Rural Livelihood Strategies in the Southern Highlands of Tanzania

An examination of household well-being in the light of economic reforms

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Abstract

Tanzania has changed from a socialist system to a capitalist system since the 1980's. Market liberalization has been the key element in the macroeconomic reforms that have taken place, and reforming the agricultural sector is seen as a priority. This research analyses the degree to which the current Tanzanian agricultural sector has modernized and commercialized after the implementation of several economic and agricultural reforms. The analysis is on the micro-level of rural households. The study uses the Sustainable Livelihoods Framework to assess the livelihood strategies that rural households in the Southern Highlands are engaged in. The study looks at the determinants of each livelihood strategy in order to define group characteristics and to discover the differences in levels of well-being per strategy. The results of the analysis show that commercialized rural livelihood strategies attain higher levels of well-being than the less commercialized rural livelihood strategies. However, there is no profound evidence that the economic reforms have changed the agricultural sector into a highly efficient and productive sector that is focused on market-oriented crops.

Keywords: economic reforms, livelihood strategies, well-being, Southern Highlands Tanzania.

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List of abbreviations

AE	Adult Equivalent
AGRA	Alliance for a Green Revolution in Africa
CFA	Common Factor Analysis
GDP	Gross Domestic Product
IIA	Independence of Irrelevant Alternatives
MDGs	Millennium Development Goals
OECD	Organisation for Economic Co-operation and Development
PCA	Principal Component Analysis
PCF	Principal Component Factoring

Table of Contents

List of tables and figures

1. Introduction

The United Republic of Tanzania is situated in East Africa, immediately south of the Equator. The population of the country is estimated 49,25 million in 2013 (FAO, 2013; World Bank, 2014). In 2012, 28.8% of the population lived below the national poverty line and 44% of the population had access to clean water. The life expectancy in Tanzania is 61 years, and the average GNI per capita is $630 (World Bank, 2015).

In recent years, Tanzania's economy has grown as a result of sound macroeconomic policies towards market liberalization. The gross domestic product (GDP) grew at 6,6 percent per year between 1998 and 2007 (Pauw & Thurlow, 2012). Because of these promising numbers, Tanzania is often named as an example of "African successes" by multilateral institutions (Nord et al., 2009). At the same time, many scientists and organizations argue that reforms towards market liberalization have failed to bring the prosperity that is claimed by the government and donor organizations (Cooksey, 2011). The rapid economic growth didn't translate into rapid reductions in poverty and malnutrition (Pauw & Thurlow, 2011), and corruption and an authoritarian government are still problematic issues (Edwards, 2014). Even after economic liberalization, the economy in Tanzania is characterized by high levels of public control and low private action (Ellis & Mdoe, 2003; Cooksey, 2013). Market liberalization is induced since the 1990s, but the market environment still doesn't manage to bring the whole rural population out of poverty.

At the micro level of individuals and households, there are external and internal factors that impact the outcomes of economic reforms. The geographical location plays an important role in this. For example, differences in infrastructure, services, climate and resource base may affect the effectiveness of policy interventions (Mdoe et al., chapter 29) and macro-economic reforms. The effects of past economic reforms and interventions towards market liberalization could thus be very diverse per household and per region.

In this research I will try get insight on how rural households are affected by past policy reforms in the region Mbeya, located in the Southern Highlands of Tanzania. I will use a livelihood approach in order to look at the household economic responses. The analysis of livelihood activities and transformations has proven to be an effective way to see the opportunities for interventions at the micro level, as well as it can show the effectiveness on previous policy changes towards market liberalization (Scoones, 2009). Livelihood strategies are characterized by the allocation of assets (physical, natural, social, human and financial), income generating activities (on farm, off farm), and livelihood outcomes (food, health, income, security). Rural households participate in a diversity of livelihood activities and strategies. Together these determine the well-being achieved by the household (Lopez, 2008).

The goal of this study is twofold. First, I want to find out to what extend the economic reforms are reflected in the livelihood strategies of the rural households in the research area. There is no time series data involved in the research, so it is not possible to compare the current situation with the situation before the economic reforms. I can therefore only focus on the question whether the desired outcomes of the economic reforms are visible in the existing livelihood strategies in the research area.

The second goal of the study is to check the assumption that commercialized livelihood strategies (stimulated by the economic policy reforms) have better perspectives in terms of well-being. In order to fulfil our goals for the research, I have formulated the following research questions:

1. What are the main rural livelihood strategies of the respondents?
2. What are the determinants of each strategy?
3. What is the impact of livelihoods choice on household well-being?
4. Did the economic reforms have the desired impact on current livelihood strategies?

This research is part of a bigger impact evaluation that will measure the impact of the project entitled "Increasing Agricultural Productivity in the Breadbasket Area of Southern Tanzania", conducted by SNV (Dutch Development Organisation) as the leading partner. The results are based on a broader study among rural households that have a membership in a farmers organization in the region Mbeya. The project benefits from this research because it will provide a window into household decision making and available livelihood strategies. This will increase the understanding of what kind of interventions are the most likely to be successful per household and per livelihood strategy.

The report is structured as follows. First, background information about the agricultural and economic development of the past 50 years is provided in Chapter 2. This information is necessary understand the current economic situation in Tanzania. Chapter 3 presents the theoretical framework that gives a better understanding of livelihoods concepts. Additionally the theoretical frameworks presents the importance of markets and transaction costs in agricultural development, and the concept of well-being is discussed. Chapter 4 is a short analysis of the research area, discussing different social and economic statistics of the Mbeya region. In chapter 5 the data and methodology is discussed. Chapter 6 reveals the results and Chapter 7 includes the discussion. Conclusions can be found in Chapter 8.

2. Economic and agricultural development

Tanzania is an agriculture-based country, with 72 percent of the population living in rural areas and 75 percent of the labor force working in agriculture (World Bank, 2014). The larger part of the poor live in rural areas and depend on agricultural livelihoods, which makes the agricultural sector a key sector for development (Pauw & Thurlow, 2011). An appropriate background on Tanzania's past reforms and economic performances is needed in order to understand the current economic situation for the agricultural sector in Tanzania (Edwards, 2014). This chapter is concerned with the history that shaped Tanzania's status quo.

2.1 Economic development after independence

In order to understand the economic challenges in contemporary Tanzania, it is important to be aware of the social and economic history after independence in 1961. During the first 25 years after independence, Tanzania was ruled according to the "African Socialism" (*Ujamaa*, meaning "familihood") ideas of president Julius Nyerere. These ideas were based on Nyerere's philosophy of socialism, with the main objective the attainment of a self-reliant socialist nation (Ibhawoh & Dibua, 2003). The *Ujamaa* included public control over agricultural markets and prices, nationalization of enterprises, and the "*villagization process"* that enforced previously scattered peasants to move to villages predesigned by planners (Ellis & Mdoe, 2003). The socialist policies of Nyerere's government were not successful, which resulted in a big black market and shortages of all sorts of goods in the mid-1970s. For the agricultural sector, these policies resulted in stagnation and consequently a decline in productivity and income (Ministry of Agriculture, 2013). As a consequence, the Tanzanian government collapsed in the late 1970s and early 1980s (Edwards, 2014). Tanzania was highly supported by foreign donor countries from independence in 1961 to the economic crisis in the early 1980s. The high amounts of aid flows resulted in a high dependency on foreign assistance. Besides that, the donors supported policies that led to undesirable outcomes and high corruption rates (Edwards, 2014). Some people even claim that the strong support from the international aid community was the cause of the economic decline: an example of what critic W. Easterly and D. Moyo call "dead aid" (Easterly & Easterly, 2006; Moyo, 2009).

Political reforms started mid-1980s, and policy adjustments focused on economic liberalization and ending a society led by state control (Cooksey, 2011). The main policy adjustments included the devaluation of the Tanzanian shilling; a cut in parastatal subsidies; import liberalization; denationalization of banks; removal of price controls; removal of state monopolies and liberalization of food markets (Ministry of Agriculture, 2013, p.1); (Cooksey, 2011, p.560). In the early 1990s, the second-generation reforms took place. The main policy adjustments of the second reforms fundamentally changed the public sector: civil service reform, budget management and privatization (Devarajan, Dollar, & Holmgren, 2001). The second-generation reforms in the agricultural sector mainly focused on export crop liberalization. According to Cooksey (2011), these export crop liberalization reforms were earnestly resisted by powerful political players who argued that there already was sufficient externally-driven liberalization. Examples that he mentions are: "(i) the re-empowerment of export crop boards which tax traders and exports (and therefore farmers) and regulate markets in which they are active commercial players; (ii) the arbitrary and sometimes oppressive treatment of farmers by local government authorities*, inter alia* through taxation; (iii) the proliferation of sector policies and strategies that privilege the state as initiator rather than facilitator at central and local levels, notably through the vehicle of foreign-aid-funded projects;7 (iv) the continued practice of government-guaranteed bank lending to certain co-operative unions" (Cooksey, 2011, p. 560).

It is highly debated whether the economic transformation that reinterpreted the roles of the public and private sector was successful. One of the problems in analysing the performances of the transformation is the unreliable data that are available, which makes it difficult to find causal relationships between policy variables and growth (Jerven, 2011). Research by Nord et al. (2009) implicates that the reforms have changed Tanzania from a state controlled economy to a market economy. Cooksey (2011) does not agree on this, and argues that the degree to which Tanzania has successfully adopted market liberalization is greatly exaggerated. He puts the statement that "the dominant liberalisation discourse explains very little of the recent changes in the practice of the Tanzanian state as regards agricultural markets, and begs the question of the actual content of 'liberalization'" (Cooksey, 2011, p. 576). Ellis and Mdoe (2003) state that the major problem lays in the fact that public services and private sector growth are very intertwined in Tanzania. This is reflected in economic trends and events that show a difference between stated and actual liberalization actions. The gap between stated and actual liberalization actions results in contradictory outcomes and interpretations of degree to which Tanzania's economy is really liberalized.

2.2 Policy frameworks from the 21st century

From the above paragraph it can be concluded that, despite numerous policy documents and frameworks, there is no clear answer to whether the past liberalization reforms are fully implemented by the government. The policy frameworks created by the Tanzanian government are nonetheless important for economic sector development in the country. Some of the main policy frameworks are discussed here. It should be noted that this is not the full list of policy documents that design the (agricultural) policies in Tanzania. I made this selection based on the relevance for this thesis.

2.2.1 The Tanzania Development Vision 2025

The Tanzania Development Vision 2015, formulated in 1999, focuses on the long-term development vision and sets goals for the country that should be attained by 2025. The five main pillars that the Vision 2025 focuses on are: (1) high quality livelihood; (2) peace, stability and unity; (3) good governance; (4) a well-educated and learning society and (5) a competitive economy capable of producing sustainable growth and shared benefits (Tanzania Planning Commission, 1999). What is noticeable is that a relatively small part is concerned with (small-scale) agriculture in Tanzania. The main promise for the agricultural sector in 2025 is that "The economy will have been transformed from a low productivity agricultural economy to a semi-industrialized one led by modernized and highly productive agricultural activities which are effectively integrated and buttressed by supportive industrial and service activities in the rural and urban areas." (Tanzania Planning Commission, 1999). The focus is on agro-industries and developing those activities that have a dynamic comparative advantage (Tanzania Planning Commission, 1999).

2.2.2 National Strategy for Growth and Reduction of Poverty I and II

There are two national strategies written for growth and reduction of poverty. In the first National Strategy for Growth and Reduction of Poverty, developed in 2009, growth sectors were defined that , should become priority areas to reduce poverty and increase economic growth. The growth sectors could be used as a mechanism to achieve the goals set by the Tanzania Development Vision 2025 and the Millennium Development Goals (MDGs). The agricultural sector (together with tourism and the manufacturing industry) is appointed as one of the growth sectors. Agriculture is named as one of the

growth sectors because it is seen as a sector with direct impact on overall growth, and furthermore indirect impact on growth via several multiplier effects. The outlined comparative advantages in agriculture are the availability of land and the land's suitability for irrigation (Tanzania Planning Commission, 2009).

The second National Strategy for Growth and Reduction of Poverty elaborates on the major struggle within the agricultural sector: productivity. This is especially a concern for smallholder farmers (and thus the majority of the agricultural sector). The report suggests "drivers" for agricultural growth, designed to increase agricultural productivity (Ministry of Finance and Economic Affairs, 2010). The following major drivers are mentioned: (1) supportive physical infrastructure; (2) water and irrigation infrastructure; (3) financial and extension services; (4) knowledge and information; (5) value addition activities and (6) trade development services (Ministry of Finance and Economic Affairs, 2010). Furthermore, the National Strategy for Growth and Reduction of Poverty II is focused on lifting Tanzania to a middle income country characterized by "(i) high quality livelihood, (ii) peace, stability and unity, (iii) good governance, (iv) a well-educated and learning society, and (v) a strong and competitive economy" (Ministry of Finance and Economic Affairs, 2010).

2.2.3 Kilimo Kwanza

The most recent and widely used framework that focuses on agriculture is "Kilimo Kwanza", meaning "agriculture first". Kilimo Kwanza is a central pillar to the Development Vision 2025, emphasizing that agriculture is the most effective tool to successfully eradicate poverty for the majority of the population. Kilimo Kwanza is also a strategy closely related to the first National Strategy for Growth and Reduction of Poverty since it reflects the implementing strategy for one of the growth sectors, namely agriculture. Modernization and commercialization of agriculture are the main goals for Kilimo Kwanza, and the private sector should be the leading implementing agent of this strategy. The strategy implementation is guided by 10 pillars that are outlined in Table 1. Kilimo Kwanza was implemented in 2009 (Government of Tanzania, 2009), and the aim was to achieve its objectives in 2013 at the end of the "Ministries Medium Term Strategic Plan" (Ngaiza, 2012).

