VCA4D
VALUE CHAIN ANALYSIS FOR DEVELOPMENT

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COFFEE VALUE CHAIN ANALYSIS IN THE SOUTHERN HIGHLANDS OF TANZANIA

FINAL REPORT
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Painting of Coffee Value Chain (courtesy City Coffee Company/HRNS)

Preface and acknowledgements

This report provides an integrated assessment of the economic, social and environmental aspects of the coffee value chain in the Southern highlands of Tanzania. It is based on field work and data analysis by an interdisciplinary team of AGRINATURA experts, in close cooperation with national experts from Sokoine University of Agricultural (SUA).

We would like to acknowledge the cooperation received from public, private and civic organizations involved in the Tanzanian coffee sector. Special thanks to the authorities of the Tanzanian Coffee Research Institute (TaCRI), the Tanzania Coffee Board (TCB) and staff from the District Offices in Mbozi, Mbeya and Ileja. We also thank the EU Delegation in Dar-es-Salaam for their support to this study.

The members of our field teams (Dr. Zena Mpenda and Ms Lucia Madala and their colleagues) played crucial role in collection and analysis of valuable data from actors of coffee value chain in the three districts. Their efforts and commitment is highly appreciated. However the collection of data and information would not have been possible without the willingness of numerous farmers, cooperative leaders, village members, local NGO representatives and coffee plant managers that shared their insights with us. We are extremely grateful for their hospitality and openness, and trust that their views are adequately reflected in this report.

Wageningen/Brussels, May 2018

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List of abbreviations

AMCO	Agricultural Marketing Cooperative
ASDP	Agricultural Sector Development Plan
ASDS	Agricultural Sector Development Strategy
CBB	Coffee Berry Disease
CLR	Coffee Leaf Rust
CRDB PLC	Cooperative and Rural Development Bank Public Cooperation
CPT	Coffee Platform Tanzania
CPU	Central Processing Unit
CVC	Coffee Value Chain
CWD	Coffee Wilt Disease
DALDO	District Agriculture And livestock development officer
GAP	Good Agricultural Practices
HNRS	Hans R. Neumann Stiftung
HP	Home Processed
KCB	Kilimanjaro Cooperative Bank
KNCU	Kilimanjaro Native Cooperative Union
MKUKUTA	Tanzania's Growth and Poverty Reduction strategy
NMB	National Micro Finance Bank
NCVIS	National Coffee Voucher Input Scheme
NGO	Nongovernmental Organization
PCB	Private Coffee Buyer
NCC	National Coffee Conference
PCS	Primary Cooperative Society
SACCOS	Savings and Credit Cooperative Society
SAGCOT	Southern Agricultural Growth Corridor of Tanzania
TaCRI	Tanzania Coffee Research Institute
TARURA	Tanzania Rural Roads Agency
TAWOCA	Tanzanian Women Coffee Association
TCB	Tanzania Coffee Board
TCDF	Tanzanian Coffee Development Trust Fund
TCGA	Tanzania Coffee Growers Association
TZS	Tanzanian Shilling
TCA	Tanzania Coffee Association
USD	United States Dollar
VICOBA	Village Cooperative Bank

Executive summary

Within the framework of the Agrinatura – EU-DEVCO Value Chains for Development (VCA4D) program, a field study has been conducted with the objective to analyse the performance and prospects of the coffee sector in the Southern Highlands of Tanzania. The study addressed the economic, environmental and social aspects of the coffee value chain in order to get insights in its contribution to economic growth, and to assess the sustainability and the inclusiveness of the coffee sector in Southern Tanzania. This analysis allows to understand relevant development perspectives and permits to identify at which stages of the value chain and for which particular actors, investments and support could be helpful to create advantages and/or eliminate constraints and bottlenecks.

The key research questions that guided our analysis can be responded in the following way:

- Contribution of the coffee VC to economic growth?

While accounting for just 3.5 percent of Tanzania's total exports, coffee is not quite the backbone of the Tanzanian economy, but where it is grown it is often the only cash crop that is capable of providing funds to support better education, greater investment in the farm and home and a degree of upward social mobility.

The Coffee Value Chain (CVC) in the Southern districts of Tanzania generates a total added value of TZS 53.7 billion (equal to USD 23 million). This represents 0.7% of the total regional GDP. The rate of integration is above 71%, showing that the production of coffee generates much more incomes within the national economy than imports.

The impact on the balance of trade is very positive. However, the share of coffee in exports is gradually declining and imports of fertilizers, machinery and packaging bags tend to reduce net generation of foreign exchange. Export opportunities to premium market (Japan) and to certified outlets (organic, voluntary labels) may offer prospects for increasing value-added generation.

The VC is sustainable and viable within the international economy (NPC = 0.8 and DRC = 0.15).

- Is this economic growth inclusive?

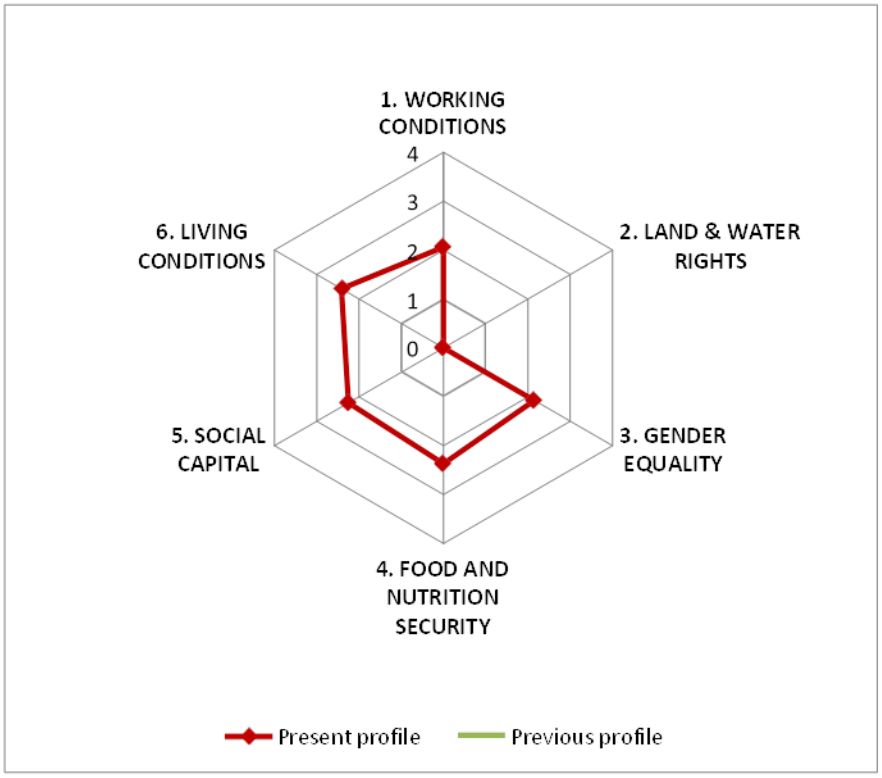
The largest share of coffee is produced by smallholder farmers. Paid labour costs represent up to 20 percent of farm production value, whereas family labour inputs is only rewarded after sales. This is frequently delayed and incurs additional levies. Input costs are rising for disease control, fertilization and irrigation requirements (also related to climate change). Calculations indicate that profitability of the different types of farmers (small, medium, large and estate) range between 25 and 40 percent. Organic farming is potentially higher due to the lower purchased input costs, despite having a lower volume of coffee production. The level of initial investment needed, in terms of lead-in-time, land and money makes coffee still a challenging crop for new farmers to become involved, but that might require decisive support in terms of input use, quality management and market access to be able to reap the potential benefits. All actors in the VC, including downstream VC actors, make profit.

In addition, the VC generates many jobs. Wages represent up to 20 percent of farm production value. Total costs for salaries accounts for TZS 10.4 billion, this equals 2.7 million working days by year.

- Is the coffee VC socially sustainable?

From a social perspective, the CVC benefits an estimated 370,000 – 450,000 small-scale farmer producers and a mostly informal workforce, of whom up to 80 percent are likely to be women. Coffee income accounts for around 80 percent of total annual cash income for smallholder farmers in Songwe and Mbeya Regions, and represents one of the highest value livelihood options currently available to most SHF in the region. Coffee income benefits the local economy as a whole and at SHF level, is often invested in farm improvements, housing and children's education. It can also provide access to credit, enable savings and act as a safety net against food insecurity and health care needs. The CVC also present opportunities for small-scale investment, small businesses and entrepreneurs. Women do not appear to receive commensurate access to the benefits of coffee production, compared to their contribution to its production and processing. While considerable work has been done to include youth in coffee related initiatives, they face a number of barriers. Cash flow and access to financial services, including credit and loans, are also potential barriers to SHF realising the full growth potential of coffee and improving yield.

In terms of social sustainability, the VCA4D study highlights a number of areas which suggest there are inherent vulnerabilities within the CVC that pose a risk for long-term sustainability, in addition to any challenges posed by climate change. Coffee has the potential to allow SHF to develop positively, in terms of investment in the education of the next generation, in improved farming practices and other assets including housing and transport. However, the current dynamics of cash flows at household level, workload and gender issues around access to and control over assets and the income generated from coffee prevents the CVC from achieving its full potential.



- Is the VC environmentally sustainable?

In the environmental analysis, different scenarios of coffee production system were built to better capture the influence of different framing practices on the result. The analysis has revealed that the environmental impacts of small farms, with irrigation and combined-use of organic and mineral fertilizers, are always lower than the impacts of estates and small farms without irrigation. The similarities (organic fertilizers, no herbicides, no fungicides, no pesticides) between this production system and organic production leads to think that the environmental impact of organic coffee will be lower than conventional coffee. However, detailed cultivation data on organic coffee are needed to draw a robust conclusion.

The environmental impact of the 4c certified coffee is comparable to conventional coffee. This is mainly to the fact the certification scheme does not provide threshold values on the application rates of mineral agrochemicals. The environmental impacts of estate coffee are in general higher than impacts of coffee from small farms. In fact the average yields in estates are not high enough to compensate the environmental impacts of the higher application rates of mineral agrochemicals.

In conclusion, coffee from small irrigated farms with limited-use of mineral fertilizers combined with organic fertilizers seems to the most sustainable production system. The environmental sustainability in estates, medium and large farms could be enhanced by improving the productivity and replacing a certain share of mineral agrochemicals by organic fertilizers. The use of manual weeding could also help reducing the application rate of herbicides which are the main contributor to human health impact. Shifting from conventional wet processing to eco-pulping could considerably reduce the impact of the coffee value chain on water consumption and non-carcinogenic human health. The

environmental performance of the production systems is more correlated with the agricultural practices than the size of the farm. Thus, the agricultural practices combined with their corresponding yields would be the convenient criteria to assess the environmental sustainability of coffee production systems.

1 Functional analysis of the coffee value chain in Tanzania

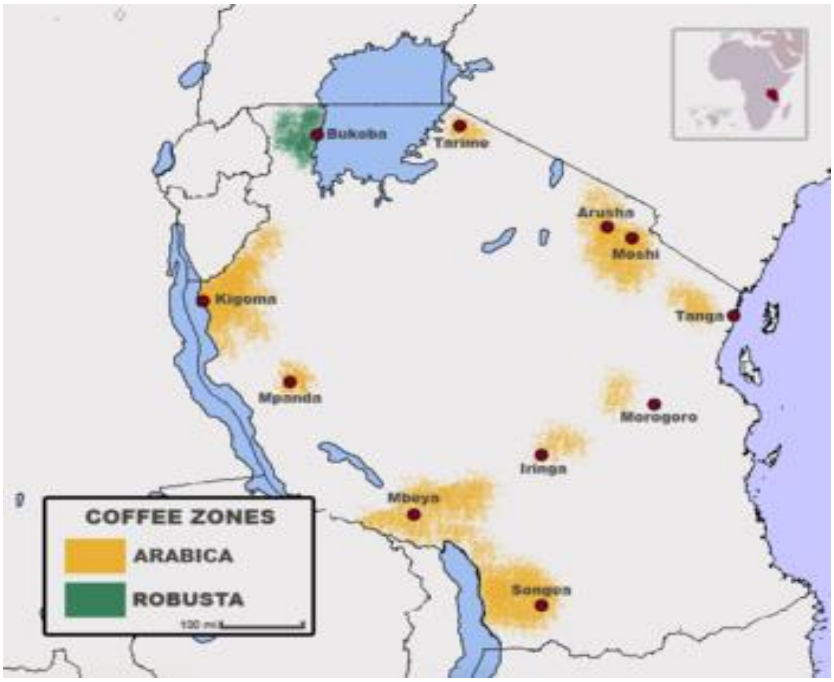
1.1 Background

Within the framework of the Agrinatura – EU-DEVCO Value Chains for Development (VCA4D) program, a field study has been conducted with the objective to analyse the performance and prospects of the coffee sector in the Southern Highlands of Tanzania. The study addressed the economic, environmental and social aspects of the Coffee Value Chain (CVC) in order to get insights in its contribution to economic growth, and to assess the sustainability and the inclusiveness of the coffee sector in Southern Tanzania. This chapter presents the functional analysis of the CVC in Tanzania.

Coffee cultivation was introduced in the Northern part of the country as an estate crop and in the mid-1920s taken up by smallholder producers (Moore, 1986). In the 1920s and 1930s, local small-scale production of Arabica coffee was linked to the cooperative movement. The Kilimanjaro Native Cooperative Union (KNCU) was established in 1932 based on several primary societies at the village or inter-village level, with the aim of promoting coffee as cash crop (Mhando et al., 2013). After independence (1961), the government tried to expand the cooperative unions with little success, but primary societies continued to evolve based on their own initiatives. However, these cooperative unions conflicted with the Ujamaa policy of villagization, since village leaders and the leaders of primary societies often had different interests regarding the use of tax money collected from the sale of coffee (Baffes, 2003). Expansion of Arabica coffee in the Southern highlands of Mbinga and Mbeya is enhanced by growing land scarcity in the Northern region, relatively older trees and increasing temperatures that affect Arabica coffee yield (Craparo et al., 2015).

1.2 Production

Coffee is one of the most important crops which bring foreign exchange in Tanzania (in addition to other crops like tobacco and cotton). Tanzania produces two types of coffee; Robusta and Arabica. Coffee production in Tanzania has been divided into three major zones: (1) the Northern zone is made up of Kilimanjaro, Arusha and Manyara regions. (2) The Western is made of Kagera, Mara and Kigoma regions. In addition, the Western zone is benefiting from the Lake Victoria which provides a cool, rainy climate without mountains. (3) The southern highland zone is made up of Mbeya, Songwe and Ruvuma regions. In addition, there are also emerging coffee production areas such as Iringa and Rukwa regions. Robusta is produced mainly in the Bukoba region, and Arabica is produced mainly in Kilimanjaro, Arusha, Mbeya, Songwe and Ruvuma regions (See: Map of Coffee production areas in Tanzania). The Arabica producing zones mentioned above produces high quality Mild coffee which is used for blending with other coffee. Of the 42 districts within these regions where coffee is produced, many of them are located along the borders, making it easy for illegal cross border trade to take place.



Map 1.1: Major coffee growing regions in Tanzania (source Wikipedia)

It is estimated that 90 percent of coffee in Tanzania is produced by smallholder farmers with less than 1 hectare of land (TCB, 2012). The estates production is estimated to be 10 percent (TCB, 2012). Smallholder farmers produce coffee mainly for commercial purposes, only 4.8 to 7 percent of annual production is consumed domestically and the rest is exported (TCB, 2016). The annual coffee production in Tanzania fluctuated from 52,960 metric tons in 2003 to 47,592 and 41,679 metric tons in 2016/17 and 2017/18 seasons respectively.

Tanzania's share in the World Coffee Market is less than 1 percent (TCB, 2017). Despite its smaller share in the world market, the Tanzanian coffee industry has a bright future because it produces Mild Arabica coffee of Colombian origin which is of higher quality and demand compared to other coffee such as Robusta. Tanzania also has the advantage of being able to begin harvesting Arabica coffee as early as May, making it available on the world market much earlier than other major producing countries. In order to maintain its share of the world market, the Tanzanian coffee industry needs to improve the quality and traceability of the coffee it produces, rather than expanding production of poor quality coffee which fetches low prices.

Coffee production is concentrated in three main geographic areas of Tanzania, in the north (Kilimanjaro, Arusha and Tarime), in the west (Kigoma and Kagera) and south (Mbeya, Songwe, Iringa and Ruvuma). About 70 percent of coffee is Arabica and 30 percent is Robusta. The Tanzanian Coffee Board (TCB) estimates that 275,000 hectares are under coffee cultivation, where large private estates reach yields up to 2.500 kg/ha (with irrigation and fertilizers), and smallholders reach an average up to 250-300 kg/ha. Around 450,000 smallholder households are estimated to be involved in coffee production , with 0.5 -1.0 hectare, who are responsible for 90 percent of coffee production; the remaining 10 percent is produced by some 110 large estates. The contribution of coffee to annual household cash income can vary from 40– 80 percent depending on geographic location and availability of alternative livelihood options. About 2.4 million additional people (or 9.4 percent of the

country's workforce) are employed either directly or indirectly as wage labourers in the industry.[1]

Coffee area expanded significantly during the 1970s and 1980s when prices were favourable but the production declined thereafter. The recent evolution of the coffee area (based on FAO data) indicates that until 2005 the coffee area registered between 100.000 and 150.000 ha. Hereafter, it increased to 250.000 ha under cultivation as a maximum (Figure 1.1), but in recent years the area shows higher variability. This may be due to the stagnation of production in the Northern region, and the relative expansion of coffee areas in the Southern part of the country. This is partly due to the TaCRI-led coffee renovation programs in response to the coffee rust and berry diseases, and further reinforced by the emerging climate change challenges (higher temperatures and more rainfall variability).

Coffee yield are also highly variable over time and between regions and types of farmers. Average yield up to 500 kg/ha is some years (Figure 1.1) , but on average registered yields are considerably lower and also show a decreasing trend over time. This may be due to relatively old trees, limited fertilizer applications and losses due to coffee diseases.

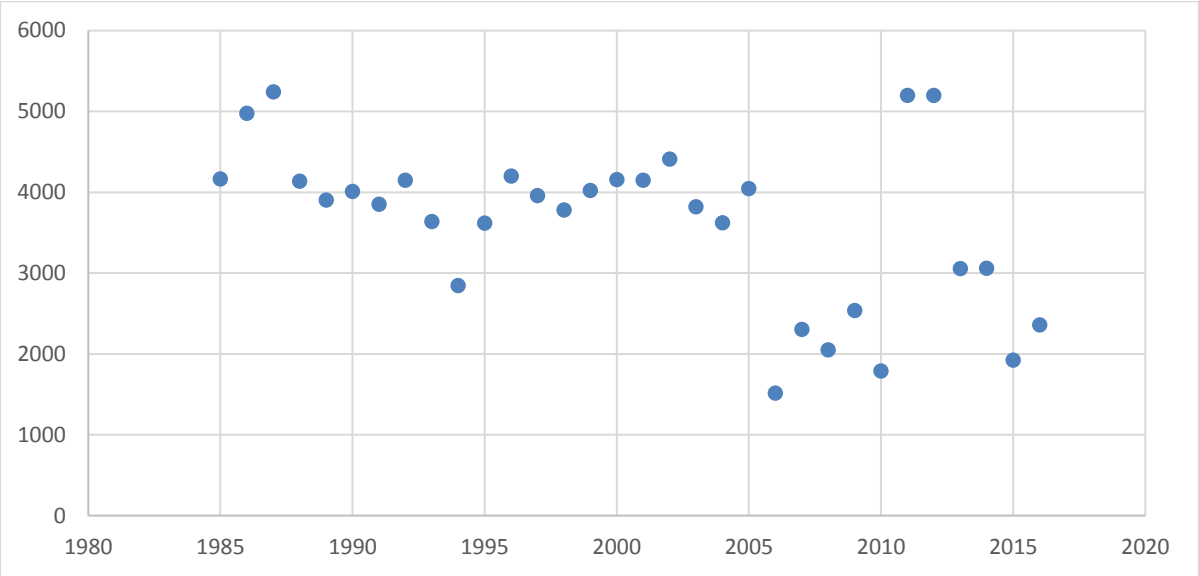


Figure 1.1: Coffee yield in Tanzania MT/ha 1985-2016 (Source FAOStat)

[1] At world scale, coffee is the most widely traded tropical agricultural commodity, 7.9m tonnes of coffee were produced in 2011, of which 6.2m tones were exported. Coffee-producing countries earned USD 23.5bn from coffee exports in 2011, 25 million smallholders produce 80 percent of the world's coffee, and coffee provides a livelihood for a further 100 million people in coffee-producing countries.

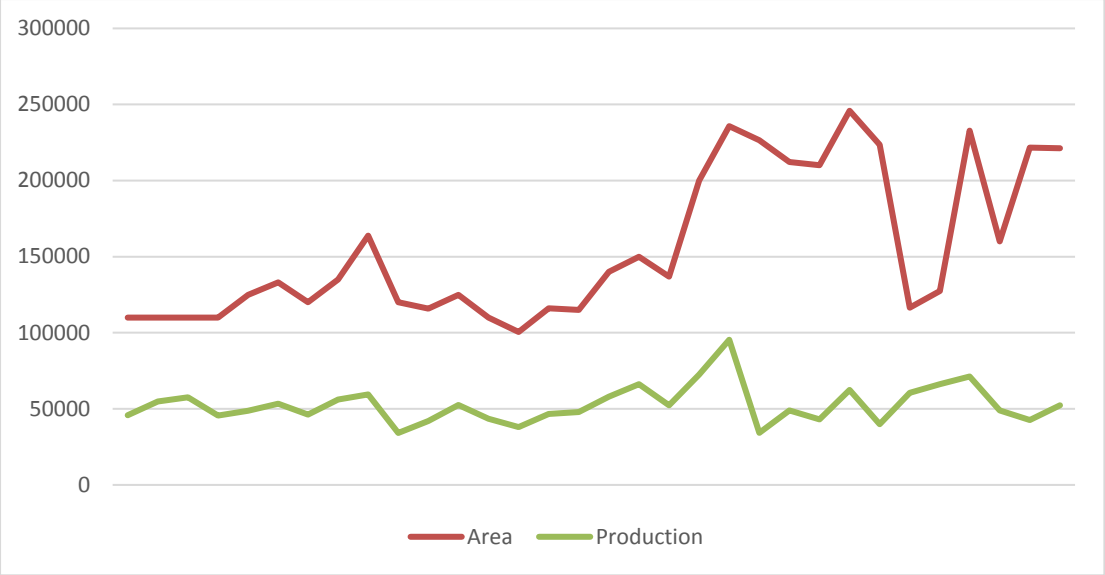


Figure 1.2: Coffee area (ha) and production (MT) in Tanzania 1985-2016 (Source FAOStat)

The Tanzania Coffee Development Strategy (2011-21) foresees an increase in coffee area and yield, especially in the Southern Highland regions (Mbeya, Songwe and Ruvuma) where sufficient land is available for coffee, and climate conditions are favourable (1000-2000 mm/yr). In this region, many Central Processing Units (CPU) are established and some production under certification (organic, RFA and organic) takes place.

1.1.1 Coffee production at the household level

From discussions with farmers, TaCRI, HNRS and the Mbozi District Agricultural Officer, amongst others, it became clear that coffee is considered a very important (and often the only) cash crop available to many smallholder farmers (SHF), who are responsible for producing around 90 percent of all coffee grown in the country. However, it is also a very capital and labour intensive crop requiring essential inputs at key points in the cropping cycle. For example; it can take between 8-10 people to harvest an acre of coffee in one day. It also requires a commitment of a portion of the farm, as it is a long-term crop which is only grown on land that is owned by the farmer, never on rented land.

1.2.1 Organic coffee

In addition to conventional coffee, organic coffee is also produced in the Mbeya-Songwe region in the Ileje district. The climate conditions in this area are favourable to organic coffee. The Ileje district is very humid, very hilly with smaller coffee plots. The relative geographical isolation of Ileje is likely to be the most critical component of Ileje's organic production – organic by default as much as anything else.

The HOPE Organic Project was one of the main organic coffee initiative in the region. It was operated by CMS (Coffee Management Service) which is one of the main curing company in the region. Level Ground trading (https://levelground.com/ourstory) which is a Canadian company is the main buyer of the produced organic coffee. CMS sales the organic coffee to Level Trading directly thanks to a direct export license. See box 1 for more details on the project.

A total number of 4,500 certified organic farmers from the Ileje district are involved in the HOPE Project. From 2013 to now, 15,150 bags of 60 kgs of organic coffee have been produced in Ileje. The project has also important Corporate Social Responsibility (CRS) activities including medical insurance to hand picking “Mamas”, equipment supply to primary schools and the use of a small share of farmers’ payment (around TZS 10 /kg of green coffee) to finance community social projects. The HOPE Project is also the leading tax payer of the district and contributes substantially to job creation.

The main successes of this project are the increase of the production volume, the higher return to farmers, and the capacity development of farmers in organic farming methods and improved relationship with the local authorities

The main challenge of the production of organic coffee is the changing policy and the legal framework. In fact, the HOPE Project was made possible because of the technical and the financial support of CMS and Level Ground. However, the new directive/regulation on the coffee sector does not allow CMS to interact directly with the farmers and this could lead to the shutdown of the HOPE Project.

The stringent requirements of organic production, climate change, the difficult access to the farms in the Ileje District were also cited as additional challenges to the development of the organic coffee sub value chain.

BOX 1: The logistic of the HOPE project

Hope is a collaborative project between Level Trade and CMS. Level Trade is the main buyer of the organic coffee and the funder of the organic certification process. The project covers 13 villages of the Ileje District. Each village has a village coordinator which organise the collection of the cherries and the parchments at a villager buying point (or cash point). The village coordinator also manages /supervises the framer training and the inspection of farms. The purchased cherries and parchments are collected at cash points by crop collectors who aggregates merchandises from different villages and send them to CPUs (cherry) and/or warehouses (parchment). The activities of the different CPUs of a zone are managed by a zonal supervisor. The production of CPUS are transported to and stored in a warehouse which is under the supervision of branch manager (Figure 1.3).

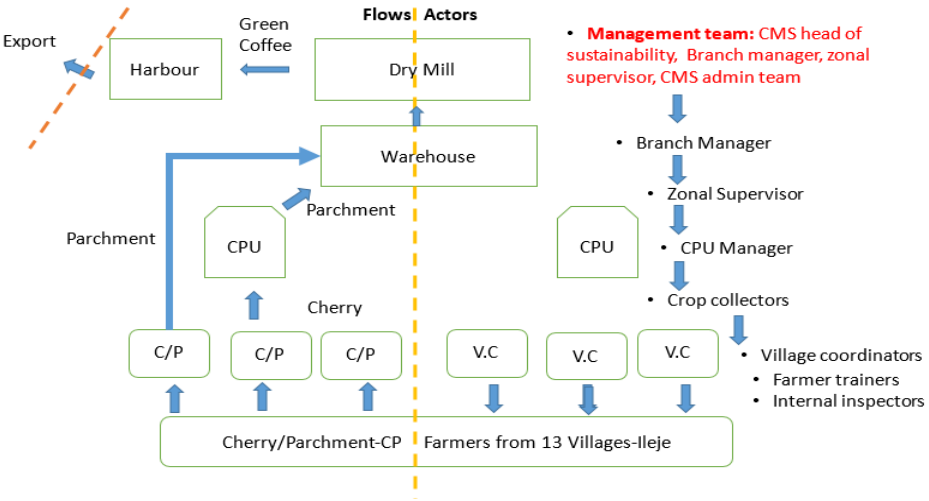


Figure 1.3: Design of the HOPE Project

- **The organic certification process:**

The main stakeholders of the certification process of the HOPE Project are CMS, Level Ground, Ecocert, the farmers and the Ileje District Council. Level Ground is the main buyer of the organic coffee and the funder of the certification costs. CMS is in charge of the implementation and operational management of the process. Ecocert is in charge of the auditing and the certification. The organic coffee production in Ileje is certified according to three standards which are The Japanese Agricultural Standard of Organic Agricultural Products (JAS), the USDA National Organic Program and the Institute of Market Ecology (IMO) Organic Standard (equivalent to the EC No 834/2007 and regulation EC No 889/2008).

The Ileje district Council collects the taxes on the organic coffee and is the main beneficiary of the CRS component of the project. CMS receives the funds from Level Ground and is in charge of the payment of the certification fees to Ecocert, the payment of the taxes to the district and the funding of the CRS activities and the direct purchase of the organic coffee at the cash points.

- **The second payment approach**

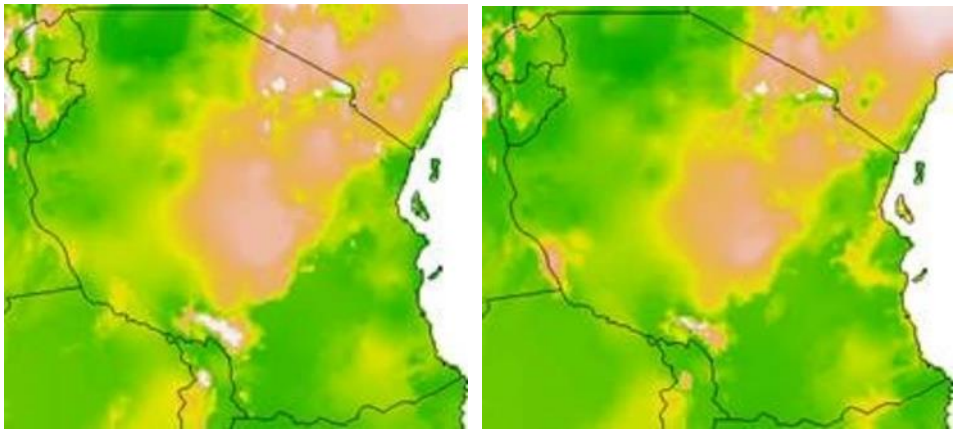
A second payment approach has been used in the HOPE project to provide the certified farmers with the best price per kg of cherry or parchment. The second payment approach consists of:

- An instant base payment (cash and carry) which is based on the market price at given period
- A second payment which is based on the difference of the price at the first payment period and the final price of the season.

Thanks to this payment approach, the HOPE project was able to attract 80 percent of the organic coffee of the region. The average price of the organic cherry and the organic parchment are respectively TZS 900 and TZS 4,200 at the cash point in 2017 (CMS, 2018). Furthermore, the HOPE project has an important farmers' training component. In fact, CMS regularly hired trainers/consultants to train the management team, the field officers, the internal inspectors and the farmer trainers in order based on the training needs identified during the audits.

1.2.2 Impact of climate change

Over the last 60 years, rising night-time temperatures and decreasing rainfall have taken a toll on coffee production in Tanzania, reducing yields by roughly half.[2] Countries throughout East Africa are expected to experience higher crop management costs, both for irrigation to guarantee timely flowering, and for agrochemicals to control crop diseases (e.g. berry borer).



Current potential in coffee area **Adaptive change coffee area**

Figure 1.4: Potential impact of climate change on areas suitable for coffee cultivation (Source WECR Global Detector)

Arabica coffee producers at lower altitudes may well find coffee production unviable in the future, and the coffee at these altitude may lose some of its quality characteristics. A recent survey by the Hans R. Neumann Stiftung in 2010 for this programme indicated that the majority of coffee farmers considered that the climate had changed, with more hot days, changes in the rainfall patterns becoming more unpredictable with rainfall erratic and in general no rainfall. This had led to a decline in yields, and more pests and diseases. Many farmers were introducing more shade to the coffee plantations, but some were reducing the area in coffee. The Tanzanian Coffee Board has announced that they expect coffee production for the coming year to be reduced by about 25 percent due to the drought.

[2] Minimum nighttime temperatures have climbed by 1.43 degrees Celsius over the last 49 years. For every 1 degree Celsius that nighttime minimum temperatures rise, coffee production decreases by about 300 pounds per 2.5 acres.

1.3 Coffee harvesting and processing

Harvesting of coffee start as early as May, for those farmers who have managed to irrigate during flowering stage and it may go on until as late as end of August.

Coffee processing starts after harvesting of ripe red cherries which are handpicked. Arabica coffee is usually wet processed, and goes through fermentation process which requires good quality water in order to produce the best coffee. It is important to use clean water during the wet processing to prevent negative effect on the cup quality of the coffee (Espindola et al., 2009). The beans are either processed at home, using a hand processing machine, or transported to a nearby CPU, which can process coffee cherries in bulk. It was noted that some of the farmers groups, for example in Igamba village, have a CPU which is being used to process coffee from both members and non-members.

The main operations of the wet processing of coffee are the reception the ripe cherries, the removing of the pulp, the fermentation, the washing, the sorting and the drying (Table 1.1). The efficiency of the wet processing is 20 percent i.e. 5 kg of ripe cherries are needed to produce 1 kg of parchment. The remaining 80 percent represents the outer skin, the pulp and the inner skin which are discarded as organic waste and in the form of wastewater. In some cases (not systematic in Tanzania), the organic waste may be transformed into compost.

Table 1.1: Operations of the wet processing and recommendation regarding the use of water (source UTZ, 2015)

Operation	Function	Recommendation
Reception	To verify the quantity and quality of cherry coffee used in the process.	The coffee should ideally be deposited dry (without water). This is why it is important to harvest 100% ripe coffee (red), which also improves its quality. If water is used, the coffee is sorted by quality (floating beans) and the water should be reused for up to two days for the same operation before it is replaced.
Removing the pulp	To remove the pulp from the bean	If the coffee is received dry, the pulp can also be removed by means of a dry process. If water is used to help remove the pulp, only very small amounts should be used, just enough to "help" the bean.
Fermentation	To remove the mucilage from the coffee by means of natural enzymes while the beans are kept in tanks or other containers.	Let the coffee dry in fermentation stacks, which allows the honey water to drain naturally at a steady pace during the process.
Washing and sorting	Elimination of the digested mucilage is the only process where the use of water is essential. This is done when the coffee has reached an adequate level of fermentation.	The first washing of the coffee should take place in the fermentation stack, removing the honey water right before the treatment. The second washing can be done in the sorting channel. Try to make full use of the available capacity by placing as much coffee as possible in the channel or pipe, filling up the whole space.

