Livelihood Assessments among Small-holder Farmers in the Southern Agricultural Growth Corridor in Tanzania: Lessons from Households in Ihemi Cluster

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Abstract

The study on which this paper is based assessed livelihoods of smallholder farmers in Ihemi cluster. Specifically, the study looked at the identification of institutional factors governing the use of water and land resources, determinants of the factors influencing male and female-headed households' income inequalities, and lastly, the comparison of agriculture production between male and female-headed households. The methodology involved a cross-sectional research design with a sample size of 150 households. Purposive sampling technique was used to select Ihemi cluster among other clusters of the SAGCOT intervention and stratified sampling technique was used to select respondents. The main method of data collection used were a structured household questionnaire-based survey and focus group discussion. Descriptive statistics, multiple linear regression and independent T-test statistics were used to analyze the data. Descriptively, majority (66.7%) of the respondents in Mufindi and Wanging'ombe district were married followed by Kilolo (56.7%). Very few respondents (3.3%) in Iringa district were single and very few had divorced (3.3%) in Mufindi district. Further, findings indicate that the number of Female Headed Households (FHH) is slightly higher in Njombe district (46.7%) followed by Kilolo (43.3%), Iringa district (40%), Wanging'ombe (36.7%) and relatively less in Mufindi (33.3%). The compounded independent T-test for mean production difference revealed that, there was a significant difference in production scores for male-headed households (M=12.4, SD=9.1) and that of female-headed household (M=9.4, SD= 7.8) conditions; t (142) = -3.233 and p=0.002, indicating significant indifference between male and female-headed households in the cluster. Furthermore, multiple linear regression model revealed that land ownership, access to credit, number of livestock owned, household education level and household size were found had significant influence on male and female-headed households' income inequalities. On the institutional factors, water sources such as shared taps, private owned taps, wells covered are for domestic purposes only while water sources such as streams, springs and rivers can be used for domestic purposes, livestock watering, watering gardens and irrigation. With this, general hygiene should be maintained and agreed contribution for maintenance in case of breakdowns. The study recommends that, diversification of income sources between female headed households and male headed households should be encouraged, fostering of community-investor linkage and increase access and control over natural resources such as land to female-headed households who are important actors in agriculture in rural areas as thy depend on land for their livelihoods. Conclusively, at the household level, female-headed households should have the same access to productive resources as men, they could increase productivity significantly. Women are good drivers for change towards more sustainable production system.

Keywords: Cluster, Livelihoods, Resources

Background information

Over 70 percent of the world's poor lives in rural areas where agriculture being their main source of income and employment. But depletion and degradation of land and water pose serious challenges to producing enough food and other agricultural products among smallholder farmers thus, impending their livelihood status (Lowder *et al.,* 2014). Until 2000, agriculture was the mainstay of

employment around the world and contributed to about 5 percent share to global GDP. Since then, the services sector has assumed this mantle and the gap between the two has widened. Although employment growth in agriculture has slowed, the number of people employed in this sector remained over one billion in the mid 2010s, representing 1 in 3 of all workers globally (ECOSOC, 2014).

Africa's agricultural sector is estimated to support the livelihood of 80% of its population and provide employments to between 60 and 65% of the economically active population (AfDB, 2010; AGRA, 2013). However, on a surprising note, the agricultural sector accounts for an average 32% contribution to the continent's gross domestic product (GDP). The reasons assumed are low adoption of improved farming practices, poor mechanization as well as devastating impacts of climate change. In reference to that background, its impacts on the livelihoods of Africa's rural population have not been realized to the expected magnitude when compared to other continents such as Asia and Latin America (AGRA, 2013). Sub-Saharan Africa's statistical data revealed no wide difference with that of the whole continent, growth in agricultural employment accounted for half of all employment growth (NEPAD, 2015). However, more people are employed out of necessity than by choice, as only a fraction of the working-age population can afford not to work (Zeigher and Steenstand, 2015).

To reduce rural poverty the government of Tanzania has among others, paid special attention to transforming the agricultural sector. This is stipulated in most development-related policy documents including the Poverty Reduction Strategy Paper (PRSP), the Agricultural Sector Development Strategy (ASDS), National Strategies for Growth and Reduction of Poverty (NSGRP), Phase 1 and II, the *"Kilimo Kwanza"* resolutions, the five-Year Development Plans (FYDP) Phase 1 and II, as well as the National Agricultural Policy (ACT, 2009; URT, 2000; URT, 2001; URT, 2005 and URT, 2013). The contribution of the agricultural sector is not much exceptional from the continent's statistics; the sector has employed about 65 per cent of the workforce and contributes to about 29 percent share of the country's GDP and export earnings (ASDP II, 2018). From the above reference, the sector forms one of the potential livelihoods options for the majority of both rural and urban dwellers in the country. With that being the case, therefore, Tanzania provided an appropriate ground to carry out the study on which this paper is based focusing on the livelihoods of smallholder farmers in the Ihemi Cluster, especially among male and female-headed households.

