

Smallholder farming in Tanzania: Opportunities for improved food security

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Social and economic dimensions
of smallholder based agriculture
and food security

Today more than 800 million people around the world suffer from chronic hunger and about 2 billion from under-nutrition.

This failure by humanity is challenged in UN Sustainable Development Goal (SDG) 2: "End hunger, achieve food security and improve nutrition and promote sustainable agriculture".

The AgriFoSe2030 program directly targets SDG 2 in low-income countries by translating state-of-the-art science into clear, relevant insights that can be used to inform better practices and policies for smallholders.

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Abstract

In many countries' agriculture is still considered the most important instrument to improve food security, economic growth, and alleviate poverty. Improvement in production by smallholder farming, which is practiced by many in Sub-Saharan Africa (SSA), including Tanzania, is presented as "the way" towards reduction of poverty. The aim of this desk study is to review the available data on food security in Tanzania, challenges facing smallholder farmers and the available possibilities for improved and sustainable agriculture production. This review was conducted from May to August 2017. Various databases were searched for articles related to smallholder farming, challenges, available opportunities for agricultural development and food security in Tanzania. The study found that a diverse range of crops, both food crops and cash crops are grown Tanzania and that a variety of livestock are kept. Food crops include maize, rice and wheat, while the main cash crops are tea, tobacco and coffee. The main livestock kept are cattle and poultry. Smallholder farmers face many challenges including lack of reliable markets, poor access to credits and inputs, poor extension services, climate change and policy related challenges. At the same time there are several possibilities for investments in agriculture through for example improved access to credits and inputs, as well as to improvement and development of sustainable agriculture for smallholder farmers in Tanzania.

Key words: Agricultural production; smallholder farmers; food security, possibilities and challenges

Acronymes

| | |
|-----------|---|
| ASDP | Agricultural Sector Development Programme |
| ASDS | Agricultural Sector Development Strategy |
| ASSP | Tanzania Agriculture Statistics Strategic Plan |
| BOT | Bank of Tanzania |
| CBO | Community Based Organization |
| CGAP | Consultative Group to Assist the Poor |
| ESRF | Economic and Social Research Foundation |
| ECDPM | European centre for Development Policy and Mangement |
| FAOSTAT | Food and Agriculture Organization Statistics |
| FAO | Food and Agricultural Organization |
| FFS | Farmer Field Schools |
| FEG | Farmer Extension Groups |
| GDP | Gross Domestic Product |
| HBS | Household Budget Survey |
| IFAD | International Food and Agriculture Development Programme |
| IFPRI | International Food Policy Research Institute |
| INSARD | Including Smallholders in Agricultural Research for Development |
| MAFSC | Ministry of Agriculture Food Security and Cooperatives |
| MALF | Ministry of Agriculture, Livestock and Fisheries |
| MAMIS | Market Information System |
| MDGs | Millennium Development Goals |
| MKUKUTA | National Strategy for Growth and Poverty Reduction |
| MKURABITA | Property and Business Formalization Program |
| MoFP | Ministry of Finance and Planning |
| MVIWATA | MtandaowaVikundivyaWakulima Tanzania (National Network of Small-Scale Farmers Groups in Tanzania) |
| NBS | National Bureau of Statistics |
| NSGRP | National Strategy for Growth and Reduction of Poverty |

| | |
|--------|--|
| NGO | Non-Governmental Organization |
| SIDA | International Development Cooperation Agency |
| SAGCOT | Southern Agricultural Growth Corridor of Tanzania |
| SSA | Sub-Saharan Africa |
| TIC | Tanzania Investment Centre |
| URT | United Republic of Tanzania |
| UNICEF | The United Nations Childrens' Fund |
| USAID | The United States Agency for International Development |
| USD | United States Dollar |
| USDA | United States |
| WFP | World Food Program |

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1 Introduction

1.1 Background Information

This report is a review of existing literature on the situation and challenges of smallholder producers in Tanzania.¹ The smallholder sector plays an important role in Tanzanian agriculture and economy. It dominates agriculture production and provides employment for the majority of people (80%) in rural areas (Alphonse, 2017). At the same time, smallholder farmers continue to face many challenges, including lack of agriculture inputs, lack of access to financial services, poor access to markets, inadequate infrastructure, all of which result in low production and productivity. There are, however, several opportunities that need to be explored in order change the situation. Smallholder farmers require better access to land, credit and markets, as well as to market information and skills in value addition to increase the quality of their produce. New technological advances need to reach the farmers through improved extension services.

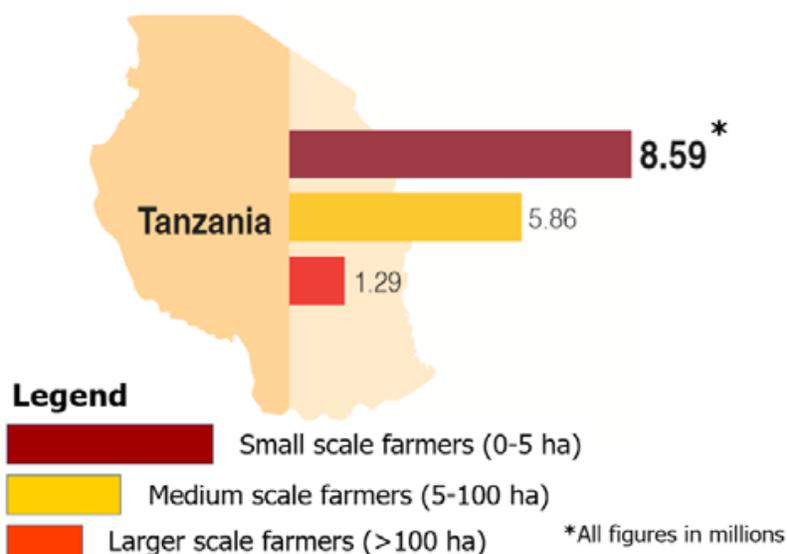


Figure 1: Area and Number of small, medium and large-scale farmers in 2015 (Adopted from Suleiman, 2018)

The aim of this desk study is to review the available information and data on the local and regional variations on agriculture conditions and food security for smallholder farmers in Tanzania, and in particular, to identify ways to meet the challenges, take advantage of the opportunities and develop an improved and sustainable agriculture production.

¹It is a report in the AgriFoSe series of country studies on different Sub-Saharan African agricultural themes. AgriFoSe is a program which directly targets SDG 2 in low income countries and funded by the Swedish International Development Agency (SIDA). For a list of previous studies and more information on AgriFoSe see www.slu.se/agrifose.

1.2 Methodology

This review was conducted from May to August 2017 while final amendments were made until 2019. During this period one month was spent in Sweden at Lund University, Department of Human Geography, and the remaining two months were spent at Sokoine University of Agriculture, College of Agriculture, Department of Food Technology, Nutrition and Consumer Sciences. Various databases including Web of Science, SCOPUS, Google scholar, FAOSTAT and PubMed were searched, as well as other websites such as those of FAO, BOT and NBS, for articles, data and other texts related to local and regional variations in conditions for agriculture and food security. Key words used for the search included smallholder agriculture, food security, farming systems, Tanzania, climate change, contract farming and agriculture policies. The literature reviewed includes government reports, agricultural data and statistics, peer reviewed articles, project documents, and reports from other sources such as NGOs and CBOs. In some cases, discrepancies were found between data reported by Government official organizations (like NBS, BOT) and International organizations' (like FAOSTAT, World Bank). This is because of different methodologies and extrapolations used in obtaining these data. However, some updated information was not found in some cases thus calling for more research in these areas.

1.3 Structure

The structure of the study is the following: After this short introductory section follows a background section (2) on agriculture, smallholders and food security followed by sections on the main food and cash crops grown (section 3), and livestock kept (section 4) in Tanzania. Section 5 focus on the challenges facing smallholder farmers and ways to address them, and the final section (6) contains the conclusion of the review.

2. Agriculture in Tanzania

Agriculture in Tanzania is the mainstay of the economy constituting about 29% of the Gross Domestic Product (GDP), 20% of export earnings and employing about 66.3% of the population (URT, 2017b). The average yearly growth rate of the agricultural sector was 3.6% in 2017 compared to 2.1% recorded in 2016 (URT, 2017b). However, this has not been enough to significantly alleviate rural poverty, given the very low level of agricultural development, particularly among smallholder farmers (MAFSC, 2016). Farm activities are the most important source of income for rural households, and account for approximately half of household incomes across all expenditure quintiles (FAO, 2016). In Tanzania, most basic food consumed is produced within the country, mainly by smallholder farmers cultivating one to three hectares (Wegerif and Hebinck, 2016). The country has 44 million hectares of arable land of which only 33% were cultivated in 2016 (URT, 2017a). A large proportion of the land could be put under irrigated cultivation. However, most agricultural production depends on the rain and only about 5% of farmers are practicing irrigation (URT, 2017a). Traditional cultivation methods still dominate agriculture, for example only 10% of land suitable for agriculture is ploughed by tractor (Premji, 2017).

Agriculture in Tanzania in general and smallholder production in particular, face many challenges of which some have already been mentioned (Anderson, Marita, and Musiime, 2016; MAFC, 2013; MAFC, 2016; Suleiman, 2018). The main challenges are:

- Access to land
- Poor land management
- Access to inputs and output markets
- Poor agriculture financing systems
- Poor infrastructure
- Lack of timely extension services and dissemination of research findings
- Poor policy environment
- Insecure property rights
- Access to labor

Despite many challenges, agricultural development is considered by the government as the most important instrument to improve food security, enhance economic growth and fight poverty in Tanzania as outlined in the Agriculture Sector Development Strategy II of 2015/16-2024/25 (MAFSC, 2016). In 2017 the agricultural GDP was 28,011,887 million TZS, which made up 28.7% of total GDP (URT, 2017b). Table 1 shows how the agricultural GDP has developed over the past decades and that in spite of a considerable absolute growth its relative (%) importance for the national economy (GDP) has diminished over the years.

Table 1: Trend of Agriculture GDP and its Percentage Share to Total GDP

| Year | Agriculture GDP (In Million TZS) | Proportion of Agriculture GDP to total GDP (%) |
|------|----------------------------------|--|
| 1990 | 9,740,831 | 42.0 |
| 1995 | 11,379,697 | 43.7 |
| 2000 | 13,322,665 | 26.2 |
| 2005 | 16,635,952 | 24.6 |
| 2010 | 20,585,284 | 25.6 |
| 2015 | 25,234,560 | 26.7 |
| 2016 | 26,436,338 | 27.4 |
| 2017 | 28,011,887 | 28.7 |

Source: World Bank Indicators, 2017

This has been the normal process in developing economies where other sectors than agriculture become more and more important at the same time as food security is greatly improved. However, in the case of Tanzania, and many other SSA countries, this happens while poverty and food insecurity

remain major problems. A large proportion of rural farming household in Tanzania have high poverty rates. A study by (Mkonda and Xinhua, 2017) reported that 90% of rural households are poor and depend on subsistence agriculture as their main livelihood. Poverty in rural areas is also recognized as a big problem in Tanzania's National Strategy for Growth and Reduction of Poverty (NSGRP)(Covarrubias et al., 2012). Against this background, and the limited success of earlier strategies, researchers, policy makers and development partners believe that improvement in production by smallholder farmers, would pave the way towards a substantial poverty reduction, improved food security and economic development (see example (Okore, 2014). To achieve this, the increase in agricultural productivity must be accompanied by poverty reduction and rural development, and be both sustainable and resilient (Kassie et al, 2013). Improvement in technology and sustainable agricultural practices are important factors in realizing this productivity increase, while preserving the soil quality and improve food security

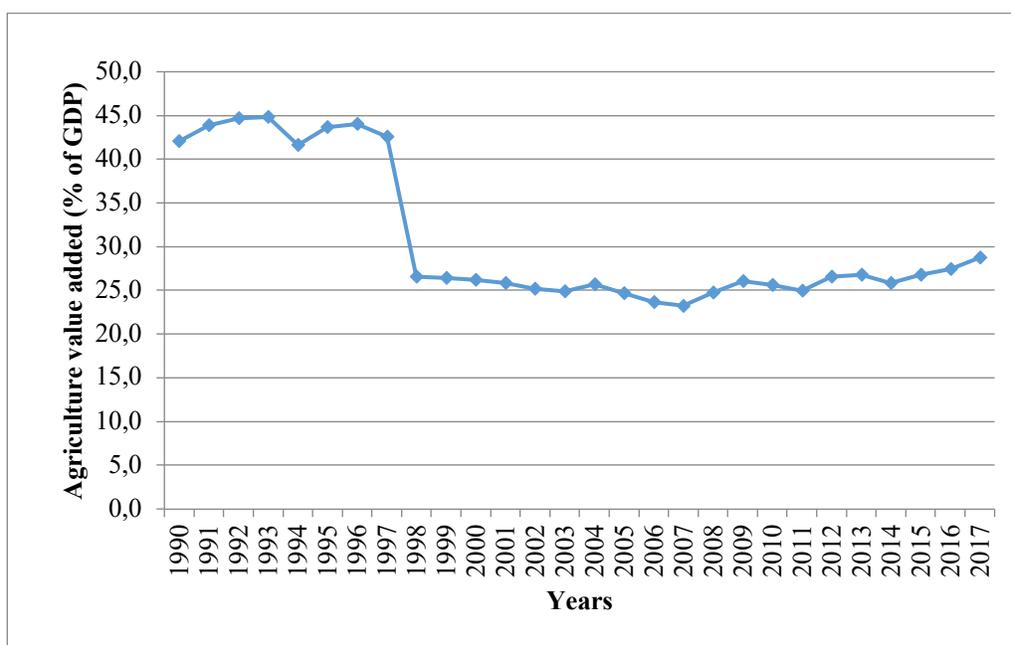


Figure 2: Agriculture Value added percentage share of GDP Source: World Bank (2017).