The high volumes of needed clean water during the wet processing and the generated wastewater are the main environmental challenges of this stage of the value chain. In fact the water use in the wet processing has three functions which are the transport of the coffee beans, the soring of the cherries by quality and the cleaning of the coffee by removing the

mucilage (Sanchez Hernandez et al, 2015). Nowadays, some actors of the Tanzanian coffee value chains start using a new generation of pulping machine (Eco-pulping) to reduce both the water and fuel consumption in comparison to home processing and conventional pulping machines (see Table 1.1; Wet processing of coffee cherries). This new technology allows reducing the loss of cherries during the processing and to have a water of consumption of less than 1 litre per kilo of cherries which is considered as efficient by UTZ (Figure 1.5). No less important concern of the wet processing is the potential impact of the generated wastewater of the flora, the fauna and water sources (and indirectly on human health). In fact, the organic matter contained in this wastewater can lead to a high acidification impact on the soil and freshwater sources (rivers, lakes). To prevent this acidification impact, some CPUs in Tanzania starts using hydrated lime to neutralise (PH 7) the wastewater.

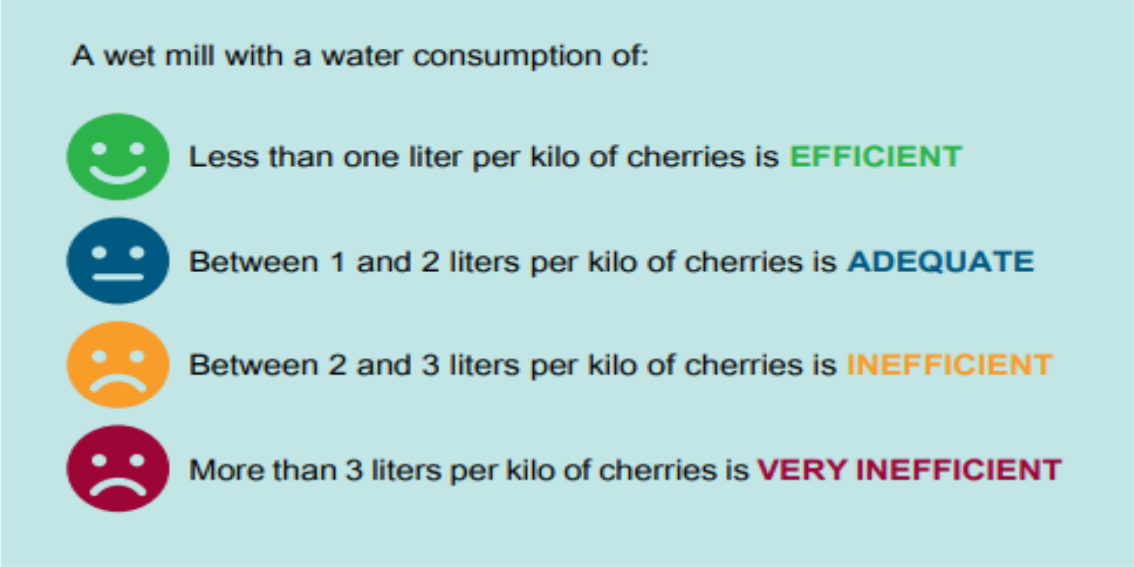


Figure 1.5: Assessment Water consumption during the wet processing (Source UTZ, 2015

At the CPU, cherries are wet processed which uses 3 to 4 hired labour who are paid about TZS 6,000 per day. After wet processing, which removed the outer flesh, coffee is then fermented in fermentation 'sinks' for about 2 or 3 days and thereafter, it is washed to remove any mucus. It is then dried in the sun, spread out on tables. Hired labour is needed for sun drying process which takes about 8 to 12 days depending on the sunshine.

Thereafter, coffee in the form of 'parchment', is packed in 60 kilogram bags send to the curing factory. Before the milling, the parchment is first inspected and weighed and then stored in the warehouse. The coffee curing itself starts with cleaning operations (pre-cleaning and destoning) in order to remove the impurities which may present in the bags of parchments. Once pre-cleaned, the coffee beans are then hulled to remove the husk and graded according to the shape, the size and the density (Figure 1.6).

The green coffee obtained after the dry milling is sometimes hand sorted (upon the demand of the client) in order to have an extra coffee quality/additional purity. After this step, the clean coffee is either sent directly to the harbour for direct export or the auction.

The curing companies can process both their own coffee and the coffee brought by other clients such as private traders, cooperatives and farmers groups.

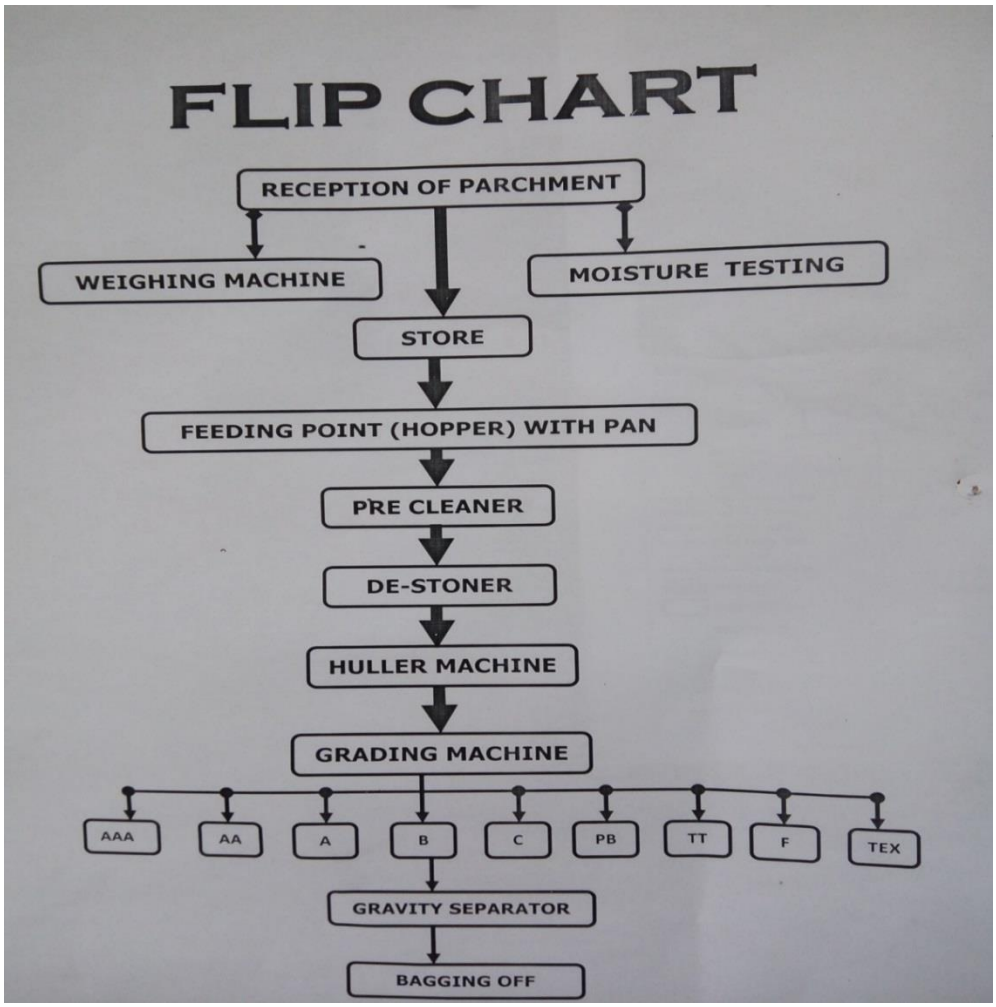


Figure 1.6: Dry Milling Process (Source Coffee Management Service, 2018)

For Mild Arabica coffee, quality is more important than in Robusta. There are two ways of assuring the quality of coffee. First, at farm level which means application of all good agricultural practices (fertilizers, pesticide and herbicides and pruning and irrigation (if possible). Secondly, picking of the red ripe cherries, processing and drying as per recommended standards. Cherries picked must be processed on the same day, fermented and dried as recommended. These principles are easily done at CPUs which employ qualified staff who ensure uniform quality of coffee as opposed to coffee processed at home. During the study, members of farmers group at Igamba village mentioned that coffee processed at a CPU has higher quality compared to processed coffee at farm gate.

Robusta which is cultivated in Kagera region is processed in a different way, and requires less attention as compared to Arabica coffee. Robusta is handpicked and hard processed, dried in sun, and thereafter, the outer shell is removed by crushing and scraping. Robusta is more bitter coffee and it is better suited for production of coffee in a powder form, called instant coffee. However, this study is focused in Arabica producing region in Songwe and Mbeya regions and less attention was given to Rubusta Coffee.

1.3 Auction

Most coffee is traded at the weekly Moshi auction, while some 30 percent is handled as direct trade. Grades AA and A coffee represent more than half of deliveries at the Auction (Figure 1.7 and 1.8). Multinational companies dominate the Tanzania's coffee auction. These companies use the "buy-back'' system, whereby they purchase coffee beans directly from local farmers, process them and put them up for auction and then buy their own coffee in the auction at low prices. Total supply of coffee is generally higher than demand at the auction (Figure 1.8). They operate through several subsidiary companies that are established with different licenses, despite the "one-license" regulation implemented by the Government. In this way, they can suppress auction prices and benefit from higher export prices, covering eventual losses and limiting the capacity of cooperatives to receive premium prices at auction.

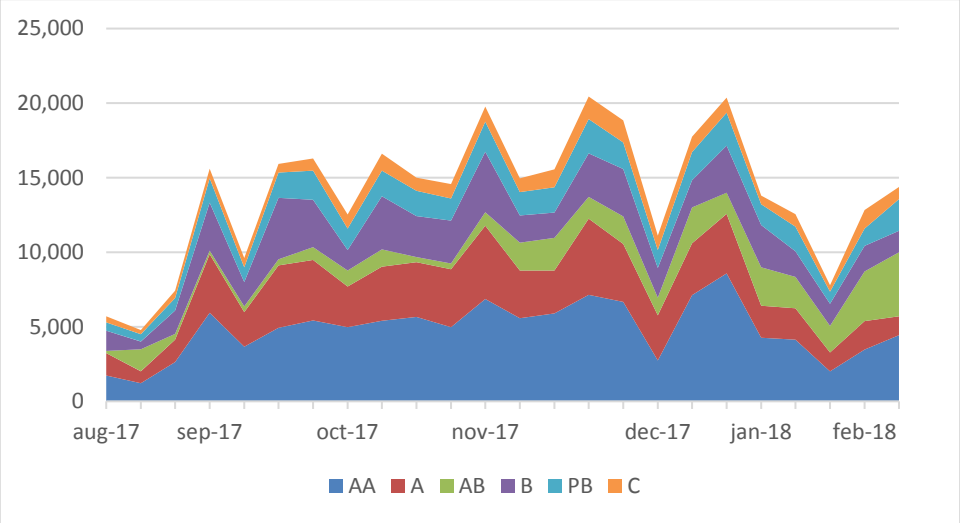


Figure 1.7: Coffee traded at Moshi Auction by quality class in bags of 50kg 2017/18 season (Source TCB)

Figure 1.8: Supply and demand At Moshi Auction 2017/18 season (Source TCB)

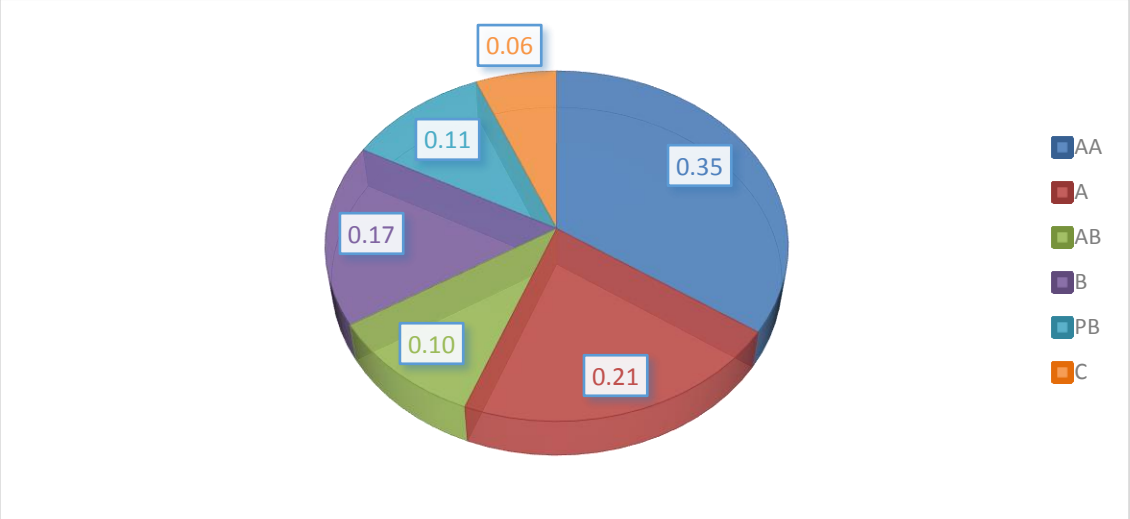


Figure 1.9: Quality shares of coffee delivered at Moshi Auction 2017/18 season (Source TCB; processed)

1.4 Exports

Tanzania coffee exports represent currently 0.6% of world coffee trade. Major export destinations are Japan, Italy, Germany and the USA (see Table 1.2).

Table 1.2: Leading destinations for Tanzania's green coffee exports

Destination	2013/14		2014/2015		2015/16	
	Quantity (T)	%	Quantity (T)	%	Quantity (T)	%
Japan	11,956	25	12,222	32	11,077	28
Italy	15,143	31	9,915	26	10,970	28
United states	6,231	13	4,988	13	6,005	15
Germany	8,485	17	5,243	14	5,967	15
Belgium	4,395	9	4,093	11	3,992	10
Finland	2,404	5	1,511	4	1,354	3

Source: TCB

Export volumes vary between 600,000 and 900,000 bags, with Japan as a major destination (30 percent). About 6-10 percent of the coffee produced is sold in the local market, primarily as instant coffee. Tanzania has the comparative advantage of being able to export mild Arabica coffee (labelled as 'Kilimanjaro') as early as July/August, ahead of the Central American suppliers when the world market is short in supply. Coffee exports are handled by a few main export companies (Taylor Winch, Dorman Tchibo, Mazao) which account for over 70 percent of total volume

Coffee has been the main export crop since its introduction a century ago. Coffee used to be one of Tanzania's primary export commodities accounting for about 5 percent of export value and generating export earnings for about USD 100 million per annum over the last 30 years (Figure 1.10). However, the share of coffee in total exports is gradually declining from 7 percent in 2001 to around 3 percent in the last few years (Figure 1.11). For the past 15 years, coffee exports from Tanzania showed varying trends. Since the mid-1990s, the country's coffee industry has been in a state of stagnation and decline. Coffee production moderately

declined from the early 1990s to 1998 after which it gradually increased until 2003. From 1980/81 to 1998/99 coffee sales declined again from 61,514 tons to 41,578 tons.

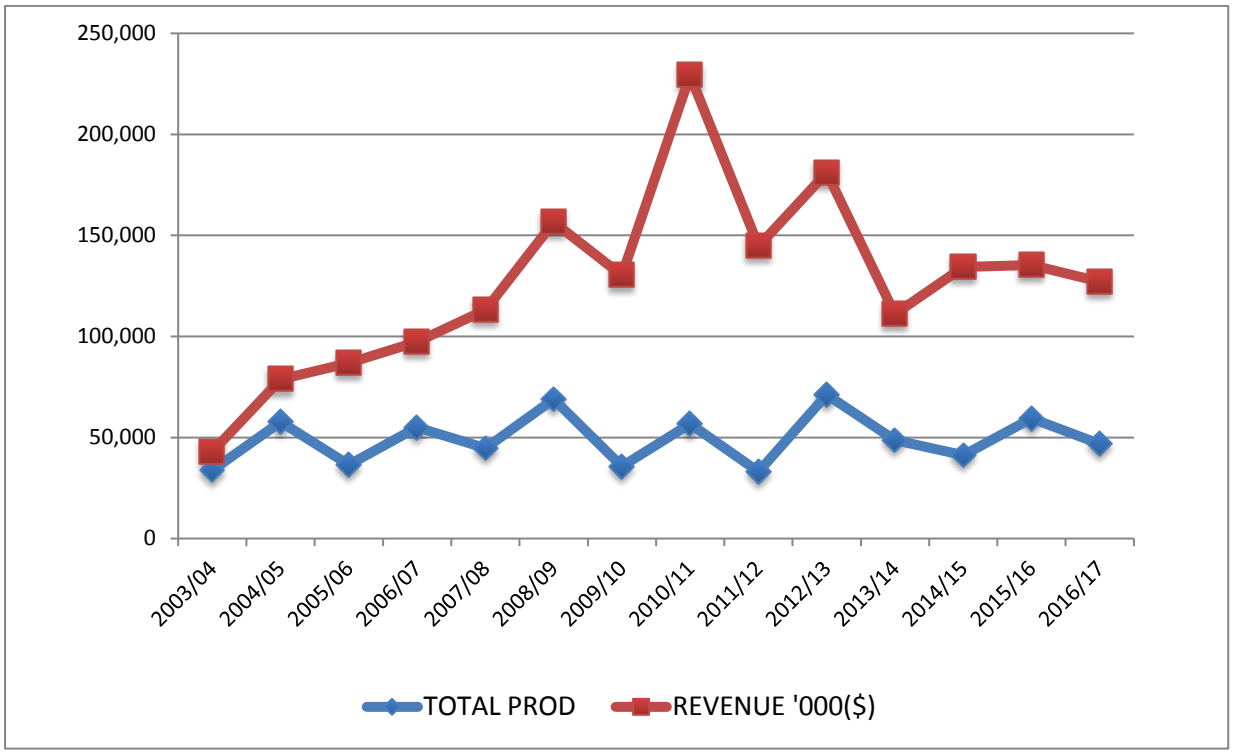


Figure 1.10: Tanzania total coffee production (ton) and revenues (x1,000 USD) 2003/4 – 2016/17 (Source TCB)

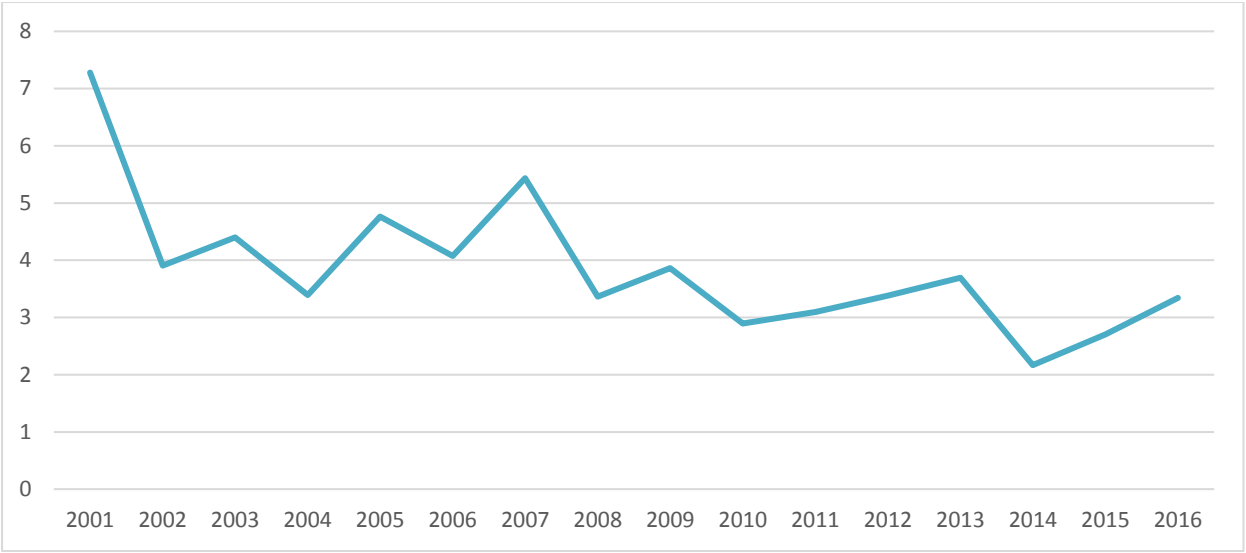


Figure 1.11: Tanzania share (%) of coffee in export value 2001-2016 (Source ITC)

1.5 Market outlets

Domestic coffee consumption is growing at an average of between 1.5-and-2 percent a year, as the coffee-drinking culture gradually takes root in urban and peri-urban areas. Annual per

capita coffee consumption in Tanzania is 0.06kg, and 7-8 percent of the country's total coffee production is locally processed and consumed (Figure 1.12).

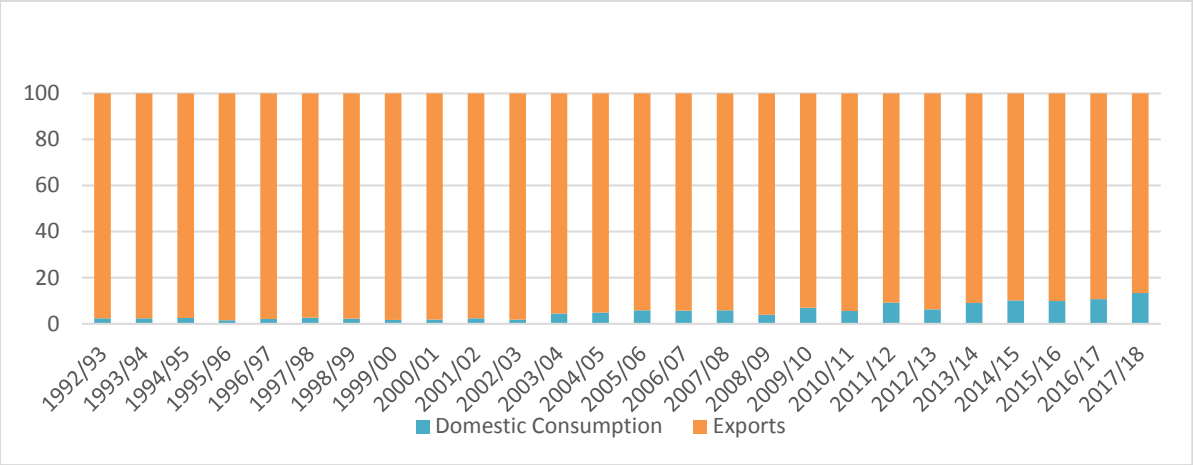


Figure 1.12: Tanzania coffee export and domestic consumption share 1992-2017 (Source ICO)

1.6 Certification

Certified coffee exports (Organic, UTZ/RainForest, Fair Trade & Cafe Practices) almost doubled from 3.1 M kg in 2015/16 to more than 6.2 M kg in the 2016/17 cycle (Table 1.3). This is 10-12% of total coffee exports. Most certified coffees are sold under direct trade arrangements.

Table 1.3: Certified coffee (2016 – 2017 season)

SUPPLIER	CERTIFIER	AUCTION	DIRECT EXPORT	TOTAL
COFFEE MANAGEMENT SERVICE	RFA	439,277	1,083,687	1,522,964
TUTUNZE LTD	RFA	599,592	655,781	1,255,373
DAN & ASSOCIATES LTD	RFA	262,708	372,120	634,828
BURKA COFFEE ESTATE LTD	UTZ	152,125	372,094	524,219
KCU LTD	IMO	447,120		447,120
AFRICAN PLANTATION KILIMANJARO LTD	UTZ	81,954	266,742	348,696
KILIMANJARO PLANTATION LTD	UTZ	23,576	298,207	321,783
MONDUL COFFEE ESTATE LTD	UTZ & CP	34,516	126,000	160,516
MAMSERA RCS LTD	UTZ	125,662	32,241	157,903
SHANGRILA ESTATE LTD	RFA	40,943	96,000	136,943
USAMBARA RCS LTD	IMO	4,589	115,360	119,949
NITIN COFFEE ESTATE	RFA	51,682	63,480	115,162
NGILA ESTATE LTD	RFA	34,655	77,940	112,595
FINAGRO PLANTATIONS LTD	RFA	103,436	6,000	109,436
EDELWEISS OLDEANI ESTATES	RFA	79,144	18,600	97,744
BLUE MOUNTAIN COFFEE FARM LTD	RFA	48,262	48,360	96,622
KIRWA KENI MRERE RCS	UTZ	5,748	21,248	26,996
KNCU LTD	FLO	23,359	-	23,359
MBOSHO COFFEE CO LTD	UTZ	19,817	-	19,817
USHIRI RCS LTD	UTZ	3,404	15,949	19,353
CDM-URU COFFEE PLANTATION	UTZ	6,252		6,252
	Total	**2,587,821**	**3,669,809**	**6,257,630**

Source: TCB

1.7 Prices

Before 1990 all coffee marketing (including input provision, transportation, and processing) was handled by the state coffee board and the cooperative unions. Modest reforms were implemented in 1990 affecting inputs, price announcements, and retention of dollar export earnings. More comprehensive reforms were introduced beginning in 1994/95, allowing private traders to purchase coffee directly from growers and process it in their own factories for the first time in more than 30 years. While producers' share of export prices increased, official statistics show no supply response.

Coffee production in Tanzania is extremely price elastic. Therefore, market prices are one of the major factors causing fluctuations in production. In 2008/09 season, the volume of coffee produced increased to nearly 70,000 tonnes in response to the spike in international prices that occurred during the food price crisis. However, coffee production decreased to just 36, 000 tonnes in the following year, also since coffee trees are biennial bearing, yielding a heavy crop in one year and a light crop the next year.

1.8 Structure and governance of the Tanzanian coffee sector

The coffee value chain in Southern Tanzania is structured along four major segments:

a) Smallholder producers (< 8 acres) that process at a local CPU and sell coffee to the auction through regional curing plants;
b) Medium producers (land sizes 8-20 acres) that process coffee at a CPU and sell at the auction through regional curing plants;
c) Large producers (<20 acres) that have their own wet processing and sell at the auction through regional curing plants; and
d) Coffee estates (areas > 100 acres) that are fully engaged in direct exports.

The figure 1.13 presents the structure and governance of the coffee sector.

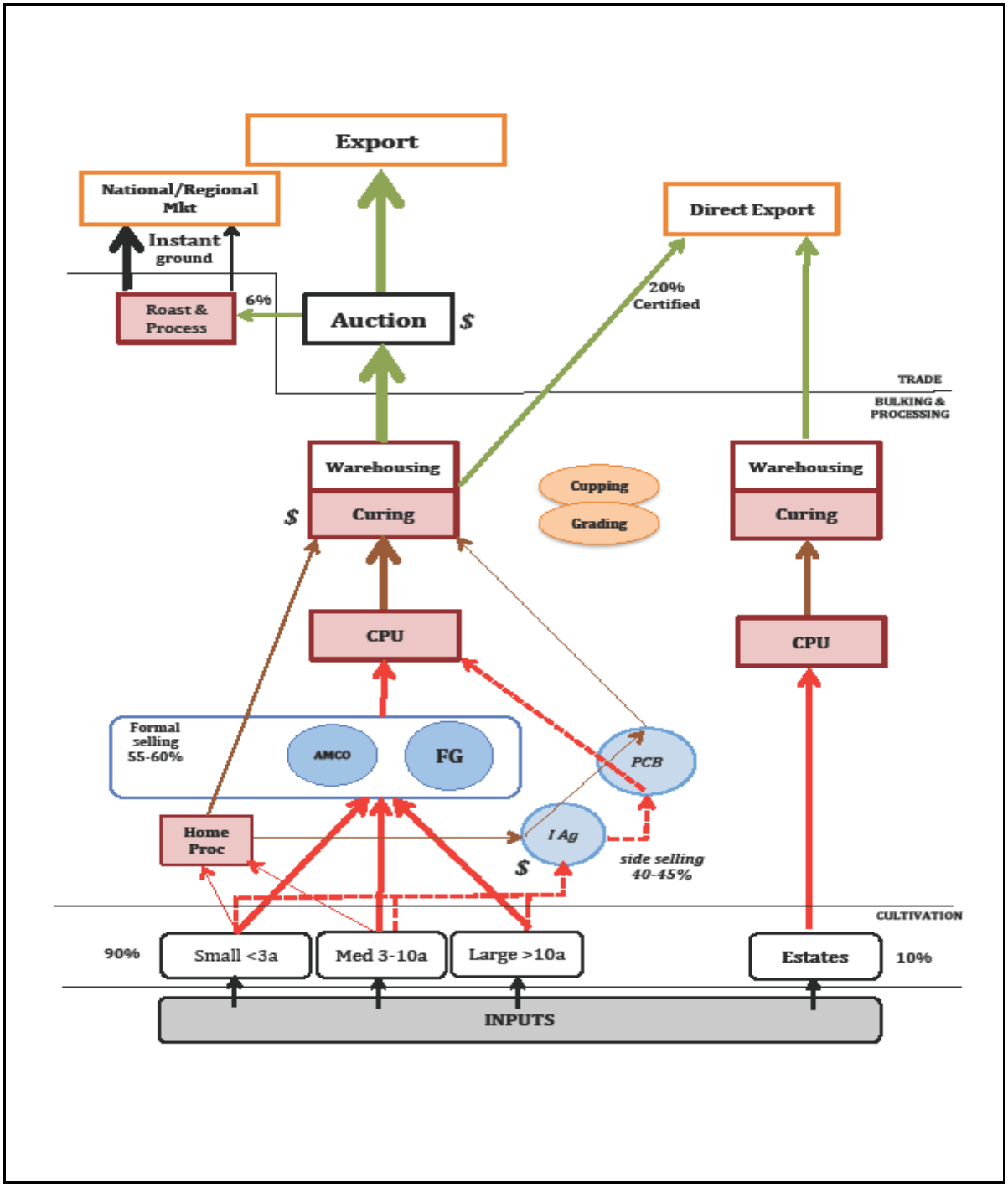


Figure 1.13: Structure of the coffee sector in Southern Tanzania (source authors)

1.8.1 Institutions and governance of the coffee sector in Tanzania

The 2013 Coffee industry regulations acknowledge the importance of collaboration and partnership between the public and private institutions in the coffee sector. The private sector has been noted as important partners in development activities because of their ability to attract finance, while the public sector has long experience in working with the rural communities. Having noticed the importance of collaboration, the private sector was invited to take some of the activities that were once done by the research institutions. During the study, it was noted that both private and public institution played a part in governance of the

coffee sector in Tanzania. Both have vital role to play in major functions of the sector which are; input provision, production, processing, curing and warehouse, marketing and exporting.

This section explains the governance arrangements of the coffee sector as it stood between January – March 2018 (prior to the recent Prime Minister Decree), taking into account the contribution of public and private sectors.[3] The functions and activities are divided into the following nodes; input provision, production, processing, curing and warehouse, marketing and exporting. Comments are made where the Decree is likely to result in a change to the existing governance structure.

1.8.2 Input provision Node

Up until 1994, the cooperatives unions took responsibility for distributing agricultural inputs to their members on a credit basis and deducted the costs from the money earned from selling their coffee. After liberalisation of coffee marketing in 1995, cooperatives were no longer able to offer the same level of support to farmers in production, which create a vacuum. To fill the vacuum, and assist farmers to continue to produce coffee, both public and private institutions stepped in and took a role in input provision to producers.

Among the private sectors in this node, agricultural input dealers are important actors as they sell agricultural inputs to farmers both in towns and villages. Likewise, Commercial Banks such as NMB and CRDB PLC offer various types of loans to assist producers in purchasing land, agricultural inputs and machineries.

For the public sector in this node, actors include; village executive officer, who is an employee of the District Councils and in charge of all matters relating to the district council at the village level. As an executive of the village government, he works closely with the village chairperson. The village government handles village level issues such as authorising the selling and purchasing of land among the producers. On the other hand, the District council is empowered to issues land to investors who want more than 50 acres. Similar, district councils are managing coffee nurseries for producing seedlings. Tanzania Coffee Research institute (TaCRI) plays a crucial role in researching and production of hybrid coffee varieties which are resistant to two deadly diseases (Coffee Leaf Rust and Coffee Berries Diseases). The improved varieties are characterised by higher yield, higher quality and diseases resistant.

Several agencies with a public (Figure 3.2, right hand side) and private (Figure 3.2, left hand side) constituency exercise influence at different levels of the coffee value chain in Tanzania. Local and regional authorities are particularly important on licences, regulations, seedlings provision, whereas at national level the TCB conducts the Auction which determines prices.

[3] The government changed the coffee marketing regulations whereby, coffee will be collected from farmers by cooperatives and the private traders are supposed to purchase coffee at the auction. The move is aimed at eliminating the middlemen and increase the income of the farmers.

Figure 1.14: Institutional structure coffee sector Tanzania (source authors)

1.8.3 Production node

Coffee production is another node which attract both public and private stakeholders. For private stakeholders, commercial banks mostly CRDB and NMB issues loans in coffee production for purchasing of machinery, labour and agricultural inputs. NGO and organisation

assist farmers in extension services such as Starbucks Coffee; Hanns R. Neumann Stiftung. In addition, HNRS teach farmers financial literacy, support group formation and management, governance and set up of savings groups. In addition, Private Coffee Traders (PCT) such as CMS and Tembo Coffee assist farmers to access agricultural inputs (fertilizers, insecticides and pesticides), as well as seedlings at cheaper price. Labour unions play a crucial role in settling disputes on coffee estates. For public stakeholders, the Tanzania Coffee Board (TCB) collaborates with District councils in provision of extension services to producers. Similar, coffee inspectors are empowered to inspect all activities done by the actors in coffee industry such as inspecting of farms and production units.