Agricultural productivity, in general, is low in Tanzania and many other sub-Saharan African countries where most farmers are smallholders. It is even lower for female-headed households (FHHs) farmers, who comprise about 50% of the agricultural labor force in the region (FAO, 2011). A report by the International Fund for Agricultural Development cited in FAO (2011) showed that the percentages of FHHs in rural eastern and southern Africa are ranges from 25 to 60%.

Literature shows the verity of the fact that women's lower human and physical capital, as well as their inability to soak up economic incentives, results in lowering productivity (Jacob, 1991; Quisumbing, 1996). Therefore, reducing gender inequality in access to and control of key productive resources is a concrete means of accelerating productivity growth and ensure the equitable benefits to both male and female-headed households to this growth; hence it's worthwhile to conduct the study.

While many gender and rural livelihood studies have focused on household asset endowments, activities and income in their analyses (Horrell and Krishnan, 2007; Carr, 2008), the role of formal or informal institutions (Nabli and Nugent, 1989) in constructing the livelihoods and/or perpetuating the poverty of female-headed households tends to receive less attention. In the context of rural Tanzania, the formal institutions that govern the behavioural relations that influence the livelihoods of female-headed households include rural credit systems and access to natural resources. Moreover, ramifications associated with informal institutions include for example the rules and constraints of customary land tenure systems, kinship, inheritance rules and social

networks that mediate household access to key resources of production, economic activity, and produce marketing channels. Several scholars have reiterated (Razavi, 1999; Chant, 2004) the need to go beyond simply equating female-headed households, or rural women generally, with poverty and to contextualize the reasons for this.

Therefore, findings of this study inform the government and other stakeholders at large of the areas that need to be adjusted so as to enhance agricultural productivity and income equality among small holder farmers and subsequently improving the livelihoods of these farmers.

Research Objectives of the Study

General objective

The general objective of this study was to conduct livelihoods assessment among the group of small-holder farmers in Ihemi Cluster.

The specific objectives of this study were:

i. To identify institutional factors governing the use of water and land resources
ii. To determine factors influencing male and female-headed households' income inequalities
iii. To compare agriculture production between male and female-headed households

Theoretical Exposition

Agriculture and livelihoods

In the least developed countries, there is a close link between the livelihoods of small farmers and their levels of agricultural productivity. The large majority of people in these countries reside in the countryside where most depends on farming as their main livelihoods (Rigg, 2006). Although scholars and development partners are acknowledging the role of non-farm activities in economies and livelihoods of rural dwellers, but the abiding sense is that these activities are still regarded as add-ons to the main business of farming (Bryceson, 2002). An increasing number of rural households with less commitment to farming and the increasing rate of rural-urban migration whatsoever cannot be under-estimated in justifying the existence of the comparison between the female headed households and male headed households. (Horrell and Krishnan, 2007). Citing evidence from various parts of Africa, Bryceson (2002), confirmed that the income diversification efforts of most rural dwellers have been directed at meeting daily needs amidst declining returns to commercial agriculture. Individuals and households have experimented with new forms of livelihood, expanding their non-agricultural income sources, while retaining their base in subsistence farming thus, the agriculture sector will remain a primary livelihoods source for many decades to come, though, not as important as it used to be a few decades ago. Various livelihood patterns are emerging, depending on historical, geographical and agro-ecological factors at local and national levels (Chukwuezi, 1999). Global changes such as structural adjustment programs, trade liberalization, focus oriented agriculture, higher costs of agricultural inputs and consumer goods comparative to decline in price of agricultural produce, devasting impacts of climate change to the agricultural sector resulted to livelihoods diversification in the agricultural sector. (Foeken and Owuor, 1999).