Table 1 Explanation of the 10 pillars of Kilimo Kwanza

#	Kilimo Kwanza Pillar	Description
1	Political will to push agricultural transformation	Foster political will and commitment of all Tanzanians to the Kilimo Kwanza Resolution for agricultural transformation to commercialization, to be undertaken by small, medium and large scale producers.
2	Enhanced financing for agriculture	Mobilize financial resources from the private sector, public sector, financial institutions, development partners, NGOs and community based organizations to implement Kilimo Kwanza.
3	Institutional reorganisation and management of agriculture	Emphasis on good governance, better coordination, monitoring and evaluation. Involvement of the private sector is of great importance.
4	Paradigm shift to strategic agricultural production	Prioritize production based on market demand and supply. Top priority for food crops. Produce what is consumed and consume what is produced.
5	Land availability for agriculture	Facilitate access to land for agriculture, enhance security of tenure, promote the harmonious and judicious exploitation of the land resource and create an enabling environment for using land to access

		credit.
6	Incentives to stimulate investments in agriculture	Introduce and review incentive policies and regulations (both fiscal and non-fiscal) to attract and retain investments in the agricultural sector.
7	Industrialization for agricultural transformation	Establish industries to provide backward and forward linkages for the agricultural sector and increase access to local and foreign markets for value added products.
8	Science, technology and human resources to support agricultural transformation	Promote the use of modern technologies by all producers; increase government expenditure on research and development to 1% of GDP; identify, train and effectively utilize agricultural expertise; and develop farm service centres.
9	Infrastructure development to support agricultural transformation	Develop infrastructure for irrigation, rural electrification, storage, roads, railways, ports, airports, market centres and information technology to support agriculture.
10	Mobilization of Tanzanians to support and participate in implementing Kilimo Kwanza	Integrate Kilimo Kwanza in governmental bodies, promote it at the national, regional, district, ward and village level. Monitor and Evaluate Implementation of Kilimo Kwanza by both private and public sector.

Source: adapted from Government of Tanzania (2009).

The fourth pillar advocates prioritization of agricultural production based on demand and supply. The Kilimo Kwanza Implementation Framework of the Government of Tanzania (2009) outlines which food crops can be seen as "strategic" to cultivate: maize, cassava, rice, wheat, bananas, potatoes, sorghum and millet. The crops that are seen as "strategic" for international trade are onions, mangoes, bananas, grapes, avocados, pineapples, tomatoes and spices. Furthermore the Implementation Framework puts focus on "transformation crops": cotton, sunflower, safflower, sesame and palm oil (Government of Tanzania, 2009). The indication of "strategic crops" and "transformation crops" in the implementation framework is interesting. This suggests that the strategic value for the crops is determined by policy decisions, and not by their market performances.

Overall, the pillars of Kilimo Kwanza show that the Tanzanian government basically wants to initiate a green revolution in the country. The government wants to enhance an agricultural revolution through policies and institutional reforms, infrastructure development especially rural roads, use of modern technology, extension services, irrigation systems, market access, reform of the land laws and advocating for investment in agro-processing sector/industry (Swenya, Kabisama, & Shadrack, 2014).

2.3 Growth scenario's

Tanzania has inserted a progressive policy framework that should drive agriculture to a higher level. The policy documents however do not include clear growth predictions that should come forward from the investments in the agricultural sector.

Pauw and Thurlow (2011) have created a model that predicts two growth scenario's for major crops in Tanzania (see Table 2). The first scenario is a "baseline scenario", where growth is expected to continue at the same pace as recent production trends. The second scenario is the "agriculture scenario", in which productivity in agriculture is assumed to increase faster than in the baseline scenario. The growth in the agriculture scenario is based on a broader range of crops and subsectors that drive the growth process than in the historical crop production data (Pauw & Thurlow, 2011). Both scenario's assume that land area will increase with 2% per year, and that this land area increase is allocated across crops grown in the region according to the current situation. The gains in yield for the individual crops are based on the

broader-based agricultural growth as previously mentioned. This means that the individual crops that have achieved growth in the past make only small improvements in the agriculture scenario. To the contrary, the poor performing crops from the past will increase their yields to a larger extend, because of their underexplored growth potential (Pauw & Thurlow, 2011). For example, the yield growth in rice (well performing crop) moves from 4.69% per year to 4.92% per year in the agriculture scenario, while maize (poor performing crop) moves from 1.92% per year to 4.39% per year.

Table 2 Historical (2000-2007) and estimated (2007-2015) yield and production growth estimations for individual crops in Tanzania

	Historical crop production data			Modeled scenarios, 2007–2015			
	Crop land allocation in 2007 (% share)	Annual production growth, 2000–2007 (%)	Yields in 2007, (metric tons per hectare)	Baseline scenario		Agriculture scenario	
				Annual yield growth (%)	Annual production growth (%)	Annual yield growth (%)	Annual production growth (%)
Cereals							
Maize	32.77	2.08	0.88	1.92	2.82	4.39	5.01
Sorghum	7.91	3.31	0.75	2.07	4.46	2.61	5.41
Millet	3.12	0.17	0.54	−3.85	1.67	−1.00	3.71
Rice	6.65	6.24	1.99	4.69	6.79	4.92	7.02
Wheat and barley	0.97	8.49	1.18	9.37	11.56	9.66	11.85
Root crops							
Cassava	8.04	3.54	8.01	3.43	4.28	4.22	5.60
Other roots	6.57	5.26	2.17	6.88	5.42	6.87	6.47
Pulses and oilseeds							
Pulses	9.64	−4.32	0.65	−9.29	−2.65	−6.60	−0.31
Coconuts	3.78	0.00	1.19	−1.74	0.23	−0.05	1.95
Oilseeds	4.62	5.01	0.63	5.94	6.69	5.56	7.89
Horticulture							
Plantains	3.75	0.12	1.83	−2.14	1.19	−0.45	2.88
Fruits	2.03	11.98	4.02	16.91	9.44	15.98	9.90
Vegetables	2.10	0.22	6.74	−1.15	0.58	1.26	3.27
Export crops							
Coffee	1.67	−0.03	0.39	−2.81	−0.86	3.58	5.65
Cashews	0.97	−2.12	0.94	−7.69	−5.84	−1.81	0.15
Cotton	3.59	9.49	0.61	10.20	12.40	10.36	12.57
Sisal	0.56	3.60	0.51	2.33	4.38	3.90	5.98
Sugarcane	0.21	8.47	16.06	10.29	12.50	10.81	13.03
Tea	0.23	3.80	1.59	3.51	5.58	5.12	7.23
Tobacco	0.41	11.39	0.52	13.70	15.97	13.74	16.02
Other crops	0.40	1.76	0.51	−0.22	1.77	1.86	3.90

Notes: Crop yields are targeted by exogenously raising TFP growth rates in the baseline and accelerated agricultural growth scenarios. Production is determined endogenously since factors can be reallocated to other sectors in response to changing productivity levels and relative prices.

Source: Pauw and Thurlow (2011)

2.4 The reality check

Despite the several strategies and policies, the agricultural sector in Tanzania is not performing well enough to make serious progress in alleviating poverty. Rural households still face low rates of productivity and high rates of food insecurity and poverty (Mdoe, Mlay, & Kadigi, 2015). This is reflected in the national household budget survey (National Bureau of Statistics, 2007), that shows a small decrease in poverty in rural areas from 40,8% in 1991 to 37,6% in 2007. The poverty rates in rural areas are bigger than the poverty in urban areas. The rural areas face bigger shortages in food and basic needs than Dar es Salaam, other urban areas and mainland Tanzania (see Table 3). Knowing that the national poverty rate for the whole country in 2012 was 28.8%. Although I cannot directly compare this data with the data from the household budget survey, it implicates again that rural areas face higher poverty rates than urban areas.

Table 3 Percentage of incidence of poverty in Tanzania

	Year	Dar es Salaam	Other Urban areas	Rural areas	Mainland Tanzania
Food	1991/92	13.6	15.0	23.1	21.6
	2000/01	7.5	13.2	20.4	18.7
	2007	7.4	12.9	18.4	16.6
Basic needs	1991/92	28.1	28.7	40.8	38.6
	2000/01	17.6	25.8	38.7	35.7
	2007	16.4	24.1	37.6	33.6

Source: Household Budget Survey (2012)

The share of agriculture in the total GDP is diminishing: in 2000 agriculture contributed more than 30 percent of the GDP, in 2008 this was 24 percent (MAFAP, 2013). Although GDP share is diminishing, the sector grew at 4,4 percent per year on average between 1998-2007. The biggest source of the growth came from major export crops are cotton, sugarcane, coffee and tobacco and are mainly cultivated by large-scale commercial farmers. To the contrary, the growth from subsistence farmers cultivating staple crops remained low due to traditional production systems (Pauw & Thurlow, 2011).

In the National Agriculture Policy of 2013 the following hurdles in agriculture are addressed as the main constraints to agricultural growth: low productivity of land, labor and production inputs; underdeveloped irrigation potential, limited capital and access to financial services, weak agricultural technical support services, poor rural infrastructure; infestations and outbreaks of crop pests and diseases; erosion of the natural resource base and environmental degradation (NAP, 2013). Other factors mentioned are weak producer organizations; gender relations; depressed prices for primary commodities in global markets; limited involvement of the private sector; limited participation of youth and weak property rights (Ministry of Agriculture, 2013). This summation of constraints implicates that the pillars of Kilimo Kwanza to a big extent have not managed to bring agricultural progress.

2.5 Agricultural development synthesis

The government of Tanzania has the incentive to transform from a small-scale agriculture driven society to a liberalized economy with a commercialized agricultural sector. Policy frameworks that were designed after the second generation reforms all focus on the shift from low productivity agriculture to modernized and commercialized agriculture. Yield and production growth assumptions did emphasize that especially former poor performing crops would benefit from a higher productivity in agriculture.
The Development Vision 2025 aims for a transformation of the agricultural sector that should be fulfilled in ten years. Supporting strategies such as the Kilimo Kwanza have clear goals, however their effectiveness and their implications for rural households remains largely unclear. Constraints in land and labour productivity seem to be a big hinder to bring economic progress to small scale farmers.

From the above I have formulated two hypotheses that I would like to test in this thesis. First, I would like to research whether the often referred agricultural transformation to commercial agriculture has taken place in Tanzania. As a follow up, I would like to test an assumption that is often made in Tanzanian policy documents: the assumption that a focus on commercial agriculture brings prosperity on the level of the rural household. This results in the following hypotheses:

Hypothesis 1. Tanzania has managed to transform its agricultural sector to a commercialized agricultural sector;

Hypothesis 2. Commercialized agriculture is the most attractive rural livelihood strategy for a rural household in Mbeya.

3. Theoretical framework

The theoretical framework that I will use for this research focuses on the following concepts: livelihood strategies, markets and transaction costs, and well-being.

3.1 Rural livelihoods

The concept of livelihood touches on what people do for a living, how they carry this out, and what they gain by doing it (Groenewald & Van Den Berg, 2012). Ellis (2000) defines a livelihood as "the assets (natural, physical, human, financial and social capital), the activities, and the access to these (mediated by institutions and social relation) that together determine the living gained by an individual or household". In recent policy thinking, people often talk about *sustainable* livelihoods, with a by-focus on future generations. A commonly used definition of sustainable livelihoods is offered by Scoones (1998), who adapted the definition from Chambers & Conway (1991): "A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks, maintain or enhance its capabilities and assets, while not undermining the natural resource base". People engage in various livelihood *strategies* in order to achieve their livelihood objectives. A rural household's decision on which strategy to adopt depends on the ability of the five assets of natural, physical, human, financial and social capital. The literature also suggests other terms for livelihood strategies that also refer to the way people respond to their circumstances. These are household coping, adaptive or survival strategies and income earning activities (Thennakoon, 2004).

3.1.1 Sustainable livelihoods framework

In order to better understand the outcomes of different livelihood strategies, DFID (1999) has developed a framework which can be used to plan new development activities and to analyse the effect of previous development activities. The sustainable livelihoods framework (see Figure 1) focuses on the relationships between the factors affecting somebody's livelihood strategy. In the following paragraph I will explain the framework in more detail.

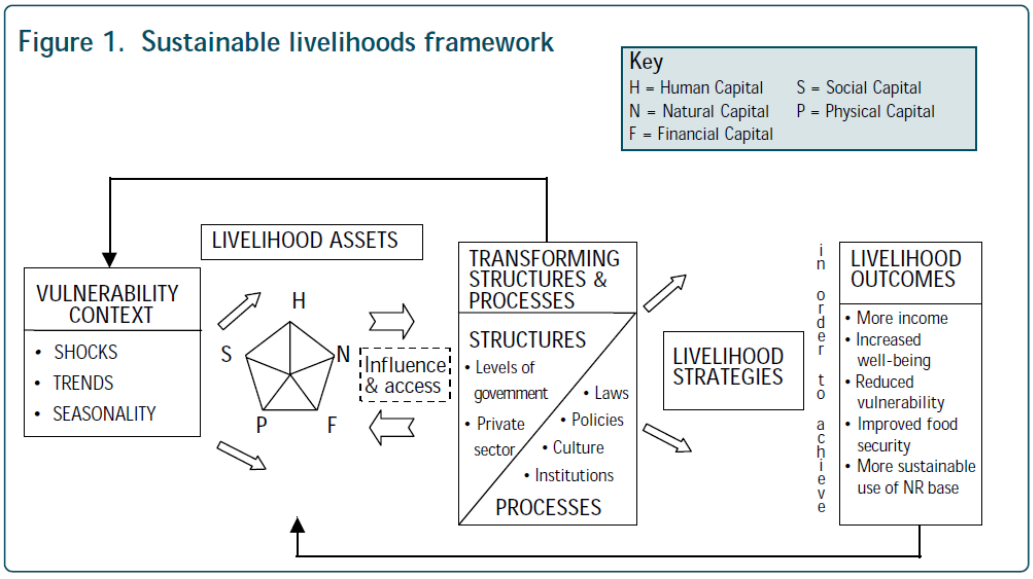

Figure 1 Sustainable livelihoods framework Source: DFID (1999)

Understanding the vulnerability context is important to get an idea of the external environment in which people live. Critical shocks, trends and seasonality are influences that people have no control of, but certainly affect the possibilities in which people can shape their livelihoods. It is important to take into account that different people are differently affected by the vulnerability context.
Livelihood assets are shown in the framework as the rendering of people's strengths (capitals or endowments) and are the essentials to attain positive livelihood outcomes. The idea behind livelihood assets is that people need a selection of assets in order to attain positive livelihood outcomes. The asset pentagon is the core of the framework, and the five capitals (human, natural, financial, social and physical) can be seen as the livelihood building blocks. The capital endowments are in reality constantly changing, so the shape of the asset pentagon is changing throughout time.