2.1 Smallholder farmers in Tanzania

Agriculture in Tanzania is dominated by small-scale farmers (Anderson et al., 2016). Smallholder farmers produce food and non-food products on a small scale with limited external inputs, cultivating field and tree crops (IFAD, 2013). They also breed livestock, fish and other aquatic organisms. Smallholder production is characterized by subsistence farming and dependence on agriculture both as a means of food production and a source of livelihood (WFP, 2013). There were approximately 3.7 million smallholder households in 2015 cultivating an average of 2 hectares of land (FAO, 2015). The majority (74%) are male-headed (Anderson et al., 2016).

Despite their large number, and the fact that smallholder farmers are contributing significantly to food security, the group generally belongs to a marginalized and disenfranchised part of the population and

often lives in remote and environmentally fragile areas. In Tanzania the average smallholder farm size varies across regions and gender (Salami et al, 2010). Research shows that smallholder farmers in Tanzania dominate the agricultural sector, with average farm sizes being between 0.9 and 3.0 hectares; they cultivate 5.1 million hectares annually, of which 85% is food crops. For example, in the predominant tobacco producing part in Ruvuma, the average farm size is 2.47 hectares, while in the smallholder coffee region of Kilimanjaro, the average farm size is only 1.08 hectares (Sarris, Savastano, and Christiaensen, 2006). In the same regions, men were more likely to have farms bigger than one hectare, while women normally farmed parcels of less than 0.3 hectares. There are different opinions on how to identify a smallholder farm. Mercy Corps AgriFin (2016), identify smallholder farmers as those with up to four hectares of land or farmers who have less than 50 heads of cattle or 100 goats/sheep/pigs or 1,000 chickens, while Rutta (2012) ascertain that smallholder farmers are those who rely heavily on the use of hand hoe as the main cultivating tool, which in turn sets obvious limitations to the area that can be cultivated.

In Tanzania smallholder farmers are constrained by insufficient infrastructure (transport, water, energy and communication), limited access to finance, insecure property rights, poor cultivation systems, which together lead to depletion of natural capital and release of greenhouse gases and other pollutants (Simbakalia, 2011; Philip, 2012). The lack of access to credit makes it difficult to make the investments necessary to achieve the increases in agricultural productivity and production required. A national survey conducted by the consultative Group to Assist the Poor (CGAP) in 2017 showed that only 10% of smallholder farmers had a bank account and nearly half of these farmers did anyway not have full access to financial services (Anderson et al., 2016). Yet, it is argued that smallholder agriculture in Tanzania remains the major engine of rural growth and livelihood improvement with the possibility to lift large numbers of the rural poor out of poverty (Food and Agriculture Organization of the United Nations (FAO), 2015). Improving rural agriculture is also relevant because, according to Anderson et al. (2016), smallholder farmers view agriculture as part of their identity, a point of pride, and a legacy for future generations. The priorities of the Agricultural Sector Development Strategy (ASDS) 2015/16-2024/25 are mainly focusing on increasing production and productivity, and on promoting public-private sector partnerships (MAFSC, 2016).

2.2 Farming Systems in Tanzania

Depending on the scale of the analysis, a farming system can encompass a few dozen or many millions of households. According to FAO, classification of the farming systems of developing regions has been based on the following criteria:

- available natural resource base, including water, land, grazing areas and forest; climate, of which altitude is one important determinant; landscape, including slope; farm size, tenure and organization; and
- dominant pattern of farm activities and household livelihoods, including field crops, livestock,

trees, aquaculture, hunting and gathering, processing and off-farm activities; and taking into account the main technologies used, which determine the intensity of production and integration of crops, livestock and other activities.

Individual farms in the same farming system thus have a broadly similar resource base, enterprise patterns, household livelihoods and constraints, and for these similar development strategies and interventions would be appropriate (Dixon et al., 2001, Golenko et al., 2013). FAO have identified eight different farming systems in Tanzania (Figure 2): 1) maize mixed, 2) root crop, 3) coastal artisanal fishing, 4) highland perennial, 5) agro-pastoral millet/sorghum, 6) tree crop, 7) highland temperate mixed, and 8) pastoral (Golenko et al., 2013). At a regional level more narrowly defined farming systems have been identified., e.g. Kadigi (2004), quoted in Mnenwa and Maliti (2010), identified four types of farming systems in the Usangu Basin in the South Western part of the country: (i) smallholder rain-fed paddy cultivation using hand hoes and family labor; (ii) smallholder rain-fed paddy production using tractor, fertilizer and hired labor; (iii) smallholder irrigated paddy production using tractor fertilizer and hired labor; and (iv) smallholder irrigated paddy production in hired plots using tractor, fertilizer and hired labor.

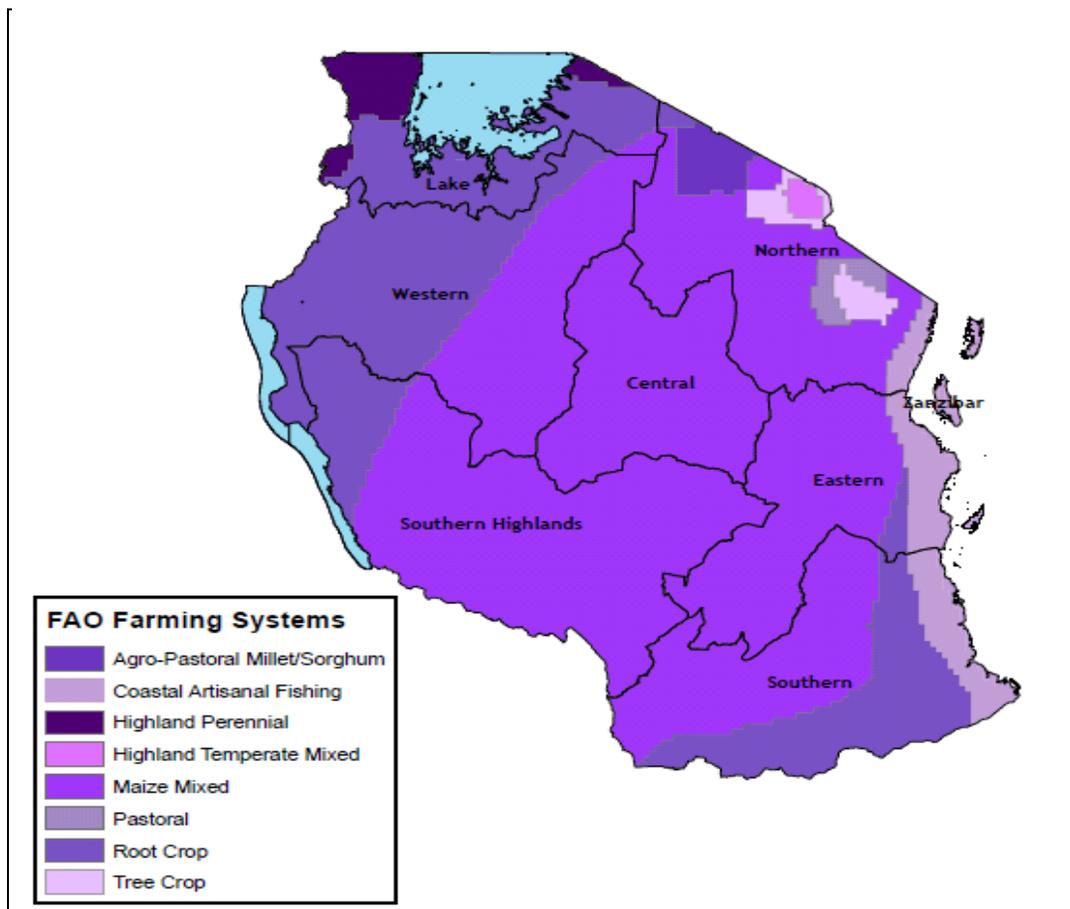


Figure 3: Map showing farming systems in Tanzania. Source: FAO 2013

2.3 Food Security in Tanzania

The economy of Tanzania has improved considerably over the past decades. The main drivers of economic growth include rapid expansion of the service sector specifically telecommunication and financial intermediation, manufacturing sector, construction, industry and trade sectors. Moreover, there have been a growing consumer base given a population growth rate of 2.6% and increased infrastructure investment in rail, ports and roads (ESRF, 2013). Approximately 26.4% of Tanzanians continue to live below the national basic needs' poverty line compared to 28.2% in 2011/12, set at TZS 49,320 per adult per month (equivalent to less than one USD per day) based on the 2018 Household Budget Survey (HBS). Improvements at the national level have also been on the proportion of extremely poor and those who cannot afford to buy basic foodstuffs to meet their minimum nutritional requirements of 2,200 kilocalories (Kcal) per adult per day, with a decline from 12 to 8%. While proportion of poor population in rural areas decreased from 84.1% in 2011/12 to 81% in 2017/18, the poor in Dar es Salaam doubled from 1.5 to 3% and in other urban areas increased from 14.4 to 16.1% (NBS, 2019).

Experts agree that sustainable food systems and resilient agriculture are the keys towards achieving food security (FAO, 2015). In the case of Tanzania, aggregate data from preliminary food crops forecast report in 2015/16 show that there was surplus food production with a self-sufficiency ratio (SSR) of 123 (MAFSC, 2017). Likewise the country produced enough food to meet national requirements for the years 2013/2014 and 2014/2015 with SSR of 125 and 120 respectively (MAFSC, 2017). Despite the high aggregate production and a decline in poverty rates, food insecurity is still a big problem in the country (WFP, 2010; ESRF & ECDPM, 2015). In the 2018 Global Hunger Index (GHI), Tanzania ranks 95th out of 119 countries with a score of 29.5 categorized as serious (GHI, 2018). The undernourishment rate has deteriorated since the 1990s from 24.2% in 1992 to 35.7% in 2012 (MAFSC, 2017).

Food insecurity in Tanzania is largely seasonal due to weather related circumstances and is more pronounced in Northern and Central Tanzania with a persisting drought condition (MAFSC, 2017; Shemsanga et al., 2010). Up to 9% of the Tanzanian population experiences annual food shortages, most commonly between October and February. Periods of heightened food shortages following a shock, like a severe drought, are most pronounced in unimodal zones, right before the start of the rainy season in December (MAFSC, 2017). This is mainly attributed to uneven and seasonal distribution of rainfall, which have led to frequent crop failure, loss of livestock, declining agricultural productivity, loss of biodiversity, and land suitable for agriculture. Being unimodal zones (experiencing one long rainfall season called msimu, which starts around November/December and ends in mid-April), food shortages in these areas occur regardless of the country's ability to feed itself in terms of production potential.

Historically, soon after independence, agriculture was declared a fundamental sector for improving the standard of living and a tool for fighting diseases, poverty and food insecurity. To achieve this mission of agricultural development different slogans were formulated by the 'Father of the Nation' and Tanzania's first prime minister, the late Mwalimu Julius Nyerere, including Siasani Kilimo meaning

“Politics is agriculture”, and Kilimo cha kufanakupona meaning “Agriculture for life and death” (Hartmann, 2016). Currently, initiatives such as the Comprehensive Africa Agriculture Development Program (CAADP) launched in 2009 followed by Tanzania Agricultural and Food Security Financing Plan (TAFSIP) in 2011 as an instrument for implementing the CAADP, the Agricultural Sector Development Program (ASDP) implemented in 2005- 2010 followed by phase two 2011-2014 Agricultural Sector Development Strategy II (ASDS-II) of 2015/16-2024/25 and the Southern Agricultural Growth Corridor of Tanzania (SAGCOT) launched in 2010 are part of the key programs and strategies aimed at boosting Tanzania’s agriculture development and improve food security (MAFSC, 2016). However, according to the current agriculture strategy (ASDS – II), greater emphasis is needed on strengthening institutional development and effectiveness, stimulating expanded and inclusive private sector-driven development and integration, increasing sustainable productivity of crop, livestock/fish and export commodities, improving household nutrition and food security and promoting the effective multi-stakeholder formulation, consensus and effective implementation of key policy and regulatory reform. This aims to improve (i) poor production techniques; (ii) underdeveloped markets, market infrastructure and farm-level value addition; (iii) poor rural infrastructure, including rural roads, telecommunications and electricity; and (iv) inadequate agricultural finance, including public expenditure.

Over the past three decades, the government of Tanzania sought to alleviate poverty by increasing farm production and food security in collaboration with development partners such as the Danish International Development Agency (DANIDA), the Japanese International Cooperation Agency (JICA), the European Union (EU), Irish Aid (IA), and the International Fund for Agricultural Development (IFAD) and the International Development Association (IDA) as well as Chinese Aid (Ngaiza, 2012). An example of the concerted efforts towards poverty alleviation is the establishment of the Dakawa Demonstration Center in 2009, as part of Chinese Aid to Tanzania. According to Adams et al. (2011) the aim of this Agricultural Technology Demonstration Centre (ATDC) was to increase both production and income of smallholder farmers through carrying out soil experiments, research, technical training, demonstrations, and promotions. For many decades the lack of these activities had contributed to hinder an increase of productivity in rural areas. Thus, agriculture production has not yet significantly improved the lives of majority rural poor despite numerous and longtime government efforts and initiatives.