Livelihood determinants

There are numerous determinants of livelihood strategy although many livelihoods are largely predetermined by accident of birth. Livelihood of this sort may be ascriptive: for instance, in India children may be born into a caste with an assigned role as potters, shepherds or washer (Agrawal, 1989). Gender as socially defined is also a pervasive ascriptive determinant of livelihood activities however, this has been criticized due to fact that a person may be born, socialize and apprenticed into an inherited livelihood, for example as a cultivar with land and tools, a pastoralist with animals or a shopkeeper, all of these two may turn to be a new household with livelihoods activities different form the ones they were born from. (Chambers, 1997). Some people improvise livelihood with degree of desperation, what they do being largely determined by the social, economic and ecological environment in which they find themselves. A person or household may also choose a livelihood especially through education and migration. Those who are better off usually have a wider choice than those worse

off, and a wider choice is usually generated by economic growth (Beck, 1989).

Institutional factors and natural resources management

Natural resource institution is conceived in a much broader sense than mere organization. Institution herein is referred as a set of rules and definition of the action for both individual and collective decision-making in the realm of resource development, allocation, and utilization (Saleth and Dinar, 2000). Since these rules are often formalized in terms of three inter-related aspects, i.e., legal framework, policy environment, and administrative arrangement, institution can be conceptualized as an entity defined interactively by its three main analytical components such as natural resource laws, policy and administration (North, 1990). However, the institutional arrangements governing the land and water sector are undergoing remarkable changes in many countries around the world in order to make adjustment of the sector's arising problems which are caused by several factors (Saleth and Dinar, 2005). For analytical convenience, these factors can be grouped into endogenous factors that are internal to land and water sector and exogenous factors that are outside the strict confines of both land and water resources (Becker and Ostrom, 1995). The endogenous factors include scarcity, conflicts over resources, financial and physical deterioration of water infrastructure, and operational inefficiency of institutions. The exogenous factors include economic development, demographic growth, technical progress, economic and political reforms, international commitments, changing social values and ethos, and natural calamities including floods and droughts (Saleth and Dinar, 2000).

Since the exogenous and endogenous factors are interrelated and their relative impacts differ by context, it is difficult either to isolate their individual roles or to generalize the direction of their effects. Nevertheless, it is possible to track their effects within the framework of transaction cost theory where they can be conceptualized as to influence either the transaction costs or the opportunity costs of institutional change (Saleth and Dinar, 2005). Therefore, institutional factors are thereby expected to govern and balance resources for future and sustainable utilization.

Male, Female and Agricultural Productivity

It is often argued that women's lower levels of human and physical capital result in lower productivity or inability to respond to economic incentives and much of the evidence cited to support this argument comes from agriculture (Quisumbing, 1996). However, an evaluation of male-female productivity differences should ideally be based on estimates of total factor productivity, in which an index of output is divided by an index of inputs, aggregated over all types of outputs and inputs, respectively (Jacob, 1991). Existing studies therefore use partial productivity measures, such as yield and labor productivity. These partial measures of productivity are complicated by differences in farming systems and social and cultural institutions. It is feasible to estimate technical efficiency differences between male and female farmers in farming systems where men and women manage separate plots, as in many African societies (Hare, 1999). It is more difficult to isolate managerial efficiency differences in agricultural settings where plots are cultivated jointly by male and female family members and hired laborers. In the latter, found in the male farming systems of Africa, Asia and Latin America, the farm manager is usually assumed to be the male head of the household, regardless of the actual contribution of women to decision-making and farm labor (Oaxaca, 1973).

Despite the volume of attempts to document male-female productivity differences, relatively few controls for individual characteristics such as education and physical assets were observed. If women systematically had lower levels of education and physical assets than men: which is typical in most agricultural settings in Africa, an approach that did not control for individual stocks of physical and human capital would tend to overestimate productivity differences due to sex. That is, women farmers would be expected to have lower productivity simply because they are female, not because they have fewer resources (Ashraf and Ashraf, 1993). This study will compare income inequality between gender

groups specifically male and female in presence of disparities in resource endowment.

Theoretical Framework

Motivation and commitment theory

According to Lines (2004), one of the empirically proven effects of participation is that it increases the motivation and commitment of people. To development work, this would mean that the poor would be more motivated to make an effort to implement the activities that have been decided which would make it more likely that the changes will lead to successful improvement of their livelihoods (Oxaca, 1973). Another benefit might be that the poor, due to the increased commitment, they will stay in the local area and help develop it, instead of pursuing their luck in other places. Glew *et al.* (1995) also asserts that participation is more likely to have a positive effect when people understand the purpose and agree with the change that is going to happen. When doing development work, it is very likely that the locals agree that development is needed especially when they have had a say in what kind of development will be the best the assumption is that participation will lead to increased motivation which will then result in increased performance.