Other determinants that influence people's livelihood are policies, institutions, organizations and legislation. These factors are taken up in the transforming structures & processes part of the framework. They shape livelihoods in the sense that they exist on many levels (micro, meso and macro) and influence both private and public sector. The transforming structures and processes determine to a certain extend the access to the five capitals, and they determine for a large part the well-functioning of markets. There is a feedback effect towards the vulnerability context as structures and processes can affect trends in a certain area. DFID (1999) gives as an example that well-functioning markets can help to reduce seasonality effects by facilitating inter-area trade.

Next in the framework are the livelihood strategies, which are closely connected with people's desired livelihood outcomes. Livelihood strategies reflect the range and combination of activities and choices that people undertake in order to achieve their livelihood goals (DFID, 1999). Access to assets is seen as the building block for the choice in livelihood strategies that a person has. Also, the more options and flexibility people have in their livelihood strategy, the more resilient they are to shocks and stresses in the vulnerability context.

Livelihood outcomes reveal the achievements of a livelihood strategy. This part of the framework gives an understanding how all factors within the livelihoods framework lead to a specific outcome. As shown in the framework, it cannot be assumed that livelihood outcomes are solely focused on maximization of income. There are many other priorities that are reflected in the livelihood outcomes (food security, well-being etc.) that can give important information about people's preferences for a specific livelihood strategy and people's behavioural attitudes.

3.1.2 Hanging in, stepping up and stepping out

The concepts of "hanging in" (protecting livelihoods), "stepping up" (improving livelihoods) and "stepping out" (changing livelihood activities and structures) are important processes that help to understand the flexibility of a rural household's livelihood strategy over time. These terms are furthermore essential in the analysis of how livelihoods can be improved. The five capitals serve as facilitating services that enable the transformation processes. Below is a more detailed explanation of hanging in, stepping up and stepping out, based on the article of Dorward (2009) and Dorward, Ruben, Pender, and Kuyvenhoven (2007), who use these concepts to understand the dynamics of poverty and to understand the changing role of agricultural systems in this.

- Hanging in: the case when people engage in livelihood activities with the goal to hold on to the assets that they currently possess. The main goal is not to lose assets as a result of disadvantageous trends and shocks (see sustainable livelihoods framework).

- Stepping up: refers to the situation where people enhance the productivity of their assets in order to expand their livelihood activities. This can be done in several ways, such as investing in new assets (i.e. equipment, skills, technology, land) or improving existing assets. The aim for stepping up is to enlarge positive livelihood outcomes, such as higher income or higher well-being.
- Stepping out: the situation where people invest in assets and activities that are more productive and eventually lead to a move into a different livelihood strategy. This is associated with the accumulation of a new set of assets. Examples are investment in education and skills in order to move out of agricultural jobs.

It is possible to be engaged in one specific strategy or in multiple of these strategies at the same time. The livelihood strategies that are likely to be chosen by each household depend on the specific household circumstances. According to Dorward et al. (2009), the main factors that determine preferences are the local market opportunities and the natural resource potential. They also make a distinction between "poor" and "less poor" households, because for these groups the set of opportunities will be different (depending on the availability of the five capitals, see Sustainable Livelihoods Framework).

Table 4 gives an idea of the likely strategies of hanging in, stepping up and stepping out that are adopted by rural households. What can be seen from the table is that poor people are likely to be engaged in "hanging in" strategies over stepping up and stepping out. The reason for this is that they mostly live in a vulnerable environment where they struggle to maintain their livelihoods. The hanging in activities are likely to be different depending on the natural resource base, market opportunities and possession of assets. Dorward et al. (2009) mention that in the case of low natural resource potential and market opportunities, poor people will rely on livestock as the most important asset, since this gives more certainty under different seasonal conditions than crop-based agricultural activities. Market opportunities determine to a high extend the success of new technologies for livelihood strategies, because increased production doesn't lead to larger positive outcomes if markets are not functioning or non-existent.

The situation for the less poor is different: instead of a "hanging in" strategy they are more likely to choose for "stepping out" and "stepping up" strategies in order to improve their livelihood. The less poor possess more assets (see sustainable livelihoods framework) and therefore there are more options for stepping out and stepping up strategies. In the case of stagnant market opportunities, the options of stepping up are limited (see Table 4). However, in some cases there is the option to export to more distant markets which makes stepping up strategies possible. In the case of a low natural resource potential, the less poor will choose to step out of agriculture. When market opportunities and resource potential are high, both stepping out (changing to non-farm activities) and stepping up (increase agricultural productivity) are among the options for the less poor household.

Table 4 Livelihood strategies for poor and less poor farmers, by market opportunities and natural resource potential

			Local market opportunities	
		Status	Low/ stagnant	High/ dynamic
Natural-resource potential	Low	Poor	Hang in (very difficult – subsistence)	Hang in (more local non-farm based)
		Less poor	Step out (migrate)	Step out (local non-farm)
	High	Poor	Hang in (farm / subsistence)	Hang in (farm and non-farm)
		Less poor	Step out (migrate) Step up ('exports')	Step out (local non-farm) Step up (local markets)

Source: Adapted from Dorward et al. (2009)

3.2 Markets and transaction costs

The importance of markets for developing countries is highly emphasized in literature about economic development (De Janvry, Fafchamps, & Sadoulet, 1991; Dorward, Poole, Morrison, Kydd, & Urey, 2003; Kydd & Dorward, 2004; Taylor, Zezza, & Gurkan, 2011). Improved market access and opportunities are seen as critical drivers for sustained pro poor development and poverty alleviation, although it is in itself neither a sufficient solution nor a magic bullet (Dorward et al., 2003; Taylor et al., 2011). Dorward et al. (2003) sum up the following reasons for the importance of markets in economic development: (1) the livelihoods of most of the poor people rely on the participation in several markets, both as private agents or as employees; (2) poverty reduction processes today and in the past have relied on private sector economic growth; (3) poor people themselves mention that their livelihoods are highly dependent on markets (or a lack of access to markets) and (4) markets can be used as a highly efficient tool to exchange, coordinate and allocate many resources, goods and services to advance economic growth.

Increased commercialization in food markets coincides with an increase in transaction costs from the perspective of the smallholder farmer (IFPRI, 2005). Transaction costs is a concept from institutional economics which is concerned with agents' decisions on market transactions where there are small numbers of parties involved on each side of the transaction (Vakis, Sadoulet, & de Janvry, 2003; Williamson, 2005). As an example, the decision for a farmer to sell product on the market is not only based on the output price, but also on the additional costs incurred for transacting in the market. As Alene et al. (2008) states, transaction costs are the embodiment of barriers to market participation by resource-poor smallholders and are associated with the significant degree of market failures in developing countries. The two main factors leading to high transaction cost are the following: (1) the usually poor provision of public goods; and (2) the costs emerging from coping with different rules, regulations and players within the markets (IFPRI, 2005). Transaction costs can be both observable and non-observable and are therefore often referred to as "hidden costs" (Ouma, Jagwe, Obare, & Abele, 2010). Examples of the most common transaction costs that are specifically significant for smallholders in developing countries are the distance to markets, poor infrastructure and poor access to assets and information (IFPRI, 2005). Transaction costs lead to high exchange costs, causing a raise in the real price of inputs and a decrease in the real price received for outputs (Ouma et al., 2010).

Closely related to transaction costs is the problem of failing markets. De Janvry et al. (1991, p. 1401) describe the situation of market failure as "when the cost of a transaction through market exchange creates disutility greater than the utility gain that it produces, with the result that the market is not used for the transaction […] In general, markets exist, but they selectively fail for particular households, making the corresponding commodity a non-tradable for that household". Market failure is thus described as household specific, not as commodity specific.

3.3 Well-being

The concept of well-being is increasingly used as a measurement tool of people's current and future living conditions. Although well-being is a widely used concept in (economic) literature, there is no consistency in how well-being is defined and measured. Furthermore, terms as happiness, life satisfaction and quality of life are often used interchangeably with well-being.

The definition that I find the most effective to use in this thesis research is the one of OECD (2013). OECD (2013) developed three pillars that will help understanding and measuring people's well-being. This threefold definition is drawing on previous work from several researchers.

- *Material living conditions* (or economic well-being), which determine people's consumption possibilities and their command over resources.
- *Quality of life*, which is defined as the set of non-monetary attributes of individuals that shapes their opportunities and life chances, and has intrinsic value under different cultures and contexts.
- The *sustainability* of the socio-economic and natural systems where people live and work, which is important for well-being to last over time. Sustainability depends on how current human activities impact on the stocks of different types of capital (natural, economic, human and social) that underpin well-being (OECD, 2013, p. 27).

This definition is coming from the viewpoint that economic (or material) well-being is critical factor to overall well-being. An increase in income will lead to improvements in other dimensions of well-being, and thereby will increase the freedom to choose a livelihood strategy. However, it is important to realize that overall well-being does not only depend on income in absolute terms. The perception whether the income is substantial to satisfy one's needs is important, as well as the relative income compared to other people's income (Ferrer-i-Carbonell, 2005). This view is supported by Easterlin (1995, p. 36), who states that "happiness, or subjective well-being, varies directly with one's own income and inversely with the incomes of others". Ferrer-i-Carbonell (2002) advocates that in the ideal situation, variables such as health, children and financial satisfaction are taken into account in the analysis of well-being.

4. Project and research area description

In this part of the thesis I will give all necessary background information on geographic and socio-economic indicators of the research area. Furthermore, I will give some information about the integrated project "Increasing Agricultural Productivity in the Breadbasket Area of Southern Tanzania", led by SNV Netherlands Development Organisation. The aim of this chapter is to sketch the context of the SNV project and of the research area.

4.1 Project description

This research is part of an independent impact evaluation that will measure the impact of the integrated AGRA project entitled "Increasing Agricultural Productivity in the Breadbasket Area of Southern Tanzania". The project is led by SNV Netherlands Development Cooperation and has four main objectives:

i) To strengthen the capacity and efficiency of farmer organizations in the target districts;
ii) To increase smallholder market led agricultural production
iii) To enhance smallholder farmers' access to structure produce markets
iv) To improve access to extension and advisory services among smallholder farmers and the private sector

The project "is anchored in increasing productivity of the selected important crops (Maize, rice, soya and beans) in the breadbasket area of southern agricultural growth corridor to competitively supply local, national and regional markets. This is achieved through Inclusive Business approach to create market access opportunities for producers which are commercially viable and scalable" (SNV, 2013, p. 15). The use of markets is thereby seen a main criterion for increasing the rural poor's well-being and living standards.

4.2 Area description

This research focuses on the livelihood strategies in the Southern Highlands of Tanzania. The data used for this study is collected in the region of Mbeya (see Figure 2). Mbeya is located in the Southwest of Tanzania and consists of 8 districts. The regional capital is the city Mbeya, and the region had a population of 2.7 million in 2012. This paragraph gives a description of the Mbeya region in order to get a good understanding of the regional conditions that affect livelihood strategies of rural households. The information used in this paragraph is mainly relying on the Mbeya Region Agriculture Sample Census, (United Republic of Tanzania, 2012).

Figure 2 Location of Mbeya region in Tanzania Source: United Republic of Tanzania (2012)

About 80% of the Mbeya region relies on (subsistence) agriculture. The density of agricultural households per district in Mbeya region can be seen in Figure 3. In 2012, the region had a total of 454.824 agricultural households, of which 54,5 % were involved in crops only, 45.2% were involved in both crop and livestock production, and 0,3% were involved in livestock only. The sale of food crops counts for 69% of the cash income for rural households in the region. The sale of cash crops counts for 8% of the cash income. The main activity for the household heads in the region is crop farming (93.2%). The second main income generating activity is wage employment and small-scale non-farm business (main activity for 4.1% of household heads), and other activities such as fishing, livestock keeping are the main activity of less than 3% of the household heads (see Table 6). The average rural household in the region uses 1.5 hectares for agricultural purposes. About 73% of the households is male headed, 27% of the households is female headed.

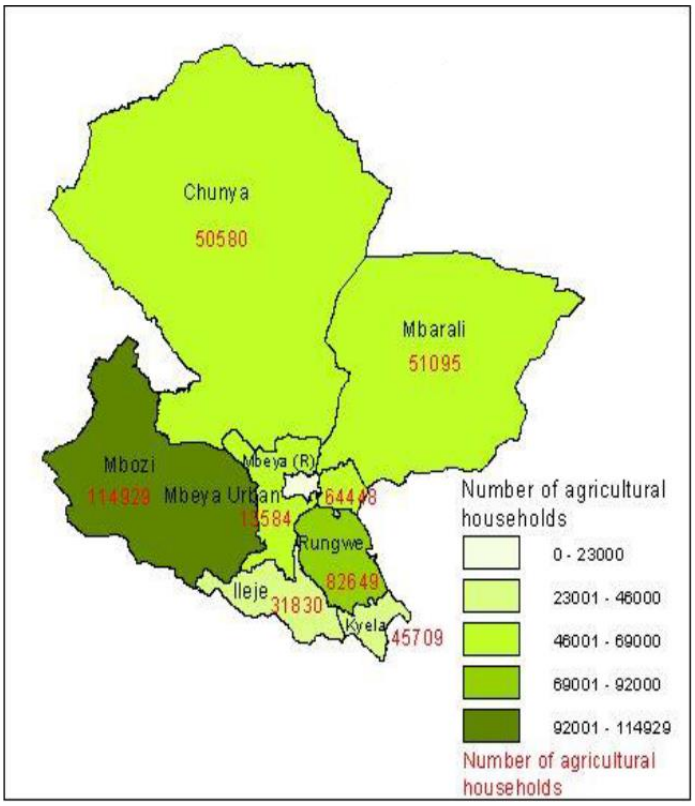

Figure 3 Total number of agricultural households by district in Mbeya region Source: National Bureau of Statistics (2012)

Both cash and food crops are produced in the region. The main food crops grown in the region are maize, paddy, beans, sorghum, Irish potatoes and sweet potatoes. The main cash crops grown in the region are coffee, Pyrethrum, and tea. The crop that is grown the most is maize, 47.7% of the total agricultural area is occupied by this crop. Area planted for maize is at least 3 times bigger than area for beans, the second dominant crop.