Food security is an important, but not the only, factor to consider when efforts to combat malnutrition are put in place. For many years, the Tanzanian agriculture sector has put its emphasis on increasing production of starchy food staples, while the prerequisite for good nutrition also include farm diversification, food availability and utilization (Alphonse, 2017). Apart from using the daily consumption of calories, food security can be measured by the dietary diversity and by monitoring changes regarding nutrition status (Leroy et al., 2015). Like in other developing countries, there is a positive association between dietary diversity and child nutritional status as well as between improvements in nutritional status in Tanzania (Ruel and Arimond, 2004) and food security (Ochieng et al, 2017). The implementation of a number of nutrition sensitive interventions by various programmes has contributed

to an improvement in the nutrition status of the population. These interventions include the Accelerating Stunting reduction in Tanzania program (a four-year initiative from 1 December 2015 - 30 November 2019), and the Mwanzo Bora (a seven-year 2011–18 integrated nutrition project) and Boresha Afya programs (a five-year 1 October 2016 – 30 September 2021), supported by UNICEF and USAID respectively. These programs have contributed to an improvement of the nutrition situation of children under five years of age over the last 25 years (Figure 4).

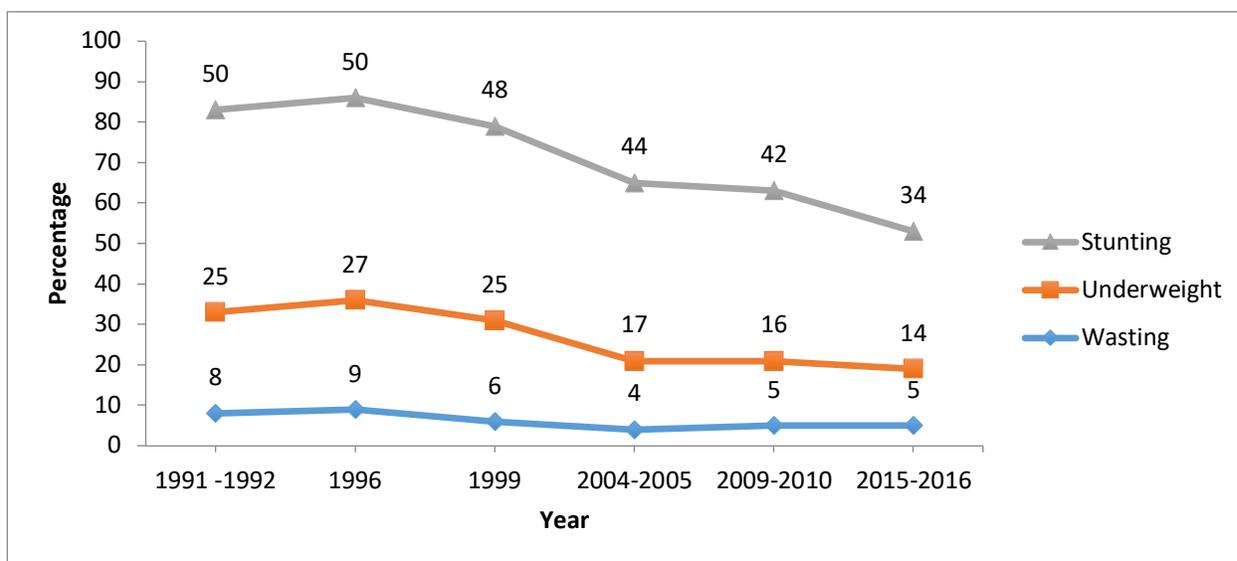


Figure 4: Under five Nutrition Indicators in Tanzania (1990 – 2016). Source: Tanzania Demographic and Health Surveys 1991/1992, 1996, 1999, 2004/05, 2009/10, 2015-16.

3. Key Food and Cash Crops in Tanzania

Tanzania's agriculture sector is extremely diverse due to the country's many agro-ecological zones. There are seven zones; Eastern, Northern, Southern, Southern Highlands, Western, Central, and Lake Zones which are further divided into 63 agro-ecological zones (AEZ) which are natural physical regions with similar climate, physiography and soil (Figure 5).

The relative contribution to country's GDP in 2016 by crop, livestock, forestry and hunting, and fisheries was 9.0%, 5.9%, 2.6% and 1.9% respectively (BOT, 2018a).

According to the 2014/2015 agricultural sample survey there were 11,287,822 farmers of which 60% were growing crops, 38% engaged in both crops and livestock production, while 2% only kept livestock (URT, 2016). As already mentioned, agriculture production in Tanzania is mainly rain fed, and land with high potential for irrigation cultivation is still underutilized (Ministry of Water and Irrigation, 2009; URT, 2012). The total area planted with crops was 17,255,084 hectares in the 2014/15 season of which 67%

was planted during the long rainy season which is March to May and 33% during the short rainy season which is November to December (URT, 2016).

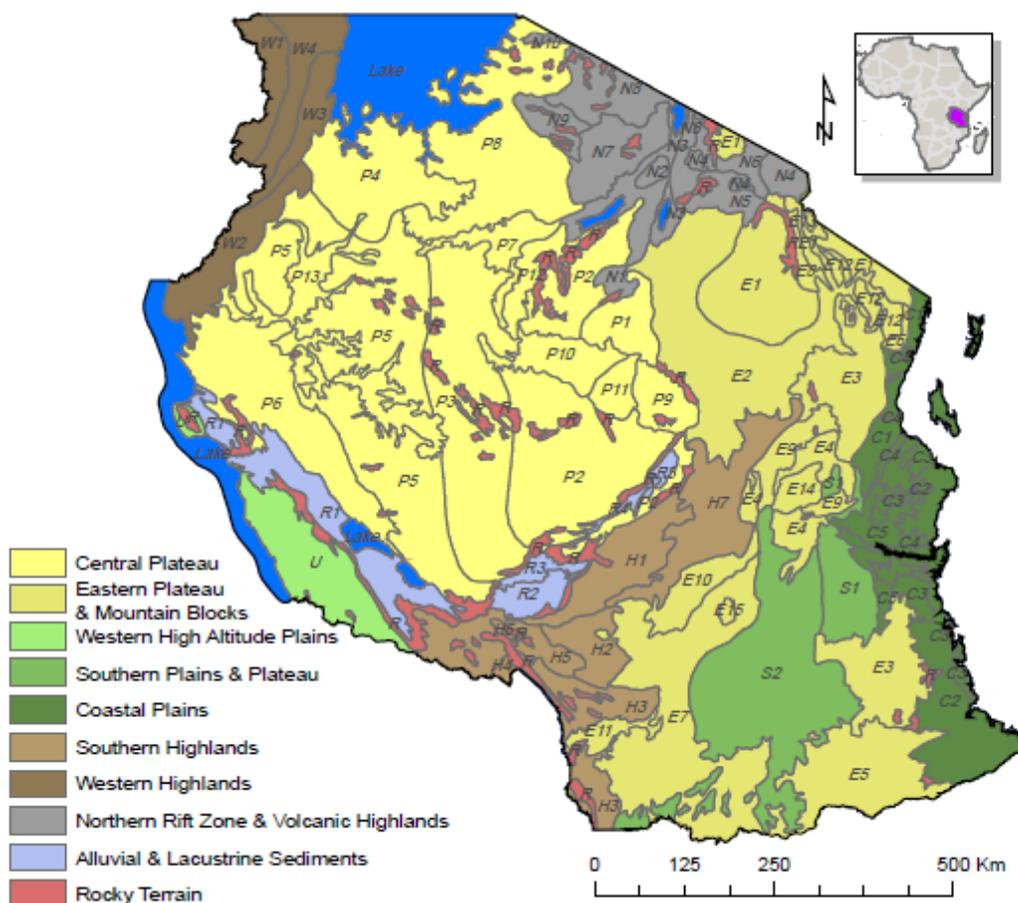


Figure 5: Agroecological zones of Tanzania.

Source: <http://www.kilimo.go.tz/agricultural%20maps/Tanzania%20Soil%20Maps/Webbased%20Districts%20Agricultural%20maps/Districts%20AEZs/Tanzania%20agro-ecological%20zones.htm>

Soil%20Maps/Webbased%20Districts%20Agricultural%20maps/Districts%20AEZs/Tanzania%20agro-ecological%20zones.htm

Crops are either classified as food crops or cash crops, but some food crops, particularly maize, rice and cassava are also important cash crops. The main food crops grown in Tanzania are maize, rice, cassava, sorghum, sweet potatoes, bananas, pulses and wheat. Of these, the most important are maize, rice and cassava that make up the basis of household and national food security (ESRF and ECDPM, 2015). The main cash crops are coffee, cashew nut, tea, cotton, tobacco and sisal (URT, 2013; FAO, 2015). Some of these crops are concentrated in specific regions, e.g. coffee and tea in the Northern and South Highlands zones, and/or amongst commercial large-scale farmers, such as tobacco and sisal (URT, 2013). Wheat is also produced in the country mainly through large scale production. Wheat is an expensive staple and only urban high-income households can afford to consume it regularly. Consequently, per capita consumption of wheat products is much higher in urban areas, particularly among high-income households, than in rural areas (Minot, 2010). Table 2 shows the area cultivated with different kinds of crops and Figure 6 the geographical distribution of the most important food crops.

Table 2: Types of crops grown per area (hectares)

| S/No | Type of crops grown | Area planted (hectares) | Percentages (%) |
|------|-----------------------|-------------------------|-----------------|
| 1. | Cereals | 5,830,972 | 67 |
| 2. | Pulses | 1,002,819 | 11 |
| 3. | Oilseeds and oil nuts | 966,583 | 11 |
| 4. | Root and tubers | 285,825 | 3 |
| 5. | Cash crops | 643,803 | 7 |
| 6. | Fruits and vegetables | 78,711 | 1 |

Source: 2007/2008 Agricultural Census.

Table 3: Types of most important food crops grown per area (hectares)

| S/No | Type of crops grown | Area planted (hectares) | Percentages (%) of total planted area |
|------|---------------------|-------------------------|---------------------------------------|
| 1. | Maize | 4,086,555 | 28 |
| 2. | Rice | 906,708 | 6 |
| 3. | Cassava | 669,134 | 5 |
| 4. | Sorghum | 568,650 | 4 |
| 5. | Wheat | 43160 | 0.3 |

Source: 2007/2008 Agricultural Census.

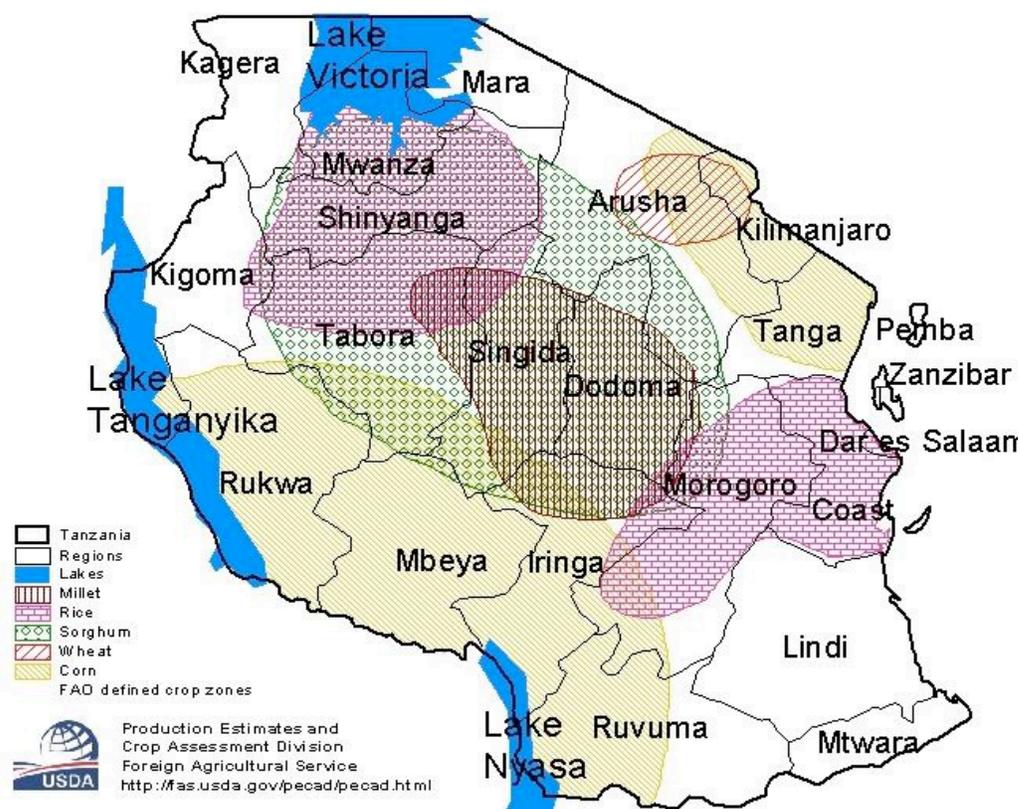


Figure 6: Map showing some key staple food production areas. Source: Adapted from Derksen-Schrock et al. (2011).

3.1 Food Crops

Production of food crops varies according to the agro-ecological conditions, which makes a particular area either food secure or susceptible to food insecurity. For example, the food survey report of 2014 shows that in the semi-arid regions (e.g. Dodoma and Singida) had more than 50% of the households food deficit (Mkonda and Xinhua, 2017). Farmer's choice of crops is influenced by many factors including soil quality and water availability, marketability and seed prices, household preferences, crop yield and pest resistance, as well as resource availability such as machinery and fertilizer (Derksen-Schrock, 2011). As mentioned, the most important food crops in Tanzania are maize and cassava, and the yearly per capita consumption of cassava (157 kg) is twice that of maize (73 kg) (Minot, 2010). However, because of its greater caloric density maize is more important as a source of calories, contributing 33% of the total caloric intake compared to 15% for cassava (Table 4). Maize alone accounts for over 70% of the national starch requirements and is the staple food for over 80% of the people in the country (Mkonda and Xinhua, 2017). In this regard, Tanzania is more dependent on maize than Uganda and Ethiopia but less so than Malawi and Zambia (Minot, 2010). Other important food crops are rice, wheat, and sorghum, each represent 4-8% of the caloric intake (Minot, 2010) (Table 4).