The relevance of the Motivation and Commitment theory in relation to this particular study is that, the study stands on the fact household livelihoods can be explained the driving force behind of increasing one's agricultural productivity and reducing the income gap.

Research Methodology

Description of the study area

This study on which this paper is based was conducted in Ihemi Cluster of the SAGCOT intervention. Ihemi is one of the six clusters proposed for SAGCOT intervention along with Sumbawanga, Mbarari, Kilombero, Rufiji and Ludewa Clusters. The selection of Ihemi was due to its potential in agricultural activities and the abundance of crops grown.

Research design

This study adopted a cross-sectional research design, the design allows data to be collected from the sampled respondents at one point in time (Olsen, 2004). This design was preferred based on its merits in involving groups of people who differ in the variable of interest, but share other characteristics such as socioeconomic status, educational background, and ethnicity as well as its suitability in describing characteristics that exist in a population and establishing the relationship among variables of interest (Bailey, 1994).

Sampling procedure and sample size

Both probability and non-probability sampling methods were used. Purposive sampling method was used to select Ihemi among the six clusters of the SAGCOT intervention and focus group discussants. On the other hand, a simple random sampling technique was used to select 2 villages from each district and then a convenience method was applied to select respondents from each village in the cluster. A sample of 150 households were involved in this study, the selection of 150 was based on the fact that a sample of 30 respondents, according to Bailey (1994), irrespective of the population size is the bare minimum for a study in which statistical analysis is to be done.

Data and data collection tools

The study used only primary data. Data was collected using a structured questionnaire consisting of both open and closed-ended questions. Closed-ended questions were used because they ensure uniformity of responses and they were easy to code and amenable to statistical analysis. On the other hand, open-ended questions permit free responses whereby, respondents were able to explain, comment or qualify their responses without being limited to certain stated alternatives. (Kothari, 2004).

Data processing and analysis

Collected data was summarized coded and entered in Statistical Package for Social Science (SPSS) for analysis whereby, both descriptive and inferential analyses were performed. The descriptive analysis involved computation of standard deviation, means, maximum and minimum values, frequency and percentage while inferential analysis included the multiple

linear regression model and independent sample t-test. Both descriptive and inferential statistical analyses were applied to make an inference on the target population.

For objective 1:

To identify institutional factors governing the use of water and land resources

To identify institutional factors governing the use of water and land resources, Descriptive and content analysis of the open-ended questions where similar themes from the open-ended answers were put together analyzed.

Multicollinearity and singularity test

Before examining objective 2, the regression model needs to be tested for the multicollinearity and singularity test so as to examine the relationship among independent variables in the model. Testing the model on multicollinearity was done by using tolerance and Variance Inflation Factor (VIF) test built in regression of each independent variable. Therefore, the higher the inter-correlation of independent variables the more the tolerance approaches zero, thus suggesting for multicollinearity. (Gujarat, 2004; Pallant, 2011).

For objective 2:

To determine factors influencing male and female-headed households' income inequalities

Multiple linear regression model was used in the analysis to determine factors influencing male and female-headed households' income inequalities and tested. The regression equation applied in this particular study was:

$$LnYi = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \varepsilon \quad ...(1)$$

α = Intercept when all independent variables are equal to zero.
Yi = Household average annual income
X_1 = Age
X_2 = Education level
X_3 = Occupation
X_4 = Total land owned
X_5 = Land ownership status
X_6 = Number of livestock owned
X_7 = Access to credit
X_8 = Household size
$\beta_1 - \beta_8$ = Coefficients of determination of independent variables
ε = Stochastic disturbance (Error term)

For objective 3:

To compare agriculture production between male and female-headed households

An independent sample t-test was applied to compare agricultural production between female and male-headed households. On the other hand, information from focus group discussions was summarized into meaningful scriptures and supplemented findings from collected data through content analysis.

Results and Discussion

Demographic profile of the respondents

Marital Status

A majority (66.7%) of the respondents in Mufindi and Wanging'ombe district were married followed by Kilolo (56.7%) (Table 1). Very few respondents (3.3%) in Iringa district were single and very few had divorced (3.3%) in Mufindi district. Further, findings indicate that the number of Female Headed Households (FHH) is slightly higher in Njombe district (46.7%) followed by Kilolo (43.3%), Iringa district (40%), Wanging'ombe (36.7%) and relatively less in Mufindi (33.3%) (Table 1). This finding implied that majority of the households in the study areas were female headed households, and this landscape was attributed by a number of reasons which were the death of a spouse due to HIV/AIDS, divorce/ separation, while other single mothers decided not to marry (single motherhood by choice). on the other hand, the percentage of widows is increasing as compared to widowers. this is because the majority of widows do not prefer second marriage after death of the husband, unlike men who marry soon after the death of a wife (Kashaigili, *et al.,* 2016).