1.8.4 Processing node

This node involves processing coffee from ripe read beans (cherries) to parchment coffee. Coffee inspectors from the District councils inspect Central purples machine to see if they meet required standards and coffee is being processed to the recommended standard to attain higher quality. The district council also regulates licences related to coffee processing and marketing within their respective areas. Ministry of work ensures safety of workers at the processing facilities. Labour unions fight for the rights of the workers and ensure that workers are treated right and work in conducive environment.

1.8.5 Curing and warehouse node

This is a process where coffee is transformed from parchment to green coffee ready for export. Both public and private sectors are actively involved. In the study areas, there are three coffee curing and warehouse facilities, which are Mbozi Coffee Curing and CMS located at Mlowo in Mbozi, while City Coffee Company is located in Mbeya city.

Various actors are engaged in this node, including; Ministry of Work who oversee the security and safety of factory workers, NHF/NSSF offer social security and compensation to workers, and Ministry of Trade and Industry offer licences. The Ministry of Agriculture, through the Tanzania Coffee Board, issues curing and warehouse licence. At the same time, the Warehouse Receipt Regulatory Board (WRRB) is responsible to ensure that warehouse operate smoothly and offer services, and this is done by inspecting the licenced warehouses from time to time.

For private sector, Commercial banks offer loans secured against the sale of coffee. When coffee is delivered to the warehouse, a receipt of delivery is issued by the warehouse manager to the Commercial bank in order to release payment which is equivalent to the value of the coffee in the warehouse. This becomes the first payment to farmers. Almost all private traders are members of Tanzania Coffee Association which represent the interest of the private traders in stakeholder's meetings such as National Coffee Conference

1.8.6 Marketing and exporting node

Coffee is auctioned by the Tanzania Coffee Board which runs the auction at Moshi Tanzania. TCB controls, regulates and set rules of the auction.

1.9 Stakeholder analysis of the coffee industry in Tanzania

This section presents stakeholders of the coffee industry in Tanzania who are also actors of the value chain. These are small scale farmers, estates, Tanzania Coffee Research Institute (TaCRI), primary societies, cooperative unions, curing companies, private coffee buyers

(parchment buyers), Tanzania Coffee Board (PCB), Private coffee buyers (exporters). The analysis is based on the major functions (nodes) which are performed by actors. The actors and their different roles are explained below:

1.9.1 Policy, regulation and licensing

The Ministry of Agriculture in collaboration with the Tanzania Coffee Board (TCB) is responsible for issuing rules and guidelines which control the coffee industry. The main function of TCB is to regulate the coffee industry in Tanzania and advise the Government of Tanzania on all matters related to the growing, processing and marketing of coffee within and outside the country. Its mission is to facilitate an enabling business environment for a sustainable coffee sector. The coffee development strategy tasked TCB to be at the central and lead overall coordination of the strategy implementation and ensure proper dialogues between all actors of the industry (multi stakeholder's process). Moreover, ensure that the share functions are implemented, provision of necessary favorable business condition to all stakeholders and provide advisory services and promote Tanzania coffees both at existing and new markets.

Despite of deteriorating financial situation, TCB has continued to perform its functions. Although licensing regulations prohibit having more than one license, TCB has failed to ensure that sister companies do not operate along the same chain. The same companies, using different names purchase coffee from farmers and at the same time, purchase coffee at the auction. This has diluted transparency at the auction, because the same company could purchase its own coffee at the auction. This kills competition that was aimed at increasing price at the auction. TCB has been accused of too much bureaucracy and failure to create a conducive environment for coffee stakeholders. A case has been cited of coffee inspectors who behave more like policemen than people who are supposed to facilitate and create conducive environment for coffee stakeholders. Likewise, stakeholders complain that TCB and the government are imposing unnecessary licenses which end up increasing costs of operation. For example, there are two exporting licenses, issued by TCB and TFDA , each one costs US$1000. Finally, all these costs are paid from a kilogram of coffee paid to producers/ farmers.

The government wants farmers to continue with coffee production regardless of their situation. The government depends on coffee as an important source of revenue and foreign currency. Farmers feel that the government has abandoned them and has failed to protect them from the foul plays of the PCBs. In the farmers' opinion, the government has not done enough to assist them to sustain coffee production and improve their livelihoods. Farmers want the extension services and distribution of agricultural inputs on loan basis to be reintroduced so that they can increase coffee productivity.

Coffee policies in Tanzania

The National Agriculture Policy 2013 (NAP 2013) aims at developing an efficient, competitive and profitable agricultural industry that contributes to the improvement of the livelihoods of Tanzanians and attainment of broad based economic growth and poverty alleviation. Through NAP, the Government is committed to transform of agriculture sector from subsistence farming towards commercialization and modernization through crop intensification, diversification, technological advancement and infrastructural development. The government recognizes the contribution and importance of the private sector as the engine

of economic growth and thus the business environment shall be improved in order to catalyse the participation of private sector in agricultural development

The NAP 2013 consequently aims at addressing challenges that continue to hinder the development of the agricultural sector. These include low productivity; over dependence on rain-fed agriculture; inadequate agriculture support services; poor infrastructure; weak agro-industries; low quality of agricultural produce; inadequate participation of the country's private sector in agriculture; environmental degradation and crop pests and diseases. Consequently, the government aims at shifting towards increased investment in agriculture and greater involvement of the private sector in the production and provision of support services to the farming community. The NAP 2013 was designated to facilitate the attainment of the National Strategy for Growth and Reduction of Poverty (NSGRP)'s objectives, the Tanzania Development Vision 2025 that envisages raising the general standards of living of Tanzanians to the level of a typical medium-income developing country by 2025, and meeting the Millennium Development Goals.

However, 2013 NAP does not give priority to any crops. Thus, Tanzania has no specific policy which deal with coffee industry, but it has a coffee development strategy, which is aimed at addressing the constraints facing the coffee sector. Tanzania Coffee Industry Development Strategy (2011-2021) strategy was developed by the National Government, in collaboration with the Coffee Industry Stakeholders under the leadership of the TCB. It was developed a through consultation with all stakeholders of the value chain (farmers, cooperatives/buyers, processors, exporters, research, extension services, Local Government Authorities (LGAs), Central government, TCB and associations representing the private sector). The Strategy has four thrusts with a total of 64 activities for implementation: (i) increase coffee production and productivity (thrust 1) with 13 activities, (ii) improve efficiency of the coffee value chain (thrust 2) with 20 activities, (ii) support overall coffee quality improvement (thrust 3) with 17 activities and, (iv) support the promotion of Tanzanian coffees abroad and explore new market opportunities including sustainable coffees (thrust 4) with 14 activities.

After five years of implementation of the Strategy, a mid-term evaluation was carried out and the following were major findings (TCB, 2017): Despite lack of specific budget for the implementation of planned activities of the Tanzania Coffee Industry Development Strategy, nearly 38 percent of the planned activities have been fully implemented, 36 percent partially implemented and only 26 percent were not implemented at all at the middle of the 10 years period of the Strategy. The Strategy has four strategic thrusts each with targets to be used for assessing achievement at the end of implementation of the Strategy in 2021. Evidence from consultations held with the stakeholders involved in the implementation of the planned activities indicates that more than 50 percent of the fully implemented activities are associated with the fourth strategic thrust of promoting Tanzanian coffees abroad and exploring new market opportunities including sustainable coffees. However, the available evidence suggests that only the first target of this thrust of increasing production of "sustainable" coffee to at least 50 percent of coffee produced in Tanzania can only be achieved in if constraints faced by smallholder farmers in obtaining certification are addressed. However, several coffee factories prefer to support the adoption of GAPs in coffee cultivation instead of going towards voluntary certification.

1.9.1.1 Recent Government Directives on coffee marketing for the 2018/19

In February 2018, the Tanzanian government issued new directives which will be used to guide coffee marketing from the 2018/19 seasons. Under the directives, a) coffee will be purchased/collected from farmers by the cooperatives only. Farmers groups and private traders will not be allowed to collect/purchase coffee from farmers. B) Cooperatives will take coffee to curing factories and thereafter, sell it at the TCB auction in Moshi, Kilimanjaro. C) All licenced private traders will purchase coffee at the auction only.

These directives are aimed at increasing prices of coffee received by farmers by abolishing middlemen who were claimed to reduce farmers' income. Table 3.2 presents the situation of coffee marketing before and after the new government's directive.

1.9.2 Research

The Tanzania Coffee Research Institute (TaCRI) is responsible for research on coffee diseases and new varieties. The coffee strategy tasked TaCRI to play a key role in the implementation by developing adapted technology through research and dissemination of the results to all the stakeholders especially coffee farmers. TaCRI is expected to lead a large scale replanting program by collaborating with stakeholders both private and public through seedlings production and distribution.

Although TaCRI has conducted researches which have come out with new coffee varieties, its ability to produce and disseminate enough seedlings for all the farmers in the country is limited. Interviews and field observation done in Mbinga, Mbozi revealed that Farmers have continue to keep coffee trees which are old, which has resulted to lower productivity. Distribution of new variety is limited by price and ability of the authorities (district councils, TaCRI and NGO to distributed seeds to farmers in areas such as Nyoni, Kindimba and Maguu. Moreover, farmers are hesitating to purchase and plants new varieties, fearing climate change, new varieties require more water while farmers cannot afford to irrigate their plots. Besides, farmers are afraid that new varieties must use agricultural inputs while most of them are not sure of accessing and uses them. TaCRI is funded by the EU and stakeholders of the coffee industry and government (on subsidizing seedlings production and distribution). However, there is confusion among stakeholders as to whether TaCRI is a public institution or a private company. This is because is it funded by the taxation from coffee.

1.9.3 Seedling production and distribution

Mainly done by TaCRI, supported at local level by farmers groups, district councils and private traders. TaCRI reports major achievements in breeding new hybrid varieties that are better CBD resistant and/or more drought-tolerant (with a potential capacity of 7 million seedlings annually). In addition, TaCRI maintains a Good Agricultural Practices (GAP) program and supports technology transfer and training to 400 farmer groups, 380,000 farmers and close to 11,000 extension workers.

1.9.4 Training of farmers

The role of training farmers is played mostly by the government and private traders (NGOs.) Traditionally, the training was done by the farmers' cooperatives. However, after liberalization of the economy and introduction of free trade, cooperatives have failed to offer this crucial service to farmers. Competition from private coffee buyers, who have capital and sometime back up from multinational companies has been one of the challenges facing farmers' cooperatives.

On the other hand, the government through extension officers are main providers of training for coffee farmers. Based on their long experience and involvement with farmers, extension officers are well placed in the village to conduct training on coffee production and processing. However, the capacity of the government in implementing the same is diminishing and the budget constraint has been mentioned as one of the handicaps. Thus, various NGOs, example TUTUNZE Kahawa, DAE Ltd in Mbinga District have emerged and taken over the role of training farmers. However, these NGO are business oriented and sometimes, their roles in assisting farmers are questionable.

1.9.5 Infrastructure

STARBEX/EU: These organizations support improvement of road network and research in coffee producing areas. They have played a crucial role in supporting coffee production and even marketing. Currently, rural and feeders roads are under the Tanzania Rural Road Agency (TARURA) which is responsible for its maintenance.

1.9.6 Production

i. Producers: Smallholder farmers

Small-scale producers are more disadvantaged because no one is directly committed to help them. They have continued to suffer from unclear policy on inputs availability, and high bank loan rates. The marginalisation of the extension services which have almost collapsed. This has made farmers to continue production of coffee using traditional ways while the market trend and demand of coffee have changed. Besides, in some areas like Kilimanjaro and Arusha regions, land which was once used for coffee is now used for production of banana and other crops. This has in turn affected the income of the farmers since banana is mostly a food crop and very little is set aside for cash income generation.

Many interviewed farmers feel they are disadvantaged, exploited, and powerless to influence prices. Policies are also not in their favour and they do not have choice in the chain. They continue with coffee cultivation because they have no other alternatives and other sustainable sources of income. Furthermore, they are prohibited from uprooting coffee trees, even if they want to utilize their meagre land in other profitable ventures. Therefore, farmers are trapped into coffee cultivation, with little or no way of getting out from this puzzle.

ii. Producers: coffee estates

These are estates which use capital intensive and modern technology in coffee cultivation. Estates are owned by both Tanzanians and foreigners. Most of the estates are located in Kilimanjaro and Arusha regions, some of which were owned by Kilimanjaro Native Cooperative Union (KNCU). Other estates are located in the Southern Highlands. Different from small scale farmers, they use modern techniques of production (machinery and utilization of agricultural inputs). Some of these estates process and export their own coffee. In the Northern zone (Kilimanjaro and Arusha) where the share of coffee produced by smallholder farmers is decreasing, the estates have remained with a crucial role in production. On the other hand, the owners of the estates are not willing to release information regarding their production and income.

iii. Local government authorities

Local government authorities in all coffee growing areas charges cess to all coffee produced in their areas. The coffee development strategy tasks local government authorities in all coffee growing areas to engage resources and funding for coffee through their agricultural development plans and budget (at least 20 percent) of coffee cess. Besides, local authorities are supposed to facilitate favourable business environment, create necessary condition for investing in feeder roads, access to water, recruitment and allocation of field officers to advise coffee growers on the Good Agricultural Practice (GAP), and sensitize on the formation of coffee growing cooperative societies.

There are local government authorities which have been supporting coffee production through subsidizing on coffee seedlings, these are Mbozi and Mbinga out of 51 districts which cultivate coffee in Tanzania. In addition, in Mbozi, local government has assisted farmers in construction of water reserves which are used for irrigating coffee. During the field visit in some coffee producing areas, it was noted that most of the Local Government deals mostly

with regulations at the production point and taxation. In some areas, local government has supported rehabilitation of infrastructures like roads, water reserve areas, just to mention but a few.

However, there are district council by laws which prohibit farmers from uprooting coffee trees, even though farmers are cultivating coffee into their own land and they can use the land the way they see fit for them, regardless of the crops they cultivate. In most areas like Kilimanjaro, farmers have reacted by stopping attending their coffee trees, and after a few years the trees which are attacked by pests and diseases wilt away. Local governments are criticized by farmers for failing to support coffee farmers in their production processes, for example, failure to offer extension services which have resulted to farmers continuing using the same production and processing techniques for years. Likewise, these local governments have failed to reinvest in taxation from coffee to coffee production. For example, some of these taxes could be used to produce coffee seedlings and distribute/sell to farmers at lower prices. These actions would encourage farmers to replace their aged trees and be assured of increasing production.

iv. Input suppliers/stockiest

These are suppliers of agricultural inputs, mostly located in towns, far from farmers. They have played these roles in other areas where the government agencies have failed to do so. Their location (in towns as opposed to where farmers are in the villages) has proved challenging for farmers who must travel to towns to purchase these needed agricultural inputs. At the end of the day, some of the farmers have failed to get these services.

v. Farmers cooperatives

In some instances, cooperatives offer extension support to farmers. Prior to liberalization of the economy, cooperatives collected crops from farmers and paid into three instalments, a system which was regarded as banking on behalf of the farmers. However, after liberalization of coffee trade, cooperative unions have failed to offer services such as distribution of agricultural inputs to farmers. To survive in the game, cooperatives are forced to operate like private buyers, not assisting farmers in production venture. Moreover, cooperatives have failed to act as banking of the farmers: paying them into three instalments (three tiers). The three-tier payment was very crucial to farmers who do not have knowledge on how to save and reinvest their income. Paying them into three instalments assured that farmers would use the second and third payments for purchasing agricultural inputs and school fees for their children.

Similarly, cooperatives have been criticized due to their business operation model which is not flexible enough to allow them to compete in the coffee market environment.

vi. TaCRI

TaCRI conducts research on coffee and offers advice and extension services to farmers. Over the years, TaCRI has managed to produce and distribute new hybrid coffee clones with high productivity and resistance to diseases. Despite all these efforts, TaCRI is not capable of reaching all the farmers in Tanzania. Some farmers have continued to keep old coffee trees whose production has decreased.

vii. Private coffee buyers (PCBs) and NGOs

These are private coffee buyers who are key partners in coffee value chain. The private sector have been tasked to collaborate in shared functions through public and private partnership which will improve the efficient of the value chain and be a useful relay for improvement of agricultural/harvest/post-harvest practices on the field. Similarly, they have extensive access to expertise, funds and ability to dedicate resources to the shared functions directly contributing to the coffee sector strategy. Such example of project and efforts are those which were dine by CPT project which was phased out in 2016.

PCBs have changed their mode of operation (from purchasing coffee only) and have started to assist farmers in production. Some of the PCBs supply the planting materials (seedlings) to farmers. In some cases, PCBs have been supplying planting material to farmers groups they work with. PCBs like Taylor Winch and DAE, TUTUNZE KAHAWA are just few examples. However, PCBs supply seedlings and construct central processing units to groups of farmers they work with to be assured of receiving coffee from farmers. In other words, these arrangements are like informal contact farming. Farmers complain that they have been monopolized by the private company and forced to sell coffee at lower prices than the market price. To overcome these challenges, some of the farmers have been reported to sell some of their coffee through other channels.

1.9.7 Financing

Financing is very important for sustainability and increasing production. The major stakeholders at this group are commercial banks, such as CRDB PLC, National Micro Finance Bank (NMB) and Kilimanjaro Cooperative Bank (KCB). Loans from commercial banks to farmers could be one of the motivations to increasing investment on coffee and achieve the objective of increasing production to 100,000 tons by 2012. Loans to farmers, through Warehouse Receipt Systems (WRS) have assisted farmers to sell their coffee directly at the auction.

However, among the challenges relating to coffee financing is how farming stakeholder's, whose land is not measured and lack entitlement, could use it as collateral and thus access loans from commercial banks. On the other hand, the government and commercial banks could think of reducing interest rate charged on loans.

1.9.8 Processing (primary and secondary)

i. Primary processing

Farmers process their coffee at home from cherries to parchment form using hand pulper machines. This is primary form of coffee processing which is common in most Arabica coffee. It is important for farmers to process their coffee as required as this is very important for maintaining the good quality of coffee.

On the other hand, estates and central pulpers unit processing coffee from cherries to parchment form using machine (CPUs). This function is done by both cooperatives owned by curing plants and private ones. It is noted that coffee processed at central pulper has higher quality than that processed at home. Farmers who process coffee at home have been blamed

of malpractice for delaying in processing cherries, fermenting and drying coffee which have resulted 5 in lowering the quality of coffee.

ii. Secondary processing

Curing plants (governmental and private) processing coffee from parchment to green beans (ready for export). However, curing plants owned by private have been preferable because of modern technology and lower prices as opposed to the cooperatives and thus, has lower curing loss.

1.9.9 Marketing

i. Small and medium size farmers

They are the main producers of coffee in the country. It is estimated that small holder farmers produce more than 90 percent of coffee produced in the country. It was estimated by interviewed experts, that farmers sell around 60 percent of their coffee to the auction, and the remaining 40 percent to private traders. Likewise, farmers can sell coffee through groups, cooperatives. Analysis of the coffee value chain indicated that farmers are least privileged as they receive lower share through prices.

Also “kata kichwa” (selling at flowering or green cherry stage in exchange for cash or inputs) and side selling to local middle men, is an important part of SHF household dynamics. It is not clear what proportion of the harvest this represents.

As farmers sell their coffee at their gate at Kindimba village in Mbinga, the same farmers will not be able to purchase 200 grams of processed coffee at 4,500 Tanzania shillings.

ii. Primary societies and cooperatives unions

Before liberalization of the trade cooperatives were not purchasing coffee from farmers but collected and sold it at the auction on behalf of the farmers. Currently, cooperatives must compete on equal footing with private buyers in the liberalized coffee environment. Thus, cooperatives, while unable to use three tiers payment systems, must purchase coffee from farmers and sell at the auction.

The current relationship between cooperatives and farmers is based on marketing of coffee. Farmers depend on primary society as their initial marketing point. Primary societies collect coffee from farmers and sell it directly at the auction through KNCU. Farmers expect to be paid by instalments. The situation is made worse because primary societies do not assist farmers in the purchase and distribution of agricultural inputs.

iii. Private Coffee Buyers (PCBs)

Private Coffee buyers purchase coffee from farmers and market at the auction. They are the result of privatization of domestic coffee marketing. In some cases, private traders have brought competition at the present coffee marketing environment, but in other cases where there are no cooperatives, they have created monopoly and offered farmers very low prices as the case of Mbinga in 1995. Besides, PCBs have been criticized for not assisting farmers in production process, and thus, farmers are left alone to produce with limited use of agricultural inputs, only to meet farmers during marketing.

Although PCBs have brought competition, but they have been accused of cheating on farmers by purchasing coffee at farm gate by tempering with the weighing machines. In other cases, PCBs, using their agents, have purchased wet coffee, an action which resulted to declining in quality of coffee.

PCBs and farmers relate mostly during the harvesting and marketing time and there is no legal obligation between them. Farmers sell coffee to PCBs in times of hardship and are paid only once. PCBs purchase coffee from farmers and does not assist them in the production process. However, PCBs expect farmers to use income accrued from coffee sales to purchase agricultural inputs and continue with coffee production. PCBs do not issue receipts and pay only once. Even when PCBs realize high price at the auction, they don't pay farmers another increment since they do not have records which show where the coffee was purchased. Thus, farmers take advantage of this by selling low quality coffee to PCBs which buy coffee regardless of its quality.

Some of the PCBs feel that farmers are not trustworthy. They do not assist them in obtaining agricultural inputs on loan basis, because farmers will not sell coffee to them. Thus, PCBs are uncertain about how the money loaned can be recovered. Therefore, they are engaged in purchasing coffee only. What is evident is that there are so many taxes both from the local government to central government. Sometimes bribes are used to get license which is given annually. Thus, to survive in the chain, PCBs must read the market trend and act accordingly in order to maximize profit and remain in business.

1.9.10 Taxation (Government and /district councils)

For many years, stakeholders of the coffee industry have been complaining about the number of taxes and licensing fees which they were required by the law to pay (TCB, 2017). These taxes and fees were mostly charged to coffee traders and eventually passed to coffee farmers as reflected by the low producer price that farmers get. These taxes and fees are said to be a burden to small holder farmers as they decrease the profit margin expected by these farmers.

The government, from 2018/19 coffee seasons, has decided to abolish some of these taxes and license fees in order to increase revenue accrued by farmers as well as increasing efficiency along the chain. To start with, from 2018/19 coffee season, TCB has abolished all licensing fees in the coffee sector for the companies which fulfil the conditions for trading on coffee. Table 1.4 indicates taxes and licensing fees on coffee industry before (2016/17) and after abolition in this coffee season (2018/19).

Table 1.4: Licensing fees (TZS) in the coffee sector before and after abolition

Type of License (s)	2016/17	2018/19
Ripe cherry coffee buying and processing certificate	500	0
Dry cherry coffee buying license	500	0
Parchment buying certificate	500	0
Coffee curing license (washed Arabica)	500	0
Coffee curing license (unwashed coffee)	500	0
Coffee warehouse license	500	0
Coffee liquoring (application fee)	5	0
Coffee liquoring license	20	0
Green coffee export license	1,000	0
Instant coffee export license	1,000	0
Roast and Ground coffee Export License	1,000	0
Local roasting license	500	0
Dry cherry hulling license	500	0
Direct export License	500	0
Exporter (application fees)	20	0

Source: TCB (2018)

Likewise, stakeholders complained about presence of multiple regulatory bodies (TCB, TDFA, Districts councils) which almost perform similar functions and thus, creating unnecessary bureaucracy which is not conducive for the smooth operation and efficiency of coffee sector.

From 2017/18, the government reduced the tax burden to the stakeholders of the coffee industry. Currently (2018/19), only 4 taxes and cess have remained in the coffee industry. These are the district cess taxation (3 percent of sold beans at the auction; reduced from 5 percent), research contribution tax (0.375 percent of sold beans), the contribution to the trust fund (0.1 percent by farmer and 0.1 percent by the exporter). It is expected that reduction of the taxes, cess and licence fees which were burden to farmers will increase prices of coffee and benefit to farmers along the value chain and not benefiting the traders who have been exempted but end up paying farmers as how it was before abolition. However, it is not clear yet as how the public outlays for the VC will be financed after abolition of taxes and licenses fees. The table below provides an overview of the new rules and regulations.

Table 1.5: Recent Government Directives on marketing for the 2018/19 coffee season

New rules/regulations	Previous rules and regulations

Coffee will be collected from the farmers by the cooperatives societies only. Farmer's groups and private traders will not be allowed to collect coffee from farmers	Farmers groups, cooperatives and private traders could collect/buy coffee from farmers
After collecting coffee from farmers, Cooperatives will take coffee for processing and later on selling at the auction.	All actors mentioned above were allowed to take coffee for processing at the curing factories
Private traders will be required to purchase coffee at the auction in Moshi	Private traders were licensed to purchase coffee from farmers
Estates and plantation must sell their coffee at the TCB auction in Moshi, but those with longer term contact, the TCB will prepare special arrangements	Estates and plantation exported coffee directly
Management of the TCB coffee auction in Moshi	
All buyers at the auction must have a tax clearance certificate.	It was not implemented before
All licensed buyers must have a bids security which will vary: TZS 500 million for big buyers (I do not know how to they be categorized) and TZS 100 for small buyers	
Payment time (prompt date) has been reduced from 14 days to 4 days. Buyers must pay in 4 days.	Payment time was 24 days
Sellers at the auction (cooperatives) will be paid in 7 days after the buyers have paid for the coffee they have bought at the auction	Payment took longer than 4 days (about 21 or more days)
There will be a special catalogue for sustainable coffee such as Organic, Fair Trade, Rainforest Alliance, Café practices and all other quality coffee with more than 80 cupping scores)	It did not exist before
Prices to be paid to farmers will be based on the auction prices. Cooperatives will be paid so that they can pay farmers.	It did not exist before
Coffee sellers at the auction will not be allowed to set a reserve price. The auctioneer will be responsible for setting the reserve prices based on the market.	Some of the coffee sellers had reserve prices
Unions and cooperatives will not be allowed to mix coffee collected from various cooperatives to maintain quality and prices for those who have worked hard to produce good quality coffee.	Coffee was collected and mixed and it was difficult to trace it back
Coffee from all primary societies will be entered the catalogues for example KDCU Kaisho RC.	It did not exist, rather, coffee collected from all primary societies under KNCU was labelled "KNCU"
TCB will set an indicative price to primary societies and unions which will be used as initial payment to farmers.	It did not exist before

1.9.11 The contribution of coffee to public revenues

Export wise, the entire coffee sector plays an important role to the economy and generates earnings of USD 100 million on average per year (TCB, 2018). The figure below shows that gold is the largest exported product. Despite of dominance of gold as single largest foreign exchange earner, coffee is still important as it contributed 7.8 percent to the GDP in 2010, 6.8% in 2015 and 4.2% in 2016. Decreasing contribution to the foreign exchange from coffee could be attributed to decline in quality of coffee and production in general due to decreasing areas under cultivation, low yields per hectares, which is attributed to incidence of pests and diseases, as well as fluctuation of the world market prices. However, increasing production of good quality coffee could be an important impetus to the contribution of coffee in public finance.

Coffee is also important for generating public revenues. Coffee was introduced during the colonial period as an export commodity, and also for enabling tax raising. The current District Cess (originally 5 percent of auction value, but recently reduced to 3 percent) is contributing substantially to the funding of district-level activities. This tax represents about 8-10 percent of the farm gate price, and account for up to 50 percent of a District's budget

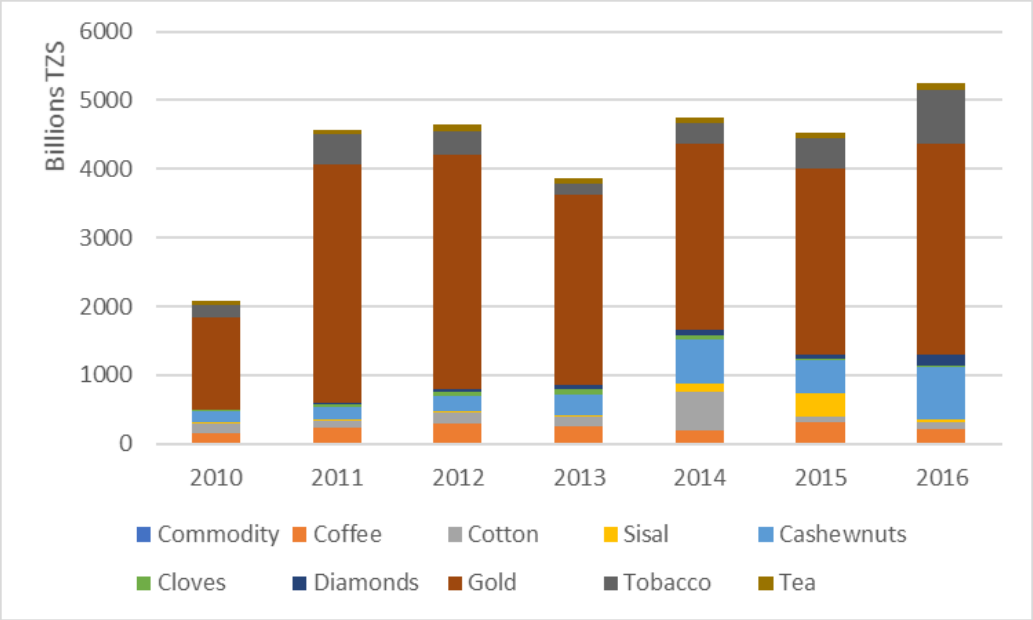


Figure 1.16: Major export products (in Billions TZS) in Tanzania 2010-2016 (source BOT 2018)

1.9.12 Transport

Both cooperatives and private sector are involved in transporting agricultural inputs as well as coffee in forms of cherries and parchment.

1.9.13 Auction

TCB on behalf of the Tanzanian government issues licensees to coffee exporters who are allowed to purchase coffee from the coffee auction in Moshi and export it. That is, exporters have met all the requirements for an export license. Coffee exporters (cooperatives and private traders) are members of the TCB auction which is conducted once a week on Thursday. The main actors at the auctions are licensed exporters these purchase coffees from the auction for export, farmer's groups/primary societies who sell their coffee at the auction and cooperative unions purchase from farmers and sell at the auction.

Although the 2002 Coffee Industry Act prohibits possession of multiple licenses in order to increase competition at the auction, PCBs have designed a way of possessing multiple licenses. This is done through establishment of sister's companies which operate in the same premises but perform different functions (one purchasing parchment coffee from farmers and another purchasing coffee from the auction and export). It is reported that initially, the relationship between the sister companies was a secret, but eventually it has become public. For example, at the auction, the sister company with the exporter license purchases coffee at the auction, which is sold by its sister company, leading to what is now called reposition of coffee. Sister companies operate along the coffee chain freely, purchasing their own coffee. The effects in the coffee chain has been the lack of competition among buyers, decrease price and income to producers.

1.9.14 Export

In Tanzania, coffee is among the major export crops; others are cotton, tea, cashew nuts, tobacco and sisal. A report by FAOSTAT (2013) shows that Coffee is the second leading export commodity in the United Republic of Tanzania after tobacco, accounting for 14 percent of agricultural exports during period 2004-2009. The report also indicated that trade data by UN COMTRADE showed that coffee contributes 4 percent of total exports during the period 2004-2011. Although production of cotton, tea and cashew nuts is higher than that of coffee, but coffee holds important position in the Tanzanian economy (see Figure 1.16)

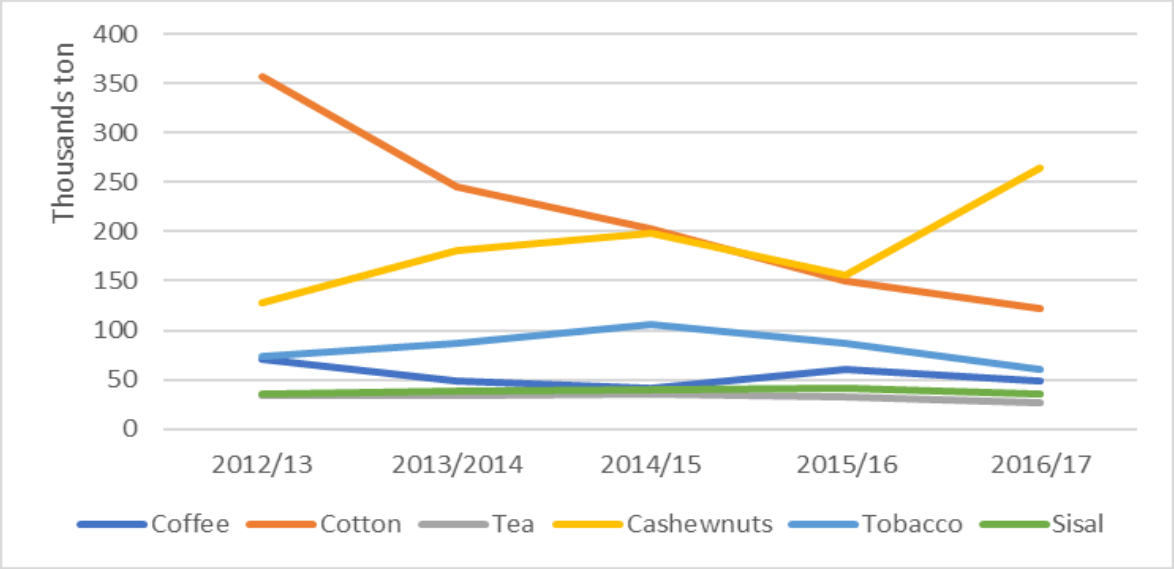


Figure 1.17: Production of selected cash crops in Tanzania (source BOT 2015/2016)

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Mahdi (2008) argues that the regulatory framework of the coffee market in Tanzania is complex and multilayered. He continues to argue that while some of the regulations in place are critical for the effective functioning of the market, others however can prove to be significant obstacles of small growers' income and profitability of business enterprises. The most common way the coffee is marketed in Tanzania is through the auction, whereby licensed exporters come to the auction and buy coffee from suppliers – individual farmers, groups and cooperatives or private buyers. During 2017/18, four big companies dominated the coffee auction by purchasing 90 percent of coffee. These companies are Taylor Winch (T) Ltd, Ibero (T) Ltd, Dorman (T) Ltd and Cotaco. Dominance and monopoly of the four companies at the auction has killed competition and thus the whole idea of the auction which is to facilitate the best price is not achieved. Thus, it is recommended that the abolition of licensing fees along the entire coffee chain including the auction is aimed at increasing efficiency along the chain, reducing monopoly of these 4 big exporting companies at the auction so that more trading companies will participate and thus, increase competition and market price accrued to the farmers.