Table 4: Importance of staple foods in diet of Tanzania

| Commodity | Quantity consumed (kg/person/year) | Daily caloric intake (kcal/person/day) | Share of caloric intake (%) |
|-----------|------------------------------------|--|-----------------------------|
| Maize | 73 | 655 | 33 |
| Cassava | 157 | 298 | 15 |
| Rice | 16 | 154 | 8 |
| Wheat | 10 | 79 | 4 |
| Sorghum | 9 | 79 | 4 |
| Other | | 730 | 35 |
| Total | | 1,917 | 100 |

Source: FAO (2006) as adapted by Minot (2010).

It is evident from the text above and Table 4 that there are also a number of other food crops (e.g. bananas and sweet potatoes) consumed and grown in Tanzania, but for the purpose of this desk review only the most important staple food crops (maize, cassava, rice and sorghum) are reviewed and discussed in detail according to their importance and contribution to the national food requirements and economic development.

3.1.1 Maize

The importance of maize cannot be overemphasized as it contributes both to food security and income for most rural households and is grown in almost all agro-ecological zones (Suleiman and Rosentrater, 2015). According to the 2016/17 annual agricultural survey, maize was the most widely produced cereal crop and was grown by 99.7% of operators and planted on 70.2% of the area cultivated with annual crops in both seasons. In 2016/17 season, Kigoma region had the highest production of maize (371,945 tons) during the short rainy season, while Mbeya, region recorded the highest maize productions (578,230 tons in the long rainy season. According to Derksen-Schrock (2011), over 80% of Tanzanian

farmers grow maize on an average area of only about 1.3 hectares. On average 85% of maize farmers in are smallholders practicing traditional cultivation methods, 10% are medium farmers, and the remaining 5% are large farms, therefore majority of maize cultivation is smallholder production (ESRF and ECDPM, 2015).

About 30% of the maize-growing households are headed by women, at the same time women contribute about 70% of the total labor in maize production (Abate et al., 2013). Between 65 and 80% of all maize is consumed within the producing households and 20% to 35% enters commercial channels. In spite of huge investments in maize production and its importance for the country's food security and economic well-being, maize productivity has stagnated at a low level. For example, the average yield for 2010-2012 in Tanzania was 1370 kg/ha, much less than the Sub-Saharan African (SSA) average of about 1800 kg/ha (Abate et al., 2013). According to the 2016/17 annual agriculture survey, the average yield decreased further that season to 1000kg/ha. The low productivity in Tanzania is due to the total dependence on rainfall, poor fertilization, insects, pests and the use of traditional varieties (MAFC, 2013). Total production showed an upward trend starting in the beginning of the last decade, but this had been achieved through expansion of the area planted rather than by productivity gains (Figure 7). Despite the low productivity of maize in Tanzania, the country is the largest producer of maize in East Africa and is ranked among the top 25 maize producing countries in the world during the past two decades (MMA, 2018).

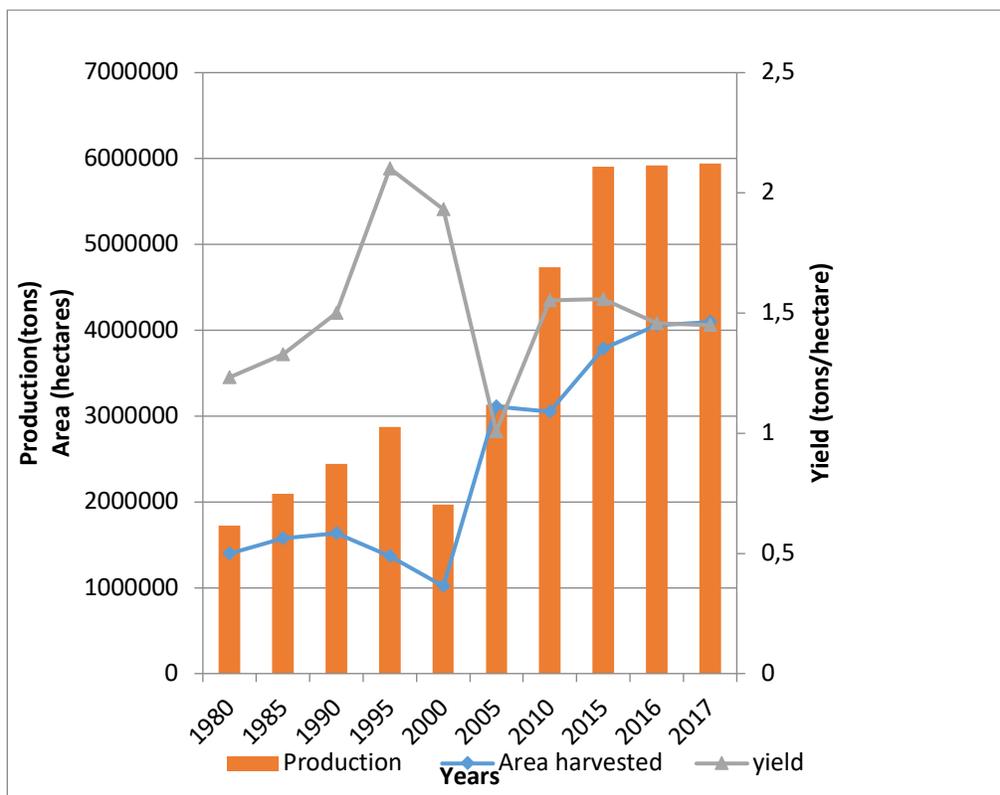


Figure 7: Maize production, yield, and area harvested in Tanzania 1980-2017. Source: FAOSTAT (2019).

3.1.2 Rice

Rice or paddy is the second most important cereal food crop in Tanzania in terms of production and was grown by 16.8% of the farming households in 2016/17 (URT, 2017a). According to EUCORD (2012), the paddy sector is among the major sources of employment, income and food security for Tanzanian farming households, and it also ensures a staple food supply for the urban population. Official data indicate that the total production in 2016/17 was about 1.35 million tons (URT, 2017a). Although Tanzania has not been self-sufficient in rice for many years, rice imports decreased from 16.5% of domestic production in 2001-2004 to 5.2% in 2005-2011 (FAO, 2015). Paradoxically, whilst rice is being imported as of current, there are still exports to neighboring countries, mainly Burundi, Kenya, Rwanda and Uganda (FAO, 2015). Approximately 30% of the crop is consumed by the producing households, some is sold at the local market and more than 60% is sold on commercial markets within the country, mainly in the capital Dar es Salaam.

The most preferred type for consumption is aromatic long grain rice, but there is also a demand for sticky white long grain rice (MAFSC, 2016). Rice is grown in most regions of the country but a major part of the production come from the Morogoro, Mbeya, Mwanza, Shinyanga, Tabora and Arusha Regions, each producing more than 100 000 tons per year. Paddy in Tanzania is mainly produced on small-scale farms of 2 to 2.5 ha (Makundi, 2017). About 74% of paddy area was planted by smallholder farmers in 2010, mainly under rain fed conditions (EAAPP, 2011). Only 26% of those irrigate between 2 and 2.5 ha often under schemes initiated and controlled by the government.

Figure 8 shows that rice production in Tanzania has increased significantly over the past two decades. This can be attributed to the introduction of irrigation technologies in many parts of the country and stable prices (MMA, 2010). Tanzania is the second largest producer of paddy in East Africa, after Madagascar (EUCORD, 2012).

Studies have shown that the increasing demand for and production of rice has the potential to bring significant positive changes to the livelihood of rural Tanzanians (Moshi, 2013). However, despite the importance of this crop a majority of farmers have continued to grow a number of traditional varieties, with long maturity and low yields, which are affected by irregular rainfall and pests (Moshi, 2013). According to FAO (2015) the main challenges facing the paddy sector in Tanzania are unawareness about new cultivars by farmers thereby affecting technology transfer; availability, distribution and cost issues for both improved seed, fertilizer and crop health products that have an impact on input delivery to the farm gate and high postharvest losses. In spite of the spread of irrigation, the lack of affordable irrigation technology is another challenge facing rice cultivation in Tanzania.

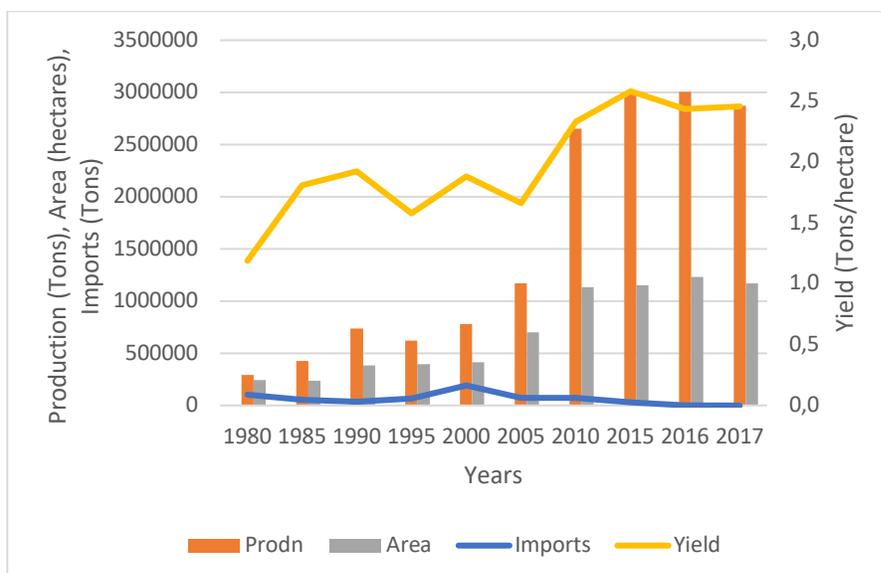


Figure 8: Rice production, yield, and area harvested and Imports in Tanzania 1980-2017. Source: FAOSTAT (2019).

3.1.3 Cassava

Cassava is an important subsistence food crop in Tanzania, but also a cash crop for many smallholder farmers. 84% of Tanzania's cassava production is consumed by humans, and most of the rest is used for starch making and livestock feed (Nyanda, 2015). Cassava is very drought-tolerant and can provide economic opportunities for smallholder farmers even under variable climate conditions (Peter, 2015). Cassava is thus produced in all agro-ecological zones, and Pwani (in eastern zone), Mara and Geita (in northwest), Mtwara (in southern zone), Kagera and Mwanza (in lake zone) have the highest production (Table 3). In 2012 Tanzania was the world's eighth largest producer of cassava, and the fifth largest in Africa (Coulson and Diyamett, 2012).

Both the root and leaves of cassava are of major nutritional importance in Tanzania. Smallholder farmers are the main producers of cassava tubers and leaves, and sell their cassava products to different customers along the value chain (Waziri, 2013; Anderson et al., 2016). Cassava roots are transported by middlemen for sale in urban centers (Bennett et al., 2012; Nyanda, 2015). Dried and pounded fresh cassava leaves are also marketed in urban areas. Farmers deliver the leaves to brokers, who then arrange for women to process the leaves before sale. There are some cases of women-organized cooperatives formed to dry and process cassava leaves (Bennett et al., 2012).

The current gap between production of and demand for cassava presents an opportunity for smallholder farmers. However, to do this they have to organize into groups for large-scale production and establish small-scale processing units to produce high-quality cassava products like breads and biscuits (Bennet et al., 2012; Anderson et al., 2016).

Despite the promising opportunities cassava production is constrained by several challenges not least at production-level. The majority of smallholder farmers producing cassava use traditional varieties and lack access to quality planting material, which result in low yields (Coulson and Diyamett, 2012). Other challenges are pest and disease damage, poor weed control, low soil fertility and limited use of fertilizers or manure. Very small-scale production activities, together with low productivity (Figure 9), make it difficult for smallholder farmers to meet the growing demand from buyers of cassava products and by-products (Kolimba, 2013). The production, yield, and area harvested of cassava is presented in Table 3.

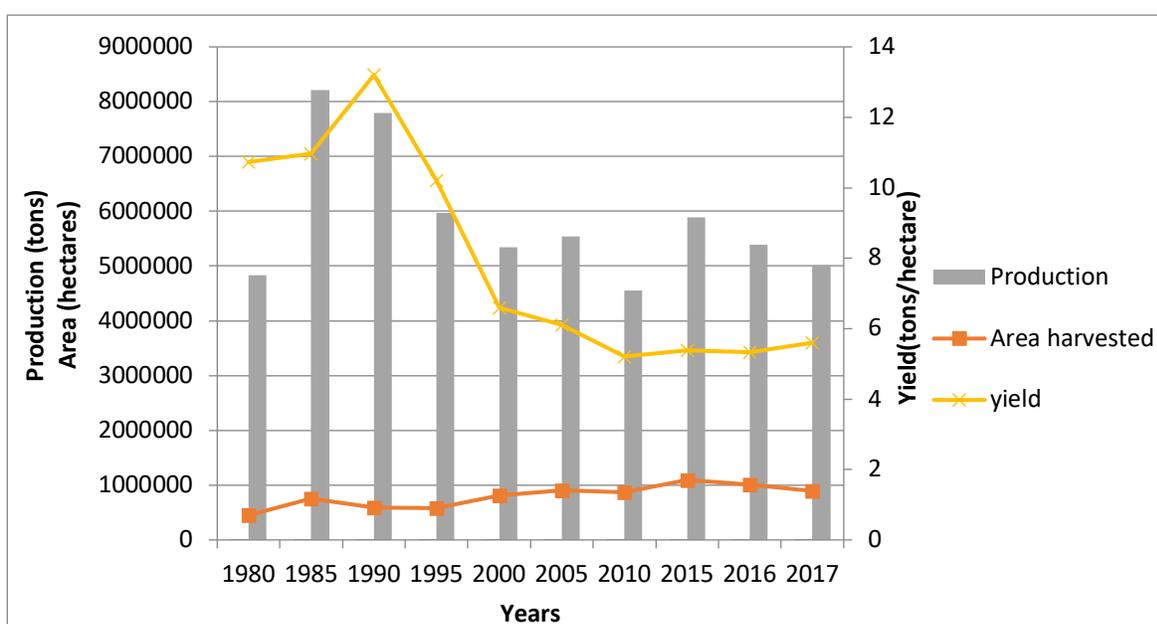


Figure 9: Cassava production, yield, and area harvested in Tanzania –1980-2017 Source: FAOSTAT (2019).