Education level of respondents

Education was one of the social demographic characteristics assessed during the study. Based on the findings, majority (96.7%) of respondents in Wanging'ombe, 93.3% in Njombe and 86.7%

in Mufindi and Iringa districts had primary school level of education. Very few had attained college level of education (e.g. 3.3% in Kilolo District) with none having a university degree. the reason for having the majority of the people with primary education level was that it is compulsory for every individual in Tanzania to areas in Tanzania and sub-Saharan Africa in general. This finding implied that, due to the fact tha majority of these rural dwellers are illiterate therefore they cannot afford formal employment and therefore forced to engage in farming and collection of forest goods (Manonga, 2013) (table 1).

Table 1: Socio-economic characteristics of households

Household head profiles	Variables	Iringa region		Njombe region		
		Iringa	Kilolo	Mufindi	Njombe	Wanging'ombe
Marital status	Married	13(43.3)	17(56.7)	20(66.7)	13(43.3)	20(66.7)
	Single	1(3.3)	-	2(6.7)	2(6.7)	2(6.7)
	Divorced	3(10)	-	1(3.3)	2(6.7)	-
	Widow	13(43.3)	11(36.7)	7(23.3)	11(36.6)	8(26.7)
	Widower	-	1(3.3)	-	2(6.7)	-
Sex	Male	17(53.3)	17(56.7)	20(66.7)	16(53.3)	19(63.3)
	Female	12 (40)	13(43.3)	10(33.3)	14(46.7)	11 (36.7)
Education	None	3(10)	6(20)	4(13.3)	2(6.7)	1(3.3)
	Primary	26(86.7)	23(76.7)	26(86.7)	28(93.3)	29(96.7)
	Secondary	1(3.3)	-	-	-	-
	College	-	1(3.3)	-	-	-
	University	-	-	-	-	-
Household size	1- 5	19(63.3)	18(60)	19(63.3)	23(76.7)	22(73.3)
	6- 10	11(36.7)	11(36.7)	11(36.7)	7(23.3)	8(26.7)
	>10	-	1(3.3)	-	-	-
Age	20- 29	-	2 (6.7)	3 (10)	-	2 (6.7)
	30- 39	6 (20)	8 (26.7)	5 (16.7)	7 (23.3)	11 (36.7)
	40- 49	9 (30)	9 (30)	9 (30)	10 (33.3)	4 (13.3)
	50- 59	8 (26.7)	7 (23.3)	7 (23.3)	8 (26.7)	8 (26.7)
	60 & above	7 (23.3)	4 (20)	6 (20)	5 (16.7)	5 (16.7)

Note: Numbers in the brackets indicate percentages

have at least a primary school education, so as to be able to read and write. On a surprise note, a good proportion of respondents (20%), (13.3%) and (10%) in Kilolo, Mufindi and Iringa districts respectively had no education at all. From this finding it can be concluded that majority of the sampled respondents were literate with primary education, similar finding as the one that was reported in (Agea *et al.,* 2011), who stated that such education status is typical of many rural

Age of the respondents

The majority of the respondents were aged between 30 – 59 as indicated in Table 1. This finding implied that the majority of the respondents were young and in their active productive age, where they work hard in the fields. Young age implies that they are confident enough to interact with the investors available in the area and learn new technologies.

Household size

As indicated in Table 1, the findings indicate that the majority that is 76.7, 73.3, 63.3, 63.3 and 60% of the respondents in, Njombe, Wanging'ombe, Iringa rural, Mufindi and Kilolo districts respectively indicated that they have 1-5 household members. Such household size is manageable when it comes to provision of basic needs (Manonga, 2013).