Table 5 Main activity of agricultural household heads by number and percentage per district.

District	Crop/Seaweed Farming		Livestock Keeping / Herding		Fishing		Employment		Other		Total	
	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
Chunya	46,209	91.4	375	0.7	0	0.0	3,622	7.2	375	0.7	50,580	100
Mbeya (R)	60,151	93.3	159	0.2	0	0.0	1,910	3.0	2,228	3.5	64,448	100
Kyela	41,533	90.9	113	0.2	339	0.7	2,257	4.9	1,467	3.2	45,709	100
Rungwe	77,956	94.3	408	0.5	0	0.0	2,653	3.2	1,633	2.0	82,649	100
Ileje	29,079	91.4	550	1.7	157	0.5	1,572	4.9	472	1.5	31,830	100
Mbozi	109,254	95.1	0	0.0	284	0.2	3,405	3.0	1,986	1.7	114,929	100
Mbarali	49,203	96.3	378	0.7	0	0.0	631	1.2	883	1.7	51,095	100
Mbeya Urban	10,339	76.1	340	2.5	38	0.3	2,566	18.9	302	2.2	13,584	100
Total	**423,723**	**93.2**	**2,323**	**0.5**	**817**	**0.2**	**18,615**	**4.1**	**9,345**	**2.1**	**454,824**	**100**

Source: United Republic of Tanzania (2012)

In 46% of the rural households in Mbeya region, one or more family members are involved in off-farm income activities. These activities include working in the public or private sector, permanently or temporary. Off-farm income activities also include working on farms that belong to other farmers. In most cases only one household member is involved in off farm employment (60%), as opposed to two (33%) or more than two (7%).

The overall literacy rate in the Mbeya region is 76%. The literacy rate among household heads is 72%, 82% of the male household heads are literate and 47% of the female household heads are literate.

Among 74% of the population in the region has completed at least one level of schooling or is still attending school. 20% of the population in the region has never attended school. As shown in Table 6, 27% of the household heads have not finished any education. The majority of the household heads have finished primary education (67%), and some have attained post primary education (5%) or adult education (2%).

Table 6 Educational attainment of household heads per district

District	Primary Education	Post Primary Education	Adult Education	No Education	Total
	%	%	%	%	%
Chunya	69	6	1	24	100
Mbeya Rural	60	3	3	34	100
Kyela	65	8	0	27	100
Rungwe	67	4	0	29	100
Ileje	68	4	2	26	100
Mbozi	71	4	1	24	100
Mbarali	63	4	3	30	100
Mbeya Urban	66	13	2	20	100
Total	**67**	**5**	**2**	**27**	**100**

Source: United Republic of Tanzania (2012)

Table 7 shows the percentages of rural households that sold (part of their) harvest. There are several problems identified in the census that make the marketing and selling of crops difficult. The main reason is that selling prices are too low in the open market (99.3% of the households selling crops mentions this). Other problems are long distances to the market, high transportation costs, lack of market information and lack of buyers.

Table 7 Percentage of households selling their crops per district

District	Percentage of households selling crops
Chunya	77.4
Mbeya Rural	89.3
Kyela	86.3
Ileje	72.4
Mbozi	87.1
Mbarali	89.1
Mbeya Urban	81.3

Source: United Republic of Tanzania (2012)

5. Data and methodology

This chapter presents an overview of the methods used to fulfil the objectives of the study. The chapter starts with a description of the data collection procedure, followed by an explanation of the cluster analysis. This analysis is used to identify the different livelihood strategies among the respondents in the study area. The second part describes the multinomial logit model that is used to understand the factors that influence the choice of each livelihood strategy.

5.1 Data collection

The data used for this study are drawn from a field study for the independent impact evaluation of the integrated AGRA project entitled: "Increasing Agricultural Productivity in the Breadbasket Area of Southern Tanzania". The data was collected in four districts of Mbeya region, namely Mbozi, Momba, Mbarali and Mbeya Rural between December 2014 and February 2015. The data was collected by a research team consisting of five supervisors and 30 enumerators. The data collection was led by A. Bongole, PhD student Development Economics at Wageningen University.

The data on livelihood strategies was collected through a household survey among 1648 randomly selected households. The one selection criteria that was held during the selection was that the households needed to be member of a farmer group in one of the four districts. The survey was separated in two parts that were simultaneously conducted for each household. The first part addressed the major land and labour related questions and was assigned to the household member primarily responsible for decision making about plots (mostly male). The second part addressed the household related question such as household composition, individual occupation and food consumption habits. This part was assigned to the household member primarily responsible for the household chores (mostly female).

5.2 Cluster analysis

In order to identify the different livelihood strategies in Mbeya, it is important to classify the strategies into groups. A functional way to classify the data is to conduct a cluster analysis. There are several steps to be taken in the cluster analysis, starting with the classification of the livelihoods. The classification can be done in several ways, because livelihood strategies are linked with several factors. Classification based on total realized income is the most commonly used way to cluster livelihood strategies (see Brown, Stephens, Ouma, Murithi, & Barrett, 2006; Nathan & Mohamad, 2014; Tesfaye, Roos, Campbell, & Bohlin, 2011). However I have chosen to qualify the livelihood strategies in a different manner. I firstly used a combination of the main productive assets land and labour (see Groenewald & Van Den Berg, 2012; Jansen et al., 2006; Jansen, Pender, Damon, Wielemaker, & Schipper, 2006). Additionally, I added commercialization indicators to cluster into groups since I want to test the hypothesis that commercial agriculture is the most attractive livelihood strategy for rural households in the research area. By using land and labour variables in combination with commercial agriculture variables I have captured the most important features from the theoretical framework that will determine the existing rural livelihood strategies in the research area.

The main productive assets in a rural household are land and labour. Land allocation shows the strategic land-use choices of a household to generate income flows, which consequently affects the well-being of a household. Labour allocation shows how the household divides its time to specific activities, both farming and non-farming activities. The main productive assets of land and labour are also used in other

livelihood strategies studies that use cluster analysis. This approach is used in papers about livelihood strategies and neoliberal policy reforms in Mexico (Groenewald & Van Den Berg, 2012), sustainable land use in Honduras (Jansen, Pender, Damon, & Schipper, 2006) and natural disasters in Nicaragua (Van den Berg, 2010). The cluster analysis will distinguish different land-use and labour-use patterns that determine the several livelihood strategies used by the rural households. A third factor that will be used in the cluster analysis is the degree to which a rural livelihood has commercialized its practices. Variables that determine the degree of commercialization are the use of warehouse, use of irrigation, use of a loan, use of crop technologies and the division between market production and home consumption of the harvest. In total, a sum of 11 classification variables are used to determine the livelihood clusters. The complete description of the variables can be found in Table 8.

Table 8 Variables used for the classification of livelihood strategies

Labour allocation	**Land allocation**	**Commercialization agriculture**
% of household members engaged in subsistence agriculture / (% of household members engaged in subsistence agriculture + % of household members engaged in commercial agriculture)	% of cultivated area used for maize	Harvest share sold on the market/harvest share sold on the market + food consumption
% of household members working in non-farm activities (forestry, petty trading, non-farm wage work, fishing, hunting etc.)	% of cultivated area used for beans	Use of warehouse
	% of cultivated area used for rice	Credit: possession of a loan
	% of cultivated area used for groundnut	Crop technologies: Use of chemical fertilizer, herbicides, pesticides, improved seeds
		Use of irrigation

The classification variables are thereafter reduced to a smaller set of variables by doing a principal-component factoring (PCF). This data reduction method is slightly different from the often used common factor analysis (CFA) which looks for linear combinations within the correlation matrix for classification variables. CFA differentiates between common and unique variance in the variables as a way to explain correlation in the variables. PCF relies on a different set of quantitative methods by accounting the variances in the observed measures. By using the PCF I can reduce the large set of measures to a smaller, more manageable number of measures that can be used in the cluster analysis (T. A. Brown, 2006). The outcomes of the PCF showed a number of 5 factors with an eigenvalue larger than 1. Following the Kaiser criterion that suggest to only retain those factors with eigenvalues larger than 1, I decided to continue with 5 factors. The PCF thus reduced the variables in Table 8 from 11 to 5. The reduction of 11 variables in 5 factor variables is useful when conducting the cluster analysis, as it results in a much more clear-cut delineation of clusters than a stand-alone cluster analysis. The 5 factor variables are thereby less subject to scale effects that influence the cluster analysis on directly measured variables (Jansen et al., 2006).

After generating the rotated factor loadings the next step is to cluster the livelihood strategies. The aim of the cluster analysis is to attain a high intra-class similarity (homogeneity within the cluster) and a low

inter-class similarity (heterogeneity between clusters) (Reddy, 2013). To measure the similarity between different observations, a distance measure is needed. I used the Euclidean distance that calculates the coefficients between each pair of households. The magnitude of these coefficients measures the similarity or dissimilarity of each pair in Euclidean space (Lopez, 2008). Households that have a low Euclidean distance coefficient will be more alike when they have high distance coefficients:

$$D_{ij} = \sqrt{\sum_{k=1}^{n} (x_{ki} - x_{kj})^2}$$

Where D_{ij} = distance coefficient between *i* and *j*; x_{ki} = value for variable x_k for case *i*; and x_{kj} = value for variable x_k for case *j.*

I first used Ward's linkage hierarchical clustering to inspect the number of agglomerate clusters in my data set. Based on the results of the hierarchical clustering, the number of natural groups in the cluster data was defined. A dendogram was drawn to visually inspect the number of groups. Based on this dendogram and common-sense checking I selected four livelihood strategy clusters.

The second step was to use a non-hierarchical clustering method named K-means clustering to check for misclassification of observations at the boundaries of each cluster. This procedure starts with dividing the data into *k* groups and selecting the cluster centre for each *k,* based on the four clusters already selected by Ward's clustering. This k-means clustering follows by an iterative process that assigns each instance to its closest cluster. The cluster centre mean is updated after each iterative process so that it converges with all instances. This process continues until all observations are assigned to the groups they are closest to (Wagstaff, Cardie, Rogers, & Schrödl, 2001).

5.3 Multinomial logit regression

When all livelihood strategies for rural households in Mbeya are determined through the clustering process, the next step is to run a multinomial logit model that will identify the main variables that influence each household's decision to adopt a certain strategy. The multinomial logit regression estimates the probability that a household selects a reference strategy over one of the other optional strategies, thereby adopting the most preferred livelihood strategy. I used the strategy with the highest share of households as the reference strategy. The coefficients per strategy show the probability that a household chooses an alternative strategy over the reference strategy. A positive estimated coefficient reveals a higher probability that a household adopts the alternative livelihood strategy, a negative estimated coefficient reveals lower probability that a households adopts the alternative livelihood strategy.

The multinomial logit model allows to predict the behaviour of dependent variables as a function of multiple explanatory variables (Dougherty, 2002). Thereby, the estimated coefficients can identify positive and negative effects that influence the likelihood that a household will opt for an alternative livelihood strategy (Groenewald & Van Den Berg, 2012).

The multinomial logit model is adapted from Lopez (2008) and looks as follows:

$$Y^* = \sum_{r=1}^{R} \beta_{jr} \cdot X_r + \varepsilon_j$$

$$Y = 1 \quad if \quad Y^* \leq \mu_{1,}$$

$$Y = 2 \quad if \quad \mu_{1,} \leq Y^* \leq \mu_2,$$

$$Y = m \quad if \quad \mu_{j-1,} < Y^*$$

In this model, Y^* represents an unobserved latent outcome of utility, Y presents the selected livelihood strategy, β_{jr} represents the estimated parameters (r = 1, 2, …, R), j represents the livelihood alternatives (j = 1, 2, …, m), X_r are the variables that represent household characteristics that influence the decision process, ε_j represent error terms (which might be skills needed to engage into livelihood strategies) and μ_j represents the unknown threshold parameter separating livelihood strategies. The set of variables X_r include variables for natural, human, physical, and financial capital. The description and descriptive statistics of all the variables can be found in Table 9.

Table 9 Household determinants of livelihood strategies

Explanatory variables	Definitions	Mean (Std. Dev.)
Human capital		
Household size	Number of household members	5.38 (2.22)
Education household head	Primary education or lower = 0, more than primary education = 1	3.12 (1.44)
Highest educational level	Secondary standard education or lower = 0, more than secondary standard education = 1	4.27 (1.92)
Sex household head	Male = 0, female = 1	0.14 (0.34)
Age household head	Years	48.48 (12.91)
Dependency ratio	Number of household members between age 15-70/ total number of household members	0.61 (0.21)
Natural capital		
Land size	Amount of land owned by the household in hectares	6.74 (12.93)
Land ownership ratio	Amount of land owned divided by the total cultivated area	0.91 (0.25)
Financial capital		
Assets owned	Estimated (median) total monetary value of the valuable items that the household owns	10.04 (21.38)
Physical capital		
Agricultural equipment	Amount of agricultural equipment that the household owns	1.46 (0.56)
Cattle owned	Estimated monetary value of livestock and cattle that the household owns	10.83 (21.52)
Commercialization determinants		
Distance to market	Distance from farm to nearest output market in kilometres	22.79 (31.62)
Distance to tarmac road	Distance from farm to nearest tarmac road in kilometres	13.91 (12.93)
Distance to agrodealer	Distance from farm to nearest agrodealer in kilometres	15.65 (24.30)

The variables "assets owned" and "cattle owned" were modified to avoid scaling problems and to be able to better interpret the marginal effects during the analysis. I scaled both variables with a factor of 0.01.