1.10 Key drivers

The current performance of the Tanzania coffee sector is shaped by five key drivers:

1. The importance of coffee for generating **public revenues**. Coffee was introduced during the Colonial period as an export commodity, and also for enabling tax raising. The current District Cess account up to 50 percent of a District's budget. Recent government measures to prohibit sales to local traders and enforce deliveries through AMCO's at the auction intend to strengthen public control over coffee revenues.

2. Coffee production in Tanzania is largely in **stagnation**, with difficulties to expand cultivation areas, declining international prices and constraints for improving quality and consistency. The National coffee strategy particularly aims to increase coffee production in the Southern highlands, where land is available for pure stand cultivation at higher densities and GAPs can be promoted to enhance higher yields. However, due to **climate change** rainfall patterns have become rather erratic and farmers increasingly need to rely on irrigation to guarantee timely flowering.

3. Coffee production represents for many smallholder farmers, and temporary wage workers, a critical source of **cash income**. Returns from coffee are typically used for paying school expenses, housing investments and other large expenditures. Smallholder coffee production is almost entirely embedded in mixed farming systems that include staple crops such as maize and beans, along with horticulture and small livestock. Coffee represents between 40 – 80 percent of household cash income. Whereas most labour for coffee maintenance and harvest is provided by women, coffee trade is usually controlled by men.

4. Coffee production requires a large number of **support services** that enable production and exchange. This starts with the adequate supply of seedlings of improved varieties (through TaCRI), the availability of suitable formulas of fertilizers (from local agro dealer shops), access to credit and/or financial services to enable input purchase, technical assistance and extension services (provided by the local government, NGOs or Curing

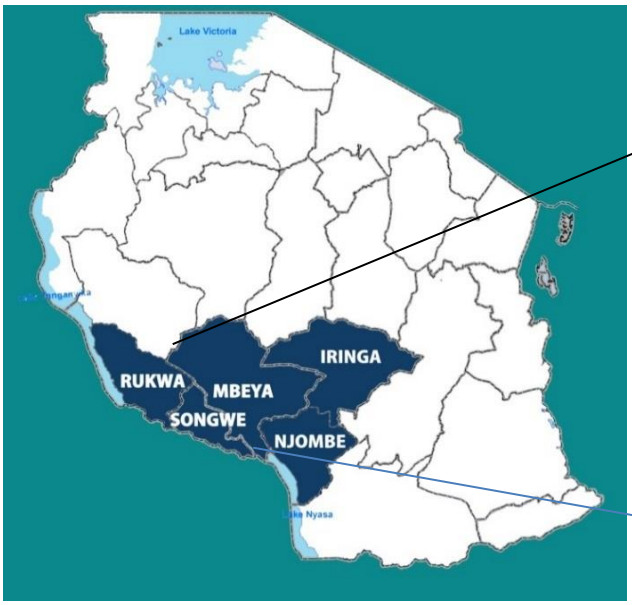
factories), support for farmer organization and community development, opportunities for certification and other services that link coffee farmers to value chains. The effectiveness of the coffee chain depends to a great extent on the availability of adequate support services.

5. The integration of the coffee value chain is embedded into a wide range of contractual mechanisms that guarantee **linkages** between value chain agents. In the Tanzanian context several incentives regimes are in place:
   - Advanced payments (pre-finance) by private coffee traders;
   - Bulk input supply (fertilizers) to support yield improvements;
   - Free seedlings provision to enhance coffee renovation (TaCRI and District councils);
   - Certification (with premium) through curing companies;
   - Warehouse receipts system for pre-auction advance payments;
   - Coffee auction to support market transparency and higher prices (but operating with strong delays)

2 Field study: scope, approach and methods

The VCA4D analysis intends to provide insights in the net socio-economic effects of these different strategies for the welfare of smallholder producers and rural families, as well as for the performance of the coffee sector. We therefore focus on a detailed analysis of the operations along the coffee cycle and assess the social, economic and environmental outcomes of different sub-chains in the focus region of Mbeya and Songwe (See map 2.1). These regions are expanding Arabica coffee areas that represent 15-20 percent of national coffee production.[4]

Map 2.1: The Southern Highlands, with further detail of Songwe and Mbeya Regions



We first reviewed aggregate statistical data on (sub)regional coffee production and relied on earlier survey data (from TaCRI and CPT) to assess the importance and for identifying key characteristics of the coffee sector. Hereafter, we outline the procedures for field data collection and the indicators used for the economic, environmental and social assessment.

[4] Note that production volumes are adjusted in 2014/15 due to changes in regional delimitation.

Table 2.1: Population, agroecological and farm characteristics in Songwe and Mbeya regions

	Songwe Region	Mbeya Region	
	Mbozi District	**Mbeya Rural**	**Ileje District**
Population density (2012 census)	446,339	690,598	124,451
General agro-ecological characteristics	Dryer than Mbeya Rural Irrigation required		Wetter and almost exclusively rain fed production system
General farm characteristics	Comparatively larger land holdings 5 estates	Comparatively small to medium land holdings	Small land holdings Organic production
Estimated total area under coffee (hectare)	36,948	5,521	6,225
Coffee produced in 2016/2017 season (tonnes)	11,008	1,756	397
Estimated yield per hectare (tonnes)	0.32	0.32	0.06
Number of CPUs	110	12	6
Number of AMCO	2	1	n.d
Location of Private Sector Traders & Processors	Coffee Management Services (CMS) MCCO	City Coffee Starbucks	
NGOs	Save the Children	Hans R. Neumann Stiftung	

2.1 Regional importance of the coffee sector

Mbeya and Songwe Regions are expanding coffee areas in the Southern highlands of Tanzania. Recently, their contribution to national output has increased to 15-20 percent (see Figures 4.1 to 4.6).

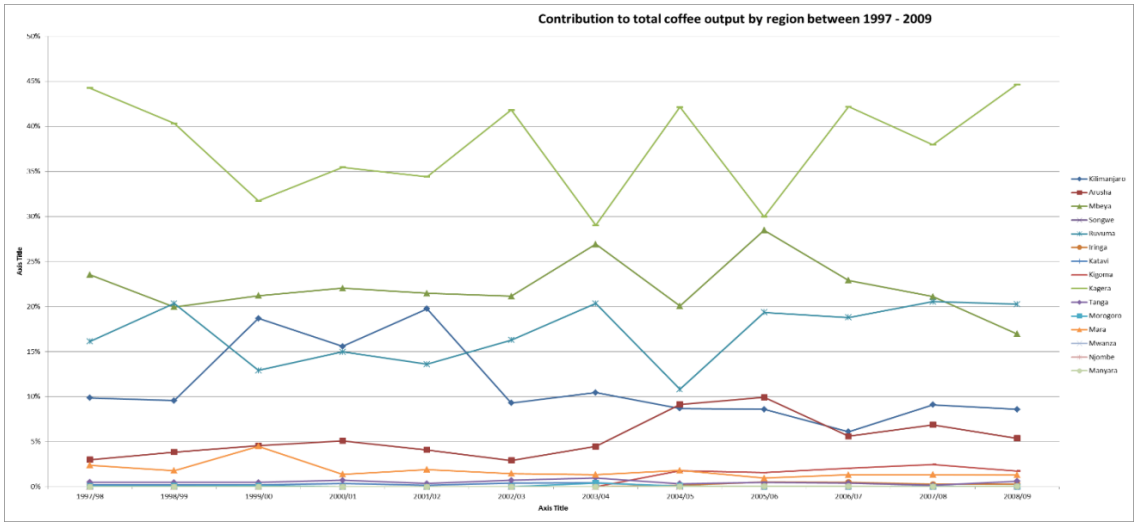


Figure 2.1: Contribution to total coffee output by region in %; (Source TCB)

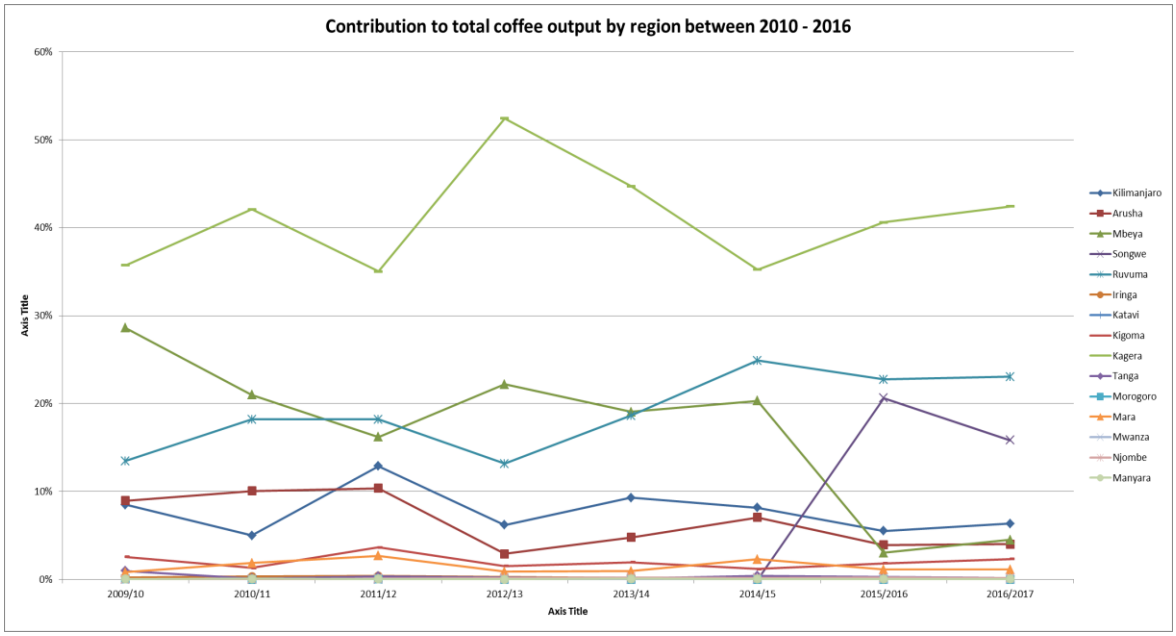


Figure 2.2: Contribution to total coffee output by region in % (Source TCB)

Coffee production in Mbeya and Songwe districts was around 10-12.000 ton in recent years, representing about 20 percent of total national coffee production. All coffee from the Southern Highlands is Arabica and has no particular quality distinctions.

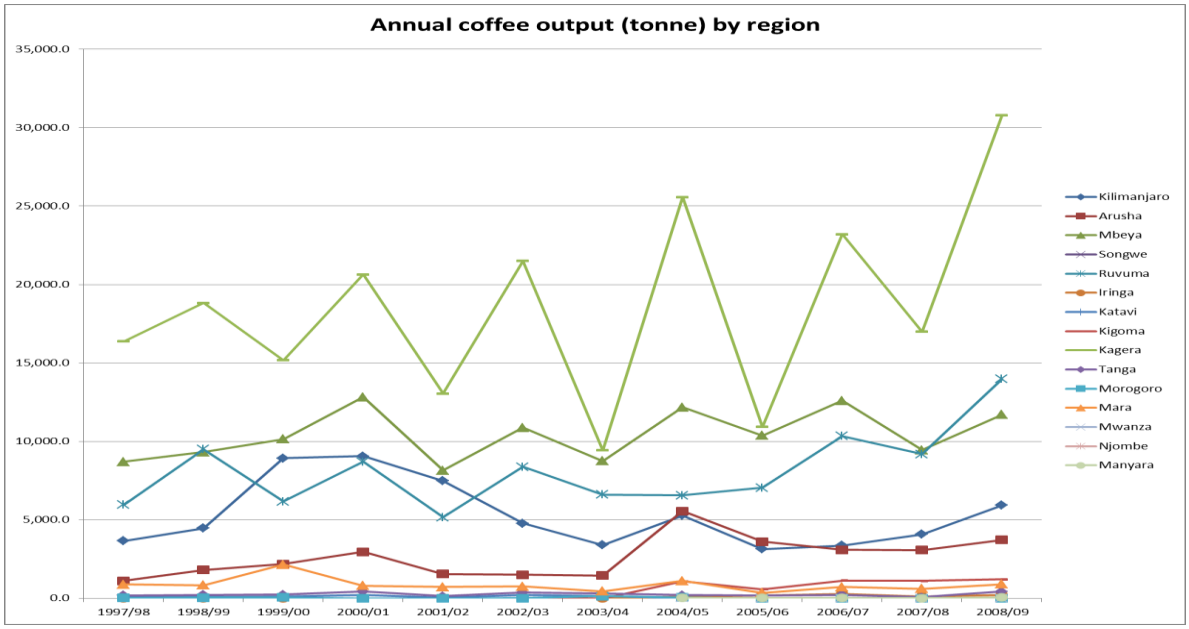


Figure 2.3: Trend of coffee output by region in tons (1997/98 -2008/09) (Source TCB)

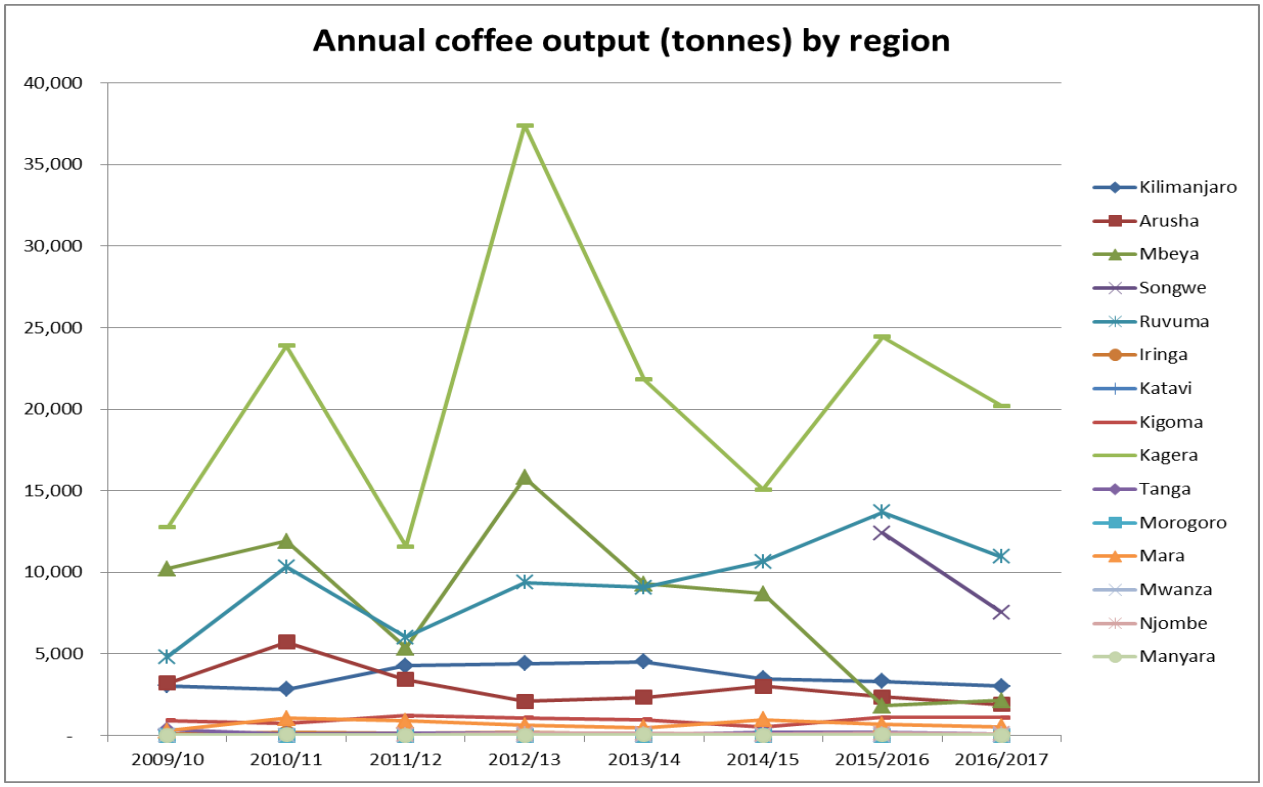
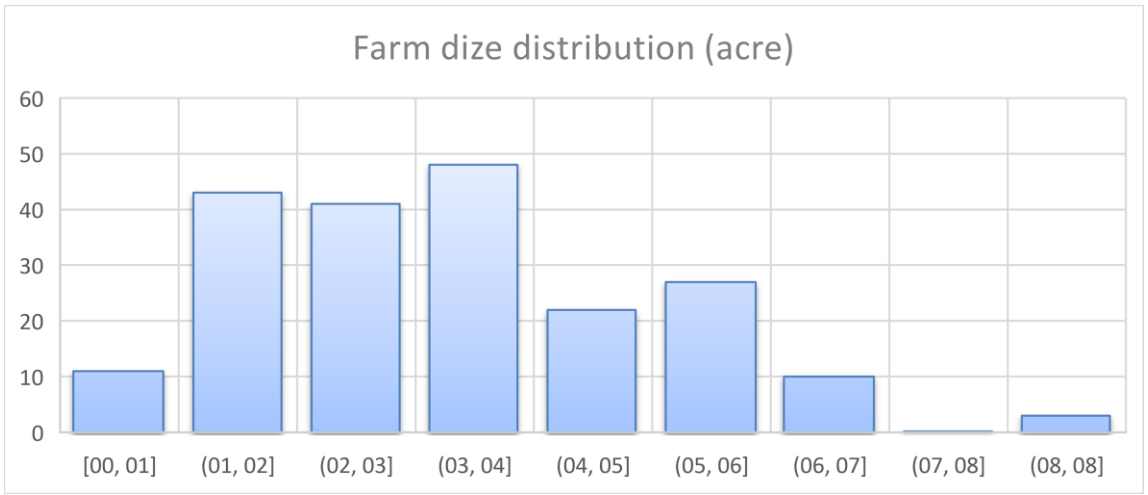


Figure 2.4: Trend in coffee output by region in tons (2009/2016/17) (Source TCB)

2.2 Regional farm structure

Basic data on coffee producers in the Western highlands can be derived from two survey: the TaCRI coffee producers survey (N=205) and the regional sub-sample from the Coffee Partnership for Tanzania (CPT) survey implemented in Mbeya by HRNS and CMS (N=610). These surveys are useful to indicate the farm size distribution (mode 3.5 acre), coffee tree density (rising from 1000 to 1500 trees/acre), coffee income dependency (between 40 and 80 percent) and gross margins of coffee cultivation (see Figures 2.5 – 2.8).

Figure 2.5: Farm size distribution (acre) (Source TaCRI)



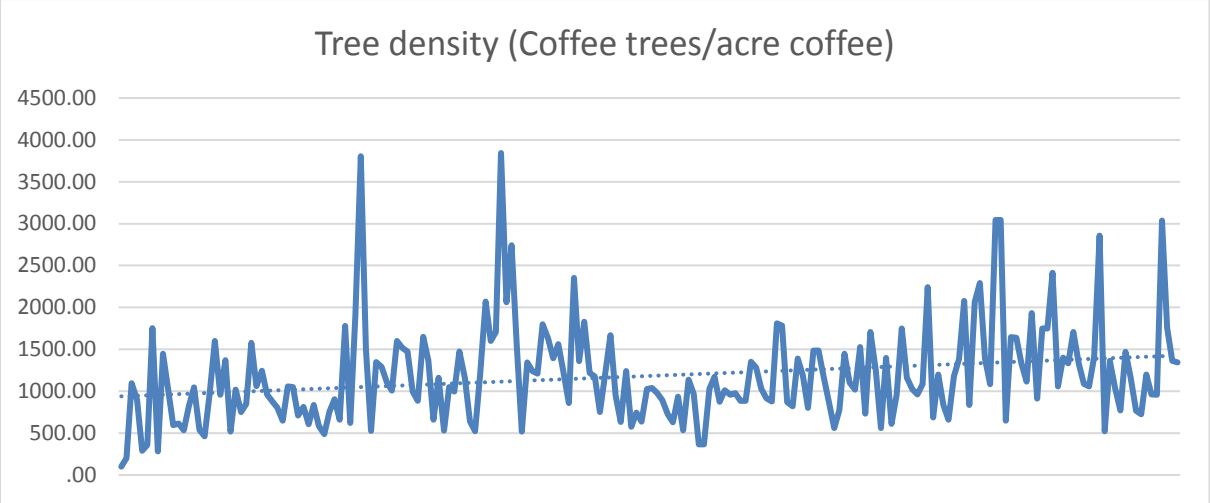


Figure 2.6: Tree density (trees / acre) (Source TaCRI)

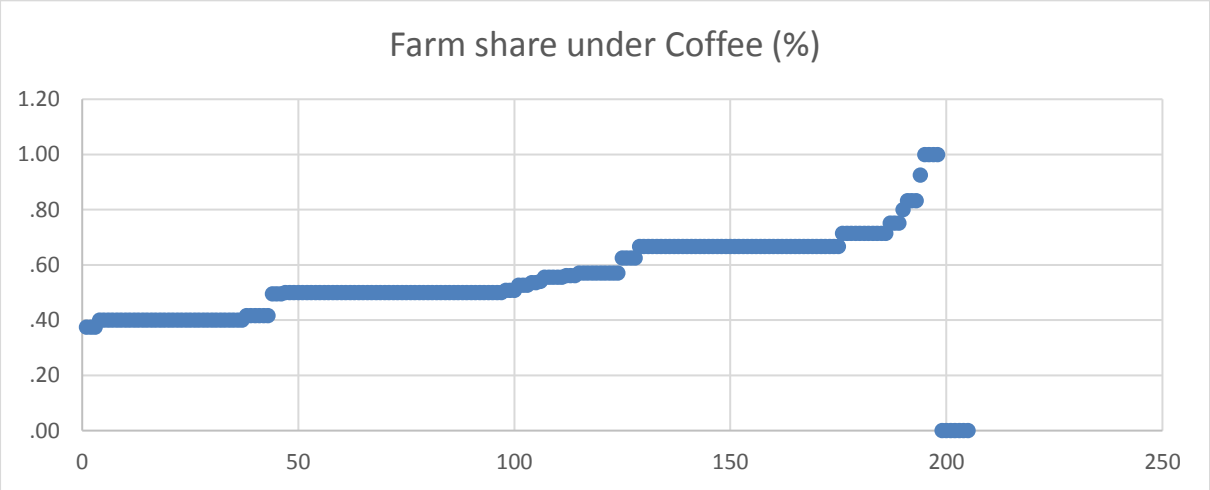


Figure 2.7: Farm share under coffee (% of land) (Source TaCRI)

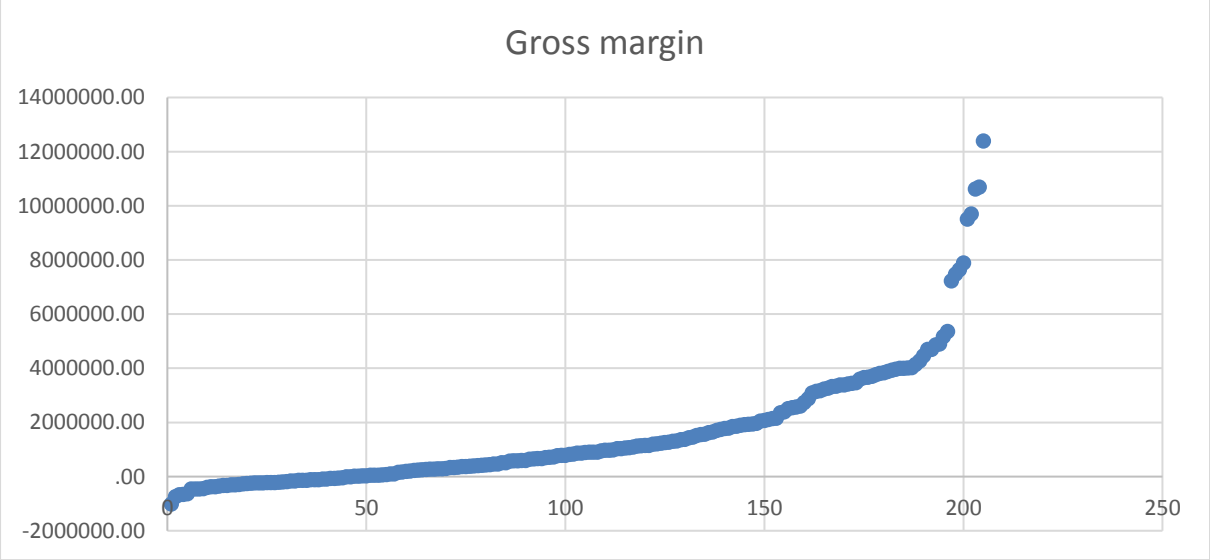


Figure 2.8: Gross margin (in TZS) (Source TaCRI)

Therefore coffee production in the Southern Highlands is divided into different categories.

1. First (1), smallholder farmers who have less than 5 acres who comprise the majority of the producers. In this category, family labour is used in most of the farm activities. In additional, rotating labour among the friends and villagers is also common where activities such as weeding, picking are shared.
2. The second category (2) are medium farmers with about 5 to 15 acres. In this category, family labour is combined with hired labour, which is used during fertilizer application, weeding and picking. Farmers who belongs to this category, especially in Mbozi district which is drier compared with other places, have invested in irrigation facilities and have been noted to irrigate their farms during flowering (September and November). This indicate seriousness of these farmers in coffee cultivation.
3. The third category is comparable to second category. The average size is a larger and can be between 15 and 50 acres.
4. The estates such as LIMA Company and Kanji Lalji are in fourth category. They have more than 100 acres, invested in irrigation facilities, with application of fertilizers, herbicide and insecticides. They are depending on hired labour from neighbouring communities. The estates use machines such as tractors. They also own their own CPU.

Coffee is cultivated on the estates as a pure stand with few shed trees, but among the small holder farmers, coffee is often intercropped with banana and other crops. Coffee productivity per trees among the smallholder farmers is estimated to be 250 grams of parchment coffee per tree (TCB, 2016) compared to estates which can reach up to 900 grams per tree. This suggest that there is an opportunity to increase productivity among smallholder's farmers on their existing farms, rather than expanding into new areas. What is need is for the stakeholders to work together in implementing Good Agricultural Practise (GAP) which will increase productivity per tree.

Inability to access agricultural inputs, limited extension services, and aging coffee trees have all been mentioned as some of the contributing factors to low productivity. Other factors include pests and diseases and the effects of climate change. Some smallholder farmers are still producing coffee from aging trees that are almost 50 years old. Conventional coffee trees are highly susceptible to two deadly diseases which are Coffee Berries Diseases (CBD) and Coffee Leaf Rust, whose treatment is expensive and consequently reduce the revenue for farmers. In response, Tanzania Coffee Research Institute (TaCRI) - with funding from the European Community (EU) has researched and produced 13 newly hybrid coffee varieties which are resistant to these two deadly diseases. The introduced varieties are high yielding and produce good quality coffee. However these newly introduced varieties are heavy feeders which require higher application of fertilizers and water. During the research, we observed that some farmers are beginning to adopt these new varieties which are sold at TZS 100 per seeding.

2.3 Regional cropping calendar

During the 2012 Census, the average household size in Mbozi District was recorded at 4.3. Although a simplistic measure, it demonstrates that household's own labour capacity is not

likely to be sufficient for a SHF growing more than 0.5 acre of coffee. To address the shortfall, many SHF appear to share labour between relatives, friends or members of which ever Farmers Group they belong to. Alternatively, they must find enough funds to pay the daily wages of labourers from the local area.

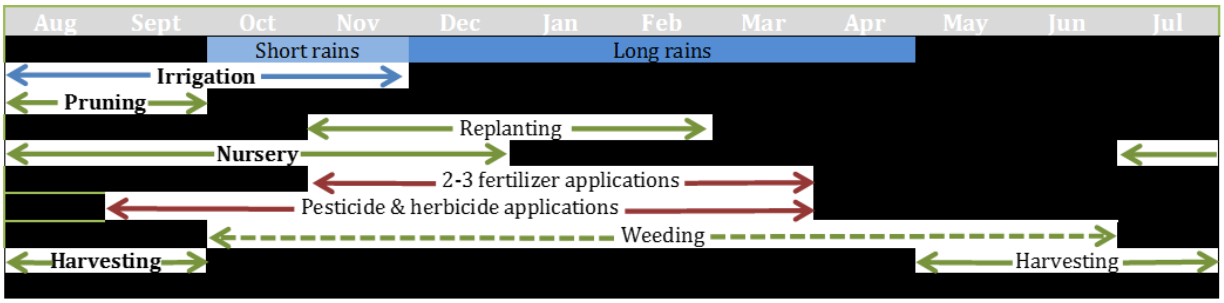


Figure 2.9: Coffee cropping calendar – Mbozi

However, money is not always available when it is needed, and there are a number of competing priorities within the household for funds at certain times of year, such as; school expenses, medical bills, improvements to housing, etc. Money received from coffee sold through the auction in Moshi, may take anything up to 3 months or more to reach the farmer, and will be subject to a number of deductions, including taxes, before it is paid. While coffee is not the only source of income for farming households in Mbeya and Songwe Regions, it is a very significant component of household income (anything from 40 to 80 percent or more of annual cash income). As a result, many SHF appear to find it difficult to meet all their other needs and also cover the cost of fertilizers, pesticides/herbicides and wage labour at the point in time when they are needed. Therefore, SHF often enter into formal and informal agreements with local traders, agents and private sector buyers, in exchange for agricultural inputs and cash.

At the informal level, this includes "kata kichwa" *(*literally; cutting off the head), where a portion of the coffee harvest may be promised to the lender, in exchange for cash or inputs. "Kata kichwa" can be seen as either a form of distress selling, or a way of using coffee in place of non-existent financial services, and most often takes place at flowering or green cherry stage, before the full extent of that year's harvest is known. The local lender therefore offers only a low rate at this point in the cropping cycle, as they must cover themselves against the risk that the coffee, when it is harvested, will be worth less than they lent the farmer. Coffee is traditionally a man's crop. The person who decides whether to use "kata kichwa", and will control the money earned from this form of sale, will be the head of household, and therefore most frequently it will be a man.

In the majority of households, it is the male head that controls any income earned from coffee and can decide how it is spent. Whether other members of the household are consulted will depend on the dynamics of the household (see also par 7.4.3). For this reason, many women also engage in informal trading of coffee. It was reported that women often withhold a small portion of the coffee they harvest and sell it 'on the side' (without their husbands knowledge) to local traders and agents. This enables women to gain access to the value of the coffee for food, school fees and other domestic priorities without having to ask their husband for money (or before he has a chance to spend it on other things).

Formal agreements with buyers and their agents takes the form of an initial 'payment' of fertilizer and agrochemicals early in the crop cycle, followed by a second payment at harvest time, to cover labour costs. These are then deducted from what is earned, after the coffee is sold at auction. Farmers are better able to access inputs and bank loans, by coming together into groups, where they can benefit from economies of scale (buying fertilizers, etc. at a cheaper price in larger quantities), bulking their coffee output together to make processing and marketing more efficient, and providing greater security for lenders. As outlined in the Functional Analysis, the majority of farmers are currently members of Farmers Groups (FG), who are registered by the Ministry of Local Government & Regional Administration (linked to Prime Minister's Office). Primary societies, or Agricultural Marketing Co-operative Society (AMCO) are currently weak or non-existing, but will become the only groups able to market coffee, after the recent Presidential decree. As a result of the recent Presidential Decree, it proved difficult to find any FG to include in the focus group discussions as they have begun to form AMCOS in readiness for the changes.

The Tanzania Demographic and health Survey and Malaria Indicator Survey (TDHS-MIS) 2015-16 shows that in Mbeya Region, 37.7 percent of children under 5 years old were stunted, compared to the national average of 34.7 percent, despite the region being among the top 10 food producers in Tanzania. There is a strong link between undernourishment and reduced educational attainment[5], although there are a number of other factors that must also be considered. According to the National Examinations Council of Tanzania (NECTa), pupils achieved a 56.7 percent pass rate in the 2016 primary school leaving examinations (PSLE) in Mbozi District, a 54.2 percent pass rate in Mbeya District and only 53.4 percent pass rate in Ileje District. This is an improvement, however, as Mbeya Region achieved only a 48.9 percent pass rate in 2014 making it one of the 10 worst performing regions in Tanzania. As a result, NGOs such as Save the Children are working with families in Mbeya and Songwe Regions to raise awareness of appropriate nutrition for pregnant and breast feeding women, and for mothers with children up to 2 years old. Work is also being done to raise awareness of appropriate child care and supervision for children up to 8 years old. While coffee is not the cause of these issues, it will almost certainly contribute to them, and can therefore provide an opportunity to address some of the underlying issues, providing these are understood.

2.4 Scope of the economic analysis

The economic analysis of the coffee value chain involves a detailed assessment of

a) The **costs and benefits** to determine viability of each VC agent;
b) The **effects of the VC to the national economy** (including added value, contribution to public finances); and
c) The **competiveness** of the VC in the international economy.