Institutional factors governing the use of water resources

There are two broad categories of water sources identified, these are community owned and privately-owned water sources. Community owned water sources include boreholes, streams, river, spring, shared taps, covered tube wells on the other hand, privately owned water sources include tap inside houses/ outside, covered tube wells and deep wells. Institutional factors governing the use of water sources differ depending on the type of source weather community owned or private owned. Rules and regulations governing the use and

Table 2: Institutional factors governing the use of water

Water source	Uses	Institutional factors (rules & regulation)
Shared taps	Domestic purposes (drinking, cooking and laundry)	• General hygiene should be maintained around the tap (cleanliness), • Every household using the shared taps should contribute agreed amount for repair if taps break down, • If children play with the tap, the parents are fined.
Covered tube wells, deep wells	Domestic uses	• No laundry around the wells, at least 50m from the well.
Boreholes	Domestic purposes	• No one is allowed to do laundry at the borehole, • When pumping the water, people should not hit the hand pump against the ground, • General hygiene should be maintained around the tap (cleanliness), • Every household using the borehole should contribute agreed amount for repair if there are any breaks down.
Springs	Domestic purposes only	• General hygiene should be maintained around the spring, • There are special vessels for fetching water, • Anyone who dirty the spring is fined, • Laundry is not allowed at all near springs.
Streams	Domestic use, livestock watering and watering gardens	• No laundry around the streams, at least 50m away, • Livestock watering is done at a specific spot and usually at the lower spot of the stream, • No grazing around the stream as it may cause soil erosion, only watering is allowed.
Rivers	Domestic use, irrigation and livestock watering	• No farming near the river, at least 60m from the river.
Private owned taps and wells	Domestic purposes	• Households pay for water services e.g. per bucket or per month.

access to the various community-owned water sources are presented in the table below. A variety of rules and regulations apply to the different community-owned water sources, some rules are generic whilst others are specific to the type of water sources. Table 2 shows the water source, uses and the rules that apply to each of the sources. In most cases the rules and regulations that apply to community-owned water sources are not written down, they are just rules of the heart.

Institutional factors governing the use of land

Land ownership was grouped into two categories; private owned land and community/ state owned land, land acquisition was through; purchasing, inheritance, acquisition from village government. Several number of institutional factors governing the use of land were identified, some were functioning in both private and community owned land, such institutional factors include; planting of trees, penalties imposed to those cutting down

Table 3: Institutional factors governing the use of land

Parameters	Uses	Acquisition	Document of ownership	Rules and regulation
Private owned land	• Own cultivation • Renting out • Fallowing • Grazing land • Woodlot • Residential purposes • Laying bricks • Beehives • Firewood collection	• Purchased • Inherited or gift • Acquired from village government • Cleared	• Title deed • Offer of right of occupancy • Customary title deed • No document	• Planting trees and maintain medicinal trees such as miulungu, minyanga, madihanyi • Buying and selling land should involve village officials e.g. VEO • Fines imposed to those cutting down trees • Land and boarder disputes are first solved by village or ward councils • Farming near the sources of water such as rivers, streams is not allowed.
Community/ state owned land	• Building of offices, hospitals, schools, markets. • Renting out for cultivation and leasing land • Laying bricks • Grazing land • Woodlot • Mining activities • Hunting activities • Firewood collection	• Purchased • Acquired from village government	• Title deed • Customary title deed • No document	• Fines imposed to those cutting down trees however cutting down trees is allowed upon special permission from V.E.O and instruction and approval from natural resource committee. • Selling land to investors must be approved by village general assembly • Farming near the sources of water such as rivers, streams is not allowed. • Firewood collection is only allowed to dried tree branches and old dried tree. • It is forbidden to live and cultivate in forest reserved areas. • Forest burning is prohibited.

trees, Farming near the sources of water such as rivers, streams is prohibited. There are no wide differences in land uses in private owned land with that of community/state owned land. Detailed institutional factors are presented in the Table 3 below.

Households agricultural Production

In order to characterize production among the sampled respondents, a cross-tabulation descriptive analysis was used. Results indicate that the mean production (100kg/bags) was 11.25 bags ranging from 0 to 52 bags with more than half (58%) of the sampled respondents reported producing below 10 bags, while very few (1.3%) 50 bags and above. However, results also indicate that female headed households had less agricultural production in almost all categories of production compared to their male counterpart. There was slightly difference in production between male and female headed households at the production category below 10 bags whereby, there were (51.7%) and (48.3%), male and female respectively as indicated in Table 3. A vast difference was observed between the category 10 and 19 bags where, third-quarter (74.4%) were male-headed households relatively to quarter (25.6%) their counterpart; similar observation was made at category 20-29 bags with more than half (69.2%) male and above quarter (30.8%) female-headed households. There were no male-headed households falling under production category of 30-39 bags and 40-49 bags respectively (what does this imply?), on a surprising note however, there were equal proportion (50%) each male and female-headed households falling under production category of 50 bags and above (What does this imply? (See Table 4).

