K. (2011). Environmental resource consumption pattern in rural Arunachal Pradesh. *Forest Policy and Economics, 13*, 166–170.

Mshote, E. F. (2016). *The effect of savings and credit facilities on migrants' and non-migrants' gendered livelihood options in Ilula emerging Urban Centre.* (Phd), Sokoine University of Agriculture, Morogoro, Tanzania. Retrieved from http://www.suaire.suanet.ac.tz:8080/xmlui/handle/123456789/1492

OECD. (2016). Agriculture in Sub-Saharan Africa: Prospects and challenges for the next decade *In OECD-FAO (2016). Agricultural Outlook 2016-2025*. Paris.: OECD Publishing.

Schuurman, F. J. (2003). Social Capital: the politico-emancipatory potential of a disputed concept. *Third World Quarterly, 24*(6), 991-1010. doi:10.1080/0143659031000163003 5

Sena, V., Scott, J., & Roper, S. (2012). Gender, borrowing patterns and self-employment: some evidence for England. *Small Business Economics, 38*, 467–480.

Sesabo, J. K., & Tol, R. S. J. (2005). Factors affecting Income Strategies among households in Tanzanian Coastal Villages: Implications for Development-conservation initiatives. *Working Paper FNU, 70*.

Simoes, N., Crespo, N., & Moreira, S. B. (2016). INDIVIDUAL DETERMINANTS OF SELF-EMPLOYMENT ENTRY: WHAT DO WE REALLY KNOW? *Journal of Economic Surveys, 30*(4), 783-806. doi:10.1111/joes.12111

Titeca, K., & Vervisch, T. (2008). The Dynamics of Social Capital and Community Associations in Uganda: Linking Capital and its Consequences. *World Development, 36*(11), 2205-2222. doi:https://doi.org/10.1016/j.worlddev.2007.10.021

UNDP. (2015). *Tanzania Human Development Report 2014: Economic Transformation for Human Development.* . Retrieved from Dar es Salaam, Tanzania.:

URT. (2014). *Proposed Conservation and Protection of Simiyu River Boundaries in Meatu District, Simiyu Region*. Dar es Salaam Retrieved from http://lvemp2.go.tz/wp-content/uploads/2015/05/Meatu-Simiyu-River-Comprehensive-Brief.pdf.

Warner, J. M., & Campbell, D. A. (2000). Supply response in an agrarian economy with non-symmetric gender relations. *World Development, 28*(7), 1327-1340.

Woolcock, M., & Narayan, D. (2000). Social Capital: Implications for Development Theory, Research, and Policy. *The World Bank Research Observer, 15*(2), 225-249. doi:10.1093/wbro/15.2.225