There is one important assumptions that must hold in order to successfully use the multinomial logit model, which is the Independence of Irrelevant Alternatives (IIA) assumption. This assumption will be violated when the livelihood strategies are not mutually exclusive. In other words, the choice for a livelihood should not be influenced by the choice for any other alternative strategy (Starkweather & Moske, 2011). There are three tests in STATA that assess the IIA assumption: Hausman test, suest-based Hausman test and Small-Hsiao test. It is important that the null hypothesis of independent alternatives cannot be rejected. In my model, this was the case for all three tests.

5.4 Household well-being indicator

The next thing that needs to be measured is the household well-being in each cluster. It is difficult to compare well-being across households or individuals, because there is no metric to compare different utilities. The most commonly used tool to measure well-being is therefore a proxy variable such as real income or resource availability (OECD, 2013). However, well-being is a multidimensional concept and therefore can be better understood while looking at multiple indicators. OECD (2013) advices to use (1) income, (2) consumption and (3) wealth as indicators for well-being.

The data that is used for this research is incomplete on income, consumption and wealth. Therefore I need to look for other quantitative indicators that can estimate household well-being. I have decided to use (1) the possession of household assets and (2) the 7 days food expenditures per household as quantitative indicators of well-being.

5.5.1 Possession of household assets

In the analysis possession of household assets will be used as an indicator for well-being. This indicator can also be seen as an observable variable that can represents the latent variable income, which is often named as a strong indicator for well-being (Po, Finlay, Brewster, & Canning, 2012). I have created an Asset Index to compare well-being across households. The data used for the Asset Index consisted of asset items owned (yes = 1) by the household. I decided to leave out those assets that were possessed by less than 10 or more than 90 percent of the households. Furthermore a variable is created that indicates if a household has an inlaid floor (yes = 1). The variables that were included in the final Asset Index were phone ownership, radio ownership, television ownership, bicycle ownership, motorbike ownership, improved stove ownership, mattress ownership, panga knife ownership and inlaid floor.

The Asset Index is created via Principal Component Analysis (PCA). PCA is a method that extracts dominant patterns from a data matrix (Wold, Esbensen, & Geladi, 1987) and is a good method to reduce the number of variables. In order to reduce the variables, I use the Kaiser criterion (the same as in the factor analysis). Kaiser criterion advises to retain those scores with an eigenvalue higher than 1, in my case this comes down to two variables. Following Groenewald and Van Den Berg (2012), I did the Kaiser-Meyer-Olkin (KMO) test in order to ensure sampling adequacy. This test is used to assess the strength of the relationships, which tells something about the factorability of the variables (Beavers et al., 2013). The KMO measure of sampling adequacy is equal to 0.80, which indicates that there is a strong relationship between the possession of the assets.

5.1.2 Household consumption expenditures

Household consumption expenditure is the second variable used to measure well-being. I use the 7 days expenditures per household as indicator. 7 days household consumption expenditures are smooth over short term fluctuations and therefore they are more accurate in estimating long-run well-being levels than 24 hour food consumption recalls. Especially for poor households this method is more reliable and less vulnerable for reporting bias (World Bank, 2001; Barret et al. 2001; Meyer and Sullivan, 2003; and Ravallion, 2003).

In order to use the household consumption expenditure data as an indicator for well-being, I need to create a mechanism that counts for the number of people in each household. The easiest way to do this is to divide the total consumption expenditures by the number of household members, but this measure can be very misleading for the following two reasons. First, there is a difference between the consumption needs in the household, with the most important presumption that children need less food than adults. Second, there are economies of scale in consumption that should be taken into account (Haughton & Khandker, 2009). Therefore, a measurement that translates total household well-being into individual well-being needs to be used. Each member of the household is measured as a fraction of an adult male. Then the sum of these fractions is used as household size (Mkenda, Luvanda, Rutasitara, & Naho, 2004). The household size is not measured by the total number of household members, but in numbers of adult equivalent (AE) (Haughton & Khandker, 2009). The formula that I use for the adult equivalent is as follows:

$$AE = (A + \alpha K)^{\theta}$$

Where A is the number of adult in the household, K is the number of children in the household. All individuals of age 15 and older are defined as adults, all individuals below 15 as children. A is the household consumption of a child relative to an adult, θ represents the economies of scale effect of the total household size. Following evidence reported in Deaton (1997), I use α = θ = 0.75 as weights for food consumption expenditures.

6. Results

This chapter gives a description of the livelihood strategies adopted by households in the research area. In this chapter I also present the summary statistics of each strategy. The chapter follows with the multinomial logit model, that gives more insights in the determinants of each strategy. The implications of adapting a certain livelihood for the household well-being is discussed next. Lastly, the effect of past economic liberalization policies is discussed.

6.1 Livelihood strategy identification

Four main livelihood strategies were identified during the cluster analysis: (1) maize farmer; (2) maize + other crop farmer; (3) diversified farmer and (4) rice farmer. The distribution of households among these strategies is shown in Table 9, that shows that most household belong to the second cluster (34.56%). The smallest amount of households is in the fourth cluster (18.58%).

Table 10 Livelihood strategies distribution

Livelihood strategy	Number of households	Percentage	Cumulative
Maize farmer (1)	366	23.69	23.61
Maize + other crop farmer (2)	534	34.56	58.06
Diversified farmer (3)	358	23.17	81.16
Rice farmer (4)	287	18.58	100
Total	1.545	100.00	

One of the main indicators that shows the difference between each cluster is the average number of crops cultivated per cluster (see Figure 4). It shows that none of the strategies focuses on one single group. All households have one crop that is the most important in their livelihood strategy. For the first three clusters, this is maize. In the fourth cluster rice is the most important crop. The main crop per cluster is also the main characteristic for the division of the clusters. The combination of the main crop with other crops is the second characteristic for the cluster division. The maize and rice farmer mostly combine their main crop with one other crop. The households in the second livelihood strategy combine maize farming mostly with two other crops, and the households in the third livelihood strategy even cultivate four crops on average. The summary statistics of each cluster are shown in Table 11.

Figure 4 Median of number of crops cultivated per cluster

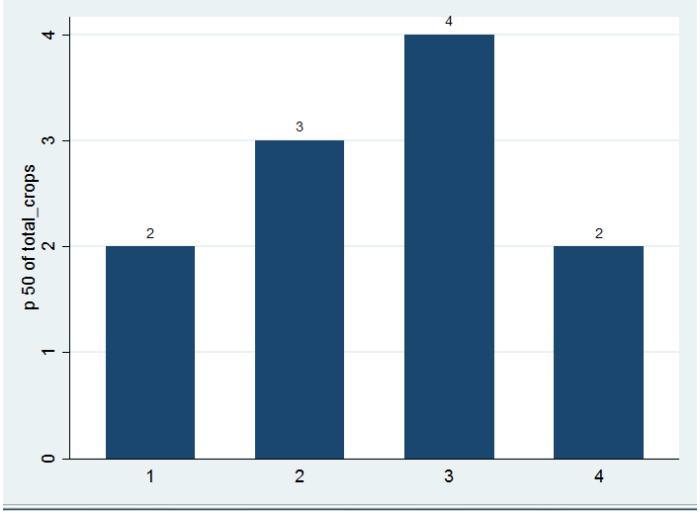

Table 11 Summary statistics for each cluster

N=1545	**Cluster 1**	**Cluster 2**	**Cluster 3**	**Cluster 4**
Share of land allocated to crop (%)	Maize farmer	Maize & beans farmer	Diversified farmer	Rice farmer
Maize	.82	.48	.45	.24
Beans	.05	.29	.13	.02
Rice	.02	.01	.01	.69
Groundnut	.01	.01	.20	.01
Other	.10	.21	.21	.03
Labour allocation variables				
Subsistence agriculture vs. commercial agriculture*	.79	.70	.80	.66
Non-farm activities**	.36	.10	.10	.16
Commercial agriculture variables				
Use of credit (% of households)	.10	.13	.04	.25
Use of technology (% of households)	.59	.62	.72	.53
Use of irrigation (% of households)	.03	.08	.05	.45
Harvest share sold on the market (%)	.98	.85	.69	.90
Use of warehouse (%)	.00	.00	.02	.37

* % of household members (15-70 year) active in subsistence agriculture / % of household members (15-70 year) active in subsistence agriculture + % of household members (15-70 year) active in commercial agriculture.
** % of household members (15-70 year) active in non-farm wage labour, petty trading, mining, forestry, fishing, hunting or other self-employed.

All livelihood strategies are separately discussed in the next part of the paragraph. A more in-depth explanation per cluster is given, based on the summary statistics shown above.

6.1.1 Maize farmer

This is the second biggest livelihood strategy in the research area that represents almost a quarter of the rural households. As the name already implicates, households that engage in this strategy are mainly involved in maize farming. 82% of the cultivated area on each farm is used for maize farming. Beans are the second crop cultivated on the land of this cluster (5%). The average distribution of the land is shown

in Figure 5. The majority of the households in this livelihood are located in Momba (175 households, 48%). The complete distribution of the districts over the first livelihood is given in Figure 6.

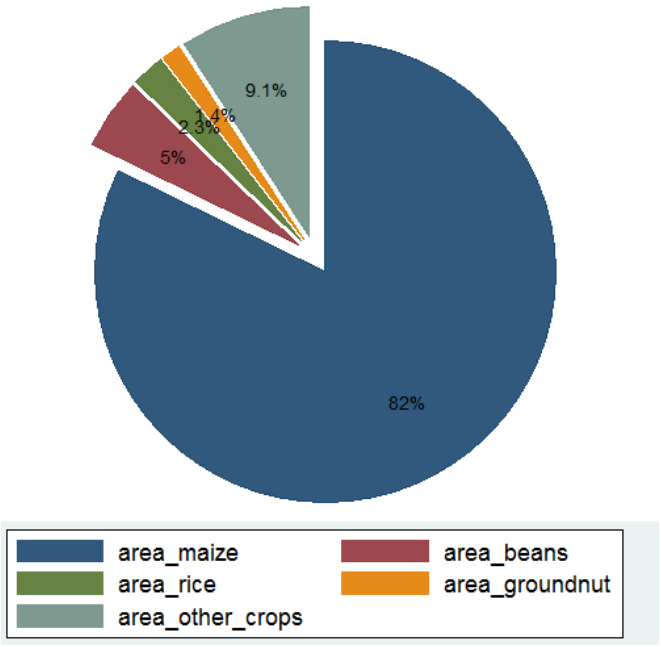

Figure 5 Distribution of cultivated land of the maize farmer in percentage (Livelihood 1).

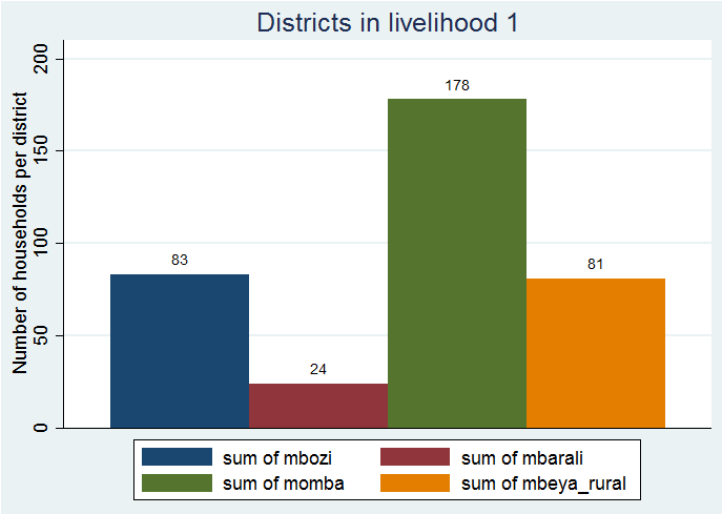

Figure 6 Distribution of maize farmer households per district (Livelihood 1)

This first cluster thereby represents the livelihood strategy that engages most in non-farm activities, having the highest ratio of household members participating in non-farm activities (36% of the household members on average). The major non-farm activity that these households are engaged in is petty trading (see Figure 7). The wage labour in the Figure represents only non-farm wage labour, off-farm wage labour is excluded.

This livelihood strategy is mainly focused on producing for the market: 98% of the total production is sold on the market. The survey data also indicate that 10% of the households in this cluster make use of a loan for agricultural production.

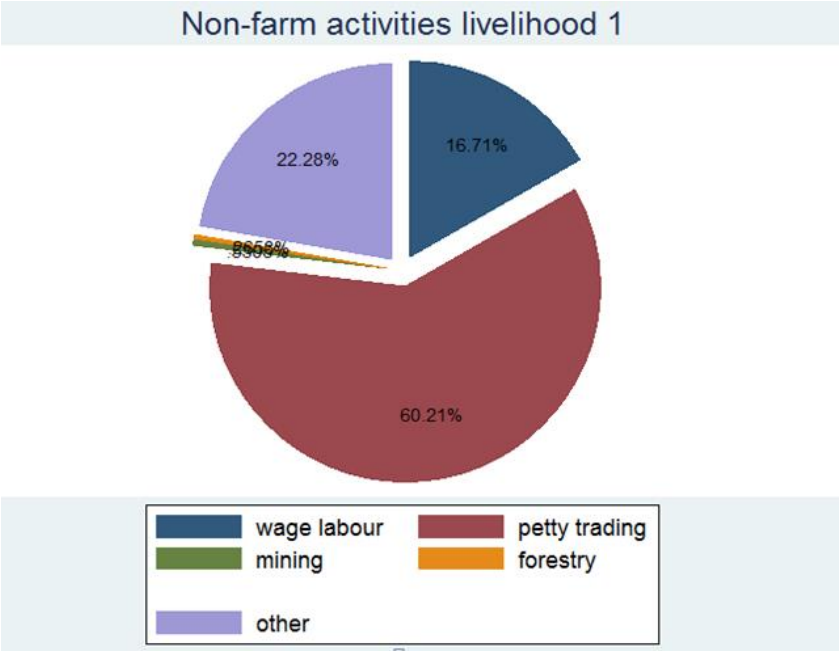

Figure 7 Distribution of non-farm work in percentage (Livelihood 1)

6.1.2 Maize & other crop farmer

This livelihood strategy corresponds to the cluster that consists of farmers that mainly cultivate maize and a second and/or third crop. Beans is the second crop that is mainly cultivated in this livelihood strategy. 48% of the land in this cluster is used for maize cultivation, followed by 29% cultivated land for beans (see Figure 8).