3.1.4 Sorghum

Sorghum is a drought-tolerant crop principally grown in the semi-arid areas of the country. The crop is grown in both Tanzania mainland and Zanzibar, but almost all (99.7%) of the 1,112,487 smallholder producers of sorghum in 2016/17 season live in Tanzania mainland (URT, 2017). The average yearly sorghum production in Tanzania was about 710 thousand tons between 2000 and 2017 (FAOSTAT, 2019). However, data from FAOSTAT show that sorghum production fluctuated strongly between 2000 and 2008, then recovered for a couple of years and started to drop again in 2014 (Figure 10). Nationwide, according to the National Annual agricultural census of 2016/2017 the area harvested with sorghum was 708,470 hectares of which 10.4% were harvested during the short rainy season and 89.6% during the long rainy season. Total production of sorghum was 465,078 tons in the 2016/17 season. More than 40% of the farmers in Lindi (in the southeast), Dodoma and Singida (in the central) and

Shinyanga and Mara (in the northwest) grow sorghum. These are regions experiencing periodic droughts, giving a relative advantage to drought-tolerant crops such as sorghum. In 2016/17 Shinyanga region had the highest production of sorghum (21,332 tons) during the short rainy season in 2014 compared to other regions, while Dodoma had the highest production (133,976 tons) during long rains. Generally, smallholder farmers primarily grow sorghum for home consumption, usually for direct human consumption, and for brewing of traditional beer. Sorghum is considered an “inferior” food and the per capita consumption is therefore higher in rural areas and among low-income households (Minot, 2010).

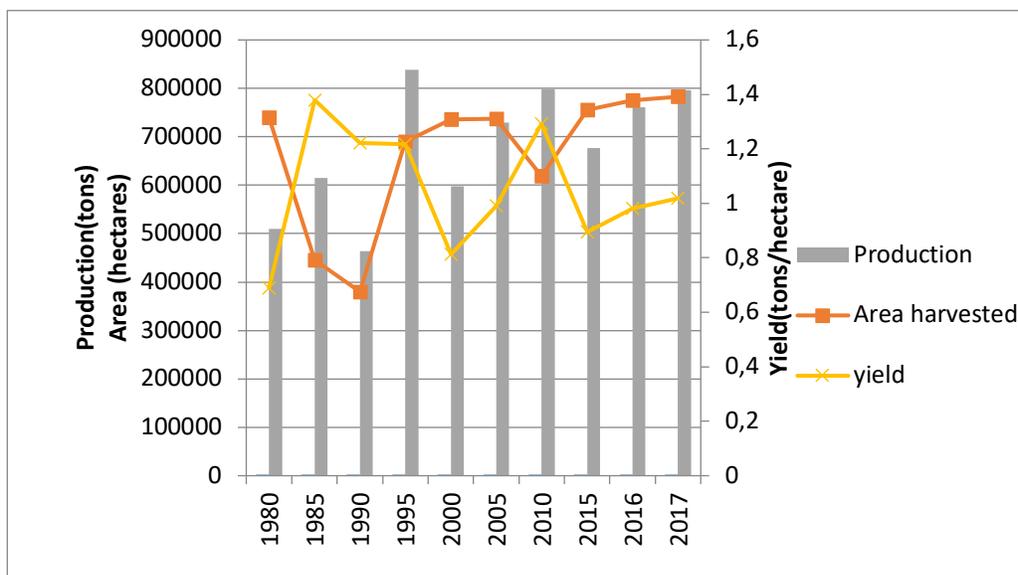


Figure 10: Sorghum production trends including area harvested and yield between 1980-2017. Source: FAOSTAT (2019).

3.2 Cash Crops

In Tanzania the traditional cash crops are tobacco, coffee, cotton, cashew nuts, sisal, cloves, sugar, tea, and pyrethrum (MAFSC, 2016). Sesame and sunflower are newly introduced cash crops adopted by some smallholder farmers (Luzi-Kihupi et al., 2015), but have, however, not yet become common due to the lack of value adding infrastructures (oil milling machinery). For the purpose of this literature review only coffee, tea, tobacco, sisal and sugarcane will be discussed. These cash crops were selected based on their perceived economic value among smallholder farmers as well as their contribution to GDP. Table 3 shows the production trend of these cash crops from 2005/06 to 2013/14.

Table 5: Agricultural production—Cash crops (in tons) 2005/2006 – 2013/2014

| | Tea | Sugar cane | Tobacco | Sisal | Coffee |
|-----------|--------|------------|---------|--------|--------|
| 2005/2006 | 32,000 | 229,620 | 51,970 | 26,800 | 54,000 |
| 2006/2007 | 30,000 | 263,317 | 56,500 | 27,794 | 34,334 |
| 2007/2008 | 34,446 | 192,535 | 65,299 | 30,934 | 48,869 |
| 2008/2009 | 32,698 | 265,434 | 55,567 | 33,039 | 43,000 |
| 2009/2010 | 34,165 | 276,605 | 58,702 | 33,208 | 62,345 |
| 2010/2011 | 35,000 | 317,000 | 78,000 | 35,000 | 60,575 |
| 2011/2012 | 33,000 | 260,055 | 126,624 | 33,406 | 33,219 |
| 2012/2013 | 33,700 | 286,380 | 74,240 | 23,344 | 71,200 |
| 2013/2014 | 33,000 | 293,011 | 100,000 | 41,104 | 48,599 |

Source: URT, 2016 (ASPD II)

3.2.1 Tobacco

Tobacco is the most important export crops in Tanzania which accounted for about 19% of agricultural exports in 2017 (BOT, 2018b). It is the main source of income for about 70,000 farmers, mostly smallholder farmers (Sumila, 2014), and generates substantial employment opportunities (Sumila, 2014). Raw tobacco represents Tanzania's most important exported cash crop growing from USD 169 million worth of exports in 2010 to USD 318 million in 2015 (URT, 2017b). Tobacco was initially produced only in some parts of the country principally in Urambo (Tabora), Shinyanga, Singida, Songea, Mpanda and Chunya (Mbeya). Currently, production has spread to neighboring districts, such as Kasulu and Kibondo (Kigoma), Sikonge (Tabora) and Tarime (Mbeya). Smallholder farmers usually sell their tobacco on contract to tobacco companies (Mwimo et al., 2016). Tobacco is usually sorted and graded based on the institutional arrangement between farmers and the company. However, classification and quality evaluation is done manually affecting tobacco prices and hence farmers' income (Mwimo et al., 2016). Other challenges that affect tobacco production by smallholder farmers in Tanzania include drought, high prices of inputs and marketing. Since tobacco is mainly produced for export, market turbulence leads to poor producer's prices, and contradicting grading systems because the markets are not well coordinated (Sumila, 2014). Figure 11 shows trends of tobacco production, harvested area and yields for the period 1980-2017.

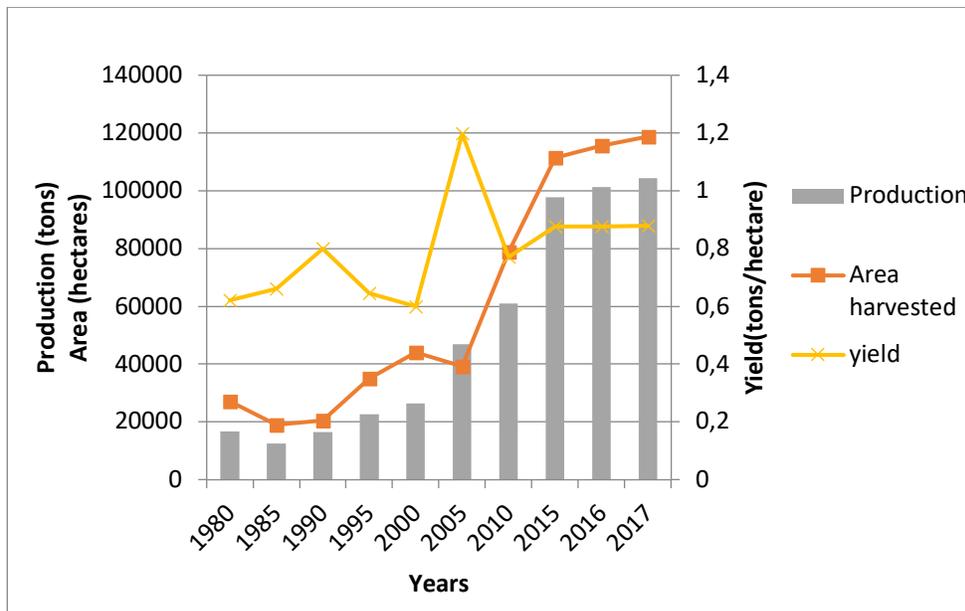


Figure 11: Tobacco trends of production, area harvested and yield 1980-2017. Source: FAOSTAT (2019).

3.2.2. Coffee

Coffee is the third most important export commodity after tobacco and cashew nuts and accounted for 12% of agricultural exports in 2017 (BOT, 2018b). The earnings from coffee export grew from USD 109 million in 2010 to USD 162 million in 2015 (TIC, 2018). Coffee production has averaged over 50,000 tons per year between 2000 and 2017 (Figure 12), and during the same period yields and harvested area passed through big fluctuations (FAOSTAT, 2019).

Smallholder farmers dominate the coffee production, despite having only between 0.5 and 2 hectares of coffee trees (Baregu et al., 2013). According to Tanzania Coffee Board (TCB), the total combined coffee production area for Arabica and Robusta exceeds 265,000 hectares. About 450,000 families produce coffee, which is approximately 90% of all coffee producers, the remaining 10% being large coffee estates (GAIN 2018). Coffee sales are mainly done at the farm gate by smallholder farmers to their cooperatives, farmer groups or private coffee buyers. Coffee is also directly exported; however, this benefits only the coffee estates that produce premium top grade coffee.

In Tanzania coffee is grown in various ecological zones, but mainly in the North and in the Western and Southern Highlands. The most important coffee producing regions are Kilimanjaro, Arusha, Mbeya, Ruvuma and Kagera (FAO, 2013). Coffee production in the Southern Highlands is mainly done by smallholder and in pure stand, while in the Northern and Western Regions, coffee production is intercropped with banana trees for shading. About 70% of the 48,982 tons of coffee produced in 2014 was Arabica, mostly produced in Kilimanjaro, Arusha, Mbeya and Ruvuma, while the remaining 30% was Robusta produced in Kagera (FAOSTAT, 2019). According to USDA Foreign Agricultural Service, production of coffee is forecasted to increase from 1.15 million bags in Marketing Year (MY) 2017/2018 to 1.30 million bags in MY 2018/19 due to a biennial bearing cycle and favorable weather conditions

reported by Tanzania Meteorological Agency (TMA) (Townsend and Mtaki, 2018). Unpredictable weather is the major challenge affecting coffee production, particularly the absence of adequate rains (Townsend and Mtaki, 2018). Other challenges include poor agricultural practices mainly by smallholder farmers, lack of access to financial services and inputs, as well as pests and diseases.

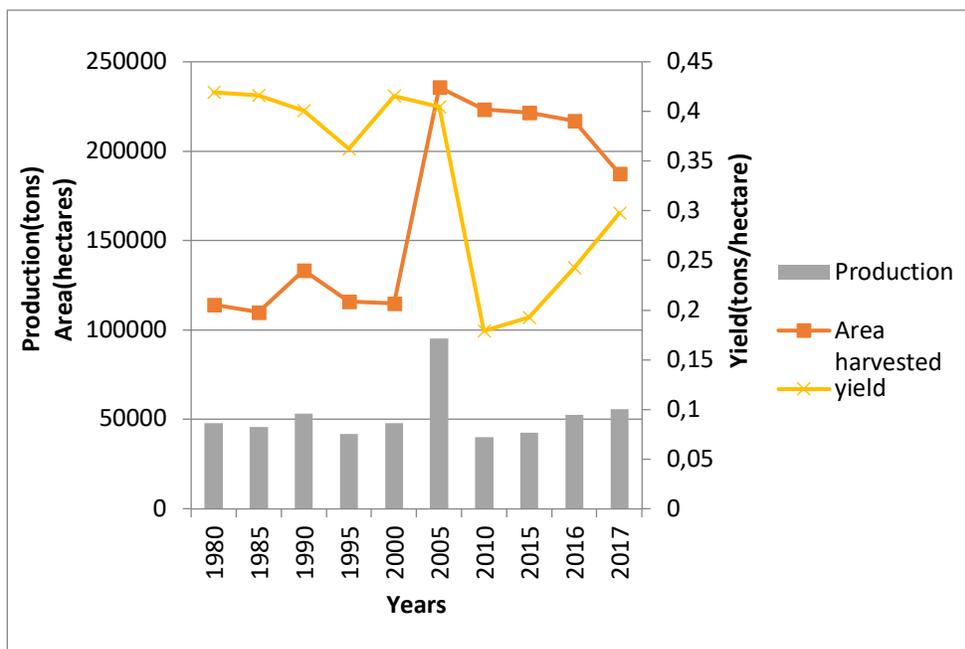


Figure 12: Coffee trends (Yield, Production and Area harvested) in Tanzania from 1980-2017. Source: FAOSTAT (2019).