Households' production

An independent sample t-test was conducted to compare agricultural production between male and female-headed households. Results indicate that there was a significant difference in production scores for male-headed households (M=12.4, SD=9.1) and female-headed household (M=9.4, SD=7.8) conditions; t(142) =-3.233 and p=0.002. These results suggest that there were statistically significant differences ($p< 0.01$) in agricultural production between male and female-headed households in Ihemi cluster (See Table 5 below). This finding implied that, in comparison between male headed households and female headed households, there was no a significant difference between the two surveyed groups in terms of agricultural production.

Multicollinearity and singularity test

The regression model was tested for the multicollinearity, this refers to the relationship among independent variables estimated in the model. Multicollinearity exists when the independent variables are highly correlated ($r>0.9$) whereas, singularity occurs when one independent variable is actually a combination of another independent variable. Testing the model on multicollinearity was done by using tolerance and Variance Inflation Factor (VIF) test built in regression of each independent variable. Therefore, the higher the inter-correlation of independent variables the more the tolerance approaches zero, thus suggest for multicollinearity. It can be noted in the results presented in Table 5 that tolerance values do not approach zero and VIF values for independent variables are below 10 which justifies that there is no multicollinearity in the model equation (Gujarat, 2004; Pallant, 2011) (Table 6).

Table 4: Household's production

Production categories (Bags)	Male HHS production	Female HHs production	Total
< 10	45 (51.7)	42 (48.3)	87 (100)
10 - 19	32 (74.4)	11 (25.6)	43 (100)
20 - 29	9 (69.2)	4 (30.8)	13 (100)
30 - 39	-	3 (100)	3 (100)
40 - 49	-	2 (100)	2 (100)
50 and above	2 (50)	2 (50)	2 (100)

Table 5: Households' production t-test

Household head sex	Levene's Test for Equality of Variances			t-test for Equality of Means					95% Confidence Interval of the Difference	
	n	F-value	P-value	t-test	Degree of freedom	P-value	Mean difference	Standard deviation	Lower	Upper
Female	57	0.520	0.041	-3.233	142	0.002	-0.362	0.68889	-0.58387	-0.1408
Male	87			-3.180	113.1	0.002	-0.362	0.63648	-0.58807	-0.1366

Table 6: Multicollinearity and singularity test

Independent variables	Tolerance (r)	Variance Inflation Factor (VIF)
Total land owned	0.877	1.141
Land ownership status	0.623	1.605
Access to credit	0.915	1.093
Number of livestock owned	0687	1.456
Household head occupation	0.888	1.126
Household head age	0.932	1.073
Household head education level	0.928	1.077
Household size	0.926	0.080

Factors influencing households' income inequalities

Multiple linear regression analysis was carried out to identify factors influencing male and female- headed households' income inequalities. The results show that, some variables had significant influence on male and female headed- households' income inequalities whereas some had no any influence on that (Table 7). The results in Table 6 shows that 46.3% of variation in male and female-headed households' income inequalities can be explained by variables included in the model. The findings show that total land owned is statistically significant influencing male and female- headed households' income inequalities at (P=0.000) and it was positively related to the dependent variable (β=0.565). This implies that households with big total land owned have higher chances of getting high incomes. A similar observation was reported in the study by (Mashayekhi, 2013), on economics survey of crop implications on optimized farm size and land consolidation which reveals that the average total cost decreases with increase in farm size as this puts into account the economies of scale which speaks of the proportionate saving in costs gained by an increased level of production due to farm size. Thus, smallholder farmers can optimize revenue through increasing farm size other things remaining constant.

Furthermore, the results from regression analysis show that the education level of the household head was positively related to the dependent variable and was statistically significant at (P=0.008). The implication of this is that households head with high education level (for this case is primary education and few secondary education) have high income than those with no education at all.

Number of livestock owned was also positively related to the dependent variable (β = 0.159) and was statistically significant at (P<0.05) as shown in Table 7. This indicates that households who own livestock have high incomes than those households who do own livestock.

Also, the results from regression analysis show that the variable access to credit was statistically significant at (p=0.000) and negatively related to the dependent variable (β=-0.264). This implies that the diminishing in

access to credits widens the income gap between male and female-headed households.