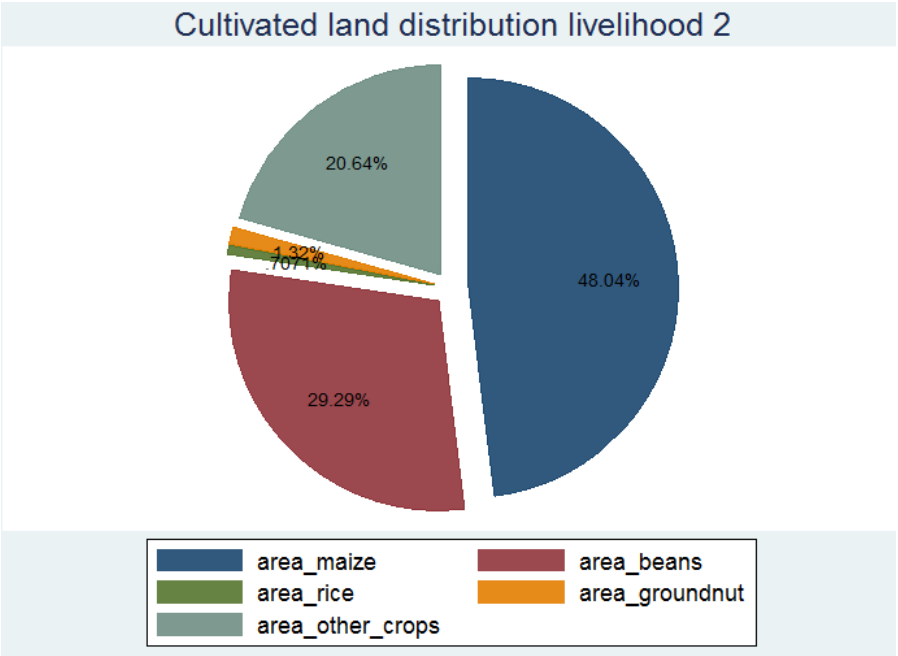

Figure 8 Distribution of land per crop (Livelihood 2)

There are several other crops cultivated by the rural households in this livelihood strategy. Coffee (cultivated by 153 out of 534 households in the cluster), sunflower (cultivated by 72 out of 534 households in the cluster) and groundnuts (cultivated by 65 out of 354 households in the cluster) are the

other important crops in this cluster. The majority of this cluster cultivates both maize and beans (95,5%). Most households in this cluster (39%) combine the maize and beans farming with a third crop. 26% of the farmer cultivates more than three crops.

The majority of the rural households that are in this livelihood cluster are settled in Mbeya rural (50%), followed by Mbozi (33%). Few households from Momba (15%) and Mbarali (2%) are represented in this cluster.

6.1.3 Diversified farmer

This cluster has the highest diversity in the number of crops that are cultivated. As shown in table 12, the majority of the households in this cluster cultivate either 3 or 4 crops (together 77% of the cluster). Only 10% of the households in this livelihood cultivates 2 crops, and the other 13% of the households cultivates more than 5 crops.

Table 12 Number of crops cultivated (Livelihood 3)

total_crops	Freq.	Percent	Cum.
2	35	9.78	9.78
3	139	38.83	48.60
4	139	38.83	87.43
5	36	10.06	97.49
6	6	1.68	99.16
7	2	0.56	99.72
9	1	0.28	100.00
Total	358	100.00	

All households in this cluster cultivate maize. In this sense there is a similarity with the first and second cluster. However, the cultivated area for maize is much smaller than in the first livelihood cluster. The biggest difference with the livelihoods in the second cluster is the importance of groundnuts in terms of cultivated area and in terms of the amount of households cultivating groundnut. Figure 9 shows clearly that the total cultivated area for maize (45% of total cultivated area) is much smaller than in the first livelihood strategy. The cultivated area for groundnuts (20% of total cultivated area) is the second biggest in this cluster.

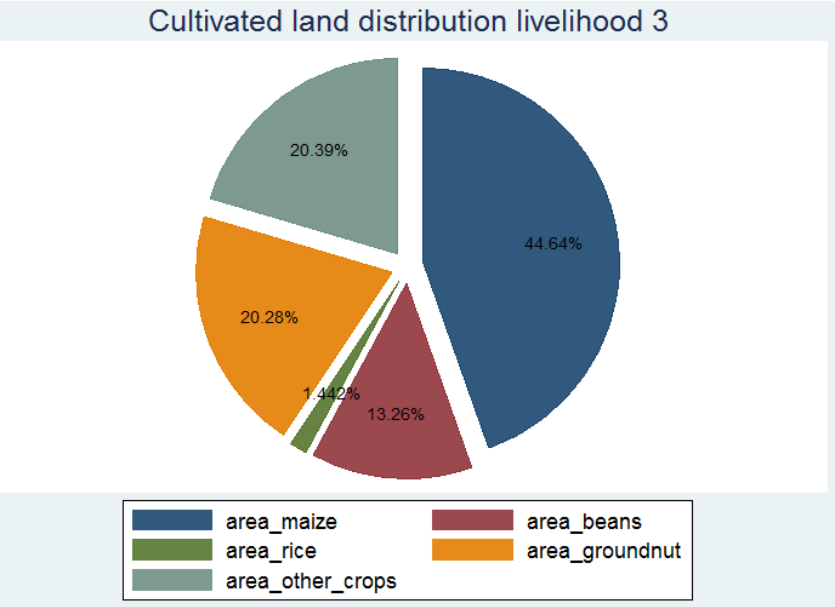

Figure 9 Distribution of land per crop (Livelihood 3)

The four main crops that are cultivated in this cluster are maize (by 100% of the households), groundnuts (by 91% of the households), beans (by 78% of the households) and coffee (by 38% of the households). In total, 28% of the households cultivates all 4 of the crops. The biggest part of the households in cluster cultivates maize, beans and groundnuts without growing coffee (43%).

The majority of the households that are engaged in this livelihood come from Mbozi (72%). 18% of the households are located in Mbeya, 6% in Momba and 4% in Mbarali.

The households in this livelihood cluster have the highest subsistence/commercial agriculture ratio, which means that these households practice more subsistence agriculture compared to other strategies. This is also reflected in a relatively low harvest share sold on the market. The average household in this cluster sells 69% on the market and keeps 31% of the harvest for home consumption. At the same time, households in this cluster have a small ratio of household members taking part in non-farm agricultural activities.

Another important difference between this cluster and the other clusters is the relative high use of technology. With technology I point to 4 specific technologies: chemical fertilizer, herbicides, pesticides, and improved seeds. Figure 10 shows how often each technology is used in this cluster. It shows that chemical fertilizer is the most often used technology (by 94% of the households), and pesticides are the least used (57% of the households). The majority of the households in this household uses 3 or 4 of the technologies (69% of the households). 21% of the households uses 2 out of 4 technologies and 10% uses less than 2 technologies.

The use of credit is very low in this cluster; only 4% of the households possess a loan for crop production.

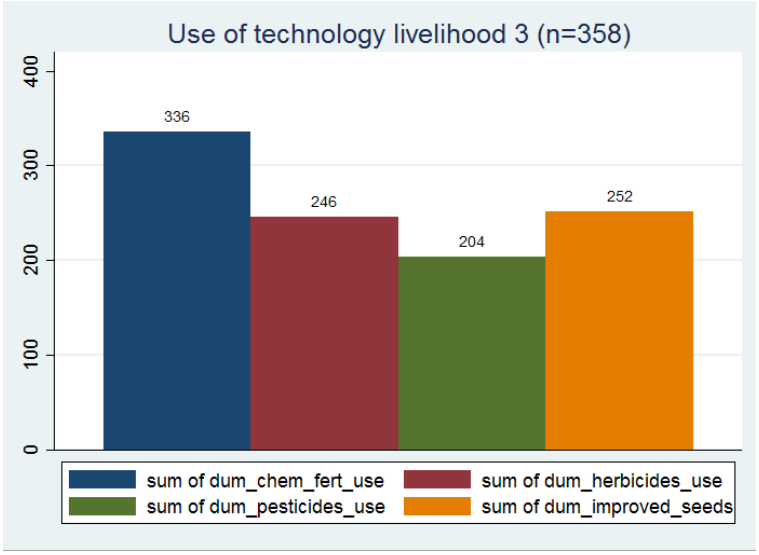

Figure 10 Use of technology (Livelihood 3)

6.1.4 Rice farmer

This cluster contains all farmers that cultivate rice as their most important crop. There is a clear connection between this livelihood and the district of Mbarali: 94% of the households in this cluster are located in Mbarali (see Figure 11).

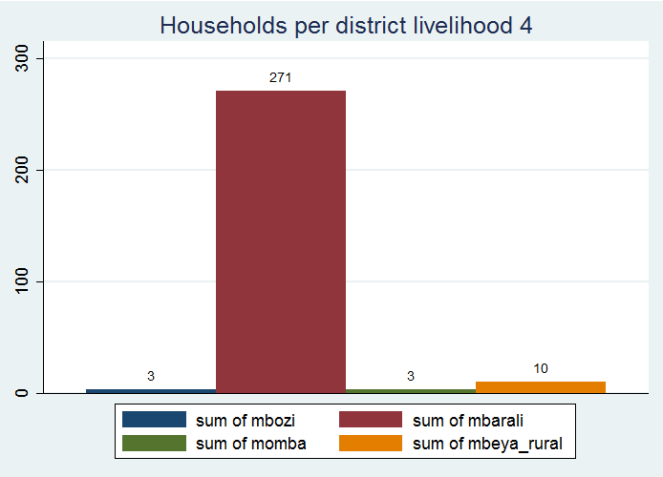

Figure 11 Number of households per district (Livelihood 4)

The importance of rice is also reflected in the amount of land that is used for rice cultivation. On average 69% of the land in this cluster is used for the cultivation of rice. This is followed by maize, which occupies 24% of the cultivated area on average (see Figure 12). In terms of cultivated area, rice and maize are the only two crops have great importance. 18% of the households cultivates only rice. The major part in this cluster (78% of the households) cultivates both rice and maize. The remaining 4% cultivates rice and at least one other crop that is not maize. The other 2 crops that have a (rather small) importance in this cluster are beans and groundnuts. 20% of the households cultivates beans besides rice and maize. 10% of the households cultivates groundnuts besides rice and maize.

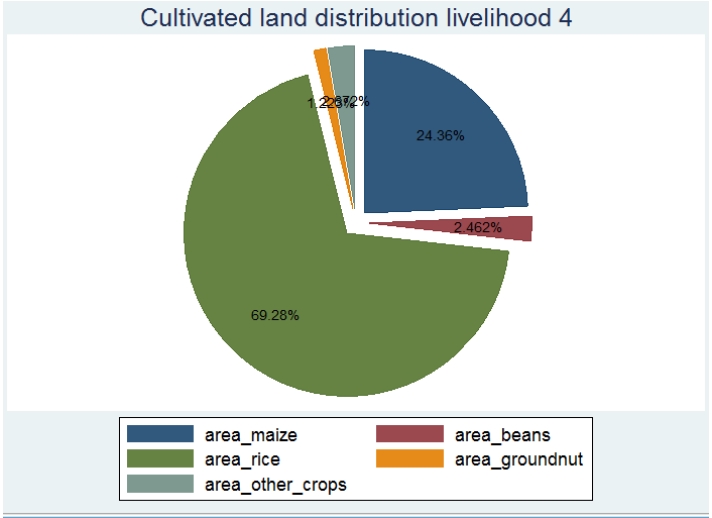

Figure 12 Distribution of land per crop (Livelihood 4)

This livelihood strategy is more commercially oriented than the other livelihood strategies. The households in this cluster have the lowest subsistence/commercial agriculture ratio. This means that they have the highest proportion of farmers that participate in commercial agriculture. Another important characteristic of this cluster is the households make more use of credit. 25% of the households in the cluster possess a loan, compared to 10%, 13% and 4% in cluster 1,2 and 3. Another interesting feature is the use of irrigation: 45% of the households in this cluster use irrigation on their farm, compared to 3%, 8% and 4% of the households in cluster 1,2, and 3. Also the use of warehouse is much higher in this strategy, with 37% of the households using this.

The use of herbicides, pesticides, chemical fertilizer and improved seeds is the lowest among all clusters. On average the households that use this livelihood strategy make use of 2 out of the 4 technologies. Chemical fertilizer is the most used technology (used by 76% of the households), followed by herbicides (used by 68% of the households).

6.1.5 Livelihood strategy synthesis

The cluster analysis distinguished four livelihood strategies after the factor and cluster analysis. The first cluster contains maize farmers, the second includes the farmers that cultivated maize combined with another crop that is as equally important for the farmer. The third cluster includes the diversified farmers, the fourth cluster contains the rice farmers. A quick overview of some of the characteristics per cluster can be found in Table 13.