3.2.3 Tea

Tea was the fourth most important export crop in Tanzania in 2017 according to the Bank of Tanzania and the Tea Board of Tanzania (TBT). It contributed about USD 50 million to export earnings of 5% of the total agricultural export revenue in 2017 (BOT, 2018). In the 2014/15 season Tanzania produced about 33,500 tons of tea making it the fourth largest tea producer in Africa and the seventeenth in the world (FAOSTAT, 2019). Tea is mainly grown in three agro-ecological zones: The Highland zone (Mufindi, Njombe, and Rungwe Districts), the Northeastern Zone (Lushoto, Korogwe and Muheza Districts) and the Northwestern Zone (Bukoba and Muleba Districts) (TBT, 2017). Over the years, tea production from both estates and smallholder farmers has increased (Figure 13) (FAO, 2016). About 90% of tea grown in Tanzania is exported and the major importers of Tanzanian tea were the United Kingdom, Kenya, and Pakistan (TBT, 2017).

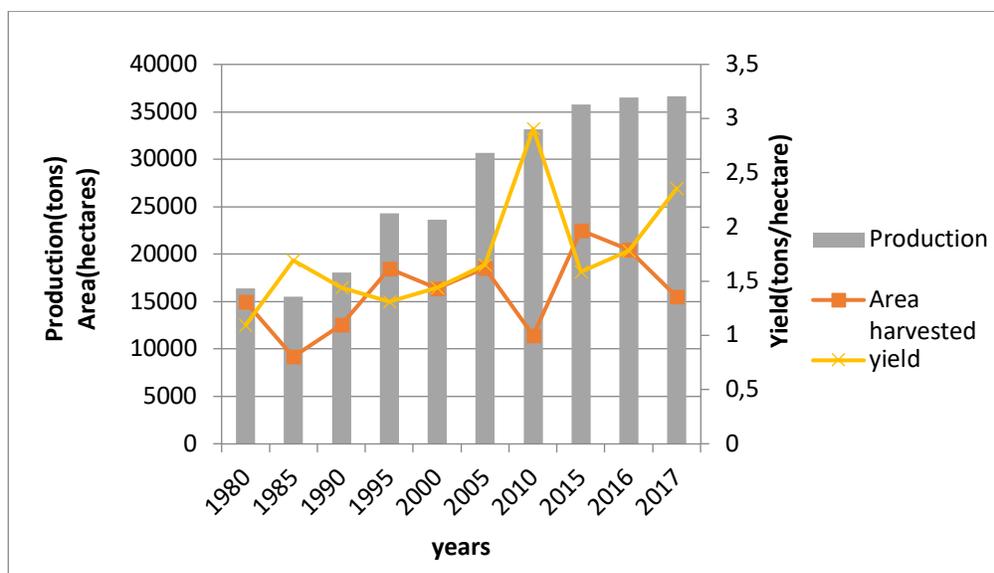


Figure 13: Tea trends (yield, production and area harvested) in Tanzania from 1980-2017. Source: FAOSTAT (2017).

3.2.4 Sisal

In the 1960s Tanzania was the world's leading producer of sisal and the crop provided one-third (USD 60 million) of the total agricultural export earnings (Hartemink and Wienk, 1995). Today sisal is the seventh most important export crop after tobacco, cashew nut, coffee, tea, cloves and cotton (BOT, 2018b) and contributed some USD 28.7 million to export revenue in 2017, equivalent to about 3% of total agricultural export revenue (BOT, 2018). In 2015, Tanzania produced about 40,000 tons of sisal and the country was the second largest producer in the world after Brazil (WGC, 2016). Data indicate that 43,000 tons of sisal was produced in the 2017/18 season (BOT, 2018b) and Tanzania exported 17,000 tons of sisal fiber during the same period, of which approximately 58% was exported to China.

The production of sisal increased between 2000 and 2017 as did the amount of yield for sisal production (Figure 14). The crop is traditionally grown mainly on large plantations that have processing facilities for decorticating and drying. At the national level, there are 22 estates (companies), with 43,320.11 hectares of land under sisal, located in Tanga, Morogoro, Kilimanjaro, and Arusha regions (Mwimo et al., 2016). Smallholder participation in sisal production gained importance with the liberalization of the sisal industry in the 1990s. They are engaged in planting sisal for hedges, smallholders in estates and smallholders growing sisal as a cash crop in non-estate areas. About 25% of sisal in 2012 was produced by smallholders (Committee on Commodity Problems, 2013). Initiatives to include more smallholders in sisal production so as to increase food and income security are increasing. An example is the setting up of a scheme in Kishapu District (Shinyanga region- lake zone) in 2007 by Oxfam and Katani Limited involving 16 500 farmers in 300 selected villages under the Tanzania Agriculture Scale Up (TASU) programme (OXFARM, 2014). These smallholders participate through Sisal contract farming scheme commonly known as Sisal Smallholder and Outgrowers Scheme (SISO) on small farms obtained by subdividing the agricultural lands by Tanzania Sisal Board. Smallholder farmers provide efficiency

advantages over plantations as they are linked with agribusiness expertise and marketing channels, thereby increasing their production and quality of the produce (Mwimo et al., 2016). Among the challenges of this system, unlike other cash crops, is that the sisal buyer does not support farmer's production through farm preparation and provision of inputs.

Among the opportunities that are available for smallholder farmers in the sisal production is the value addition. To add value, fibre can be used to produce twine, cordage for hay, packaging, baling, building and many other uses including carpets, wallcovering, doormats, car mats, buffing cloth used for polishing of metal and furniture, fine yarn, bag cloth, padding, mattresses and handicrafts (FAO, 2013). Farmers are required to invest in value addition, however, challenges such as agriculture financing, policy environment and modernization of infrastructure delay the full use of the opportunity (Birner and Resnick, 2010; Committee on Commodity Problems, 2013).

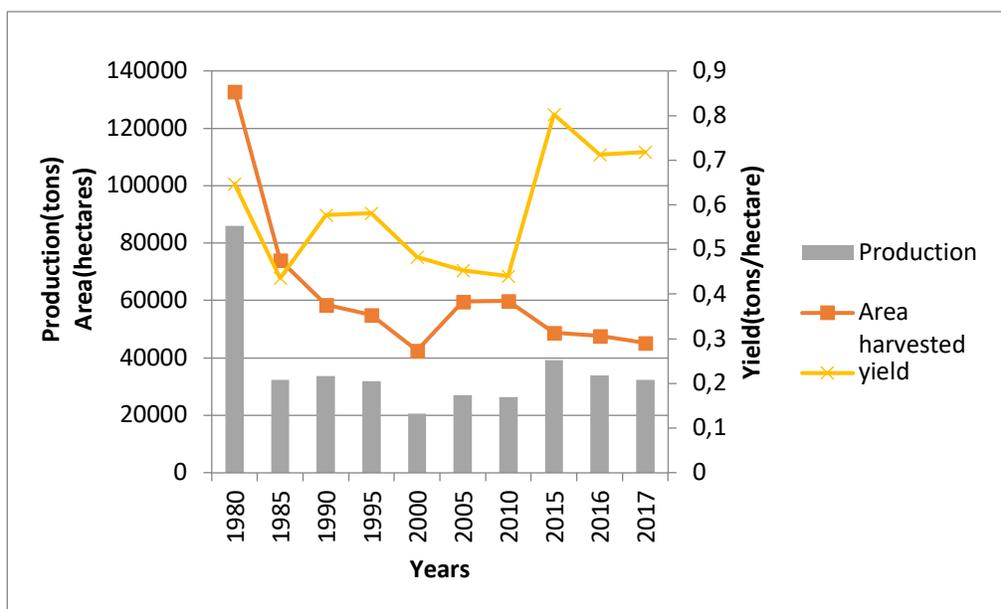


Figure 14: Sisal production trends (tons), yield (kg/ha) and area cultivated (ha) in Tanzania from 1980 to 2017. Source: FAOSTAT (2019).

3.2.5. Sugarcane

Sugarcane is the main source of sugar in Tanzania and it is one of the cash crops produced both for export and domestic consumption. According to official statistics, the supply of sugar was 291,000 tons in 2017, against a national demand of about 590,000 tons (ANSAF, 2018). In 2016/17 Tanzania mainland produced approximately 382,000 tons (90%) and Zanzibar 65,000 tons (URT, 2017a). The main sugar producing regions are Kagera (the largest planted area) and Morogoro (the largest producer), which also have sugar processing factories.

Large sugar producing companies, like Kilombero, Mtibwa, and Kagera Sugar Industries, own the majority of the sugarcane estates in Tanzania. Production per unit area (hectare) varies greatly due to management, ratoon stage, input costs, etc. According to Figure 15, production increased from

2,840,437 tons in 2015 to 3,001,080 tons in 2017 with yield decreasing from 37.12 tons/hectare to 26.14 tons/hectare as a result of a considerable increase in the area harvested as yields have fallen dramatically since 2005 (FAOSTAT, 2019). Although sugarcane is traditionally grown by large scale farmers, smallholder producers of sugarcane are engaged in outgrower schemes contracted by sugar processing companies like Kilombero Sugar Company Limited (KSCL). The small farm outgrowers are facing challenges particularly on sucrose measuring and governance issue, which are compounded by a number of other factors e.g. diseases and lack of extension service leading to poor quality of the cane (Akyoo, Jeckoniah, and Kabote, 2018). There are also a lot of complaints around bribery, lack of transparency and inaccuracy in the process eventually leading to very low earning for the farmers.

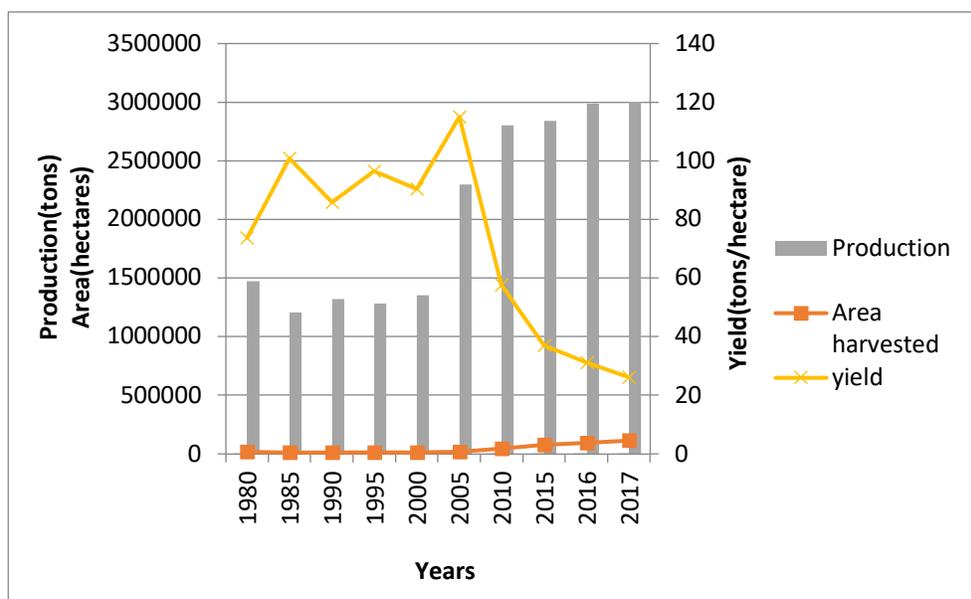


Figure 15: Sugarcane production, area cultivated and yield in Tanzania from 1980 to 2017. Source: FAOSTAT, (2019)

4. Livestock

Livestock is a key agricultural sub-sector and of big importance for many smallholders in Tanzania. Production of meat, milk and eggs also plays an important role for the national food supply. In 2015, Tanzania had the third largest livestock population on the African continent comprising of 25 million cattle, of which 98% were indigenous breeds, complemented by 17 million goats, 8 million sheep, 2.5 million pigs, and 36 million chickens (MAFSC, 2016). In 2017, the livestock sub-sector had a growth rate of 2.8% compared to 2.6% recorded in 2016 and contributed 6.9% in the overall GDP.

In 2010 the livestock sub-sector contributed about 30% to the agricultural GDP and 3.8% to the National GDP, seven years later the contribution to agricultural GDP decreased to 23% and to overall GDP increased to 6.9% (BOT, 2018b). About 275,469 (2%) farmers were exclusively involved in livestock production in 2014 while some 4.2 million households engage in both crop and livestock farming (URT, 2016). In Tanzania, 51% of households in 2011 were to some extent earning income from livestock

husbandry according to 2012 National Panel Survey (Covarrubias et al., 2012). In this review we will discuss cattle, poultry, pigs, sheep and goats.

4.1. Cattle

Cattle is the most important livestock in Tanzania with the third largest cattle population in Africa, more than 24 million heads (Suleiman, 2018). The population of cattle has increased over the years to reach almost 26 million in 2014 (Figure 16) (FAOSTAT, 2019). Smallholder farmers own most of the cattle (99%) and ranches own only about 1% of the entire cattle population in the country (Kurwijila et al., 2012). In fact, almost all of the smallholder farmers keep a small number of indigenous cattle. Although cattle keepers are spread over the entire country, a majority of the cattle is found in the Northern, North Western and Central regions of the country. Cattle are primarily kept for meat and milk production. Over the years, beef consumption has increased, probably due to rising incomes. In 2014, more than three million cattle were slaughtered for meat compared to two million in 2000 (FAOSTAT, 2019). Quantities and qualities of pasture is a major challenge in cattle keeping especially for farmers with big herds. Only 40% of rangelands is currently available for livestock grazing, the rest is inaccessible due to tsetse fly infestation or lack of adequate water resources (MAFSC, 2016). This has resulted in a number of conflicts over pasture land and access to water, which have led to deaths of both animals and humans (Mwamfupe, 2015). Livestock diseases such as tick-borne diseases also pose challenges to smallholder farmers.