On the other hand, some factors that were thought to influence male and female- headed households' income inequality were not statistically significant. Such factors include land ownership status, primary occupation, and household head age ($p>0.05$). The insignificance of land ownership status can be attributed to the fact that majority of the households' own land, likewise for the case of primary occupation, majority of respondents had the same primary occupation which is farming and livestock keeping. From these results (Table 7). There is clear justification and evidence that there is influence of social-demographic characteristics of the household head to income inequality as majority of these characteristics were statistically significant (both education level and household size were significant 99% and 95% level of confidence respectively). Therefore, the null hypothesis "there is no statistically significant influence of socio-demographic characteristics of the respondents on income inequality" is rejected.

Overall evaluation of the model

The adjusted R^2 value of 0.637 implies that 63.7% of the variation in income inequality among male and female-headed households were explained by the parameters estimated in the model equation. However, it also implies that there are other parameters which significantly influence income inequality but were missed during the model equation estimation. Such parameters are open for further investigation.

Results presented in Table 8 reveal that the F-value of 17.525 was significant at the 99 % level of confidence ($p=0.000$) which implies that all predictors estimated in the model equation were well fitted and possess an influence to the dependent variable.

Table 7: Multiple linear regression results

Independent Variables	Std. error	coefficients	T	Sig.
Constant	0.172		32.335	0.000***
Total land owned	0.007	0.565	8.610	0.000***
Land ownership status	0.160	-0.087	-1.123	0.264
Access to credit	0.063	-0.264	-4.102	0.000***
Number of livestock owned	0.088	0.159	2.141	0.034**
Household head occupation	0.013	0.054	0.826	0.410
Household head age	0.002	-0.017	-0.262	0.794
Household head education level	0.066	0.173	2.708	0.008***
Household size	0.053	0.130	2.063	0.041**

Note: ***= Significant at the 99% level of confidence; **= Significant at the 95 % level of confidence

Table 8: Summary of the model

Model	Sum of squares	df	Mean square	F-value	Sig.
Regression	11.231	7	1.604	17.525	0.000***
Residual	13.000	142	0.092		
Total	**24.231**	**149**			
R	**R^2**	**Adjusted R^2**		**Std Error of estimate**	
0.681	0.663	0.637		0.30257	

Note: *** = Significant at 99% level of confidence

Conclusion and Recommendations

Conclusion

This study aimed at conducting livelihoods assessment among the group of small-holder farmers in Ihemi Cluster. Specifically, it focused on comparing agriculture production of the

households within the cluster, determining factors influencing male and female-headed households' income inequalities and identifying institutional factors governing the use of land and water resources between male and female headed households. A cross sectional single-visit survey was conducted involving smallholder farmers from Iringa rural, Kilolo, Mufindi, Njombe and Wanging'ombe districts which form Ihemi cluster in the SACGOT intervention areas.

Most of smallholder farmers in Ihemi cluster depend directly on agriculture sector, relying mainly on natural resources which are available in the area. Smallholder farmers are faced with low productivity challenge rooting from lack of access to markets, access to credit, and lack of accessibility to natural resources such as land and water resources. Agricultural productivity is one of the key determinants of high and sustained agricultural growth which leads to improved livelihoods to many of smallholders who are depending on it.

Currently, most of farming households, women comprise a huge proportion of the agricultural labor force (46%). Female-headed households should have the same access to productive resources as men, they could increase productivity significantly. Women are good drivers for change towards more sustainable production system.

Recommendations

Based on the findings of the study the following recommendations are suggested for the improvement of sustainable livelihoods of smallholder farmers in Ihemi cluster:-

i. Households that are headed by females should have the same access to resources as compared to male headed households.
ii. As much as smallholder farmers hugely depend on natural resources such as water for their agricultural activities, then there should be in place different conversation efforts of these resources so as to ensure their continuity.
iii. Livelihood diversification (diversification of income sources). Smallholder farmers should be encouraged to diversify their sources of incomes to reduce much dependency on crop production. Adding up multiple income streams through other economic activities such as livestock keeping, mining, local manufacturing, commerce, haunting, fishing, would protect a smallholder farmer from a down economy. if one loose from one source of income can simply turn to another source of income generating activity.
iv. Based on the number of households, deliberate measures should be taken to improve their living conditions, specifically on having access and control over resources such as land. Women are the important actors in agriculture in rural areas as they depend on land for their livelihoods.
v. Many smallholder farmers had no title deed, offer of right to occupancy even the customary title deed. The acquiring right of occupancy among smallholder farmers will enable them towards accessing loans from financial institutions. Loan would act as catalyst in improving agriculture as well as other non- agriculture activities.

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