Table 13 Overview of main features per cluster

N=1545	**Cluster 1** (n=366)	**Cluster 2** (n=534)	**Cluster 3** (n=358)	**Cluster 4** (n=287)
	Maize farmer	Maize + other crop farmer	Diversified farmer	Rice farmer
Land allocation	Maize as most important crop	Maize combined with another crop	Maize combined with multiple crops	Rice as most important crop
Labour allocation	Both on-farm and non-farm	Mostly on-farm	Mostly on-farm	Mostly on-farm
Commer-cialization	Focus on market consumption	No use of warehouse facilities	High use of herbicides, pesticides, improved seeds	High access to credit and irrigation

6.2 Multinomial logit model

In this section I investigate the determinants of each livelihood strategy. I use a multinomial logit model to explain the relationship between household characteristics and the choice for a particular livelihood strategy. The aim of the multinomial logit model is to understand what type of households are involved in which livelihood activities. The multinomial logit model uses the 5 assets from the sustainable livelihoods framework (DFID, 1999) as starting point. The model uses variables for human capital (household composition and education level), natural capital (land owned), financial capital (assets owned) and physical capital (cattle and agricultural equipment owned). There is no sufficient data to include variables for social capital, however I assume that this is positively related (mainly) with natural and physical capital. Distances to important agro-related facilities (output market, agrodealer and tarmac road) are included in the multinomial regression, as well as socio-economic indicators (sex and age household head, dependency ratio). The results of the logistic regression are shown in Table 13.

Table 14 Multinomial logit coefficients: determinants of livelihood strategies

Variable	**Maize farmer**		**Diversified farmer**		**Rice farmer**	
	Coëf.	St. Error	Coëf.	St. Error	Coëf.	St. Error
Sex household head (female = 1)	-0.224	0.223	-0.210	0.220	0.292	0.231
Age household head	-0.000	0.006	0.005	0.006	0.018	0.007***
Education household (1= more than primary)	0.544	0.222**	0.188	0.240	0.759	0.244***
Education household (1=more than secondary ordinary)	0.298	0.230	-0.078	0.237	-0.040	0.258
Household size	-0.046	0.038	0.006	0.036	0.034	0.040
Household dependency ratio	-0.880	0.385**	0.379	0.368	0.378	0.421
Land ownership ratio	-0.811	0.302***	-0.117	0.346	-1.263	0.332***
Land owned	0.031	0.010***	0.010	0.012	0.032	0.010***
Assets owned	0.012	0.004***	0.002	0.005	0.006	0.005
Cattle owned	-0.008	0.003**	-0.002	0.003	-0.003	0.003
Agricultural equipment owned	-0.086	0.127	0.128	0.126	-0.490	0.149***
Distance to agricultural market	0.003	0.003	-0.001	0.004	0.015	0.003***
Distance to agrodealer	-0.003	0.003	-0.011	0.004**	-0.031	0.005***
Distance to tarmac road	-0.006	0.003*	-0.005	0.004	0.013	0.003***
Constant	1.038	0.517**	-0.780	0.538	-0.628	0.578

* significant at 10%; ** significant at 5%; *** significant at 1%

Number of observations = 1518
Log Likelihood: -1930.88
Pseudo R^2: 0.0629
Prob. Chi = 0
Maize + other crop (strategy 2) is the base category

The table examines the variables that would affect the probability for households to choose another livelihood strategy than the reference group (livelihood strategy 2, maize + other crop farmer). The data show that the characteristics of the cluster "diversified farmers" are only little different from the "maize & other crop farmer". The results show that the diversified farmers are more likely to live closer to the agrodealer. There are substantial differences between the reference strategy and both the maize farmer

and rice farmer strategy. Farmers with a higher education, more land and a (relatively big) share of rented land have a higher likelihood to be engaged in maize or rice farming.

There are particular household characteristics that make it more likely to be engaged in maize farming over maize + other crop farming. The household dependency ratio has a negative effect on the probability of being engaged in maize farming. This means that the cluster with the maize farmers has significantly more people below 15 or above 70 years old in the household compared to household members between 15 - 70. Households that have a relatively high amount of assets owned are more likely to be engaged in maize farming, while a high amount of cattle has a negative effect on the probability of being engaged in this livelihood strategy. Furthermore, the distance to the tarmac road is relatively smaller for farmers that are engaged in maize farming.

There are also aplenty household characteristics that increase the probability to engage in rice farming. Households involved in rice farming have a relatively aged household head compared to the reference strategy. Households that own more agricultural equipment have a lower probability to be engaged in rice farming. Rice farmers are in general further away from the agrodealer. At the same time, households that live closer to the agricultural output market and a tarmac road have a high likelihood to be engaged in maize farming.

6.3 Livelihood strategies and well-being

This part of the chapter focuses on the relationship between the livelihood strategies and well-being. I created two variables to measure well-being (asset index and consumption expenditures) and in the first paragraph these variables will be analysed. In the second paragraph I compare well-being across households and especially across the four clusters. Furthermore I try to find the main factors that influence well-being, and I analyse how much well-being can be attained from each livelihood strategy.

6.3.1 Determinants of well-being

Both asset ownership and food consumption expenditures are used in order to determine the levels of well-being. The ownership of assets reveals information about the well-being of the households in the research area. I assume that a household has higher levels of well-being once the ownership of assets is higher. Furthermore there is a clear relationship between the amount of food consumption and well-being, because economic welfare will increase when a household has more resources to spend.

I analysed the scores of the two variables with an eigenvalue > 1, derived from the principal-component analysis (see Table 14). The table shows that "phone ownership" and "inlaid floor" have the biggest influence on the outcomes of score 1. The households that have a high score on variable 1 thus have a higher likelihood to possess a phone and a radio. All the components in score 1 are positive, which means the higher the score for variable 1, the higher the ownership of assets in the household.

The scores in the second score table show both positive and negative values on the asset variables. This means that a high score on variable 2 means that the household has a high amount of specific assets, and consequently a higher level of well-being. Table 14 shows that the positive outcome on this variable is mainly based on the assets that only a small proportion of the households possess. The most influential positive scores in variable 2 are television ownership (owned by 21.5% of the households), motorbike ownership (owned by 15.9% of the households) and improved stove ownership (owned by 11.3% of the households). This implies that the high scores for variable 2 are based on the possession of

relative "luxury" assets that are only available a small proportion of the households. This also means that a high score on the second variable counts for a higher level of well-being.

Table 15 Determinants of asset index scores

Variable	Percentage of households possessing the item	Scores variable 1 (Eigenvalue 2.54814)	Scores variable 2 (Eigenvalue 1.10434)
Phone ownership	80.6	0.404	-0.088
Radio ownership	70.5	0.361	-0.183
Television ownership	21.5	0.333	0.494
Bicycle ownership	56.9	0.230	-0.365
Motorbike ownership	15.9	0.301	0.399
Improved stove ownership	11.3	0.205	0.374
Mattress ownership	88.5	0.381	-0.254
Panga knife ownership	84.8	0.231	-0.451
Inlaid floor	63.3	0.419	0.117

The food expenditures data are a summation of the total household food expenditures from one week. The total household food expenditures are then divided by the number of household members in terms of adult equivalent (AE). This means that each member of the household is measured as a fraction of an adult male. The exact calculation of the AE can be found in section 5.1.2 of this thesis.

6.3.2 Well-being levels per livelihood strategy

The Asset Index scores and consumption expenditures per adult equivalent for each cluster are shown in Table 15. The scores show that maize farmers attain the highest asset index score, followed by the cluster rice farmer. The cluster maize + other crop farmers has the lowest scores, and the diversified farmer group are only a fraction better off.

Table 16 Asset index scores and food expenditures per cluster

Variable	Maize farmer		Maize + other crop farmer		Diversified farmer		Rice farmer	
	Mean	St. Error	Mean	St. Error	Mean	St. Error	Mean	St. Error
Asset Index Score 1	0.216	1.638	-0.362	1.703	-0.052	1.512	0.416	1.251
Asset Index Score 2	0.323	1.061	-0.024	1.010	-0.257	0.970	-0.134	1.098
Total Asset Index Score	0.537	2.090	-0.386	1.787	-0.310	1.689	0.282	1.897
Total Asset Index Score counted for eigenvalues	0.908	4.512	-0.949	0.246	-0.416	3.864	0.913	3.736
Consumption Expenditures per adult equivalent	9.378	7.847	6.055	5.443	5.778	4.821	7.560	5.144

The first asset index score indicates that the cluster rice farmers is the best listed, followed by the maize farmers cluster. The maize + other crop farmer cluster has the lowest score, which means that these farmers have a small amount of assets compared to the other clusters. Phone ownership and an inlaid

floor are the most important determinants of the first score, which means that a relative big proportion of the rice farmers and a relative small proportion of maize + other crops farmers own these assets.

The second asset index score is only positive for the cluster maize farmers. The cluster diversified farmers has the lowest score on this variable. As said before, the determinants of this score are the "luxury" assets that are only owned by a small proportion of the farmers. This means that the maize farmers are the best off, followed by rice farmers, maize + other crop farmers and diversified farmers. In terms of total scores, there are two clusters that perform relatively well (maize and rice farmers) and there are two clusters that perform less well (maize + other crop and diversified farmers).

Table 15 also gives an overview of the mean consumption expenditures per capita (in adult equivalent) per cluster. The group that with the biggest expenditure on food consumption per capita is the maize farmer cluster, followed by the rice farmer cluster. The cluster maize + other farmer and diversified farmer are respectively the third and fourth. The maize farmer cluster spends 62% more on food consumption than the diversified farmer cluster. There is thus a big difference in the food expenditure patterns of the clusters.

Both the asset index scores and the food expenditures data conclude that the two clusters that perform best are (1) the maize farmer and (2) the rice farmer. The less performing clusters are (1) diversified farmer and (2) the maize + other crop farmer. The results from the multinomial logit model already implied that the diversified farmer cluster and the maize + other crop farmer have the most similarities. This is also reflected in their levels of well-being, which lay relatively close to each other. The maize farmer cluster and rice farmer cluster show similarities as well: they both have higher levels of well-being, their farming practices are more specialized, they attained higher education levels and have a larger share of rented land.

6.4 Influence of economic reforms on livelihood strategies

In this part of the thesis I will discuss the livelihood clusters in relation to the economic reform policies. I want to know whether the goals of the economic reforms are visibly shown in the current livelihood strategies of the rural households in the research area. I want to find out if the hypotheses stated in chapter 2 are correct. The first hypothesis implicates that the Tanzanian agricultural sector has transformed from a subsistence based to a commercial based sector. The second hypothesis is a follow-up of the first hypothesis and claims that commercialized agriculture is the most attractive livelihood strategy for rural households in Tanzania/Mbeya.

6.4.1 Hypothesis 1: *Tanzania has managed to transform its agricultural sector to a commercialized agricultural sector*

The second chapter discussed the degree to which the Tanzanian agricultural sector has adopted policies that should transform the agricultural sector to a commercialized one. The Development Vision 2025 clearly formulated the goal to transform "from a low productivity agricultural economy to a semi-industrialized one led by modernized and highly productive agricultural activities which are effectively integrated and buttressed by supportive industrial and service activities in the rural and urban areas". To what extend is this reflected in the results from the data analysis?

In the cluster analysis, I included some "commercialization variables" in order to test the degree of commercialization among the clusters. These were "use of credit", "use of technology", "harvest share sold on the market" and "use of warehouse". Based on these data it can be concluded that the rice

farmer cluster is most commercially oriented. This cluster is the only cluster that is making use of warehouse and irrigation. Furthermore it is the cluster that makes the most use of credit. Commercialized farming characteristics can also be found in the maize farmer cluster. This cluster makes no use of irrigation or warehouse, but has a very high score on the harvest share sold on the market. The maize + other crop farmer cluster and the diversified farmer cluster show very little commercialized farming characteristics, with the exception that they make high use of technology. These two clusters show more characteristics of subsistence farming: they hardly use irrigation or warehouse, they have the smallest share of harvest sold on the market and they make little use of credit. The National Strategy for Growth and Reduction of Poverty has stated that the comparative advantage of farmers in Tanzania is the abundance of land and the suitability of the land for irrigation. The results from the multinomial logistic regression cannot conclude that these comparative advantages hold for the farmers in our research area: the majority of the farmers is small-scale and irrigation is only used in the district of Mbarali where rice farmers are active and irrigation systems are supplied by the public sector.

This outcome implies that the first hypothesis "*Tanzania has managed to transform its agricultural sector to a commercialized agricultural sector"* has to be rejected. For Mbeya it holds that the majority of the rural households is not involved in what can be called commercialized agriculture.

6.4.2 Hypothesis 2: *Commercialized agriculture is the most attractive rural livelihood strategy for a rural household in Mbeya*

One of the desired outcomes of the transformation to commercialized agriculture is increased living standards for rural household. Therefore it is interesting to check whether the households engaged in livelihood strategies with a (relatively) high degree of commercialization really reach the highest level of well-being.

The two clusters with the highest scores for the well-being indicators were the rice and maize farmer clusters. Their Asset index scores and food consumption expenditures were substantially higher than the scores of the other two clusters. The characteristics of the maize and rice farmers indeed show that they have things in common that the other clusters don't have. As said before, these clusters have specialized their production on one crop. Furthermore they do not cultivate more than 2 crops on average. Third, they have the biggest proportion of harvest sold on the market. Maize is the top market producer (98% of harvest sold on the market) followed by rice (89% of harvest sold on the market). Fourth, the rice and maize farmers have larger land cultivation areas and land owned (see Table 16). Both in terms of land ownership and rented land these farmers have larger land sizes in use. The high level of specialization, their focus on market output and the larger land area give a good indication that the maize and rice farmers are engaged in livelihood strategies that have a greater focus on commercialized agriculture.

Table 17 Average owned land area in acres

Cluster	Mean	Standard error
Maize farmer	8.24	1.04
Maize + other crop farmer	5.37	0.27
Diversified farmer	5.66	0.30
Rice farmer	8	0.82

One of the unexpected outcomes of the cluster analysis is that the maize and rice farmers are more often involved in non-farm activities. This indicates that they are not fully specialized in farming. An

explanation for this could be that these farmers are actively looking for opportunities to increase their income, thereby not limiting themselves to on-farm income generating activities. This could thus be an example of exploring the opportunities of "stepping out" their current livelihood strategy.