The inventory of costs and benefits of VC agents includes six stages (see also Figure 3.1):

1) Input provision (land lease, seedlings, fertilizers, wage labour) and credit;

[5] For example; In 2016, Twaweza, an NGO, conducted a study testing 197,451 children between 10 years to 14 years on their ability to do a Standard Two multiplication assignment. They found 53.4 percent of well-nourished children completed the test successfully, compared to only 37.7 percent of the moderately malnourished children, and 35.5 percent of those considered severely malnourished.

2) Primary production/cultivation of coffee (permits, inputs, irrigation, wage & family labour, etc.);
3) Coffee wet processing (home processing or at central processing unit);
4) Curing (dry processing) including, warehousing, grading and cupping;
5) Trade (direct trade or through auction); and
6) Exporting or Local processing (roasting).

For the financial analysis of the primary production, we made a distinction into 4 major production systems (large-scale estates and 3 different types of smallholder producers) and different farming systems: conventional and organic production.

The various production and processing practices also have environmental implication, whereas different value chain organization and governance regimes tend to influence social coherence and have distributional (equity) implications.

The economic value chain analysis was done by using AgriFood chain Analysis (AFA) developed by CIRAD and supported by the French Ministry of Foreign Affairs and the EU/VCA4D project. AFA is a model that enables to estimate the contribution of interlinked value chains actors to the national economy and makes estimations on the comparative performance in the global economy.

We were not able to calculate the value on the national level based on the data collected in the Mbozi region. The collected data is region specific in terms of coffee variety, climate and resources and as such not transferable for other coffee farmers in Tanzania.

2.5 Scope of the environmental analysis

The environmental analysis will cover the two main production systems, namely the estates and the small farmers, in a cradle to gate perspective. Each production system will be divided into three sub-systems which are the conventional production, the organic production and certified productions (Rainforest Alliance and Coffee Practices). In addition, sensitivity analyses will be used to assess the influence of irrigation (or not) as wells as the influence of the type of coffee variety (improved vs. traditional) on the results of the environmental analysis.

- **Field emissions**

The coffee cultivation in Tanzania is highly agrochemical intensive. Farmers apply fertilizers (urea, NPK…), fungicides and pesticides at different periods of the agricultural calendar. These agrochemicals will induce different emissions (nitrate, nitrogen oxides, ammonia, heavy metals, potassium, phosphate…) in the soil, the ground water and the air.

Furthermore, the pulping, the fermentation and the drying processes could be energy and water intensive in the case of a CPU in comparison to the Home Processing. However, CPU could have better pulping yield and high quality green coffee with limited or even negligible losses. The direct emissions (particulate matter, nitrogen oxides, carbon monoxides, sulphur oxides…) generated by the combustion of the fuel will be calculated for this stage of the value chain.

The remaining stages of the value chain (curing, warehousing, transportation, roasting and distribution) will have electricity and/or fuel as the main input. As for the pulping stage, the emissions related to the combustion of fuel will be calculated. For the electricity consumption, the Tanzanian electricity mix will be modelled in order to take into account all the emissions related to the primary sources of the electricity.

- **Relevant impact categories and corresponding environmental indicators**

The cultivation of coffee requires direct inputs from the ecosphere (land and water) and technosphere (agrochemicals, energy, packaging materials…). In the southern part of Tanzania, some of interviewed persons talked about possible deforestation due to expansion of coffee cultivation. The use of fake fertilizers has also been notified by some of the stakeholders.

To better address the potential environmental impacts of the cultivation stage, the three main environmental endpoints will be used:

- The impacts of the use of the different agrochemicals on the **ecosystem quality** at the damage level and their contribution to ecotoxicity and eutrophication at midpoint level. The impact of the expansion of coffee cultivation on land transformation and deforestation will also be assessed. The water use will be analysed in order in order to investigate the potential impact of the irrigation on the available water resources;
- The impacts of agrochemicals and airborne emissions (fuel combustion) on **human health**;
- The impacts of the use of mineral fertilizers and fossil energy on the **depletion of mineral and non-renewable resources.**

The remaining stages of the value chain (curing/warehousing, roasting, grounding and transport) have energy as the main inputs. The potential contribution of these energy-using processes to global warming will then be assessed.

2.6 Scope of the social analysis

The social analysis focused on unpacking the dynamics of the six domains, and their components, which combine to produce a detailed social profile for the value chain (Annex 6). Details of how the social profile is constructed are outlined in the VCA4D methodological brief. The information used to carry out the analysis for this study was gathered from secondary information sources, stakeholder and key informant feedback and a short but detailed household level field study carried out in three districts from Mbeya and Songwe Regions (Annex 5). During the first scoping mission, the key parameters of the social analysis were identified (not all components of the six domains being relevant for every study), key informants identified and the focus for the field level study was confirmed. During the two VCA4D study visits, the Social Specialist carried out a series of interviews with local, regional and national level stakeholders and key informants, including SHF and government representatives. In addition to this, a team of Tanzanian researchers were commissioned to carry out a small household level survey and several focus group discussions during February 2018 (Annex 5). The purpose of this field research was to develop as representative a picture of SHF coffee production in Songwe and Mbeya as possible, in order provide disaggregated

evidence for a set of specific, household level issues that were identified during the course of the VCA4D study. These issues were:

- Access to and control over money within the household (between men, women and youth), including access to savings and other financial services;
- Workload and labour distribution between household members;
- Influence of coffee production on nutrition and school attendance;
- The role of farmers groups (both FG and AMCO), including formation, governance and effectiveness;
- With the presence of five coffee estates in Mbozi District, the analysis will also attempt to explore their influence on the surrounding communities.

In accordance with the identification of Songwe and Mbeya Regions as being focal to the VCA4D analysis, household data collection was carried out in selected communities within Mbozi, Mbeya and Ileje Districts. Data collection was carried out through tailored focus group discussions with women, men, Farmers Groups/AMCOs and youth, plus additional individual interviews, as time permitted. Communities were selected in order to explore key characteristics of the District, in terms of the issues outlined above.

Table 2.2: Sampling of the respondents

District	Sample	Specific Requirements
Mbozi District	4 coffee growing communities per District	2 communities close to a coffee estate (supplying labour) 2 communities not influenced by coffee estate
Mbeya Rural District		2 communities close to a main road or feeder road 2 communities on a minor road
Ileje District		2 communities growing organic coffee 3 communities, non-organic production

2.7 Field visits

This report is based on findings of the member of the Tanzania Coffee Value Chain Study team, made during two joint missions (between 29th January to 10th February 2018, and between February 26 and March 9) to guarantee a common scope of the study, followed by several individual field visits to recollect detailed information to address the specific research questions, see Annex 8 for a complete program of the visits.

The aim of this first visit was for the team to identify the scope of the overall coffee value chain analysis and complete a preliminary functional analysis for the sector. Prior to the visit, the EU Delegation to Tanzania specified the regions in the south of Tanzania, including the Southern Highlands, which are of particular importance to their ongoing agricultural sector support programme. Of these priority regions, Mbeya and Songwe account for 15-20 percent of the total Arabica coffee produced in Tanzania in 2017, with the vast majority originating from two Districts; Mbozi (18 percent) and Mbeya Rural (3 percent). Therefore, the study visits focused on these two regions.

In addition, institutional meetings were held with key national level stakeholders in Moshi, Arusha and Dar-es-Salaam. Moreover, a great deal of documents could be reviewed (see List of References) and some (inter)national key experts have been consulted through internet.

The mission conducted interviews with and made field visits to the stakeholders presented in table 2.3, below.

Table 2.3: Mission interviews

Stakeholder	Organizations	Number
State agencies	Ministry of Trade, Ministry of Finance	2
Sector agencies	TCB, Coffee Auction	2
Coffee research	TaCRI, SAU	2
Coffee cooperatives	KNCU, G-32, Ibemba Primary society	5
Farmers groups	Ibemba, Tumaini, Igawa, Upendo	5
Women's groups	Tumani; Armani	2
Youth groups	Tumani; Songwe	2
Local agencies	District Councils	3
Curing factories	CMS, CCC, MCCC Ltd	3
NGOs	Kaderes, Save the Children	2
Coffee Foundations	HRNA (Neumann Stiftung), Starbucks Café Practices	2
Coffee smallholder farmers	Mbeya Rural, Ileje and Mbozi Districts	100
Coffee estates	Mbozi (4) and Mbeya (1)	5
Coffee Certification bodies	Utz, RFA, FT/FLO, ŞC, TCP	5

3 Economic analysis

The economic value chain analysis has been done by using AgriFood chain Analysis (AFA) developed by CIRAD and supported by the French Ministry of Foreign Affairs and the EU/VCA4D project. AFA is a model that enables to estimate the contribution of interlinked value chains actors to the national economy and makes estimations on the comparative performance in the global economy.

For this economic analysis we distinguish 2 different value chains:

1. The conventional value chain with production location in Songwe and Mbeya Region;
2. The organic value chain with production areas only Mbeya Region (Ileje District).

We are not able to calculate the value on the national level based on the data collected in the Mbozi region. The collected data is region specific in terms of coffee variety, climate and resources and as such not transferable for other coffee farmers in Tanzania.

3.1 Financial analysis

Production

We interviewed different types of producers with small, medium, large and estate farms with coffee production. Small farmers have a maximum farm area of 8 acres, medium farms have an area up to 20 acres and large farmers have an acreage of more than 20. The table below gives an overview of different key descriptive characteristics (Table 3.1):

Size of the interviewed smallholder farmers is 4.4 acres. The average reported yield does not fluctuate a lot between the different categories. However between the small farmers we found big differences in yield going from 0.24 to 0.75 ton per acre. Compared to the smaller farmers, the estate production per acre is only slightly higher. This relates to the fact that it is calculated over the total area of coffee cultivation, but the harvested area is small since the estates are in process of replacing old trees with new improved trees.

The farm gate selling prices varies between the actors depending on how the coffee is sold. Smallholder farmers with own processing facilities fetch a lower price due to a lower quality but save some costs on transportation. The medium, larger and estate farms obtain a better price for their coffee due to value-adding wet processing.

We interviewed 3 estates in the study area. Only 1 estate was producing with irrigation. This is contradictory to the typical estates in other parts of the country, were irrigation is used by most of the larger farmers and estates.

Table 3.1: Categories of different coffee producers in the study area and their economic profiles

		Small farmer (n=5)	Small farmer with processing (n=2)	Medium farmer (n=1)	Large farmer (n=1)	Estate (n=3)
Cultivated coffee area	Acre	4.40	3.50	15.00	50.00	169.33
Coffee yield (parchment)	Ton/ acre	0.42	0.43	0.47	0.54	0.52
Total production (parchment)	Ton	1.85	1.51	7.00	27.00	89.00
Total production (clean)	Ton	1.48	1.20	5.60	21.60	71.20
Selling price per ton of parchment	TZS	4,200,000	4,000,000	4,300,000	4,500,000	4,200,000

The calculated average profit margin for the farmers and the estates in the study varies between 30 and 40 percent (Figure 3.1).

Small farmers without own processing have more costs related to external processing services. E.g. the costs that have to be paid to the CPU. This is circa TZS 100 per kg of cherries (or TZS 500 per kg parchment) and about TZS 135 per kg of parchment.

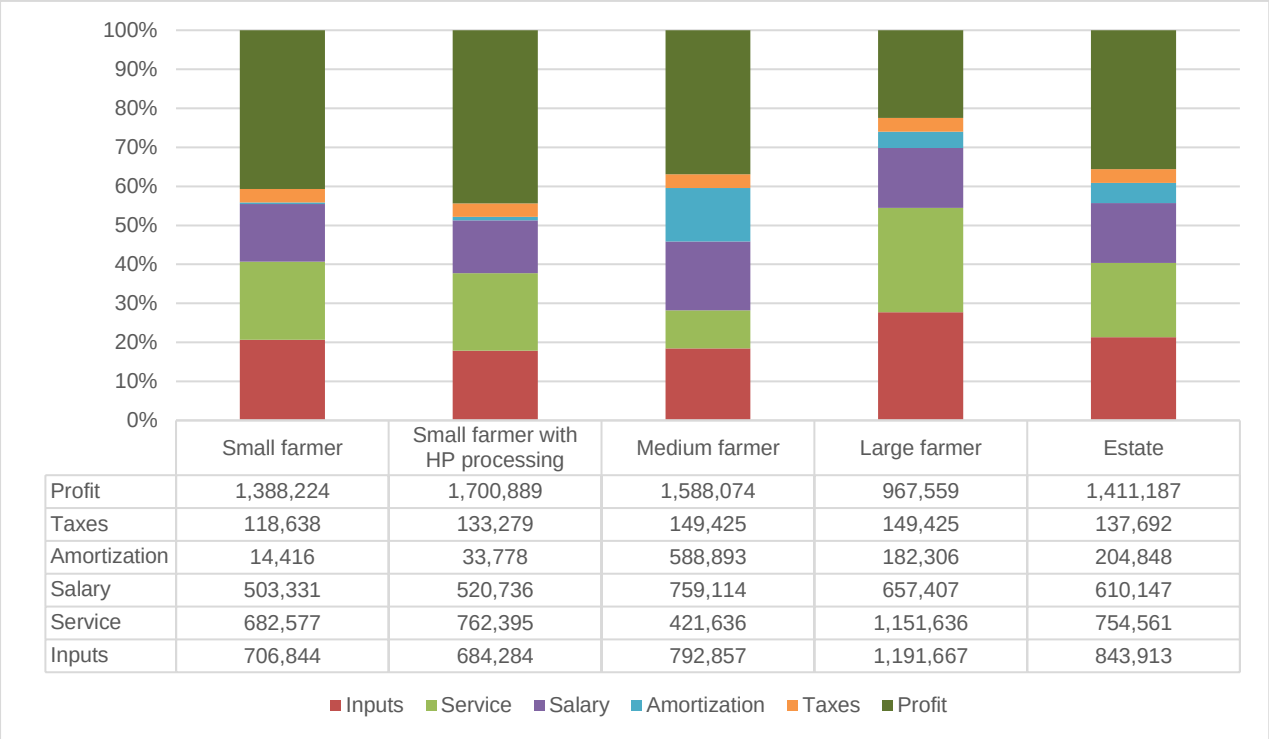
Small farmers with own, basic, home processing have more costs related to salaries for processing. However these farmers are able to sell the coffee for a higher price and as such they have a higher profit margin.

However it happens that farmers are forced, due to cash flow problems to cover school fees or other urgent expenses, to sell the coffee for a significant lower price to middle men. Of course this influences profitability.

Most SHFs are part of farmers group, but not all are part of a formal cooperative. As farmer group they supply or own a central processing unit. The medium farmer interviewed has his own wet processing facility including fermentation tanks and drying table. Operating this equipment requires serious labour. This increases the costs of production, however the higher selling price compensates for this. The large farmers interviewed tend to outsource the wet processing to a central processing unit. He argues that this is less costly for him.

Harvesting is done once a week and the cycle continues until all ripe cherries have been picked. Picking of coffee at household level is normal done by family labour. When additional labour is hired, pickers are paid between TZS 800 –1,000 for each 20 kilograms bucket they fill. The rate varies over the course of the harvesting season, depending on demand. At the estates, picking is also done by hired labour between TZS 1,000 and 1,200 per bucket of 20 litres during peak harvesting time. A single person cannot physically pick more than 5 buckets in a day, so the daily take home pay during harvest will be no more than TZS 5,000 (or TZS 6,000 on an estate) which at today's exchange rate is equivalent to between Euro 1.80 – 2.20 a day in total. Once the number of ripe berries declines, workers are paid a daily rate, as it becomes very difficult for them to fill the buckets quickly.

Only 1 out of 3 estates report the use of irrigation. But this does not directly leads to a higher reported yield.



	Small farmer	Small farmer with HP processing	Medium farmer	Large farmer	Estate
Profit	1,388,224	1,700,889	1,588,074	967,559	1,411,187
Taxes	118,638	133,279	149,425	149,425	137,692
Amortization	14,416	33,778	588,893	182,306	204,848
Salary	503,331	520,736	759,114	657,407	610,147
Service	682,577	762,395	421,636	1,151,636	754,561
Inputs	706,844	684,284	792,857	1,191,667	843,913

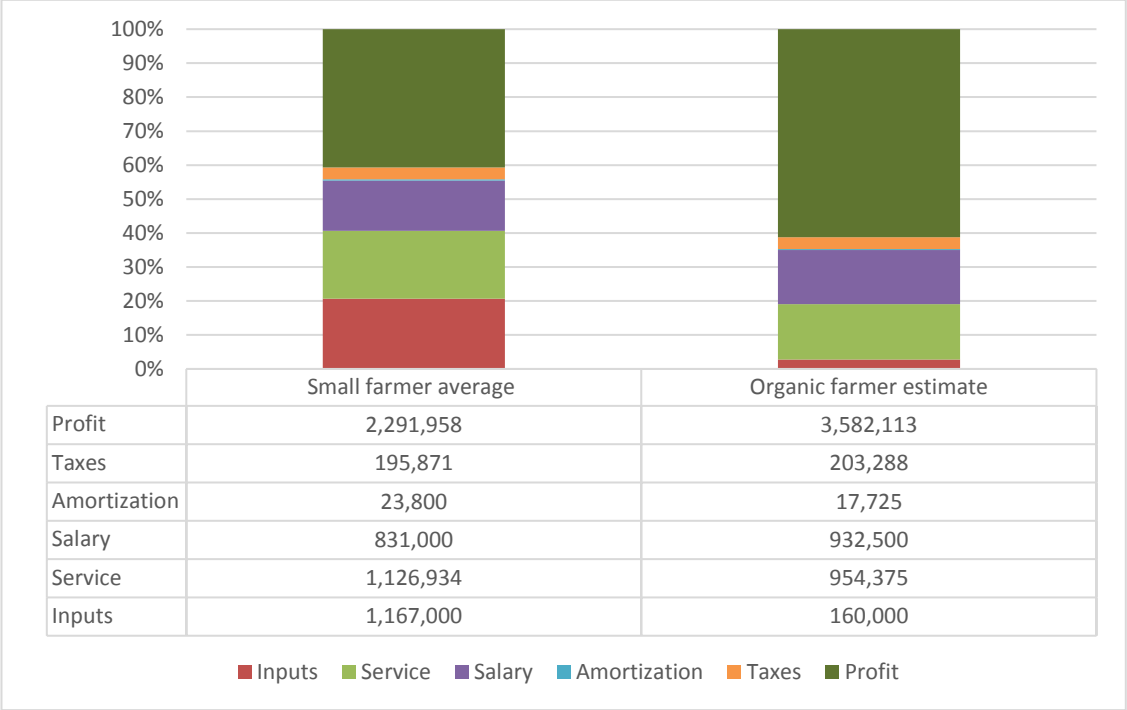
Figure 3.1: Cost structure of different types of conventional coffee farmers in TZS (per ton of parchment produced)

Organic farming

In the figure 3.2 below we compared the cost benefit data of organic farmers with the average economic profile of the farmers interviewed. Unfortunately, we were not able to collect primary data on organic practices in Mbeya Region. Therefore we made several assumptions based on available literature (Bachwenkizi, 2009).

- Organic farmers are not using chemical inputs, but do require organic inputs (e.g. manure);
- Lower productivity;
- Organic farmers receive a farm gate premium price of 115-130 percent; and
- Organic farmers use manual labour for weeding instead of herbicides.

Based on these assumptions, figure 3.2 gives a brief comparison of the different types of farming. We see that profitability of organic farming is much higher due to the lower costs, despite having a lower volume of coffee production. This is line with other studies like Bachwenkizi (2009) that conclude that organic farmers are more likely to earn more income due to the fact of premium price received. However she also concludes: “farmers are faced with some problems in their production activities. Lack of inputs such as organic manure, organic or natural pesticides for disease and pest control, lack of credit facilities, high cost of buying mulch, higher production cost and low price of organic coffee”.



	Small farmer average	Organic farmer estimate
Profit	2,291,958	3,582,113
Taxes	195,871	203,288
Amortization	23,800	17,725
Salary	831,000	932,500
Service	1,126,934	954,375
Inputs	1,167,000	160,000

Figure 3.2: Cost benefit data of conventional SHF coffee farming and an estimate of organic SHF in the study area per ton of parchment produced in TZS

CPU and Curing Factory

The interviewed CPU processed 80 tons of parchment coffee and they received an additional 20 tons of home processed coffee. Some farmers choose to do HP since it is more easy for them to transport parchment coffee compared to red cherries.

The CPU is a service provider. They process the coffee on behalf of the farmers. The farmers bring it themselves (by car, motorbike, carriage etc.). The CPU does the wet processing and brings it to the Mbeya curing factory for further processing. The costs for processing at the CPU is TZS 100 per kg of cherries. All the costs for the farmers are in the end deducted from the selling price.

Sorting is done at arrival by the farmers on the sorting grounds. Farmers they pick the green, overripe and rotten coffee berries. The farmers take the rejects back to their farms for own processing or consumption. At reception in CPU the coffee is weighted and the processing starts.

- The CPU does de-pulping and sorts it in P1 and P2 (smaller sized beans). P1 represents circa 80 percent of the beans. There is no difference in price between P1 and P2. The de-pulping machine comes from Kenya and has a value of TZS 21 million. The machines will last 15 years. Every 3 year a new de-pulping disc is required costing TZS 650,000.
- The fermentation is started for about 2 days in the fermentation tanks. The fermentation tanks are produced locally (TZS 10 million) and have a depreciation period of 6 years.

- After this the drying process is started on drying tables. They dry the beans for 11/12 days. The moisture content is not measured, but estimated by biting on the beans with the teeth. The drying tables are made locally and have a value of TZS 20 million.
- The beans are sold in 45kg bags (bags supplied by the curing factory to the CPU, free of charge).

The main cost driver for the CPU is labour (50 percent of total costs or 34 percent of turnover). The CPU is operated by the board and they all receive compensation. In the peak time a full day compensation (TZS 15,000) is paid to a small number of board members that supervise the operations. In addition casual labour is contracted for washing and drying. Due to the high value of the coffee a guard is constantly overlooking the coffee during peak months.

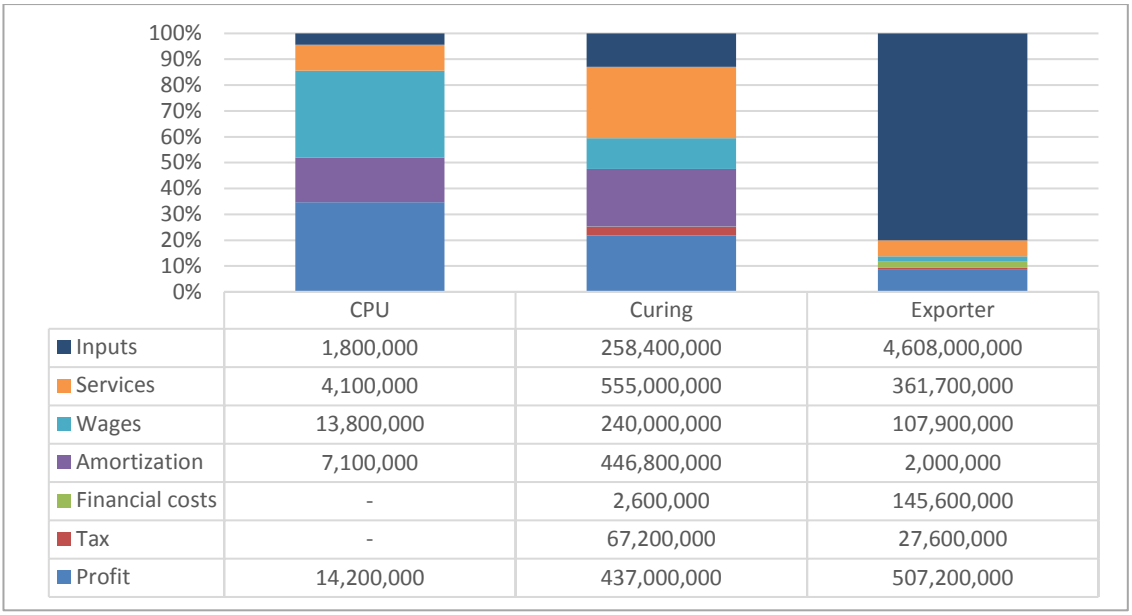
There are 3 curing factories in the study area (for dry processing). The curing companies provide service to farmers, farmer groups and CPU's. They do not actually buy the coffee but are service providers. They have a service charge of 60 USD per ton. Bags for export are paid by the farmers. For farmers the storage is free, but exporters are charged. One of the visited factories has a capacity of 21,000 ton.

The majority of the equipment is imported. Curing machines are all imported and the latest equipment originates from Brazil. They also have some older machines originating from Switzerland.

Exporting and roasting

In 2008/2009 TCB registered over 65 exporters. These licensed exporters bid at government supervised auctions through the TCB. Direct exports are allowed only to farmers who satisfy TCB quality requirements and can prove higher export prices. The main costs for the exporter are the cost paid for the coffee and service charged by the curing factory for dry processing. The profit is estimated at 10 percent of the total turnover. Total turn of over is valued at TZS 5.7 billion (2.5 million USD).

The domestic coffee demand is on the rise. Currently between 7-10 percent of the coffee is sold on the national market. A number of Estates have their outlets and sell roasted coffee to visitors. Also, roasters are buying at the auction or from exporting companies and serve the urban consumers centres in Dar-es-Salaam and Arusha are on the rise. Unfortunately we were not able to collect financial data from roasters directly. However for the macro economic analysis we used assumptions based on estimations from roasting activities as studies in other countries (e.g. Honduras).



	CPU	Curing	Exporter
Inputs	1,800,000	258,400,000	4,608,000,000
Services	4,100,000	555,000,000	361,700,000
Wages	13,800,000	240,000,000	107,900,000
Amortization	7,100,000	446,800,000	2,000,000
Financial costs	-	2,600,000	145,600,000
Tax	-	67,200,000	27,600,000
Profit	14,200,000	437,000,000	507,200,000

Figure 3.3: Cost benefit analysis of a CPU, Curing Factory and Exporter in TZS

3.2 Assumptions used in the model

The inputs for AFA originate from the cost benefit data for each value chain actor (see previous paragraph) in combination with production volumes for the different primary producers. Based on the production data available we were able to compute (or estimate) the different volumes produced for each actor. In AFA these estimations are used as a proxy for the flows and value generated at every stage in the value chain. We used the following assumptions (Table below):

- Based on regional data from TCB for the studied Districts.
- Data per actor based on estimations. General census is that the majority of the coffee is produced by smallholder farmers. A further division of the volumes produces by the farmers based on the assumption that about 95 percent is produced by small farmers, 4 percent medium and less than 1 percent by larger farmers. The estates are estimated to produce between 150 and 150 tons of parchment per season.
- It was not possible to differentiate between farmers that have own processing (or home processing) and that deliver to the wet processor, since there is no data available that indicate the weights of the different shares.
- Annex 1 gives an overview of the product flow chart based on the Table below.

Table 3.2: Initial volumes for the different actors in terms of size and value chain

	Total production in ton*	Share (%)	Production in ton estimated per type of actor by authors
Total	11,808	100	
Small farmer		95	11,217
Medium farmer		4	472
Large farmer		1	120
Estate			200
Total			12,208

Source: *TCB and estimations authors

3.3 Economic analysis at value chain level

The value chain has been modelled in AFA by entering the financial data for all actors in the system. After the initial volumes as presented in the table above are used as proxies to determine the total volume by each type of farmer. Table 3.3 below gives the cost benefit analysis of each actor in the VC and the contribution to various costs items in the chain.

Table 3.3: Cost benefit analysis per actor in the conventional value chain (x1 TZS 1,000,000)

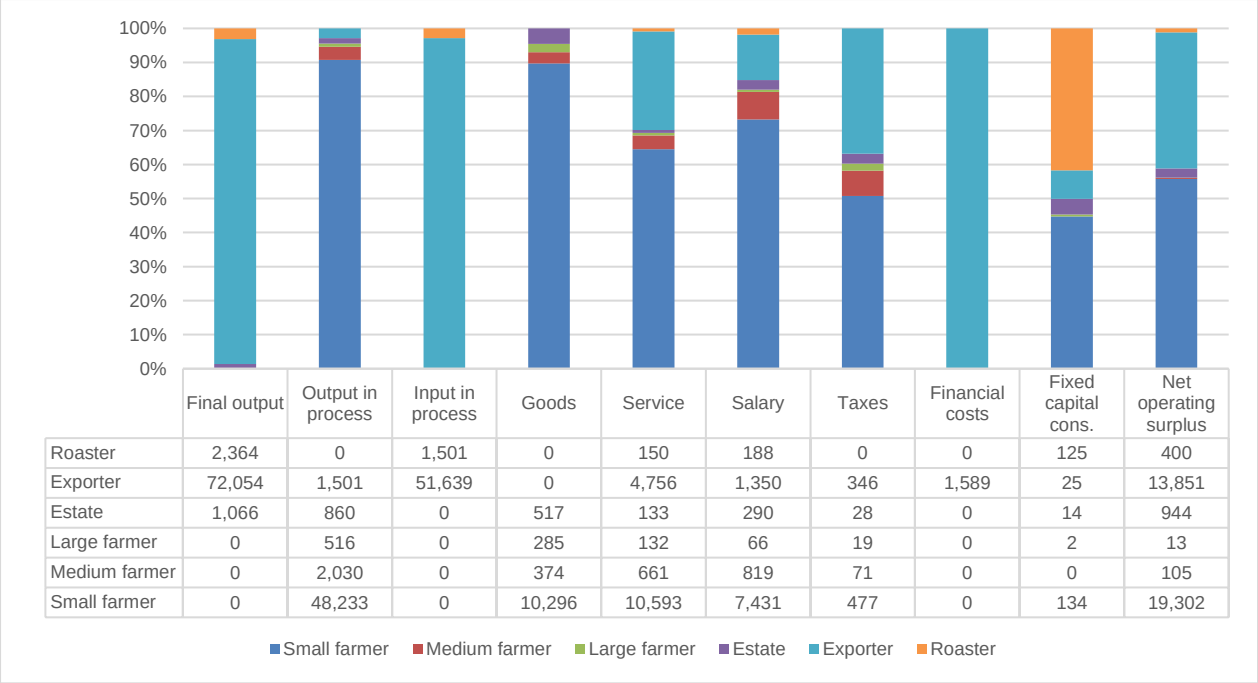
	Final output	Farm output	Input in process	Farm inputs	Service	Salary	Taxes	Financial costs	Fixed capital	Net surplus / Profit
Small farmer	0	48,233	0	10,296	10,593	7,431	477	0	134	19,302
Medium farmer	0	2,030	0	374	661	819	71	0	0	105
Large farmer	0	516	0	285	132	66	19	0	2	13
Estate	1,066	860	0	517	133	290	28	0	14	944
Exporter	72,054	1,501	51,639	0	4,756	1,350	346	1,589	25	13,851
Roaster	2,364	0	1,501	0	150	188	0	0	125	400
Value chain	75,484			11,473	16,426	10,143	940	1,589	300	34,615

Source: AFA

The small farmers are major contributors to all cost items in the value chain (Figure 3.4). This is mainly due to their share in the total volume produced.

Fixed capital items are mainly covered by exporters and the roasters. This is largely due to the fact that they require large capital investments in machinery and other facilities like trucks and storage areas.

A large share of the net operating profit or (net profit) is generated by the exporters. Wet processors and dry processors are not directly included in this analysis since they do not become owners of the coffee traded. However, indirectly they are part of the economic analysis since the services paid by farmers and estates are also considered, see also table 3.4.



	Final output	Output in process	Input in process	Goods	Service	Salary	Taxes	Financial costs	Fixed capital cons.	Net operating surplus
Roaster	2,364	0	1,501	0	150	188	0	0	125	400
Exporter	72,054	1,501	51,639	0	4,756	1,350	346	1,589	25	13,851
Estate	1,066	860	0	517	133	290	28	0	14	944
Large farmer	0	516	0	285	132	66	19	0	2	13
Medium farmer	0	2,030	0	374	661	819	71	0	0	105
Small farmer	0	48,233	0	10,296	10,593	7,431	477	0	134	19,302

Figure 3.4: Contribution to costs items for each actor in the conventional VC, in TZS x1,000,000 (source AFA)

The figures below give an overview of the contribution of the conventional and the organic coffee VC in Southern Tanzania. Smallholders produce about 95% of the total production, but only gain 41 percent of the value. Exporters and the farm workers are other important beneficiaries of the CVC.