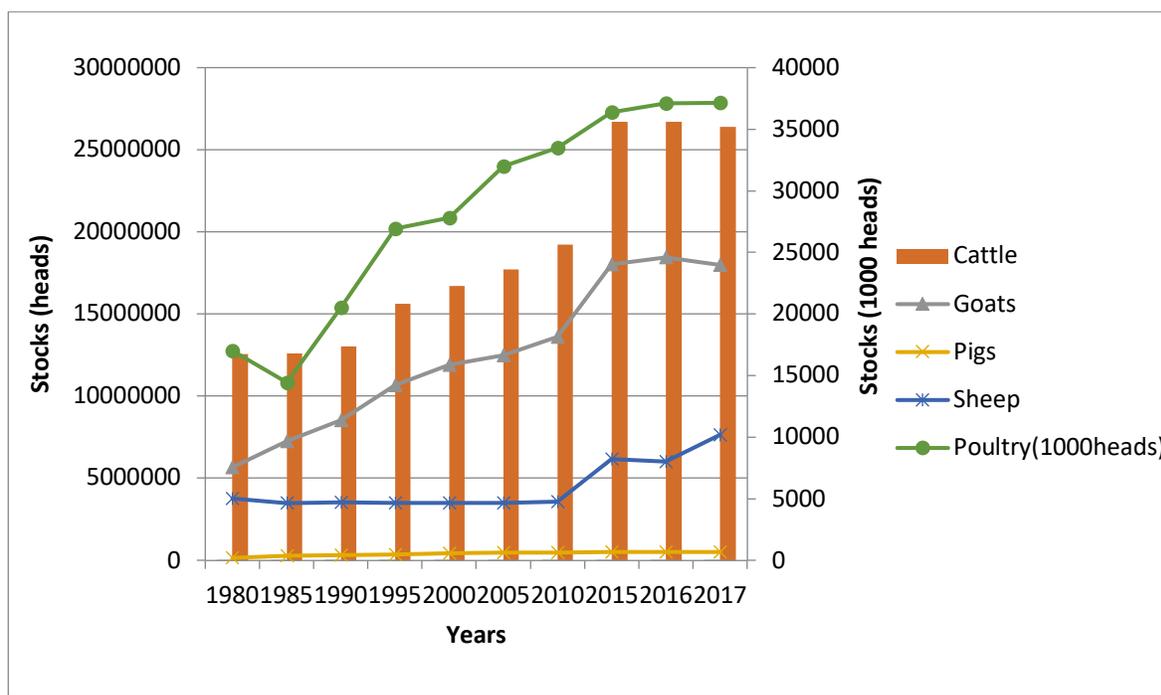


Figure 16: Cattle, Goat, Pig, Sheep and Poultry Stocks in Tanzania. Source: FAOSTAT (2019).

4.2 Poultry

In Tanzania poultry farming plays an important role in both urban and rural settings and makes a considerable contribution to household food security and nutrition (Silva et al., 2017). Tanzania had approximately 40 million chicken in 2015, of which 96% in Tanzania mainland and the rest in Zanzibar (URT, 2017a). As shown in Figure 13, chicken stock has been steadily growing between 2000 and 2017 (FAOSTAT, 2019). The majority (94%) are traditional indigenous breeds, which are principally kept in rural areas using traditional production methods (Ringo and Mwenda, 2018). A majority of households in Tanzania keep chickens and/or other poultry. This is more common in rural household, which usually keep a few indigenous chickens for family consumption and for sale. The African Chicken Genetic Gains (ACGG) baseline survey conducted in 2015-2016 showed the mean chicken flock size per household to be 27 chickens (Ringo and Mwenda, 2018). However, demand for local chickens remains high mainly due to the preferred taste of the chickens among Tanzanians and the generally trusted methods of raising the birds.

Poultry producers in Tanzania are mainly using three different systems. The traditional (indigenous) system, which allows local (indigenous) chickens to scavenge, is characterized by low productivity of eggs and meat. The improved family chicken sub-system involves keeping improved local and/or imported exotic breeds, usually in an intensive production resulting in moderately high productivity. The (large scale) commercial system, finally, is an intensive system of poultry production with high productivity, producing 270 eggs/bird/year compared to 50 eggs/bird/year in the traditional system (Silva et al., 2017). Chicken farming, including large scale production, is getting more common in urban areas, mainly to meet local market demand including from hotels, supermarkets and small grocery stores (Ringo and Mwenda, 2018).

Tanzania has ample space to expand poultry production and could accommodate an estimated 100 to 200 million additional birds (Ringo and Mwenda, 2018). According to the Tanzania Poultry Breeders Association (TPBA), local (indigenous) chickens have a high potential to improve food security and household income of rural people, particularly in the case of disadvantaged groups such as women and children (TIC, 2018). A further expansion of the indigenous poultry industry will go a long way to contribute to rural development with multiplier effects for employment, poverty reduction and livelihood improvement, especially for the rural poor (RIU, 2011). A major problem in this context has been that both government and donors have been focusing on cash crops and ignoring other available opportunities such as poultry production (Rutta, 2012). Other problems facing the poultry industry are poultry diseases, mainly due to lack of proper knowledge of the correct time for administering vaccination, or poor quality medications/vaccines used by smallholder farmers (Ringo and Mwenda, 2018). Low quality of feed is another challenge facing the poultry industry, as feed produced often lacks important nutrients. Policy environment is another challenge because most of the hatcheries do not follow the standard operating procedures. Market access and value addition are also challenging to most smallholder farmers (Silva et al., 2017). It is also argued that the unmet demand for chicken meat

and increase in the number of hatcheries for local chicken from 14 in 2011 to 26 in 2015 is a potential opportunity that could absorb a majority of the rural population (FAO, 2015).

4.3 Pigs

In Tanzania, pig production has been growing considerably in many parts of the country and contributes significantly to the livelihood of households. This has been due to the increased demand for pork especially in urban areas (Mbwambo, 2015; Kamaghe et al. 2014). Over 95% of the pigs in Tanzania are kept by small-scale producers with unit average of 3.04 animals (Suleiman, 2018). In 2017, approximately 500,000 pigs were reared in the Tanzanian mainland (FAOSTAT, 2019). Pigs accounted for 9% of the total livestock population in 2012/13 and were raised by 22.4% of households. Pig production in Tanzania is concentrated (about 54%) in the southern highlands (Mbeya, Iringa, Njombe and Ruvuma), (URT, 2015). Data from FAOSTAT (see Figure 16) indicate that the number of pig stocks is increasing slowly (FAOSTAT, 2019).

Despite its importance for improving household livelihood, pig production is constrained by a number of challenges including porcine diseases, poor feeding, lack of market, inbreeding, inadequate extension services and lack of capital (Mbwambo, 2015). To overcome these challenges, the government of Tanzania and other stakeholders should take measures to support research, provide extension services, train farmers in pig keeping, provide credit facilities and create a sustainable market within and outside the country (Maziku et al., 2017) as well as solving market challenges, improve trading capacity and facilitate smallholder pig production, the government should facilitate the construction of pig markets, slaughter facilities/abattoirs and fresh pork outlets.

4.4 Goat

Goats are mainly raised by low income smallholder households with average flocks of less than ten animals (Covarrubias et al., 2012 cited by Ringo and Mwenda, 2018). In 2017, the number of goats in Tanzania was 19,055,651 heads, which is an increase of some four million since 2007/2008 (URT, 2012, 2017a). In 2007/2008 the average number of goats per household was nine, but most households (45%) kept only between 1 to 4 goats and less than 5% of households had more than 24 goats but these accounted for about 40% of the total goat population (URT, 2012). The leading goat producing regions are Arusha, Manyara, Tabora, Dodoma and Shinyanga making up almost half (43%) of the entire goat population (URT, 2015).

The two major purposes of goat keeping in Tanzania are as a source of income by selling live animals and for household consumption purposes, especially the goat meat (Ruvuga, 2016). Other purposes include provision of milk and as a source of manure for agricultural purposes. Like other livestock producers, goat keepers experience a number of challenges, which include feeds scarcity, especially during dry periods, infectious diseases, market problems, theft and wildlife invasion.

4.5 Sheep

In 2017 there were approximately 5.5 million sheep in Tanzania (URT, 2017a). Manyara (in northern zone) and Simiyu (in northwestern zone) have the highest number of sheep. Most sheep in the country are of indigenous breeds, which are easily adapted to a wide range of agro-ecological zones and are thus widely distributed over the country (URT, 2015). They are also preferred by small farmers as they multiply and grow faster than e.g. cattle. Sheep are mainly kept to provide income and manure to the household. Challenges for sheep farmers include diseases, poor marketing infrastructures, their low genetic potential and the low quality of feed (URT, 2015).

5. Ways Forward to Address the Challenges Facing Smallholder Farmers in Tanzania

Tanzania is endowed with abundant fertile land for cultivation and good access to water resources, which gives it a big potential for agricultural production and export. The country also has, unlike many other African countries, been politically stable for a long time. In spite of all this, Tanzania has not been able to increase agricultural production enough to eliminate poverty and food insecurity (Leyaro and Morrissey, 2013). A report by Mount Meru group (2015) claim that the nation has continued to consume what it does not produce and produce what it does not consume despite having good agro-ecological potential. A study by Mwatawala et al. (2016) highlights that changes in agricultural-related technology is one of several challenges facing smallholder farmers and which prevents agricultural growth from translating into a reduction of poverty and food insecurity. Furthermore, IFAD (2017) argues that together with low productivity, there is also a lack of primary processing, and that market access is weak. The same study by IFAD further reveals that to date production gains have been achieved principally by expanding the area cultivated rather than by an increase of yield, and that this has driven deforestation and land degradation.

Another analysis of agriculture in Tanzania is given by a report included in the ASDP II, which identifies the major factors causing the low productivity of land and labour to be: (i) poor production techniques; (ii) underdeveloped markets, market infrastructure and farm-level value addition; (iii) poor rural infrastructure, including rural roads, telecommunications and electricity; (iv) inadequate agricultural finance, including public expenditure, (v) policy environment for imports and exports, and (vi) degradation of land and other natural environments as a result of poor agriculture practises and/or other human activity (MAFSC, 2016). The vision of 2025 for Tanzania states that [the economy should be] “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. A solid foundation for a highly productive, competitive and dynamic economy will have been laid”. However, this vision will, according to the government of Tanzania, only be achieved by a transformation of the agriculture sector through value addition of primary products, thereby influencing investments in industry and service sectors (MAFSC, 2016). Despite all the challenges facing smallholder agriculture, numerous possibilities can be explored to achieve the agricultural transformation in Tanzania. In a review, Suleiman (2018) discusses in detail a number of challenges facing the agriculture sector in the country, while in this review the possibilities are discussed.

5.1 Rural and Agricultural Investments

Investment in agriculture must be viewed in the wider economic context in which agricultural development occurs. Also, policies and programmes intending to promote investment in agriculture need to recognise that agricultural development depends on the simultaneous growth of agricultural

production and the value chains to which it is linked (FAO,2013). An example of this is the Southern Agricultural Growth Corridor of Tanzania (SAGCOT) initiative in the Southern corridor ², which seeks to attract more than USD 3 billion of investment in order to dramatically increase food production, increase annual farming revenues by more than USD 1.2 billion, benefit small-scale farmers and the rural poor, and establish Southern Tanzania as a regional food exporter (Kashaigili et al, 2016).

The government of Tanzania has adopted a multi-pronged approach to improve the agricultural sector as articulated in the Agricultural Sector Development Programme (ASDP) of 2010-2015 and currently ASDS II phase two of 2016-2021. The program employs a value chain approach as means of helping smallholder farmers to gain access to local, regional and global markets.

Good investment opportunities in the agriculture value chain will benefit smallholder farmers through contract farming and by providing knowledge and skills on good agricultural practises, irrigation technology, farm inputs and markets for their produce (Mwimo et al., 2016). There is also a great potential in improved knowledge and skills in food processing with simple technologies, which can reduce the problem of postharvest losses of perishable products and increase incomes of farmers (Bennett et al., 2012; Waziri, 2013). The horticultural value chain has the potential of creating employment opportunities at the household level, as well as at a national level, because it involves different activities from the farm gate to the final market and increase product value at each node (Jeckoniah et al., 2013).

The government of Tanzania is currently providing a number of fiscal incentives through Tanzania Investment Centre (TIC) which started in 1997 for both national and foreign investments in foreign trade related to agriculture (MAFSC, 2016). Incentives include reduction of taxes and tariffs on farm inputs including machinery, fertilizer, herbicides and pesticides to zero rate, in order to facilitate access by farmers. Agricultural machinery and farm implements have favourable investment allowances and deductions, including a 100% capital allowance for costs related to machinery and other equipment needed for land clearing and construction of irrigation systems. Additionally, there is a 50% capital depreciation allowance for agricultural machinery. Also, the deferment of Value Added Tax (postponement of payment of VAT) in respect of capital goods including buildings, machines, equipment, furniture and fixtures for investors gives relief of expenses during importation of capital goods (TIC, 2018b). These incentives will benefit smallholder farmers, either directly or indirectly, through investment in Agro-industry and Agro-Processing, development of out-growers to complement the sources of raw materials for the industries, and improvements in Research and development in crops cultivation. For example, Kagera Sugar Limited is among the companies that has invested about \$190 Million over the 2001-2018 period in sugarcane growing and processing. It has succeeded to improve power generation

²The Southern corridor that cuts through the coastal plains, Kilombero and Ruaha river valleys, as well as the hills and valleys of the Southern Highlands and Usanguhas has considerable underutilized agricultural potential and is characterized by low productivity, low levels of investment, and high rates of poverty (Kashaigiri et al., 2016).

capacity, expand sugarcane milling capacity and install center pivot irrigation systems on 3,600 hectares of the sugar estate. The company supports smallholder farmers through out-grower schemes and provision of employment in plantations and factories (TIC, 2018c).