Based on the results, the second hypothesis cannot be rejected. It is indeed proven that the most attractive livelihood strategies also have are also the farmers with a higher degree of commercialization.

6.4.3 Tanzanian economic reforms: a well-grounded African success story?

As indicated in the theoretical part of this thesis, the Tanzanian agricultural sector struggles to increase productivity among smallholder farmers. The economic reforms, focused on commercialization and modernization were recognized as the key elements to lead the agricultural sector to a higher level, thereby increasing the well-being of the rural population. Past research on the Tanzanian agricultural sector does not present a unified position on the degree to which the reforms were successfully implemented. This begs the question if the goals of the reforms are fulfilled in the research area. The data from this research is insufficient to draw conclusions on, since there is no time series data to make comparisons of the situation before and after the economic reforms. In this paragraph I therefore solely focus on the question whether rural households have adapted livelihood strategies that involve commercial activities.

The livelihood strategy analysis showed that there is a variety in the degree to which farmers have commercial characteristics. The biggest part of the farmers (58%) is actively engaged in the livelihood strategies that show lower levels of commercialization. Although the other 42% of the rural households is more commercially oriented, they cannot be compared to large-scale commercial farmers. The two most important crops in the research area are rice and maize, which are typical "traditional" crops. Export-oriented crops such as cotton, sugarcane, coffee and tobacco are hardly cultivated by the rural households interviewed and thus play no major role in the lives of the farmers.

I used several "commercial agriculture" indicators as input for the cluster analysis, and these statistics give a good indication of the degree of commercialization in the research area (see Table 18). The indicators "use of irrigation", "use of credit" and "use of warehouse" are all dummy variables, and show that the use among rural households is very low. This leads to the assumption that water and irrigation infrastructure, as well as financial and extension services, are not widely used in the study area.

Table 18 Summary statistics for commercial agriculture indicators

Variable	Mean	St. Dev.
Use of technology	0.622	0.298
Use of irrigation	0.131	0.337
Use of credit	0.129	0.292
Use of warehouse	0.073	0.260
Home consumption/market production ratio	0.838	0.335

The last indicator that can tell something about the degree of commercialization and modernization is the degree to which a farmer is able and willing to access information. I assume commercially oriented households are able to request information about farming practices and about agricultural markets. The data provide limited but useful information about this (see Table 19). Nearly one third of the farmers has attended one or more agricultural trainings in life, and 44% of the farmers has seen a demo plot.

Requests for information from extension officers or NGO officers remains limited (respectively 18% and 4%) and information about marketing opportunities is requested by 20% of the farmers.

Table 19 Summary statistics about information access and/or use

Variable	Mean	St. Dev.
Farmer has requested information from extension officer in the past (yes = 1)	0.18	0.39
Farmer has requested information from NGO officer in the past (yes = 1)	0.04	0.19
Farmer has attended agriculture related training in the past (yes = 1)	0.31	0.46
Farmer has requested information about market opportunities in the past (yes = 1)	0.20	0.40
Farmer has accessed demo plot in the past (yes = 1)	0.44	0.50

Summarizing these findings, I conclude that there is not sufficient data to draw conclusions whether the economic reforms and agricultural policy changes have had the desired impact on smallholder farmers in the study area. What the data do show is that the use of available infrastructures such as irrigation is still only used by a minor group of farmers. The same holds for the use of forward and backward linkages and the degree to which farmers are actively looking for information: this remains limited. Thereby the Tanzanian agriculture in the study area is still largely focused on subsistence agriculture. There has no shift taken place from subsistence agriculture to large-scale commercialized agriculture, and farmers still rely on traditionally cultivated crops and do not focus on the "transformation crops" suggested by the Kilimo Kwanza Implementation Framework. However, traditionally cultivated crops as maize and rice are seen as "strategic crops" that have growth potential. The growth scenario's given by Pauw and Thurlow (2011) also predict higher growth rates for these crops, because of their unexplored potential.

If the goal of the economic reforms is to initiate a green revolution in the country, there is still a long way to go. The current state of agriculture in the study area is not ready to take agriculture to this level yet.

7. Discussion

This research has tried to contribute to the knowledge on the relation between rural households, economic reforms and well-being. The results gave provided information about the effectiveness of the agricultural policies and the correctness of the vision that Tanzania's agricultural sector would be better off when agriculture is more commercially focused. In this discussion I will make links between literature and the results from the quantitative data. Furthermore I will point out the weaknesses of the analysis and what could be improved in the future.

A shortcoming of the research was the lack of data from the situation before the economic reforms. I have tried to measure the effects of the economic reforms on the livelihood strategies that farmers are currently engaged in, but there is no data on the type livelihood strategies that these farmers were engaged in before the economic reforms. Therefore it is impossible to conclude that engaging in a specific livelihood strategy was the result of economic reforms. This research therefore only examines whether the preferred outcomes of the economic reforms are visible in the type of livelihoods that exist in the research area.

The use of the Sustainable Livelihoods Framework has proven to be a helpful tool to analyze the livelihood strategies. The part of the framework that might be underrepresented in this research is the vulnerability context. I have highlighted the main geographical, social and economic characteristics of the region Mbeya, but I did not have sufficient information about previous and current shocks, trends and seasonality in the research area to give a full representation of the vulnerability context in the research area. The livelihood assets pentagon is the most important feature of the Sustainable Livelihoods Framework, and it also functions as the backbone of the research.

The multinomial logistic regression showed significant results for all of the capital variables. One of the shortcomings of the analysis is that it lacks one or more variables that could represent social capital. Furthermore, not all other livelihood assets were equally represented in the multinomial logistic regression. The analysis would have benefitted from extra data on for instance financial capital (i.e. a credit constraint indicator) and natural capital (i.e. quality of the soil). The livelihood outcomes that were analyzed in this research solely focused on well-being, while in reality there are many more outcomes important in order to achieve sustainable livelihoods. It would therefore be interesting to extend this research in the future by including more social, economic and environmental indicators that could define sustainable livelihood strategies.

The concepts of "hanging in", "stepping up" and "stepping out" seem to be very helpful in analyzing different types of livelihood strategies. The economic reforms can be seen as a strategy from the government to move subsistence farmers from hanging in livelihood strategies to stepping up livelihood strategies. The results have shown that not all livelihood clusters have managed to move from hanging in to stepping up strategies. The rural households engaged in maize + other crop farming and diversified farming still mostly engage in hanging in activities, focusing on holding on to what they currently possess and coping with trends and shocks without losing their assets. The literature mentions that it might be impossible for certain households to move from hanging in to stepping up because the households lack the minimum requirements (such as a minimum amount of land, education etc.). It is very likely that this is also the main reason that farmers from the maize + other crop and diversified livelihood strategy do not move into other activities such as the maize or rice farmer strategy. Maize + other crop farmers and diversified farmers possess less of each of the livelihood capitals, which both leads to a lower level of

well-being and a smaller amount of opportunities to move into stepping up strategies. The maize and rice farmers seem to have had more opportunities to engage into both stepping up and stepping out activities. The literature suggest that the households who have better market opportunities, have higher accumulation of assets and possess greater land area are also likely to be engaged in activities other than hanging in activities. This can be confirmed by our results about the rice and maize farmer clusters. Farmers in these cluster invested more in assets such as credit, irrigation and education. For this reason they have managed to increase the productivity compared to the other two livelihood strategies. Thereby they have a broader scope of livelihood activities, since they have a higher percentage of household members engaged in non-farm work. This means that the households from the maize and rice farming clusters engage in both stepping up and stepping out activities in their livelihood strategies. Lastly, the literature describes that there is a difference between poor rural households (who engage in hanging in activities) and less poor rural households (who engage in stepping up and stepping out activities). This distinction is also reflected in our results from the well-being indicators: the rice and maize farmers have better scores on all the well-being indicators.

The impact of transaction costs and failing markets is also addressed in the multinomial logistic regression, where I used three variables representing transaction costs (distance to nearest agricultural output market, agrodealer and tarmac road). The transaction cost variables were integrated in the multinomial logit regression in order to check whether one cluster would be more market oriented than another cluster. Based on the literature it would be logical that the maize and rice farmer clusters are located closer to the output market, agrodealer and tarmac road. However, our results do not show that these distances are significantly closer for the rice and maize farmers. The results even show that the distance to the output market and tarmac road are significantly longer for the cluster rice farmers compared to maize + other crop farmers. For these variables, the outcomes suggested by the literature do not correspond to our findings. It might be the case that there are other unknown factors that impact the outcome of the variables (i.e. rice and maize farmers live further away from the agricultural output market, but have more transportation options that decrease the time needed to reach the market). Another explanation could be that I did not capture the commercial orientation well enough in the variables. I could have solved this by adding other market-oriented variables such as market information available to farmers.

The cluster analysis has helped to order and qualify the different livelihood strategies. I think that the cluster analysis might have improved if I had more exact data about the labor activities. The dataset did not include information on the order of importance of the different labor activities, which made it impossible to accurately estimate the level of commercialized farmer practices. For future research I would include a scaling mechanism that indicated the importance of each labor activity as income generating activity for the household. Another thing that could have impacted the results is the valuation of the assets owned. During the data collection, the respondents qualified the value of their assets themselves, which leaded to a high degree of inconsistency in the valuation of the assets. This problem was solved by using one standard valuation per asset, namely the median per asset.

This research also attempted to measure the level of well-being among each livelihood strategy. In the theoretical framework I opted to use the OECD definition of well-being, focused on material living conditions, quality of life and the stock of the five capitals. It appeared to be difficult to incorporate quality of life in measuring well-being, because I had no data to assess this. Quality of life contains an intrinsic value which can differ under different cultures and contexts, which makes it hard to measure.

However, I think that it could have made this analysis more accurate when this would be included in the measurement of well-being. The data set for calculating the well-being also exhibited some weaknesses. There were consumption expenditures excluded during the data collection, such livestock home consumption. Furthermore the assets were counted for their possession (household possesses the item = 1), without counting for the value of each asset.

In future research it would be a great advantage to include qualitative interviews. This would be a good way to analyze the levels of well-being perceived by the rural households in the study area. It would be interesting to see whether maize and rice farmers would still be the favorite livelihood strategy in terms of well-being when quality of life would be included in the analysis. Furthermore it would give additional information about the motives behind the choice for a particular livelihood strategy. I furthermore think the indicators for well-being (asset ownership and consumption expenditures) were somewhat narrow for assessing well-being, and I would recommend extra well-being indicators in future research. The incorporation of indicators related to i.e. health, children and financial satisfaction would have given a more complete definition of well-being.

8. Conclusion

Over the last 40 years, multiple policy reforms in Tanzania's economic and agricultural sector have taken place. The country has changed from a socialist economy to a liberalized economy, initiated by two series of major agricultural and economic reforms. The reforms have always had a focus on liberalization: from crop liberalization to land liberalization to market liberalization. The government wants to continue to reform the agricultural sector in this way. Future reforms should convert the agricultural sector from a subsistence, low productivity sector to a sector that uses innovative production systems, a sector where farmers are able to increase their well-being by using the market mechanism. This research has tried to find out how the economic reforms and policy changes have affected rural livelihood strategies to this point in the region of Mbeya in the Southern Highlands of Tanzania. I thereby examined the degree of commercialization in each livelihood strategy and I examined the levels of well-being per livelihood strategy.

The multinomial logistic regression showed the determinants of each livelihood strategy. The maize + other crop strategy was chosen to be the reference strategy, because the biggest amount of households were engaged in this livelihood strategy (534 households). The model showed that the diversified farmer and the maize + other crop farmer had many characteristics in common. Meanwhile there were numerous differences between the reference strategy and the maize farmer strategy and the rice farmer strategy. Maize and rice farmers also showed the most commercial attitude in their farming practices, by specializing on one crop, a higher use of output markets and a greater use of irrigation and credit. The maize and rice farmer differentiated themselves from the other clusters in the sense that they received more education and they owned more land. Maize farmers also owned more assets, rice farmers owned more agricultural equipment. The multinomial logistic regression already enlightened that maize and rice farmers were in a better position compared to the other livelihood strategies. This was confirmed by the estimation of well-being that was done after the multinomial logistic regression.

Results have shown that well-being is the highest for the rural households in the maize farmer and rice farmer strategy. These clusters achieved considerably higher values on the asset index, and they also had higher food consumption expenditures. This supports the statement of the government that higher levels of well-being can be attained when farmers are pushed into more commercialized livelihood strategies. Households that are engaged in the maize farmer and rice farmer livelihood strategy have a better position (more land available, higher education, etc.) and this suggest that they could benefit more from the economic reforms and subsequently have reached higher levels of well-being. The diversified farmer strategy and maize + other crop farmer strategy show lower levels of commercialization and lower levels of well-being. They are therefore seen as the less favourable livelihood strategies. The limited amount of assets suggests that farmers are pulled into these livelihood strategies, because the low amount of assets might impede them to move into other, more favourable livelihood strategies.

The main promise for the agricultural sector in the Development Vision 2025 is that "*The economy will have been transformed from a low productivity agricultural economy to a semi-industrialized one led by modernized and highly productive agricultural activities which are effectively integrated and buttressed by supportive industrial and service activities in the rural and urban areas.*" (Tanzania Planning Commission, 1999). The outcomes of this research imply that the Tanzanian government still has a long way to go forward in order to have achieved this in 10 years. The majority of the households is still engaged in livelihood strategies with low levels of well-being, and traditional production systems are still

widely used in the area of research. There seem to be only limited opportunities to move from a hanging in strategy to a stepping up strategy for the diversified farmers and maize + other crop farmers. A recommendation to the policy makers is therefore to check for the minimum requirements that would enable these farmers to engage into livelihood strategies with higher well-being statuses. In this way the economic reforms could have a more direct effect, not only on those farmers that possess more assets and are already pushed into more lucrative livelihood strategies, but on *all* farmers that together define the national agricultural sector of Tanzania.

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