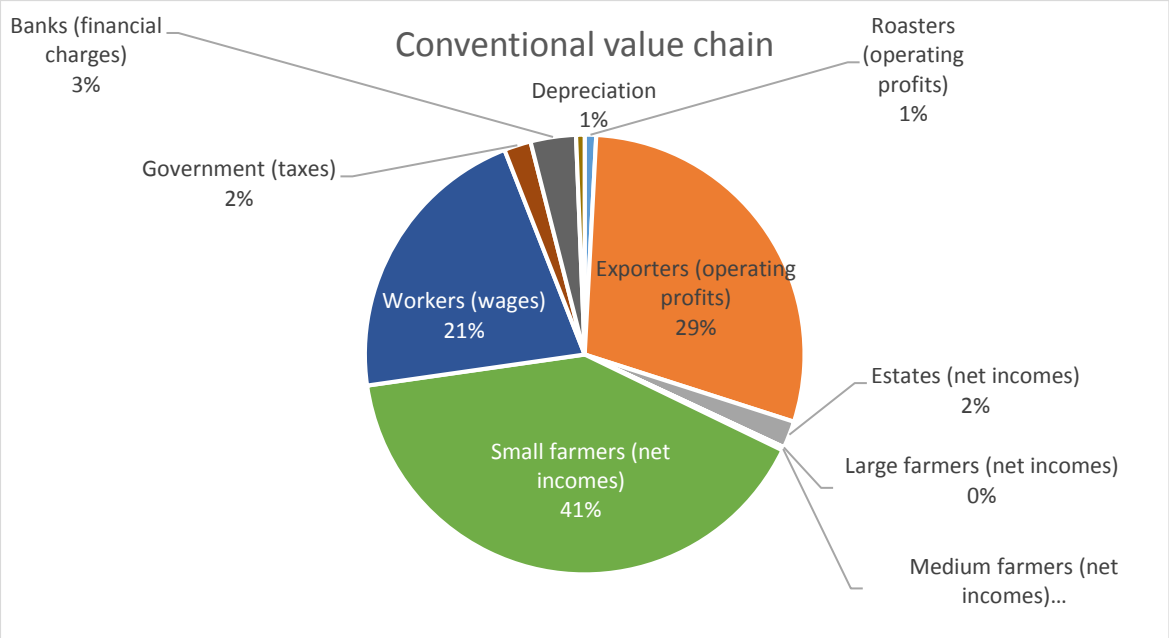


Figure 3.5: Calculated distribution of the gains from the conventional coffee value chain per actor

3.4 Added value generated in the Coffee Value Chain

AFA calculates the total value generated in the value chain. This is based on the total value of the inputs and services used in the VC and the breakdown of each item by import or value added. The value added distinguishes and additional level of segregation between different economic sources such as labour costs, taxes, financial costs, deprecation and net result. For each economic source a contribution share has been estimated. As a result the imports of inputs tend to decrease the value since money flows out of the country. This mainly relates to the import of bags, crop protection inputs and fertilizers.

Wet processing and dry processing represent the services offered to the other actors in the value chain and the economic value distribution estimations are directly based on the cost benefit data collected during the study. The value by wet and dry processors represents about 20 and 30 percent of imported materials. This is mainly related to machinery for processing. Table 3.4 provides an overview of the estimations for all related services and inputs.

Table 3.4: Attributed value of inputs and services for various economic sources (in %)

	Item	Value (x1,000, 000 TZS)	Import	Value added	Salary	Taxes	Financial costs	Fixed capital	Net surplus / Profit
Inputs	Fertilizers	3,968	0.85	0.15	0.50	0.40	0.00	0.00	0.10
	Herbicides	695	0.85	0.15	0.50	0.40	0.00	0.00	0.10
	Insecticides	933	0.85	0.15	0.50	0.40	0.00	0.00	0.10
	Other inputs	45	0.85	0.15	0.50	0.40	0.00	0.00	0.10
	Pesticides	150	0.00	1.00	0.80	0.00	0.00	0.00	0.20
	Replacing of plants	849	0.85	0.15	0.50	0.40	0.00	0.00	0.10
Service	Bags for export	2,487	0.80	0.20	0.40	0.20	0.10	0.20	0.10
	Transport	407	0.50	0.50	0.30	0.20	0.10	0.30	0.10
	Wet processing	4,425	0.20	0.80	0.45	0.05	0.00	0.20	0.30
	Dry processing	1,087	0.30	0.70	0.30	0.10	0.10	0.30	0.20

Source: AFA

The AFA results show that the conventional coffee value chain in the South contributes TZS 53.7 billion (equal to USD 23 million). AFA differentiates direct and indirect effects of the value chains on the contribution (Table 3.5). The total added value of this specific value chain represents 0.05 percent of the total national GDP at current prices. On a regional level the conventional coffee sector contributes 0.7 percent, based on regional GDP calculations by the National Bureau of Statistic (2017)[6].

The contribution of the organic CVC in the studied area accounts for TZS 2.3bn (equal to USD 1m). This is roughly 5 percent of the accumulated added value of the conventional regional CVC value chain. Annex 3 gives a detailed description of the assumptions supporting the calculations.

Table 3.5: Calculated added value of the conventional coffee value chain in TZS

[6] http://www.nbs.go.tz/nbs/takwimu/na/National_Accounts_Statistics_of_Tanzania%20_Mainland_2016.pdf

	Direct effect	Indirect effect	Total
Imports	8,920,235,376	0	8,920,235,376
Labour	10,142,625,696	2,687,981,928	12,830,607,624
Tax	939,686,486	782,623,156	1,722,309,642
Finance	1,588,546,944	146,162,632	1,734,709,576
Fixed Capital	299,955,099	1,096,746,952	1,396,702,051
Net earnings	34,614,626,096	1,411,587,789	36,026,213,885
Total added value			53,710,542,778

Source: AFA

The Rate of Integration of the value chain into the domestic economy (Total Value Added / VC Production) is higher than 71% = 53,711 million TZS / 75,484 million TZS [7].This means that the production of 100 TZS of coffee generates more than 71 TZS of incomes for domestic actors.

The Total imports/ VC production is > 12% = 8,920 million TZS / 75,484 million TZS.

As there are not subsidies to the VC, the Public Funds Balance for the Southern Highlands of Tanzania is calculated at 1,722 million TZS (940 million TZS of direct taxes and 783 million of indirect taxes).

The Balance of Trade is very positive and amounts to 63,134 million TZS for this region. It is calculated by subtracting the value of the imports of goods and services by all the actors of the VC (8,920 million TZS) from the value of the exports of coffee (72,054 million TZS).

3.5 Macro-economic ratios

Countries are part of the worldwide economy, and as such, domestic products somehow compete with those available on the international markets. Therefore, measuring the balance of the goods and services produced and consumed by the VC using relevant international prices (parity prices) gives an indication of the overall economic gain or loss for the national economy. It also gives an indication on the international competitiveness of the VC. Viability within the global environment is assessed with the National Protection Coefficient (NPC) and the Domestic Resource Cost Ratio (DRC).

The Nominal Protection Coefficient (NPC) is a ratio that contrasts the observed (private) commodity price with a comparable world price. This ratio indicates the impact of policy (and of any market failures not corrected by efficient policy) that causes a divergence between the two prices.

The NPC on tradable outputs, indicates the degree of output transfer; for example, an NPC of 1.10 shows that policies are increasing the market price to a level 10 percent higher than the world price. However in this case there is no relation between national policies and the market/ world price.

[7] This is a minimum because some 12,853 million TZS (= 75,484 million TZS of Production - 53,711 million TZS of Total value added - 8,920 million of Total imports) are not broken down and could be VA or imports (Tables 3.3 and 3.5).

$$NPC = \frac{\text{Production at market price}}{\text{Production at the international price}}$$

The Domestic Resource Cost (DRC) is defined as the ratio of the value of its domestic net inputs to the value of its traded net production. A DRC value less (greater) implies that the net benefits are positive (negative).

$$DRC = \frac{\text{Non-tradeable domestic factors at market price}}{\text{(Production at international price – Tradeable goods at the international price)}}$$

The assumptions are presented in Annex 2.

Table 3.6: Economic ratios

	Conventional (regional)
Nominal Protection Coefficient (NPC)	0.80
Domestic Resource Cost (DRC)	0.15

Source: AFA

The NPC is below 1, meaning that the value of the production at market price is less than the value of the production at international prices. Therefore, the VC generates less income than it would generate if the market prices were close to the international prices.

The DRC is less than 1, meaning that the value of the domestic factors used in the VC and measured at market prices (without transfers) are less than the value created by the VC measured at international prices (parity prices). There represents an overall gain for the national economy.

It can therefore be concluded that the VC is competitive and viable within the global economy.

3.6 Conclusions of the economic analysis

The CVC in the Southern districts of Tanzania generates a total added value of TZS 53.7 billion (equal to USD 23 million). This represents 0.7 percent of the total regional GDP of Songwe and Mbeya.

The largest share of coffee volume is produced by smallholder's farmers (95 percent). The medium, large and estates only produce 5 percent of the regional volume. We have not observed large differences between average yields generated by the different types of farmers. However individual cases show large variation. The reported yields in very small farms are often higher because of the possibility for the farmer to invest more time in maintaining the farmland. Overall all the calculated profit margins for the different types of

farmers in the CVC are profitable. However SHFs often face cash flow problems and are forced to sell their coffee premature for a low price to cover upcoming school fees or medical bills. This can affect profitability significant.

Paid labour costs represent up to 20 percent of farm production value, whereas family labour inputs is only rewarded after sales. Total costs for salaries accounts for TZS 10.4 billion, this equals 2.7 million working days (assuming the commonly paid daily wage of TZS 3,800). Coffee payments are frequently delayed and incur additional levies. Input costs are rising for disease control, fertilization and irrigation requirements (also related to climate change). Calculations indicate that profitability of organic farming is potentially higher due to the lower purchased input costs, despite having a lower volume of coffee production. The level of initial investment needed, in terms of lead-in-time, land and money makes coffee still a challenging crop for new farmers to become involved, but that might require decisive support in terms of input use, quality management and market access to be able to reap the potential benefits. Also the downstream VC actors report a profitable profit margin.

The share of coffee in exports is gradually declining (3.5 percent) and imports of fertilizers, machinery and packaging bags tend to reduce net generation of foreign exchange. Export opportunities to premium market (Japan) and to certified outlets (organic, voluntary labels) may offer prospects for increasing value-added generation.

Coffee is not quite the backbone of the Tanzanian economy, but where it is grown it is often the only cash crop that is capable of providing funds to support better education, greater investment in the farm and home and a degree of upward social mobility.

4 Environmental analysis

4.1 Goal and scope definition

The general objectives of the environmental aspects of this study are defined as follows:

- To calculate and compare environmental impacts of the two main coffee production systems in Tanzania namely the estates and small farmers in a cradle to gate (harbour) perspective for the export coffee and a cradle to shop perspective for the local consumption. For each production system, three sub-systems or sub-value chains are identified. These are the conventional production, the organic production and certified production (Table 4.1). In addition, sensitivity analyses are used to assess the influence of irrigation (or not) on the results of the environmental analysis.
- Identify the life cycle stages with the highest environmental impacts and the main drivers of these impacts
- Identify improvement opportunities allowing to enhance the sustainability of the value chain
- To identify the main environmental challenges but also the opportunities of the coffee value chain in Tanzania

In addition to the technical identification of the environmental challenges and opportunities, the results of this study will be used by EU DEVCO to improve its knowledge of the coffee value chain and for a better policy dialogue with the national stakeholders.

4.1.1 Description of studied system

The scope of this study includes the production of inputs for cultivation (fertilizers, herbicides, fungicides, pesticides, energy, water, land), the seedlings' production in nursery, the cultivation (taking into account farm size, tree density, yield, agrochemicals' application rates, energy consumption, water consumption and on field direct airborne emissions, waterborne emissions and soilborne emissions), the wet processing and the dry milling. For the export coffee, the transport to the harbour of Dar-es-Salaam by truck is taken into account (Table 4.1).

For the locally consumed coffee, the transport of the clean coffee to the roastery of Bukoba (the biggest one of the country), the roasting and grinding processes, the packaging and the distribution are taken into account.

Although, certified coffee and organic coffee are included in the scope of the analysis, the field survey has not allowed collecting up-to-date data on these two sub-value chains. In fact, certified coffee production is more developed in the Kilimanjaro region (North) then in the southern highland. Furthermore, farmers seem to be less interested by this production system which requires more efforts (in terms of management and practices). They also claimed that the premium received for certified coffee is not high enough to compensate the required extra work. However, we managed to get access to relatively old data (2010

situation) of 4 C[8] (Common Code for the Coffee Community) certified farmers of the Mbeya region.

For the organic production system, only one initiative has been identified in the district of Ileje (Mbeya-Songwe region). It is the Highland Organic Products Export (HOPE). It was operated by CMS (Coffee Management Service) which is one of the main curing (dry mill) company in the region. Level Ground trading (https://levelground.com/ourstory) which is a Canadian company is the main buyer of the produced organic coffee. CMS sales the organic coffee to Level Trading directly thanks to a direct export license. 4500 certified organic farmers from the Ileje district are involved in the HOPE Project. From 2013 to now, 15150 bags of 60kg of organic coffee have been produced in Ileje. The project has also important corporate Social Responsibility (CRS) activities including medical insurance to hand picking "Mamas", equipment supply to primary schools and the use of a small share of farmers' payment (around 10 TZS/kg of green coffee) to finance community social projects. The HOPE Project is also the leading tax payer of the district and contributes substantially to job creation (more description in the coffee production and processing systems chapter in the functional analysis). Unfortunately, the managing entity of the HOPE project was not able to provide us with cultivation data of organic coffee and the production area was not accessible during the field visit because of dangerous driving conditions. Nevertheless, a cultivation scenario (organic fertiliser combined with small amounts of mineral fertiliser and limited amounts of herbicides and pesticides) which is close to organic production has been added to the analysis in order to get an idea of the sustainability performance of organic coffee.

[8] http://www.globalcoffeeplatform.org

Table 4.1: Scope of the environmental analysis of the coffee value chain in the Tanzanian southern highlands

	Estate (with irrigation)			**Small, medium and large farmers (with or without irrigation)**		
Nursery	Traditional/improved seedlings			Traditional/improved seedlings		
	(Land, agrochemicals, PE bags, energy, water)			(Land, agrochemicals, PE bags, energy, water)		
Cultivation	Conventional	Organic	Certified (RFA and CAFE Practices)	Conventional	Organic	Certified (RFA and CAFE Practices)
	(Land, agrochemicals, PE bags, energy, water)	(Land, organic pesticides, organic fungicides, organic herbicides, manure, compost, energy, water)	(Land, selected agrochemicals, energy, water)	(Land, agrochemicals, PE bags, energy, water)	(Land, organic pesticides, organic fungicides, organic herbicides, manure, compost, energy, water)	(Land, selected agrochemicals, energy, water)
Pulping, fermentation and drying	Central Processing Unit	Central Processing Unit	Central Processing Unit	Central Processing Unit/Home processing	Central Processing Unit/Home processing	Central Processing Unit/Home processing
	(Energy, water, solid waste, liquid waste)	(Energy, water, solid waste, liquid waste)	(Energy, water, solid waste, liquid waste)	(Energy, water, solid waste, liquid waste)	(Energy, water, solid waste, liquid waste)	(Energy, water, solid waste, liquid waste)
Curing	Own plant			Curing/warehousing service providers		
Transport	Transport to harbour and to abroad for export			Transport to harbour and to abroad for export/ or transport to local roaster for local transformation		
	(Fuel consumption)			(Fuel consumption)		
Local consumption				Roasting, grounding and distribution		
				(Energy, water, solid waste, liquid waste)		

4.1.2 Functional unit

The **functional unit** is the unit for which the performance of a product system is quantified. It is used as a reference unit for which the LCA study is performed. It is therefore critical that this parameter is clearly defined and measurable. In this study, two functional units are defined:

- A coffee bag of 60kg for the export market at the harbour of Dar-es-Salam
- A pack of 1kg of roasted and ground coffee in local shops

4.1.3 System boundaries

- Spatial boundaries: The environmental analysis of the coffee value chain is a cradle to shop for the locally consumed coffee and a cradle to the port Dar es-Salam for the export market. The geographical scope of the study is limited to Tanzanian southern highland for the cultivation, the wet processing and the dry milling phases. The roasting and the grinding for the local market is considered to happen in Bukoba (western Tanzania) where the biggest roastery is located. Since the main part of agrochemicals is imported, their transport from the harbour of Dar-es-Salam to the Mbeya-Songwe region is considered.
- Temporal boundaries**:** The environmental assessment considers the current situation (harvest period of 2017). The actual state of cultivation practices, wet processing, dry milling, roasting and grinding is considered. It would have been interesting to consider data of the last 5 years but most of the small farmers do not keep a regular record of their cultivation and harvest data.
- Technological boundaries: The analysis covers the two main production systems which are estates and small farmers. The Tanzanian electricity mix (Table 4.2) has been considered for the dry milling, and the roasting and grinding. For the specific case of wet processing, both hand processing and Central Processing Units (CPU) are considered. Additional sub-scenario has been made with normal CPU and eco-pulping (less water and energy) CPU in order to assess the benefit of this new technology

Table 4.2: Tanzanian electricity mix (Wernet. G. et al, 2016)

Feedstock/import	Share
Hydro	29.62%
Natural gas	49.36%
Oil	19.58%
Import from Mozambique	1.10%
Wood chips	0.34%

4.1.4 Cut-off rule

The cut-off rule allows excluding from the scope of a study, activities, materials or energy flows with very low environmental significance. Sometimes, the cut-off could be motivated by both the low environmental significance and the lack of data and/or the difficulty to model a given activity or product.

In general, infrastructures, capital goods, small equipment and manual operations are not considered in coffee LCA studies. The manufacturing of the agricultural machines, of the milling plants (dry mill, roastery…) and small equipment, the harvesting, the building of the

warehouses, and the production of the bags are excluded from the scope of this study. However, the use of these infrastructures (mainly the energy consumption) is taken into account.

4.2 Life Cycle Inventory

The Life Cycle Inventory (LCI) is a gathering of input/output data that relates to the functional unit of the system being studied.[9]

In the framework of this study, a dedicated data collection template has been developed. It covers all the stages of the coffee vale chain and includes all the inputs from the nature (water, land…) and the technosphere (agrochemicals, energy, packaging…), and all the outputs (green coffee, wastewater, pulp, emissions…).

For the foreground information, the data collection template has been used to gather secondary data and primary data from the literature and Tanzanian stakeholders by the experts. Additionally, a team of enumerators has performed a field survey in order to collect primary information directly with value chain actors. Thanks to their work, primary data and/or estimation were collected directly from estates, small farmers, home processers, CPUs, curing companies and exporters.

The SimaPro software (version 8.4.0.0) has been used to assist the LCA system modelling and to link the reference flows with the environmental databases, and compute the complete life cycle inventory of the systems. The SimaPro software is widely used and regularly updated LCA software with large background databases and LCIA methods.

The LCI datasets describing background processes (e.g. electricity generation, fertiliser production.) are in large part from the Ecoinvent (v3.3), the Agrifootprint and the Agribalyse (v1.3) databases. Most of the environmental datasets (or life cycle inventory datasets) which are contained in these databases (e.g. pesticide production, transportation processes) are initially modelled for western countries (mainly Switzerland, France and other European countries). During the modelling, the datasets (background data) of technologies which are available in or comparable to the ones of developing countries are chosen.

The quality of LCA results is dependent on the quality of data used in the study. Every effort has been made to implement the most credible, representative, and up-to-date information available. In this study, specific data from Tanzanian southern highlands (not national average) have been collected directly with farmers and estates. During the data collection process, differences in farm sizes (small, medium and large farms), agricultural practices (irrigated farms, non-irrigated farms, use of mineral agrochemicals, combined use of mineral agrochemicals and organic fertilizers) were taken into account in order to ensure that the data are representative of the coffee production practices of the region.

4.2.1 Data quality

Primary data have been collected directly from the estate and the farmers by the enumerators. The collected data have been then processed by the team in order to identify the inaccuracies and the missing information. After the cleaning and the correction of the

[9] ISO 14040:2006

data, a validation workshop was organised with 4 local experts (2 agronomists, 1 extension officer and 1 experienced farmer). This exercise was particularly useful. Some inconsistencies were identified in the nursery data, the irrigation data, and the water and energy consumption during the wet processing. Assumptions and expert judgment have been used during the validation meeting to correct all the errors. Due to this exercise, the nursery data, the cultivation data and the wet processing data could be considered as high quality validated data.

For the dry milling, the information collected with one of major curing companies in the region seems to be very low in comparison to values which are found in the literature. Discussions with the curing company have not allowed identifying the error. Finally data from the literature and from author's previous works on coffee have been used to model the dry milling and the roasting/grinding. The energy consumption during these two phases depends more on the installed technology than the geographical location. Furthermore, the contribution of d phases to the impact on the environmental area of protection (ecosystem quality, resource depletion and human health) are lower (by experience) in comparison to the cultivation phase.

On the basis of these observations, the quality of the data is considered good and the conclusions of the environmental analysis could be used for decision support.

4.2.2 Direct on field emissions

During the nursery and the cultivation phases, a certain share of the used agrochemicals are transformed into airborne, waterborne and soilborne emissions. In the framework of this study, the flowing on field emissions have been considered:

- CO2 emissions into the air from the direct land use change
- N2O, NH3 and NOx emissions into the air from the nitrogen contained in the mineral fertilizers and the manure
- $NO3^-$ emissions into the groundwater from the nitrogen contained in the mineral fertilizers and the manure
- $PO4^{3-}$ emissions into the groundwater from the phosphate contained in the mineral fertilizers
- Herbicides, fungicides and pesticides emissions into the soil from the application of these chemicals to the soil and/or the plant.

Equations derived from IPCC 2006 Guidelines (IPCC, 2008), World Food LCA Database Guidelines (Nemecek et al., 2014), Ecoinvent Guidelines (Nemecek & Kägi, 2007), Agri-footprint methodology (Durlinger et al., 2017), Agribalyse (Colomb et al., 2014) and judgement have been used (Table 4.3) to calculate the on field direct emissions.

Table 4.3: Calculation of the direct on field emissioner

	Equations	Sources
C02 from land use change	=(54.5[1]-21[2])*1000*44/12*land use change per ha coffee in TZ[3]	IPCC 2006, Chapter 4, FAOSTAT
N NPK	=%N in NPK*Mass of NPK	Own assumptions, VCA4D Honduras coffee study
N Urea-	=%N in Urea* Mass of Urea	Own assumptions, VCA4D Honduras coffee study
N Org.	= % Norg* Mass organic fertilizers	Own assumptions, VCA4D Honduras coffee study
N AN	=% N in CAN * Mass CAN	Own assumptions, VCA4D Honduras coffee study
NH_3	=(N Urea*0.15+N AN*0.02+N NPK*0.04+N Org.*0.1)*(14+3)/14	VCA4D Honduras coffee study
N_20	=((N NPK+N Org. +N AN+ N Urea)*(0.01+0.3*0.0075)+30[4]*0.01+0.01*NH3*14/(14+3))*44/28	IPCC 2006, VCA4D Honduras coffee study
NOx	=0.21*N_2O	Wolfensberger and Dinker, 1997
NO3-	= (N NPK+N Org. +N AN+ N Urea)*0.3*(14+3*16)/14	Own assumptions, VCA4D Honduras coffee study
P_2O_5	=% P in NPK* Mass NPK	Own assumptions, VCA4D Honduras coffee study
$PO4^{3-}$	=0.1*P_2O_5 *95/284	Own assumptions, VCA4D Honduras coffee study
Emissions of Pesticides, Fungicides, Herbicides	= 100% the applied values	Own assumptions, Ecoinvent 2007

Notes: [1]Carbon content of above-ground biomass in African tropical mountain systems in tonne, IPCC 2006, Chapter 4: Forest land, [2]Carbon content of above ground biomass in tropical, moist, perennial cropping systems in tonnes, IPCC 2006, Chapter 4: Forest land,[3] FAOSTAT, and [4] rough estimate for the nitrogen in the crop residues (VCA4D Honduras coffee study)

4.2.3 Production of seedlings in nursery and cultivation of coffee

Data on seedlings production were calculated during the validation workshop by the local experts. The number of seedlings produced per acre as well the required inputs (agrochemicals, seeds, PE bags) have been estimated based on expert judgment. A water demand of 200L per day for every 1,000 seedlings during a nursery cycle of 7 months was considered (Ratha Krishman et al., 2014)

For the coffee cultivation, input (agrochemicals, tree density, water, farm sizes, energy…) and output (production of parchment per acre) were collected for the main production systems (estate and farmers). For the estates, the production data of three different estates have been used in this study (see: Table 4.4: Production of seedlings in nursery and cultivation of coffee) because of the differences in their agricultural practices.

The estate 1 uses much more mineral fertilizers (300kg of NPK and 300kg of hyperphosphate per acre) than the two others but without herbicides, fungicides and pesticides. This production method will require a lot of manual work for weeding and pest control activities. It results slightly low yield in comparison to the other estates despite the use of higher rates of mineral fertilizers.

The estates 2 uses les mineral fertilizers than the others (193.55kg of Calcium Ammonium Nitrate per acre) estates but combined with herbicides, pesticides and fungicides. It uses more herbicides than the other estates. This results in higher yield (comparable to Estate 3 and higher than Estate 1) despite its relatively lower tree density (700 trees/acre) in comparison to the others (1000 trees/acre).

The estate 3 seems to make a trade-off between (a balanced use) the use of mineral fertilizers, and herbicides/pesticides. This results in the highest yield between the 3 estates. However, this estate uses a huge amount of fungicides (25.32kg/acre) which may counterbalance the environmental benefit (for some specific indicators, e.g. ecosystem quality) of the higher coffee production rate per acre.

An irrigation scenario has been developed for the three estates. Each tree is supplied with 500L of water per irrigation and the trees are irrigated 4 times (2 times per month during 2 months) in order to have a better flowering. The corresponding energy consumption (diesel consumption by pumps) has been also calculated. An average energy consumption of 20L of diesel per 12h of irrigation and an irrigation duration of 2 mns per tree were considered.

Farmers have been divided 3 categories namely small farmers, medium farmers and large farmers.

For small farmers, three cases have been considered (Table 4.4):

- Small farmer with irrigation: a farm with a relatively small size (2 acres), with irrigation, low application rate of agrochemicals and higher application rate of organic fertiliser (manure)
- Small farmer without irrigation: a farm with a bigger size (6 acres), a balanced used of mineral fertilizers, herbicides and pesticides and lower application rate of manure.
- 4C Certified small farmer: average input and output data of about 200 4C certified farmers (year 2010) have been collected from Hanns R. Neumann Stiftung (HRNS) Mbeya. The 4C code of conduct has 27 GAP principles across economic, social and environmental dimensions (4C Association, 4C code of conduct, version 2.0, April 2015). The environmental dimension of covers a number of good practices including the conservation of biodiversity, minimised use and the handling of pesticides, soil conservation and fertility management, efficient water use and wastewater management, safe management of hazardous waste and efficient energy management. The code of conduct does not provide threshold values in terms of agrochemical application rates. Thus, the 4C certification does not have a direct influence on the quantified input/output data of the coffee production. The application rate of agrochemicals and the resulting yields of 4C certified farms are comparable to performance of a conventional production system.

For the medium (15 acres) and larger (50 acres) farmers, cultivation data were found for only 1 farmer per category:

- The medium farmer uses irrigation with mineral fertiliser rates that are lower than the ones of estates but slightly higher than small farmers are. It has a very good yield (higher than estate 1) proportionally to its lower mineral fertiliser rate. The large

farmer combine limited amount of mineral fertilisers with high amounts of manure without irrigation. It has a yield which is comparable to the one of estate 2.

The assessment of the input-output data of the different production systems reveals that:

- There is no standard/systematic practice in the coffee cultivation in the region. The application rate of agrochemicals may vary from one producer to the other
- In general the production yields are higher in estates in comparison to small farms. Medium and large farmers have yields which are comparable to the ones of estates. However, a well-managed **very small** farm can have a better yield than estates.
- The direct on-field emissions are directly influenced by the application rates of agrochemicals. Thus, the higher applicate rates of agrochemicals in estate will result in in higher emissions which could counterbalance the environmental benefit of higher yields in this production system.

Table 4.4: Production of seedlings in nursery and cultivation of coffee

	Nursery	Estate 1	Estate 2	Estate 3	Small Farmer, with irrigation	Small farmer, no irrigation	Medium farmer with irrigation	Large farmers, no irrigation	Small farmer, 4C certified
Tree density (trees/acre)	255,760	1,000	700	1,000	700	700	800	900	729.8
Yield (kg parch/acre)	-	429	542	550	750	250	466.67	540	270.00
DAP (18-46-0) in kg/acre	50	-	-	-	-	-		-	-
Fertilizer NPK (22-06-12) in kg/acre	-	300	-	409.84	50	166.67	200	100	246.11
Hyperphosphate (0-29-0) in kg/acre	-	300	-	-	-	-	-	-	-
Liquid booster NPK (0-29.5-5) in kg/acre	6	-	-	0.825	-	--	-	-	-
Calcium Ammonium nitrate (27-0-0) in kg/acre	20	-	193.55	-	-	-	-	100	-
PE bags (kg) in kg/acre	731	-	-	-	-	-	-		-
Irrigation water in m3/acre	10,741.92	2,000	1,400	2,000	1,400		1600	-	
Manure (1.5-0-0) in kg/acre	1,000	350	30	0.08	2,500	830	-	4.000	-
Seeds (kg)/acre	73	-	-	-	-	-	-	-	-
Herbicide kg/acre		-	1.65	0.56	1.70	2.26	6.8	1.7	0.79
Pesticide kg/acre	1.07	-	0.70	0.00	0.54	2.14	1.07	17	0.51
Copper Fungicide kg/acre		-	3.23	27.32	-	-		-	1.10
Other Fungicide kg/acre		-	0.39	-	-	-			
Diesel L/acre	63.00	40	28	40.00	32.50	-	44.4	-	-

4.2.4 Wet processing

The wet processing of the coffee includes the pulping of the ripe cherries, the fermentation, the washing and the drying. The treatment of the wastewater has also been taken into account. In average, 5kg of ripe cherries are needed to produce 1kg of parchment. In this study, three wet processing scenarios have been considered (Table 4.5):

- Hand processing: a manual machine without a combustion engine is used. This processing does not require fuel and has a higher water consumption (7 to 11.5 L/kg cherry) than the CPU-Eco-pulping according to the Manual for the construction of wastewater treatment systems in small coffee processing plants (Sanchez Hernandez L. et al, 2015). This high-water consumption will result in a bigger volume of wastewater and as a consequence the use of more hydrated lime for the fermentation of the organic matter contained in the wastewater.
- CPU-normal: which represents the average situation in central processing unit. It has an average water consumption of 11L per kg of produced parchment and an energy consumption of 1L of petrol for 675kg of cherry (CPU owner, 2018).
- CPU-Ecopulping: which represents a new category of pulping machine with a lower energy and water consumption. In this study, the eco-pulping machine has a water consumption of 4L per kg of parchment and an energy consumption of 1L of diesel per 2,250kg of cherry (CPU owner, 2018).

The wastewater generated during the processing is stored in a pond in which the organic matter contained in the wastewater is digested and transformed into methane. To facilitate the fermentation process, 1 to 2 kg of hydrated lime is added per m3 of wastewater (Sanchez Hernandez L. et al, 2015). Before sending the wastewater to the pond, 70 percent of the organic waste (outer skin, pulp, inner skin..) are transformed into compost. Once in the pond, 50 percent of the remaining organic waste are transformed into methane according to the following rule (Ruben, R. et al, 2018):

- 21 percent of dry matter per mass unit of organic waste
- 1.1kg of COD (Chemical Oxygen Demand) per kg of dry matter
- 0.25kg of CH_4 per kg of COD

Table 4.5: Wet processing of coffee cherries

	Hand processing	**CPU-Normal**	**CPU-Ecopulping**
Transport - km	-	2	2
Loss of cherries	0.05	0.03	0.03
Water-m3/t of parchment	43.31	11.33	4.12
Energy*	0.00	7.62	2.27
waste-water-m3/t parchment	38.98	10.20	3.71
Hydrated Lime-kg/t parchment	58.47	15.30	5.56
CO2 from lime application	25.73	6.73	2.45
Composted organic waste-t/t parchment	2.94	2.88	2.88
Organic waste sent to the pond- t/t parchment	1.26	1.24	1.24
Dry matter content of organic waste sent to the pond/t parchment	0.26	0.26	0.26
CH4 from the dry matter in the pond kg/ ton	36.38	35.69	35.69

*Energy consumption of CPU normal in L of petrol, CPU-Ecopulping in L of diesel

4.2.5 Dry milling or curing

The dried and packed parchment is conveyed to milling plants where it is inspected and weighed before storage in the warehouse before the processing.

The processing includes cleaning operations (pre-cleaning and destoning), hulling and grading (separation of coffee beans according to grading scale ranging from AAA (best) to TEX (worst). The grading is done according to the shape, the size and the density of coffee beans . An energy consumption of 130 to 180 kWh (based of author's previous works and the VCA4D coffee value chain in Honduras) has been considered for the production of 1 tonne of green coffee. The milling efficiency is 80 percent.

4.2.6 Roasting and grinding for the local market

After the dry milling, more than 90 percent of the Tanzanian coffee is exported. About 7 percent of the total is consumed local. The Tanzania Coffee Board (TCB) estimates an average increase of 1.5 to 2 percent per year of the local Consumption (Mtaki B., USDA Global Agricultural Information Network, Tanzania Coffee Annual Report, 2016).

For the roasting and grinding, an energy consumption of 70 kWh has been considered per tonne of green coffee (based of author's previous works). 1.19 tonne of green coffee are needed to produce 1 tonne of roast and ground coffee.

The following packaging materials are considered per kg of roast and ground coffee (based of author's previous works):

- 25g of aluminium pouch
- 62g of cardbox

Finally, a distance of 1100 km has been considered for the transport of the green coffee from the Mbeya-Songwe region to Bukoba where is located the biggest coffee roaster of the country.

4.2.7 Transport and distribution

After the milling, the export oriented production is transported by truck from Mbeya-Songwe region to the harbour of Dar-es-Salam on an average distance of 900km.

The locally consumed roasted and ground coffee is distributed from Bukoba (extreme western Tanzania) to all the big cities. An average distribution distance of 1,100km has been considered.

4.3 Life Cycle Impact assessment

The Life cycle impact assessment stage aims at translating the resource consumptions and the emissions of the life cycle inventory into relevant environmental impacts which are understandable for decision makers. Each environmental flow will be connected to a corresponding environmental impact. Once classified in the relevant impact category, a characterization factor will be used to express the relative contribution of the environmental flow to this impact category. The environmental impact could be at midpoint level or at endpoint level. The midpoint is located at the early stages of the cause-effect chain and explains the physico-chemical changes in the environment. The endpoint goes further on the cause-effect chain and explains the damages on the environment and the society.