5.2 Access to Markets and Market Information

Many agriculture crops are no longer only produced for the local community, but also for regional, national and international markets (Salami et al., 2010). This has been facilitated by recent improvements in the use of technology to share information. Local radio stations, mobile phones, social media and the internet have increased the availability of reliable and timely market information to both sellers and buyers of agriculture produce (Tende et al., 2017). In Tanzania, mobile phones are used to share prices of both cash and food crops in different locations. This information facilitates for farmers to plan and set the right prices for their produce. There has also been a development whereby trade unions, farmer groups, including village community banks, and other actors have used their platforms to ensure that market information is shared among farmers and consumers of farm products. Partnerships are an important aspect to be considered as an opportunity for overcoming agricultural challenges faced by farmers. Public-Private Sector Partnership (PPP) could provide agriculture support services through consultancies and sales and installation of various technologies. PPP arrangements can also provide an opportunity for farmers to purchase affordable agriculture technologies and other inputs. One example is a Southern Agricultural Growth Corridor of Tanzania (SAGCOT), an initiative started in 2010 and running for 20 years up to 2030, a PPP to improve the business enabling environment to promote agricultural growth in the country's southern corridor. The achievements include over 190,000 hectares of land now under improved technologies/agriculture practices, the productivity of rice per acre for participating farmers nearly doubling, and at least 450,000 people having benefited from Feed the Future value chain interventions (Feed the Future, 2019).

5.3 Access to credits

According to PCMA (2011) lack of financial credit to farmers means that agricultural products continue to be processed using traditional techniques, which are labour-intensive, yield poorer quality products and fetch a low market price. Access to credit by smallholder farmers is still low despite some initiatives like the disbursement of 22 billion Tanzanian Shillings (Tshs 22 billion) to the Tanzania Investment Bank for agriculture financing in 2013 (MAFAP, 2013). The big need for access to affordable credits presents an opportunity for smallholder farmers to invest in for example improved technologies so as to increase productivity. It is against this background that various government agricultural programmes, such as Agricultural Sector Development Programme (ASDP), KILIMO KWANZA, Southern Agricultural Growth Corridor of Tanzania (SAGCOT), National Strategy for Growth and Poverty Reduction (MKUKUTA), and Property and Business Formalization Program (MKURABITA), have set strategies which aim to improve the livelihoods of farmers (URT, 2010). Through these programmes' farmers have been advised to form groups, thereby benefitting in terms of trainings and access to funds (Ascent Consulting Groups, 2016).

One of the actors is the village community bank (VICOBA), which through its local branches is mainly involved in lending schemes with a focus on fostering participant's ability to innovate and manage viable income generating activities through entrepreneurship training (SEMIT, 2008; Lushakuzi et al., 2017). However, from 2012 the possible sources of credits increased when the Tanzania Agricultural Development Bank started targeting smallholder farmers to achieve vibrant enterprises throughout agricultural value chains, a process which was expecting to bring positive results (Njenga et al., 2013). Currently, the bank has funded 3 irrigation projects, have issued 283.1 Billion TZS countrywide, have reached 822,143 beneficiaries and have started to support farmers who lack collateral (The Citizen, 2019).

5.4 Irrigation Technologies

Tanzania has unexploited water resources in most parts of the country, including rivers, lakes and underground water, which could be used for irrigation and other farm uses. Studies have shown that Tanzania has an irrigation potential of about 29.4 million hectares with varying degree of agricultural potential, 2.3 million hectares classified as high potential and 4.8 million hectares with medium potential (Kaburire and Ruvuga, 2011). Although it is theoretically possible to irrigate 29.4 million hectares, less than 5% of this area was irrigated in 2012 (URT, 2013). There are several plans and strategies, such as SAGCOT, ASDS II and KILIMO KWANZA, which have been put forward to facilitate for smallholder, medium and large-scale farmers to adopt irrigation technologies and use it to enhance productivity and profitability (MAFSC, 2016). The resulting projects will study the conditions in the areas where irrigation is possible and promote the appropriate irrigation methods such as gravity, pressurized systems for drip, sprinklers or other systems (MAFSC, 2016). This intend to ensure that all water sources that could be used for irrigation are promoted and that storage facilities are built to ensure preservation and storage of water. There is also a possibility to rehabilitate existing traditional small-scale irrigation schemes. Such schemes, like the catchment areas and wetlands in the Southern Highland regions, are likely to contribute to increased productivity and profitability of the agriculture in the area (URT, 2006). For instance, Amos et al (2005) found that traditional irrigation farming (vinyungu) is becoming increasingly important in Southern Highlands. In these areas, when crops and vegetables such as maize, beans, and tomato were grown together and irrigated, the farmers obtained maximum profit and their incomes were increasing. Another way to ensure that the traditional irrigation scheme remains functional is to introduce and promote rainwater harvesting technologies. Through PPP-arrangements farmers could access irrigation technologies, with the private sector supplying the technology, installation and maintenance at a fee, affordable to smallholder farmers. A good example is the rice irrigation canal at Mbarari in Mbeya (URT, 2016b).

5.5 Access to Extension and Research Services

One of the principal aims of agriculture research is to test and disseminate agriculture technologies through extension services to farming communities. For many years this research in Tanzania was

focused on cash crops, but after independence more emphasis has been given to food crops (Coulson and Diyamett, 2012). Focus at this point was changed to ways to increase productivity of food staples through the development of simple technologies that could be used by smallholder farmers. However, it is now clear that agriculture research should be more client-oriented, meaning that it should address challenges and problems raised by farmers including major outbreaks of plant and animal diseases (MAFC, 2013). This research should also be aligned with extension services so as to reach a wider range of smallholder farmers and other actors in the value chain (Coulson and Diyamett, 2012). In order to meet the demand, the government has established research stations all over the country, called Agricultural Research Institutions (ARIs), focusing on different aspects of agricultural development (MAFSC, 2016).

Findings from these ARIs and other agricultural research centres have ensured that farmers received information or extension services on ways to improve productivity and production (ESAFF, 2013). Farmers are involved in selection of a technology package including choice of seeds, and other agriculture inputs. Additionally, farmers have received new technologies aiming at enhancing farm income, minimizing post-harvest losses and improving food security. Some positive results of extension services can be found for example in a 2018 report by Farm to Market Alliance Tanzania that was launched in 2015; 34,400 farmers have been trained in good agricultural practises, 8000 farmers have been trained in post-harvest management practices, 5,300 items of post-harvest equipment have been purchased by farmers attending trainings (FtMA, 2018).

The development of District Agricultural Development Plans (DADPs) may be used by the communities to identify agricultural problems, their causes, effects and possible solutions. Another way of identifying research needs and to ensure effectiveness, collaboration and tapping technology experience, is to address regional and international priorities, including initiatives from programmes/strategies or organizations, such as New Partnership for Africa's Development (NEPAD), Comprehensive Africa Agriculture Development Programme (CAADP), Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA), and the Consultative Group on International Agricultural Research (CGIAR). The Tanzanian government has also committed itself to increase research funding through its ASDS II strategy and strengthen extension services (such as farmer field schools, Ward Agricultural Resource Centres) which increase the possibilities to address the many challenges faced by small farmers (MAFSC, 2016). National research institutions at a regional level and their priority crops are shown in Table 6.

Table 1: Agricultural Research Institutes in MAFC

| Zone | Regions | Research Institutes | Crops |
|-----------------------------------|---------------------------------------|--|---|
| Eastern | Dar es Salaam, Morogoro, Pwani, Tanga | Ilonga-Kilosa (Zonal HQ), KATRIN-Ifakara, Dakawa-Morogoro, Mikocheni-DSM, Kibaha-Pwani, Mlingano-Tanga | lowland maize, simsim, cowpeas, pigeon peas, sorghum |
| Western | Kigoma, Tabora | Tumbi-Tabora | Agroforestry, maize, rice, sorghum |
| Northern | Arusha, Kilimanjaro, Manyara | Selian-Arusha (Zonal HQ), HORTI-Tengeru-Arusha | maize, wheat, beans, pigeon peas, indigenous vegetables, Fruit propagules |
| Southern Highlands | Iringa, Mbeya, Rukwa, Ruvuma | Uyole-Mbeya (Zonal HQ), Kifyulilo-Mufindi, Seatondale-Iringa | Maize, Beans, Soyabean, Wheat, horticultural crops, potatoes, rice |
| South | Lindi, Mtwara | Naliendele-Mtwara | Cashewnuts, cassava, simsim, groundnuts, sorghum |
| Central | Dodoma, Singida | Makutupora-Dodoma (Zonal HQ), Hombolo-Dodoma | Sorghum, millets, grapes |
| Lake | Kagera, Mara, Mwanza, Shinyanga | Ukiriguru-Mwanza (Zonal HQ), Maruku-Bukoba | Cotton, rice, chickpeas, banana, cassava, maize |
| Sokoine University of Agriculture | Morogoro | | Cereals, legumes, horticultural crops including fruit propagules |

Source: (Eastern and Southern Africa Small Scale Farmers' Forum (ESAFF), 2013)

5.6 Farmers groups and representation

Farmers groups are commonly formed within externally funded programs. This implies that logistic support and sensitization to supporting the process of group formation is seen as the key to success (Pelimina and Justin, 2015). From the project and program perspective, these groups are mainly used to reach as many farmers as possible in a relatively short time and maximize the effectiveness of technology generation and diffusion. It is also a way to provide more relevant extension services to members and assist in creating linkages to both private and public Agriculture Service Providers (ASP). From the farmers' perspective, the main purpose of these groups is to promote members' interests and enable them to make decisions (Lema and Kapange, 2006). There are many farmers organizations with different formal status, some registered with the authorities, others just informal groups. MVIWATA (Mtandao wa Vikundi vya Wakulima Tanzania – National Network of Small-Scale Farmers Groups in Tanzania), with approximately 200,000 farming household members, is a farmers' organization that unites smallholder farmer groups in order to have a common voice to pursue the economic, social, cultural and political interests of smallholder farmers (Kaburire and Ruvuga, 2011). The organization wants to be an effective representative of farmers' interests and to engage in national fora for the agricultural sector. It has very strong linkages to agriculture research and development agencies/partners and is very active in accessing sources of information and knowledge for innovation sources. There are also other important farmers' groups, particularly those specializing in specific commodities, such as Kilimanjaro Native Coffee Union (KNCU), and Association of Kilimanjaro Specialty Coffee Growers Ltd (AKSCG). In several of the national agriculture programs (e.g. NSRGP, ASDP I, and ASDP II), farmer field schools (FFS) and farmer extension groups (FEG) have been highlighted as instruments to maximize the effectiveness of various policies and programs. These groups are

organized and maintained by extension workers under the Ministry of Agriculture (MAFC). Through FFS and FEGs farmers have realized that their unity enables them to engage in more productive farming practices, use new technologies and take advantage of increased market opportunities (URT, 2016). When farmers are addressed at group level, skills and technology retention is higher than when such knowledge is given individually. For example, a study by Pelimina and Justin (2015) on contribution of farmer's organizations to smallholder farmers' welfare in Kasulu district, Kigoma region (western zone), report that more farmers who were in groups were able to access more extension services, inputs and market information and thus increase their productivity. Other achievements of farmer groups include the improvement of rural markets as conceived by MVIWATA through the support of the European Union. Two markets, the Mkata market in Tanga region and Igagala market in Iringa region, were constructed and two storage facilities at these two markets were established (Okore, 2014). Moreover, this project saw the establishment of a market information system (MAMIS SMS Trading) enabling farmers and traders to access information on prices and available crops via a short messaging service (SMS).

6. Conclusion

Agriculture is the largest contributing sector to the GDP in Tanzania and the major source of income for a majority of Tanzanians. Smallholder agriculture, including both crop and livestock farming, dominates the agriculture sector in the country. There are many challenges facing smallholder farmers and the agriculture sector in Tanzania, including lack of reliable markets and credits, poor extension services, climate change and other, policy related, challenges. Despite the challenges there are also a number of opportunities. Market information and partnerships, particularly through PPP, provide an opportunity for improvements in agriculture productivity and income generation. A wide range of information is currently being utilized by smallholder farmers, including the use of text messages on food prices and availability of agriculture inputs, as well as information on crop and livestock diseases. Investment opportunities, access to credits, in particular loans where farmers are sometimes allowed to use their produce as collateral as in Tanzania Agriculture Development Bank, as well as affordable technologies for the entire value chain also promises future opportunities for key positive changes for smallholder farmers in the country. Provision and sharing of technological advances with smallholder farmers and through extension services is one way to ensure that farmers get access to new technologies, and contribute to identifying solutions to agriculture challenges through involvement in research. Current government efforts to develop infrastructure like roads and railways may benefit farmers as improvements in these infrastructures will facilitate transportation of produce from surplus to deficit areas. Supply of agricultural inputs at subsidized prices, development of markets, and increasing financing possibilities for agriculture are paramount to make sure smallholder farmers benefit from agriculture production and that the national food security situation is improved.

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