In this study, the RECIPE 2016 (H) method has been used. This calculation method has the advantage to combine both midpoint and endpoint impacts (Figure 6.1). It also includes the latest IPCC emission factors for climate change and used relatively complete impact pathways. It is also recognised by important number of LCA experts and stakeholders. For the specific context of the coffee value chain in Tanzania, both endpoint and midpoint impacts are considered. The endpoints allow to directly address the three most important environmental safeguard zones which are ecosystem quality, human health and resource depletion. Endpoints are also more relevant for policy dialogue because they give the environmental implications of a product system at a macro level (damages on the society and the environment). Since coffee production is agrochemical intensive, the midpoint level impacts the ecosystems (eutrophication, acidification…), human health and resources (human toxicity) will allow to better assess the benefit of good agricultural and processing practices.

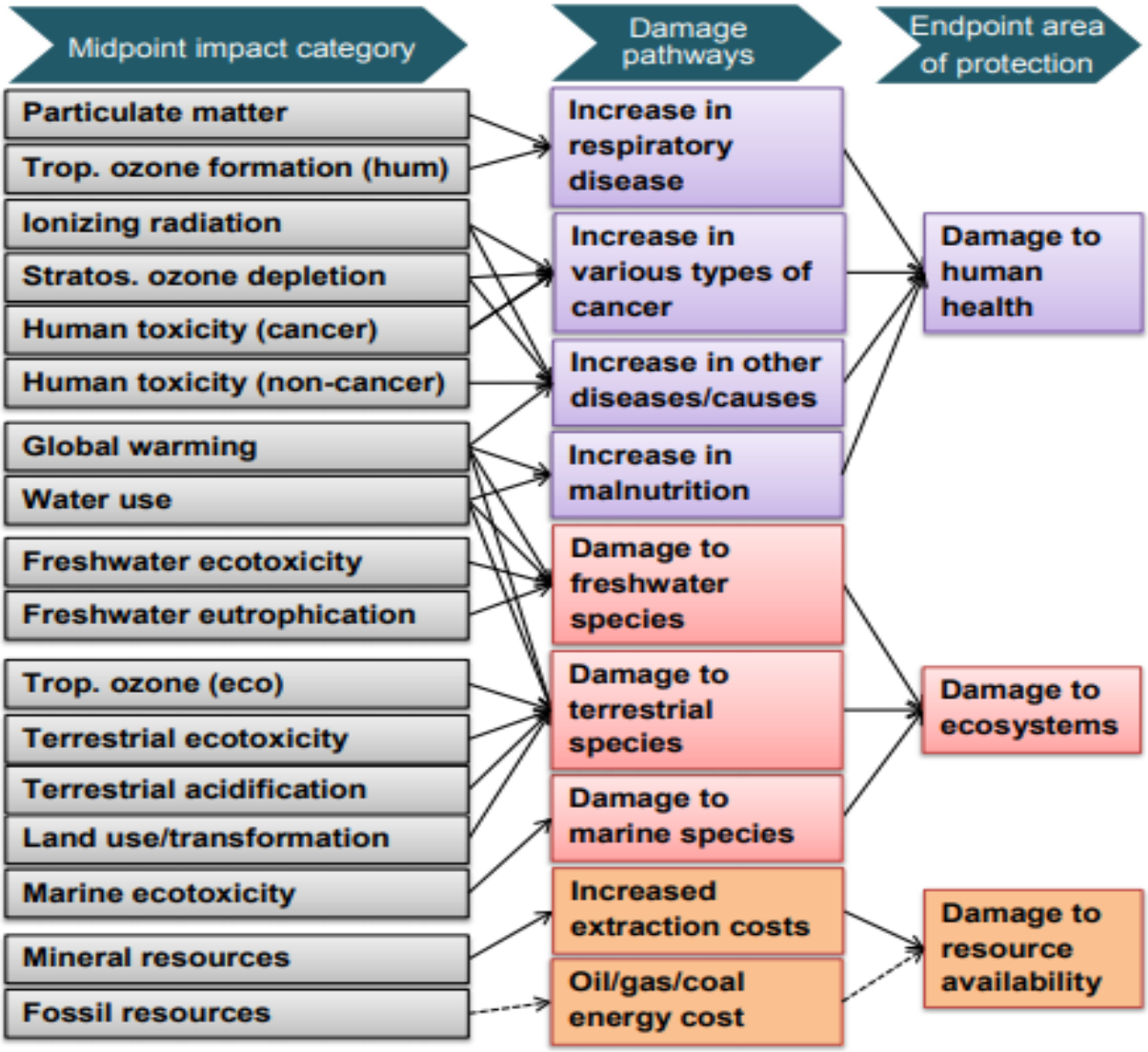


Figure 6.1: General concept of the RECIPE 2016 method[10]

4.4 Results

The results of the environmental analysis of the coffee value chain are presented in 2 sections. In the first section (Results 1), both endpoint and midpoint impacts of the exported coffee are discussed. The results are expressed per coffee bag of 60kg. In the second section (Result 2), only endpoint impacts of the locally consumed coffee are briefly presented because the same trends are observed for both the export and the locally consumed coffee. In fact, the exported coffee and the locally consumed coffee are produced in the same conditions and their "farm to curing" impacts are the same. The main difference between the two products is the roasting and grinding of the locally consumed coffee. It is important to keep in mind that the impact of roasted and ground coffee will always be higher than the impact of clean coffee.

[10] Huijbregts M.A.J. et al, ReCiPe 2016 A harmonized life cycle impact assessment method at midpoint and endpoint level Report I: Characterization, RIVM Report 2016-0104

In all the sections, different production scenarios (3 estates, 1 small farmer with irrigation, 1 small farmer without irrigation, average 4C certified small farmer without irrigation, 1 medium farmer and one larger farmer) are presented in order to better assess the sensitivity of the results to different agricultural practices.

4.4.1 Results 1: Cradle to harbour environmental impacts of the export coffee

4.4.1.1 Endpoint impacts: on the three areas of protection

A) Human health

The human health impact of the coffee is mainly due to the use of agrochemicals and fossil fuels during the cultivation phase. As it could be expected, the impact on human health is inversely proportional to the yield in comparable production systems (see figure below). Thus, for the estates, the medium farmer and the large farmer, the higher the yield, the lower the impact. The impact of the estate 1 is particularly high because of the high amount of mineral fertilizers (300 kg NPK and 300 hyperphosphate per acre). The large farmer who combines limited amount of mineral fertilisers with big amounts of manure performs better (lower environmental impact) than the estates. The medium farmer also has an impact, which is lower than the impact of the estates 1 and 2.

The human health impacts of small farms are much lower than the impacts of estates. This is due to the fact that small farmers use in general less agrochemicals than estates on one hand and the fact that yields in estates are (big but) not bigger enough to compensate the negative impact of big amount of agrochemicals.

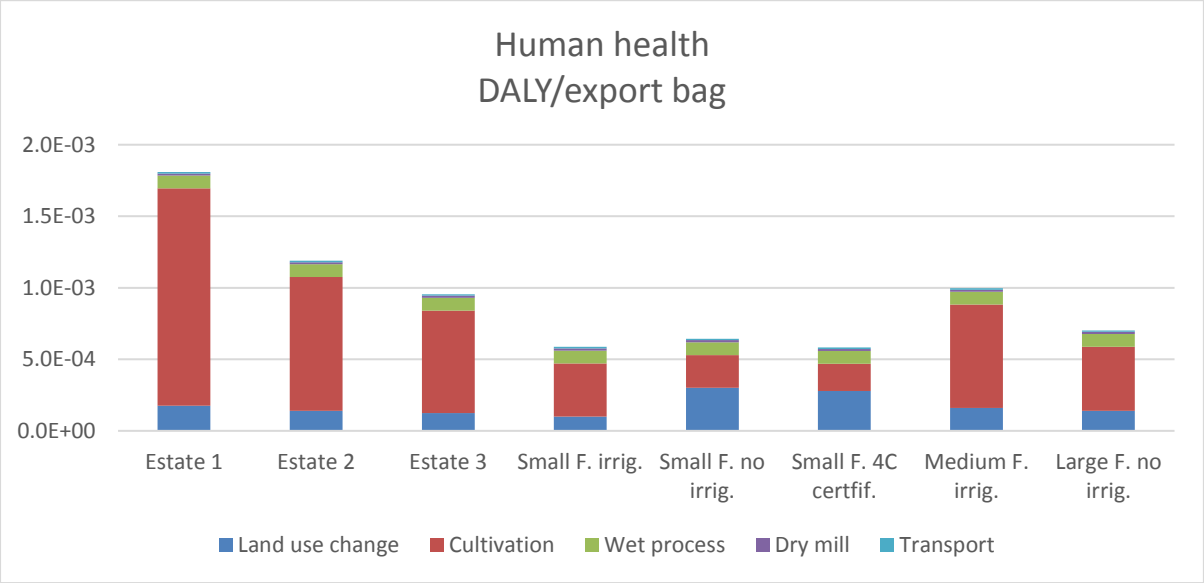


Figure 6.2 : Human Heath impact of the coffee value chain (Daly/export bag)

B) Resources

As the impact on human health, the resource depletion is also highly influenced by the cultivation phase. Again, the impact of estates is higher than the impact of small farmers for the same reason cited for human health. The small farm with irrigation has the lowest impact (Figure 6.3). This is due to the high production yield (750kg/acre) combined with low use of

mineral fertiliser. In fact, the small farm with irrigation uses the lowest rate of mineral fertiliser (in comparison to the other scenario) combined with a big amount of organic fertiliser (2500 kg of manure/acre). The small farm without irrigation and the 4C certified farms (also without irrigation) have comparable results. Actually these two production scenarios have comparable yields (250kg and 270kg) and comparable direct on-field emissions. The impact of the medium farm is comparable to the impacts of non-irrigated small farms. These two groups of farmers have comparable mineral fertilisers. The impact of the large farmer is higher than the impacts of the small farms and estate 3. This is to the use of high amounts of insecticides by the large farmer

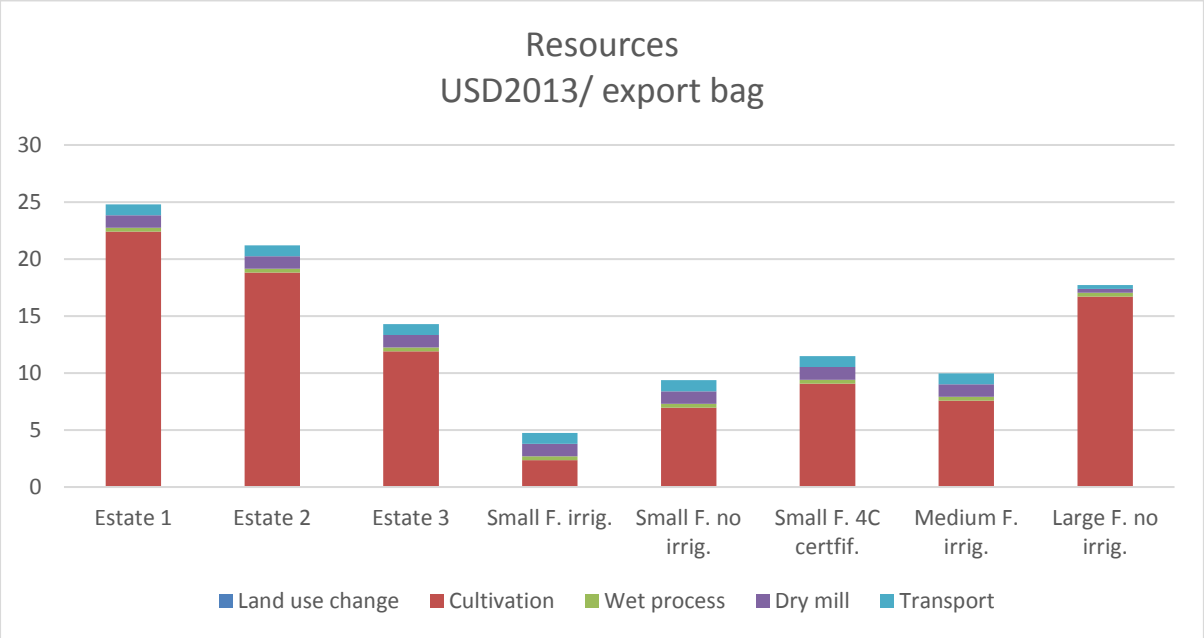


Figure 6.3: Contribution of the coffee value chain to resource depletion (USD2013/ export bag)

C) Ecosystem quality

The impact on the quality of ecosystems is influenced by both the land use and the use of agrochemicals. As for the ecosystem quality, the small farm with irrigation has the lowest impact per coffee bag because of its higher yield and the low application rate of mineral fertilizer (Figure 6.4). Unlike the impacts on human health and resources, the impacts of the small farm without irrigation and the 4C certified farms are higher than the impacts of estate 2 and estate 3. This is because the ecosystem quality indicator is highly influenced by the land use. Furthermore, one can notice that the impact of estate 3 is comparable to the impact of estate 2 despite the fact that estate 3 has a better yield. This is due to the use of big amounts of fungicides (27.32kg fungicides/acre) in estate 3.

The large farm has the lowest impact after the small farm with irrigation. This is because the large farm has a yield, which is comparable to the ones of estate while using less mineral fertilisers (combined with big amounts of manure). Within each group, estates in one hand and farmers in the other, the higher the yield, the lower the impact on the ecosystem quality. In fact, this indicator is highly influenced by land occupation and more land is needed to produce the same amount of coffee when yields are low.

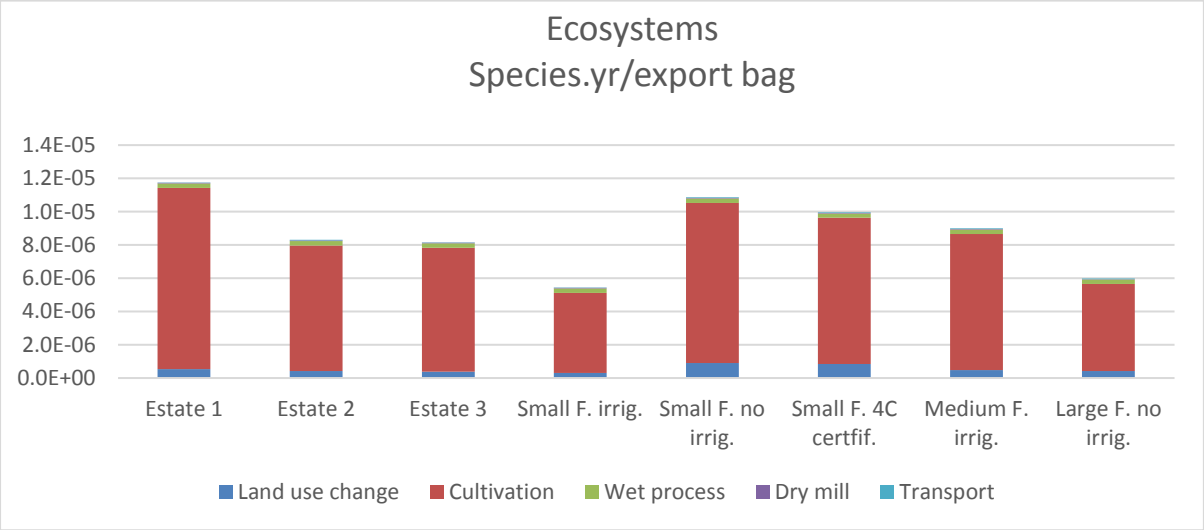


Figure 6.4: Impact of the coffee value chain on the quality of ecosystems (Species.yr/export bag)

4.4.1.2 Impacts at the mid-point level

A) Climate change

The climate change impact of the coffee value chain is mainly related to the direct land use change, the use of fossil fuels for irrigation, the use of mineral fertilizers, the use of lime during the treatment of the wastewater from the wet processing and the fermentation of the organic matter contained in the wastewater from the wet processing. This organic matter is transformed into methane after the introduction of hydrated lime. In general, the climate change impact is correlated with the yield: the higher the yield, the lower the climate change impact. However, the disadvantage of the lower yields of the small farms without irrigation and the 4C certified farms are compensated by their low use of agrochemicals. Consequently, estates 1 and 2 and small farms without irrigations have comparative impacts on the climate (Figure 34). The small difference between the large farm and estates 1 an2 is due to the fact that the large farm does not practice irrigation and avoids as consequence the impact of diesel (needed for irrigation machines). It is also important to keep in mind that the land use change impact per acre is the same for all the production systems in the region. The differences in the graph are linked to the yield. A higher yield will lead to a low land use impact per mass unit of coffee.

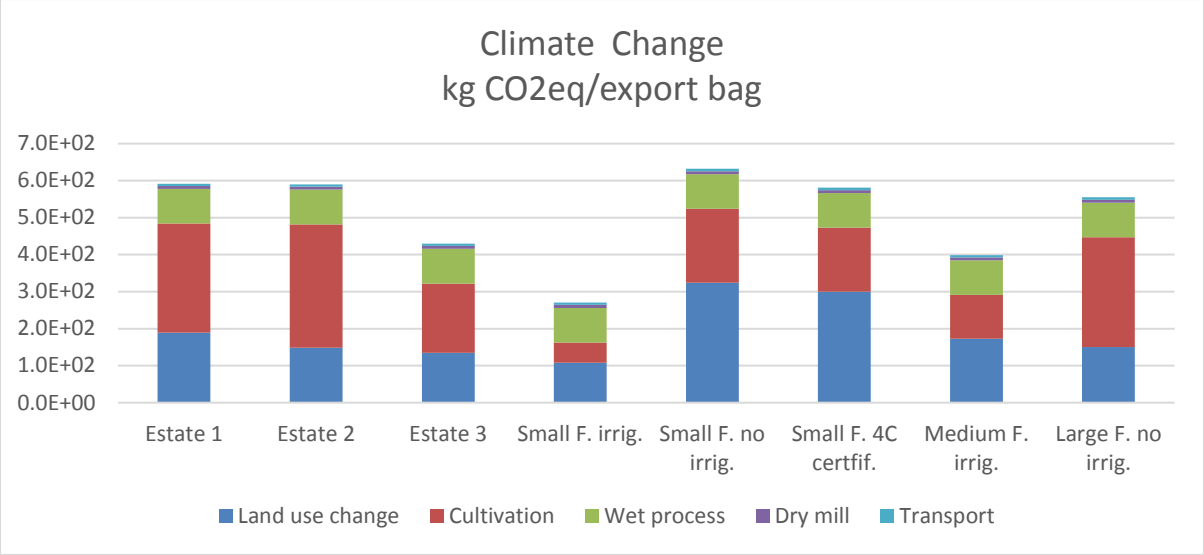


Figure 6.5: Impact of the coffee value chain on climate (kg CO2eq/export bag)

B) Terrestrial acidification

The assessment of the terrestrial acidification shows that the impacts of the small farms (without irrigation and 4C certified) are higher than the impacts of estates 2 and 3. As for the previous impact categories, the result are correlated with the yield of the different production systems at the exception of estate 1and the large farm for which the relatively higher yield was not enough to compensate the high amounts of mineral fertilizers for estate 1 and high amounts of pesticides/insecticides for the large farm (figure 6.6.). For this impact category too, the small farm with irrigation has the lowest impact on the environment.

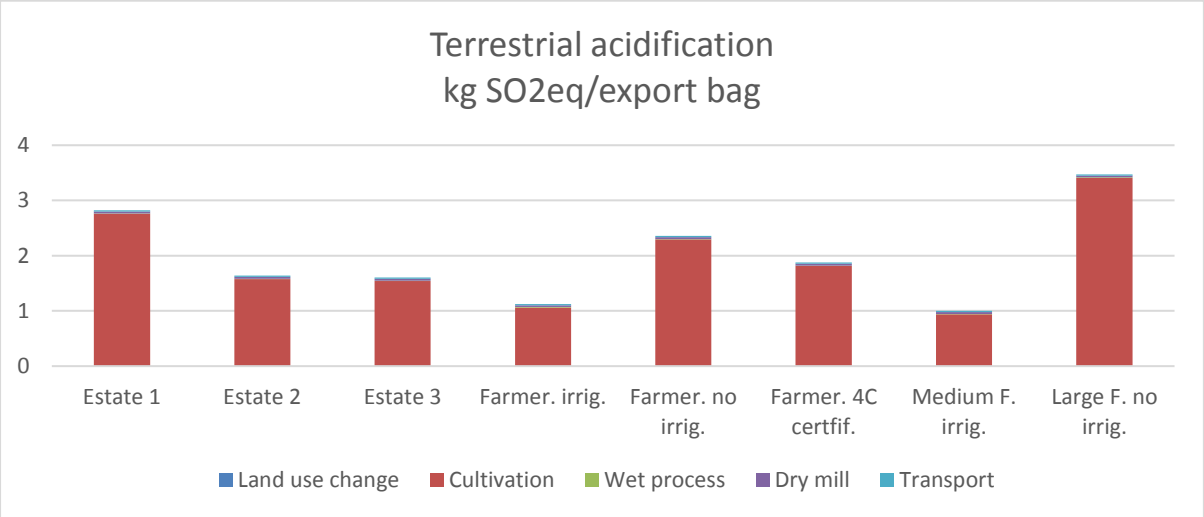


Figure 6.6: Contribution of the coffee value chain to the terrestrial acidification (kg SO2e2/ export bag)

C) Freshwater eutrophication

The freshwater eutrophication is mainly due to the emissions of nutrients (NPK) in the water. Estate 1 has the highest eutrophication impact. In fact this impact category is highly

influenced by the phosphate-based chemicals and estate 1 one has the highest consumption of NPK (300kg/acre) and hyperphosphate (300kg/acre).

The small farm with irrigation has the lowest impact because of its high yield and the limited use of NPK fertiliser. Figure 6.7 shows clearly how the contribution of the coffee value to the freshwater eutrophication could be reduced by shifting form phosphate-based fertilizers to other mineral fertilizers and manure. The relatively high impact of the large farm (in comparison to estates 2 and 3 and small farms) is due to the high application rate of pesticides/insecticides.

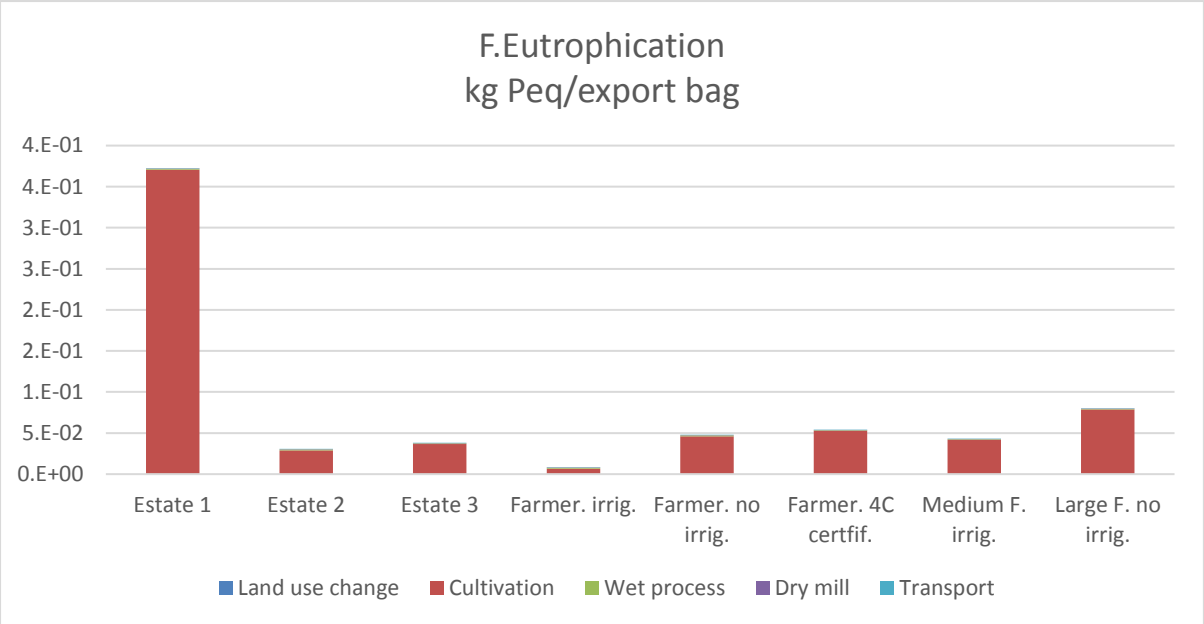


Figure 6.7: Contribution of the coffee value chain to the freshwater eutrophication (kg Peq/ export bag)

4.4.2 Results 2: Cradle to shop environmental impacts of the locally consumed coffee

The result of the analysis of the locally consumed coffee (Figures 6.8, 6.9 and 6.10), 38, and 39) follow exactly the same trend as the results of the exported coffee. The interpretation of the results for exported coffee are equally valid for the results of this section.

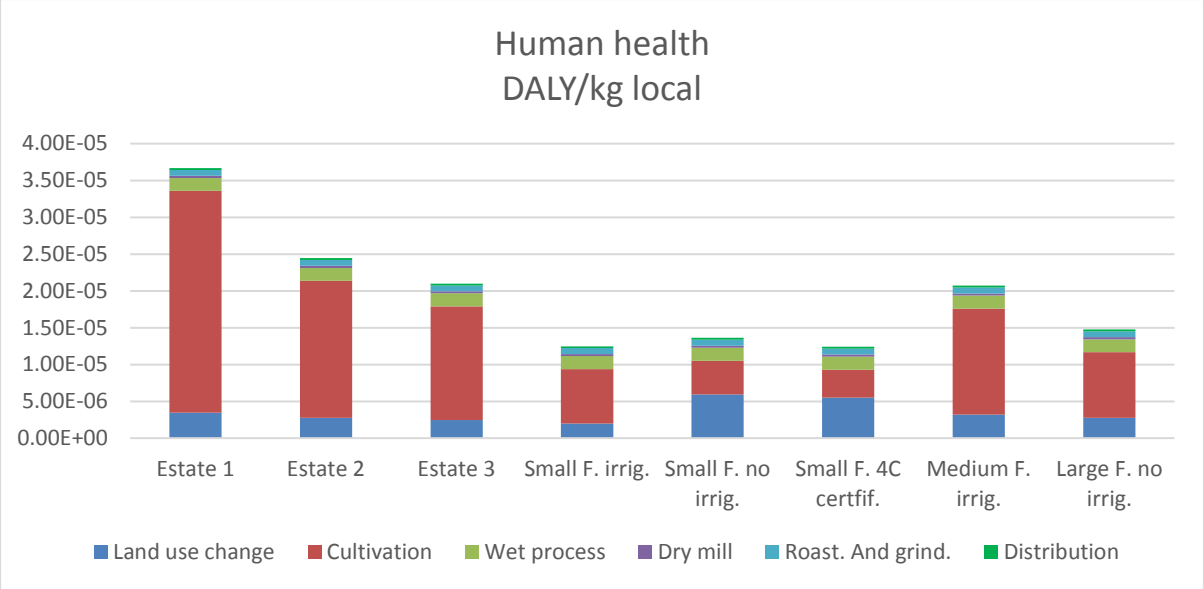


Figure 6.8: Impact of the coffee value chain on human health (DALY/kg local)

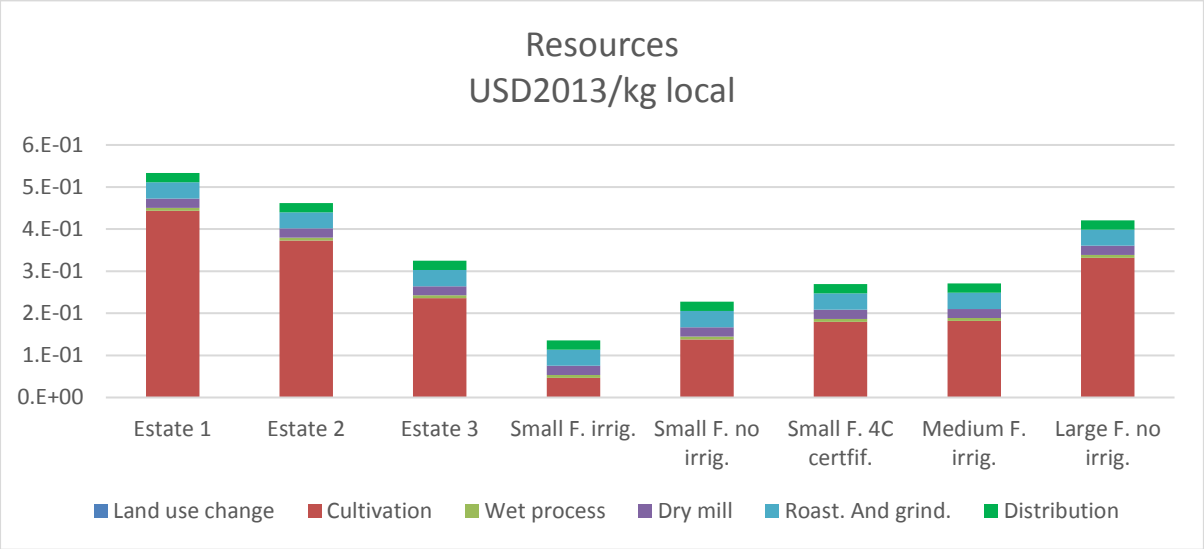


Figure 6.9: Impact of the coffee value chain on resource depletion (USD2013/kg local)

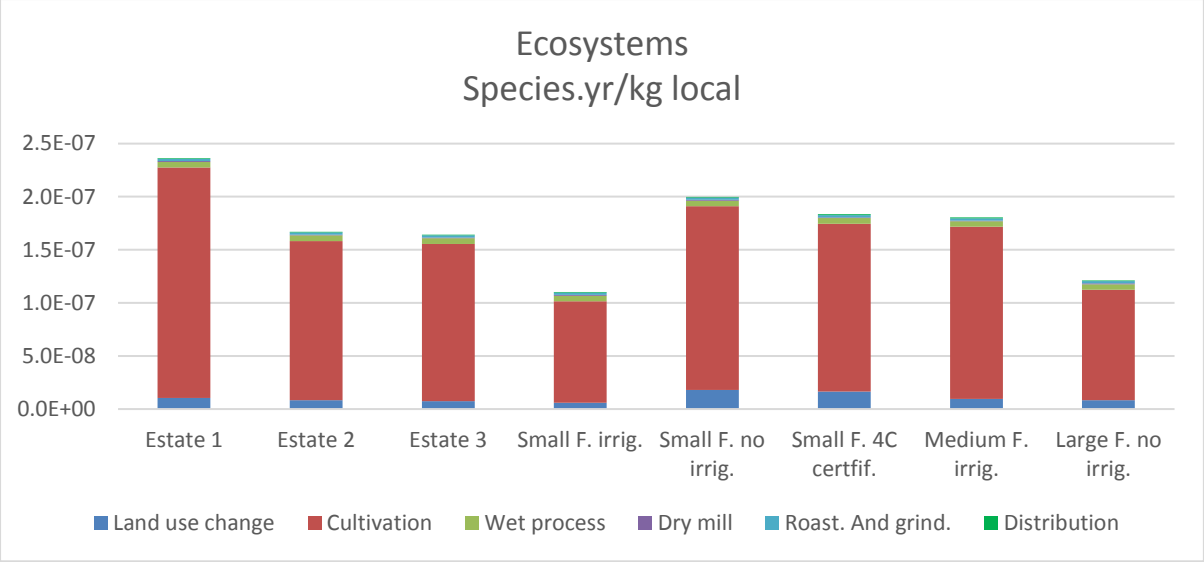


Figure 6.10: Impact of the coffee value chain on the quality of ecosystems (Species.yr/kg local)

4.5 Sensitivity analysis

The influence of the pulping technology on the results of the environmental analysis has been assessed. Shifting from a normal CPU to an eco-pulping CPU would reduce the water consumption of the value chain by 8 percent. 48 percent of water consumption of the coffee value chain could be reduced by replacing a home processing unit by a normal CPU (figure 6.11).

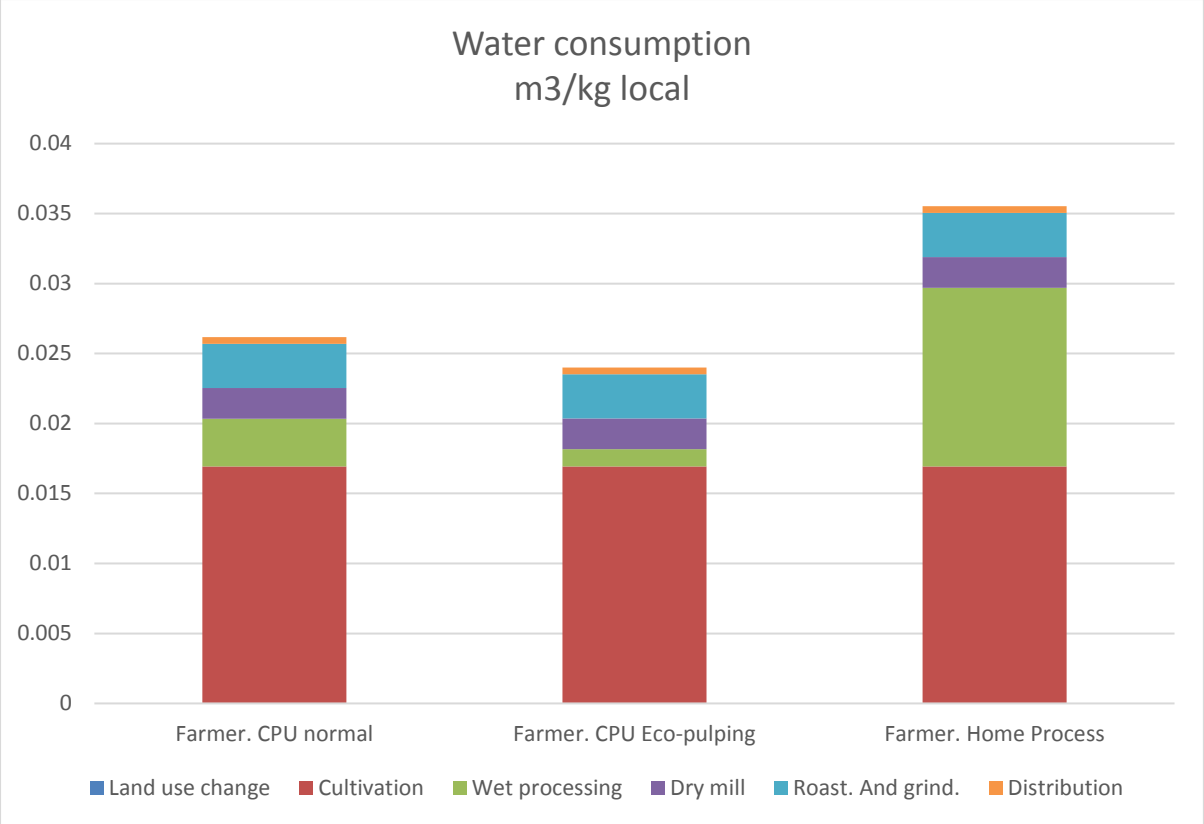


Figure 6.11: Influence of the pulping technology on the water consumption (m3/kg local)

The influence of the pulping technology on the impact on human heath (non-carcinogenic) has also been assessed. The replacement of home processing unit by a normal CPU will reduce the non-carcinogenic human health impact by 18 percent.

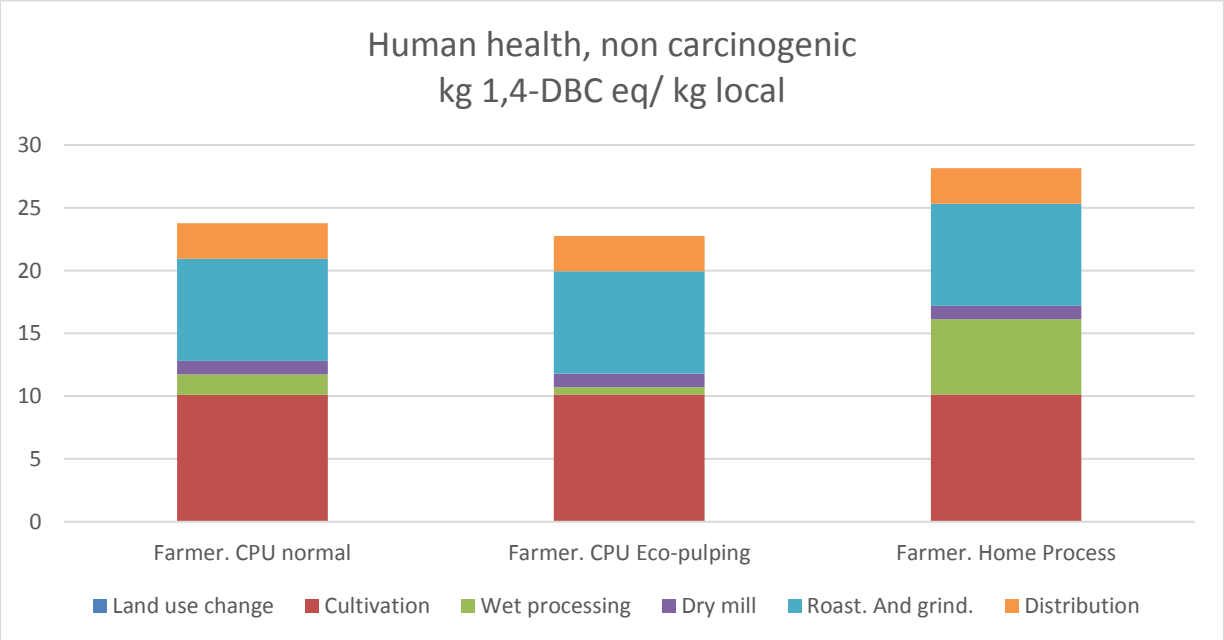


Figure 6.12: Influence of the pulping technology on human health (non carcinogenic) (kg1.4DBC eq/ kg local)

4.6 Conclusions of the environmental analysis

The comparative analysis of the different production systems revealed that:

- The agricultural practices vary from one farmer to another (also from estate to another). Despite the advices provided by extension officers, coffee producers do not use the same agrochemicals rates and the same farming technics (manual weeding versus herbicides for example). The differences in soil composition, the financial capacity to buy agrochemicals and to irrigate, the availability of water sources, the rainfall in the zone …etc. are all important elements which may influence the choice of agricultural practices and ultimately the nature and the level of environmental impacts.
- The environmental impacts of the coffee value chain on the 3 areas of protection (quality of ecosystems, resources and human health) are correlated with the application rate of agrochemicals and the productivity (yield). A production system with a lower application rate of mineral agrochemicals and a higher yield will always have a better environmental score (lower environmental impact). The cultivation phase is the main driver (the main contributor) for the 3 endpoint categories.
- The same trends are observed for both the locally consumed and the export coffee.
- The small farm with irrigation and a combined-use of mineral and organic fertilizers has the lowest impact for the endpoint and the midpoint categories. This is mainly due to the high production yield (in comparison to all the scenarios), the lower use of mineral fertilizers and the non-utilization of herbicides/fungicides/pesticides. However, this production system may require more manual work (manual weedings). In general, the yields in very small farms are higher because of the possibility for the farmer to invest more times in maintaining the farmland. The assessment of the results of this production system leads to believe that organic coffee from (very) small farms will have lower environmental impacts than conventional coffee.
- The combination of mineral fertilizers and organic fertilisers seems to be more environmentally sustainable for all the considered production systems
- The environmental impacts of 4C certified coffee and conventional coffees are comparable for all the impact categories. This is due to the fact that certification system does not provide threshold values in terms of agrochemical application rates and does not have a direct influence on the quantified input/output data of the coffee production.
- In general, the impacts on human health and resources of small farms are lower than the ones of estates. This mainly due to the fact the relatively higher yields in estate are not higher enough to compensate the higher impacts induced by the use of important volumes of mineral agrochemicals. Improving the productivity in estates will help reducing their higher environmental impacts.
- In average, the impact of estates on ecosystem quality could be slightly lower than the impacts of small farms (both certified and non-certified) without irrigation. This is mainly due to the high land use impacts (more land needed to produce the same amount coffee) of small farms without irrigation.
- The estate production systems could slightly score better (lower environmental impacts) than small farms without irrigation for some specific midpoint impacts (climate change, terrestrial acidification and freshwater eutrophication). However,

these limited benefits are not high enough to reverse the trends which are observed at endpoint level.

- Shifting from conventional wet processing to eco-pulping could considerably reduce the impact of the coffee value chain on water consumption and non-carcinogenic human health.
- The agriculture practices are more important than the size of the coffee production area. A high yield should be the single criteria to assess the environmental sustainability of coffee production systems. The assessment of the environmental sustainability should always have an input/output perspective.

The results of the environmental analysis of the coffee value in chain in Tanzania are comparable to the ones of the environmental analysis of the coffee value chain in Honduras (Ruben et al, 2018) for which the same calculation methods have been used. The average environmental impact on human health of 1 kg of Tanzanian green coffee is equal to 1.5.E-5 DALY (1.2 E-5 for the Honduran coffee) and varies from 5.1 E-6 DALY to 3 E-5 according to the production system.

The impact of the Tanzanian coffee on the ecosystem quality is equal to (in average) 1.4 E-7 species.yr/kg while the corresponding impact of the Honduran coffee is equal to 1.7E-7 species.yr/kg.

Nevertheless, the impact of the Honduran coffee on resources (0.51 USD2013/kg) is 2 times higher than the impact of the Tanzanian coffee (in average 0.24 USD2013/kg). This could be explained by the fact production systems (especially in small farms) in Tanzania are not that resource (agrochemicals and fuel for irrigation) intensive.

5 Social analysis

The CVC contributes to inclusive growth and social sustainability by providing access to the international and domestic coffee markets for somewhere in the region of 370,000 – 450,000[11] small-scale or smallholder farmers (SHF)[12]. These farmers are responsible for producing an estimated 90 percent of Tanzania's annual coffee output. As well as the direct benefits of coffee sales accrued by SHF and their families, the CVC also provides important opportunities for local employment at key points during production and processing (particularly at harvest time) and contributes to maintaining a dynamic local economy. Coffee also provides a key source of revenue for District Government. While coffee represents an important source of income for many SHF, the coffee sector in Tanzania faces a number of challenges and disincentives that have prevented the CVC from achieving its full potential in terms of social benefits (Figure 5.1). The detailed VCA4D Social Profile analysis can be found in Annex 6.

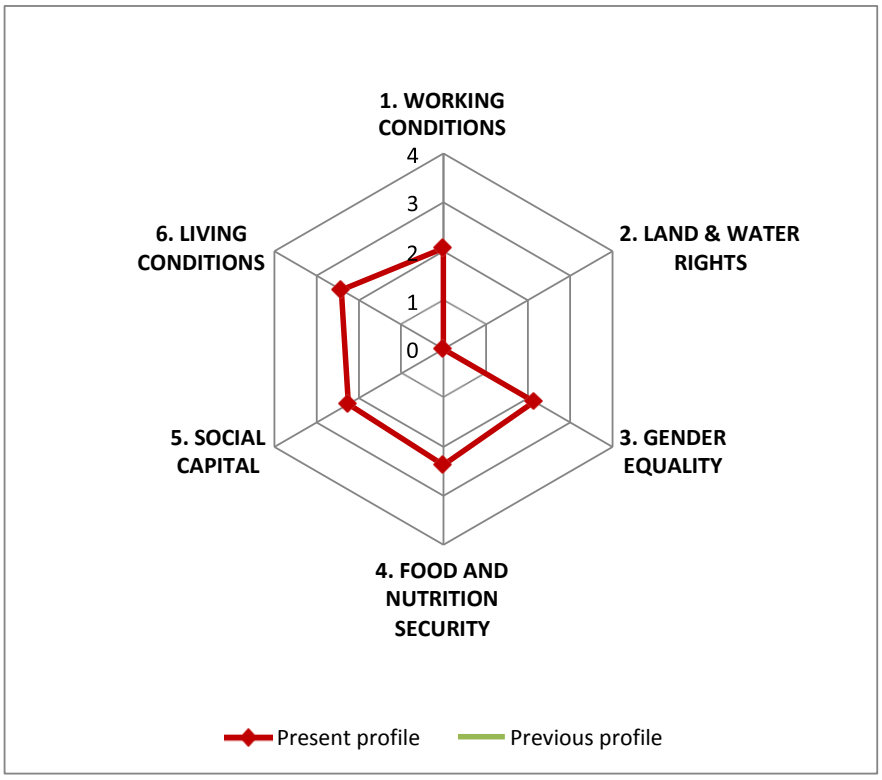


Figure 5.1: Overview of the VCA4D Social Analysis Profile Score

The analysis of social sustainability and inclusiveness contained in this section of the report is based on feedback and data provided to the VCA4D Team by key informants ranging from SHF to national level stakeholders, between January – March 2018, and augmented by additional secondary data sources. The VCA4D social study included an additional survey amongst 119 coffee farming households, plus a series of focus group discussions with men,

[11] The Tanzanian Bureau of Statistics estimates the number of small scale coffee farmers to be 450,000. However, only 259,000 small scale farmers are currently registered with the Tanzanian Coffee Board (TCB). It is estimated that this represents 70 percent of existing farms.

[12] There is currently no official definition of a 'smallholder' coffee farmer.

women and youth from Mbozi, Mbeya Rural and Ileje Districts of Songwe and Mbeya Regions respectively, which took place in February 2018 (see Section 4.6 for more details of the methodolgoy). This additional information provided a more in-depth understanding of SHF livelihood systems, and their influence on coffee production. Survey respondents were chosen at random, and only those who had not taken part in focus group were selected. Where necessary, the analysis of Songwe and Mbeya Regions is placed within the wider national context, using relevant secondary information and key informant feedback.

5.1 Social characteristics of small scale coffee producers in Songwe and Mbeya Regions

There is no single definition of a small-scale or smallholder coffee farmer in Tanzania. For the purpose of the VCA4D study, coffee farmers were divided into three broad SHF groups based on the total farm size[13]. They are: a large coffee farmer with >10 acres, a medium coffee farmer with between 3 – 10 acres and a small coffee farmer of < 3acres, plus estates with more than 70 acres. The average SHF in the region is estimated to farm a total land holding of around 5 acres. This is quite close to the findings of the VCA4D social survey which found an average farm size of 4.55 acres among respondents, with only a small difference between the three Districts (Table 5.1). By comparison, the average farm size in Kagera Region, the main Robusta growing part of Tanzania, is 2.5ha (6 acres), of which around 0.8ha (2 acres, or 33 percent) is under coffee, while farm sizes in the Kilimanjaro area are known to be in decline.

Table 5.1: Sample of farm sizes based on 119 survey respondents living in Mbozi District (Songwe) and Mbeyar Rural and Ileje Districts (Mbeya) in February 2018.

Region	District	Average farm size	Maximum	Minimum
Mbeya	**Mbeya Rural**	4.47	15	0.5
	Ileje	4.04	14	1
Songwe	**Mbozi**	4.55	22	1
Overall		**4.55**		
Relation between farm size and amount of coffee grown		+0.75 *Correlation coefficient*		
Relation between farm size and the proportion of the farm given over to coffee		-0.29 *Correlation coefficient*		

In addition to farm size, there are a number of other characteristics that were found to be likely to affect SHF ability to engage with, and benefit from the CVC. These are described in more detail in the following sections of the report, and summarised in Table 7.2.

[13] These grouping were provided to the VCA4D Team at the beginning of the study by the Mbozi District Agriculture Officer. The applicability of these categories across Songwe and Mbeya Regions is not known, but results from the social survey suggest that they are relevant.

Table 5.2: Summary of the factors that are likely to affect the ability of SHF to engage with the CVC and derive benefit from it, based on observations and stakeholder feedback during the VCA4D field missions between January – March 2018

Factor	Considerations	Observations on other coffee growing regions	Significance for SHF engagement with the CVC
Total farm size	Farm size characteristics will vary by region and between districts, depending on the demographic, cultural and agro-ecological characteristics of the area. The size and location of the farm can influence the range of on-farm options, and relative importance of off-farm/employment/income earning strategies.		The relative importance of coffee as a part of SHF livelihoods will vary (the VCA4D study found a range of between 40 percent – 80 percent of annual cash income, with some producers owning land purely for the purpose of coffee farming, because presumably they earned sufficient income elsewhere to mitigate the risk). Households that are more dependent on their farm for subsistence needs, either through home consumption or cash income, will give more of the farm to other crops, The greater the proportion of the farm given over to coffee, the greater the potential vulnerability to market volatility, unless the household have access to a diverse livelihood portfolio to mitigate price fluctuations. Coffee is often intercropped with banana, beans, maize and other fruits and vegetables to mitigate this risk. The existence of alternative on-farm options, and the need to ensure food security, will influence the proportion of the farm given over to coffee. Off-farm and non-farm livelihood options are also important, and where these are available, SHF can take greater risks (e.g. growing 100% coffee on a very small plot) or be less dependent on coffee altogether.
Land tenure	Coffee is a long-term crop requiring secure tenure rights to the land on which it is grown, either through a traditional system or legal title. Coffee is never grown on rented land. Smallholder coffee farmers own the land on which they farm coffee (or will be a member of the family who own it). The total farm area can be expanded by renting or buying additional land, depending on the financial and labour capacity of the household. However, rented land will not be used for coffee production. Coffee confers a greater monetary value on the land on which it is grown, making it more expensive to buy an established coffee stand and unlikely to be passed on to other family members except by inheritence.	The chagga have uprooted coffee trees after collapse of prices. Land is very valuable in Kilimanjaro and Arusha, coffee land cannot be rented and it is difficult to buy a coffee farm. However, practices such as burial in coffee farm has significantly reduce amount of land available for coffee	
Area under coffee	New coffee is certainly being planted, but much of the existing coffee stands are likely to have been inherited by the current owner - as evidenced by the advanced age of coffee trees in Tanzania (some up to 40yrs old). Lack of alternatives, the value of coffee land, time commitment and the legal penalties that exist for rooting up coffee plants, is likely to discourage change (or make it more difficult for farmers to change the focus of their farming systems). This means that, to a greater or lesser extent, the area of a farm given over to coffee cultivation is likely to have been determined sometime in the past when circumstances were different, and possibly also by a previous generation.	In Mbinga, there is a possibility of expanding coffee cultivation by moving to the lowlands areas. In the highland areas such as Kindimba village, some of the coffee trees reach up to 70 years	
Dynamics of household finances	Coffee is very input intensive in terms of fertilizer, pesticides, water and labour, and the new varieties of coffee even more so. These inputs are needed at certain times of the year which often coincide with other farm and household priorities, such as school expenses, house maintenance and inputs for subsistence crops, or when cash income from other sources is at its lowest. Under the formal auction two or sometimes three payment system, some of the value of the coffee can	Illegal coffee trade exists in all coffee producing areas; in Mbinga it is called Magoma	Smallholder farming households appear to function mainly through cash transactions, with some in-kind exchanges. They have a limited access to credit and loan facilities and other banking options. While most SHF do attempt to save and budget as best they can, they often have to react to circumstance, deciding to trade off one element of the household budget against another over time.

	be released before the final sale of beans. These payments are intended to cover the cost of inputs such as agrochemicals or labour. However, the timing of these payments was reported as being inconsistent and unreliable. As a result, many SHF make use of other, more local and accessible routes to release some of the value of their crop (e.g. selling to local traders and "kata kichwa"), or making direct sales to coffee exporters. The cash earned from coffee impacts on a wide range of livelihood activities such as improving housing, paying school expenses and investing in the farm and other income generating opportunities. While households are considered a collaborative unit, men and women still have differing degrees of access to and control over cash income and spending, particularly in relation to coffee.		
Livelihood portfolio	The range of alternative livelihood options depends very much on location. In Songwe and Mbeya, most farms grow staple food crops and local cash crops which can be sold in the local markets. However, the earning potential for these crops is low compared to coffee. Many people also keep small livestock, such as chickens, and zero graze dairy cows for their milk. There are also options for income generating activities such as labouring and 'boda boda', plus petty trading along the main highways.	In Mbinga, Ruvuma, few alternative livelihood activities, mainly livestock keeping and selling of food crops such as maize. Boda boda is also common among the youth	
Access and control over income	The social benefits from coffee earnings will also depend on the power dynamics and financial literacy of the household, in terms of who has access to and control over the income from the crop.		
Access to labour	Access to labour is a key factor in successful coffee production. The VCA4D study team were informed that it takes around 10 people one day to harvest an acre of coffee [*pers comm*]. During harvest season, Arabica coffee is picked once a week as the cherries ripen. They must be picked and processed within 8hrs to ensure good quality beans. With an average Tanzanian household comprising of 4.8 individuals, it is clear that small-scale coffee farmers who grow more than 0.5acres will need access to labour. Wage labour at harvest time is principally done on a piece work basis, based on filling a 5kg bucket with cherries each time. Child labour is not uncommon.		Depending on the financial capacity of the farmer, additional labour will be hired, or shared and reciprocated through a formal or informal group or other social ties.

5.1.1 The relationship between farm size and area of coffee grown

The VCA4D social survey found that the degree of specialism (expressed as the proportion of the total farm given over to coffee) varied widely across the sample, with only a very few small farms given over exclusively to coffee, while others used less than 15 percent of their farm for the crop. Of the 119 farmers surveyed, there were only 6 farmers who did not grow any coffee at all; five had land holdings of 1 acre or less, while only one farmer, reported having a substantial 6 acre farm. Not unsurprisingly, there appears to be quite a strong, positive relationshiop between total farm size and the area given over to coffee (giving a coefficient of +0.75), such that the large the farm, the greater the area of coffee grown. Assuming farm size is a good indicator of household socio-economic status, this is not surprising, since coffee requires considerable investment in terms of agrochemical inputs and labour.

In 2012, the Coffee Partnership for Tanzania (CPT) Baseline Survey interviewed 1690 coffee farming households across five regions, including farmers in Ileje, Mbeya Rural, Mbozi and Ruvuma Districts of Mbeya Region (the survey took place before Songwe Region was created, in 2015). They reported that the average percentage of SHF farmland devoted just to pure stand coffee was 27 percent, and intercropped coffee was 50 percent. The VCA4D Social Survey found the rate to be much higher amongst the 119 respondents – not less than 54 percent (see Table 5.3, below) – and with a median percentage of 50 percent across all three sampled districts. Only 35 respondents (29 percent of the sample) reported using 27 percent or less of their farm land for coffee.

Table 5.3: Proportion of total farm area given over to coffee by district, based on 119 respondents to the VCA4D Social Survey, February 2018

	Mbeya Region		**Songwe Region**	**Overall average, all districts combined**
	Mbeya Rural District (n=39)	**Ileje District (n=44)**	**Mbozi District (n=44)**	
Average	59.5%	55.4%	54%	56.5%
Median	50%			

Interestingly, the VCA4D survey found that there was an inverse correlation between farm size and the *proportion* of the farm given over to coffee (giving a coefficient of -0.29). So, while the area under coffee certainly increases with farm size (where there is more land available), the actual investment in coffee, expressed as the *proportion* of the farm given over to it, does not follow the same trend. This may well be linked to the portfolio of other livelihood activities that the household engages in. It was not possible to ascertain the relative importance of coffee as an income source among the sampled farmers, but from observation, it is likely that the specialist coffee producers (with 80+ percent of their land holding given over to coffee) will not be 'farmers', in the true sense, in that they will almost certainly be engaged in other, more secure, non-farm livelihood activities such as full-time paid employment or a small businesses, and so are not reliant on coffee as an income source and may only be investing in the crop as an additional activity.

Eighteen of the VCA4D survey respondents reported using 100 percent of their farm land for coffee, representing 15 percent of the sample. A total of 22 farmers reported giving over 80-100 percent of their land to coffee. The average farm size of these specialist farmers was only

3.4acres (with a mean of 3.5 acres), while the average land holding of those farms growing coffee on only 27 percent of their farm or less was 4.6 acres (with a mean of 4 acres). The majority (52 percent) of these non-specialist farms were from Mbeya Rural. In Ileje District, 34 percent of the sample could be classified as specialist farms, while 23 percent fell into the generalist category. What was not captured during the VCA4D social survey, was the age of the coffee and whether they were intercropped or grown as pure stands. This would have added to our understanding of the degree of 'intensity' of these farms.

Individuals with greater specialization are exposed to a greater risk, in terms of variation in income, if there are changes in yield, there is a slump in market price or if they lose market access[14]. If the farmer draws sufficient income from other sources (e.g. paid employment or a business), this would balance out the risk of specialising in coffee and smooth out cash flow. Similarly, the final evaluation of the Coffee Partnership for Tanzania (CPT) project (NORC 2017), which included farmers from Mbeya, concluded that the number of productive coffee trees a farmer grew was inversely correlated with their yield, measured as kg/productive tree. The study hypothesized that CPT participants limited the extent and intensity of their coffee based on the availability of household labour and how much cash there was available to pay for hired labour and other inputs. As a result, once the number of trees exceeded the household labour capacity and budget, trees would not receive as much attention and yield would decline. Although yield per tree would decline under these conditions, it was possible for overall production to increase. Smallholder coffee farmers were found to be *more concerned with income than yield*, leading many farmers to adopt the strategy of planting more trees in order to earn more money, even if the production per tree decreases.

Another factor to consider is that older coffee trees will, most likely, have been planted by a previous generation of the family to those that are currently farming it. The decision over how much coffee to plant will therefore have been taken when circumstances were very different in terms of market prices, access to extension services and the relationship between the actors in the value chain at the time. This issue came out during the VCA4D study focus group discussions, where several smallholder coffee farmers expressed feelings of being 'obliged' to farm coffee because they had inherited it, and did not have an alternative.

Therefore, other factors are clearly coming into play when it comes to the decision to invest in coffee. It is beyond the scope of the VCA4D study to identify what these are, but a household's strategy for achieving food security and degree of access to alternative livelihood options are likely to be important components. It should be noted that the sampling method used for the VCA4D survey will have influenced the results. A more extensive survey would provide greater depth, and coupled with more probing questions, would reveal more of the factors that might determine the degree to which farmers are able to commit to a crop of coffee, considering that most will also need to ensure production of staple crops from their farms, and provide sufficient means to balance cash flows over the course of each year.

5.1.2 Coffee as part of smallholder livelihood portfolio

According to a study carried out by AGRA/IDH in 2018, which included Mbeya and Songwe Regions in the Southern Highlands, coffee has the potential to increase the disposable income

[14] It is not unlikely that changes brought about by the recent changes to coffee sector regulation may cause those SHF who are reliant on, or have specialised in, coffee and sell directly to private traders, some difficulty in the short term. Their ability to weather this period will depend on what other livelihood options they can access.

of SHF but is not sufficient to lift farmers out of poverty by itself (pers comm; Paul Klein Hoffmeister, IDH, April 2018). As noted in the previous section, small-scale coffee farmers are more focused on cash income, than yield, and tend to manage household cash flow in a more reactive way. Feedback from the VCA4D focus groups (February 2018) suggest that in Songwe and Mbeya it represents an average of around 80 percent in Mbeya and Ileje, and slightly less in Mbozi Districts. During the VCA4D Study, the Team were told that coffee farmers in Mbeya and Songwe sold approximately 60 percent of their coffee through the auction, and a further 40 percent either directly for export or to local traders. A very small amount of coffee may well be kept for home consumption, as it was reported that coffee farmers drink coffee at home, but this is likely to be a very tiny proportion of the total crop and possibly to coffee that is of such low quality that it cannot be sold.

At a national level, the importance of coffee to household income will vary across different parts of the country, depending on the range of other livelihood options available. A recent study found it to be as low as 39 percent in Kigoma Region (Andrew.R, 2014), and may be as high as 90% in some areas (IDH, 2018). Farm and household characteristics will also vary by region of the country and even between districts, depending on the demographic, cultural and agro-ecological characteristics of the area, all of which will influence the relative importance of coffee to SHF livelihood portfolio and cash flow (see Table 5.4 below).

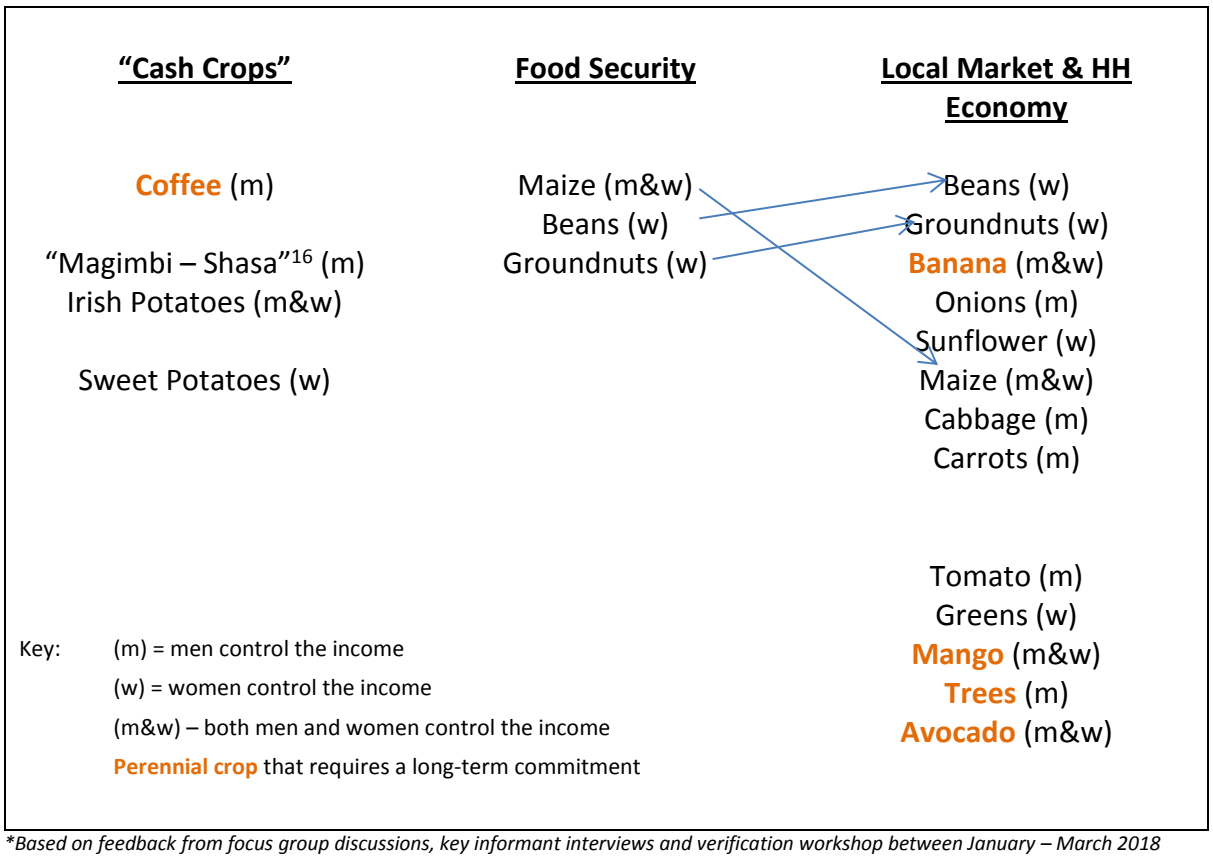
Table 5.4: Difference in farming systems practiced within the five most important coffee growing regions, based on the 2014/2015 Annual Agricultural Sample Survey Report and Coffee Production

	Crop farming (%)	**Livestock farming (%)**	**Mixed crop and livestock farming (%)**	**% contribution to total coffee output in 2016/2017 season (%)**
Kagera	73.9	0.6	25.5	42
Ruvuma	89.8	0	10.3	23
Mbeya*	53.5	1.6	44.9	20 (*Songwe – 16 percent, Mbeya 4 percent*)
Kilimanjaro	48.8	3.7	47.5	6
Arusha	27.7	13.8	58.5	4
				Total = 90%

**Songwe Region was only created in 2015 from a section of Mbeya Region, and is therefore included in under Mbeya results for 2014/2015 AASS Report.*

Along with Ruvuma, Rukwa and Morogoro; Mbeya and Songwe Regions are considered the 'bread basket' of Tanzania. These areas are highly productive regions and account for a substantial proportion of Tanzania's output of both staple and cash crops. For example; Mbeya recorded the highest maize production of any region in mainland Tanzania in 2017, yielding 578,230 tons, the equivalent of 10 percent of the national output. It also achieved the second highest yield for sweet potato (4.2 tons/ha) and produced 35 percent of Tanzanias output for Irish potato (AASS 2017). With this degree of productivity, it is clear that farms in Songwe and Mbeya are highly active.

The majority of SHF who took part in the VCA4D study grew staple crops, as well as coffee and other cash crops. Key cash crops for farmers in Mbozi, Mbeya Rural and Ileje Districts were (in order of contribution to household income); coffee, various types of potatoes, beans, groundnuts, bananas, onions and sunflower (Figure 5.2). All crops had the potential to contribute to household income. For example 'green maize' (also known as 'fresh maize') was seen being roasted on the cob and sold as a 'snack' along the main highway that passes through Songwe Region, although the trade in 'green' maize is prohibited by Government. SHF can often earn far more money from their maize crop by selling it in this way, than they can from selling maize in the local market[15] as a staple food crop; another example of the type of trade-off that SHF make by prioritising cash income against potential impacts on food security. Matoke bananas and cassava are also a common 'snack' to be found along the main highways. Livestock is also important, with stall raised dairy cattle being quite common in many parts of Songwe and Mbeya.



**Based on feedback from focus group discussions, key informant interviews and verification workshop between January – March 2018*

*Figure 5.2: Main crops grown by small-scale coffee farmers in Songwe and Mbeya Regions, their relative importance to household livelihoods and who controls the income from these crops**

In addition to agriculture, many SHF households also diversify their household income through activities such as petty trading (e.g. selling roasted green maize or home produced 'mandazi'), labouring or running a small business. Roughly one-fifth of smallholders in

[15] The price of maize in the market in Mbeya is one of the lowest in the country. At the end of March 2018, the retail price for 90kg of maize was recorded at TZS 31,000 in Mbeya, while the same quantity fetched TZS 90,000 in Arusha and Dar es Salaam (https://knoema.com/RATINRWP2017JUL/ratin-retail-and-wholesale-prices?country=1000040-tanzania&market=1000260-mbeya)

[16] Magimbi-shasa = a type of potato popular during the fasting period of Ramadan, and hence sold to distant markets such as Dar es Salaam and Zanzibar.

Tanzania also receive remittances from family and friends (CGAP 2016), and it is likely that remittances may form a component of household income in Songwe and Mbeya Regions as well. However, the VCA4D study did not collect sufficient data to confirm to what degree this might be the case.

The availability of alternative livelihood activities in the two study regions will depend on a number of factors including; location and educational attainment. Proximity to the Tanzam highway, the main road transport route between Tanzania and Zambia and Malawi which passes through Songwe, and urban centres such as Mbeya City, Vwawa and Mwolo, provide opportunities for small businesses (e.g. 'boda boda' motorbike taxis), petty trading and employment. Elsewhere, coffee estates provide access to seasonal labour opportunities particularly during harvest time[17]. Mbeya and Songwe regions also have several manufacturing industries including Mbeya Cement Company Limited, New Mbeya Textile Mills, Mbozi Coffee Curing, Coca-Cola plants, Mbeya Consolidated mines, Industries under Small Industries Development organization (SIDO) such as Pemacco, Common Facilities Workshop (CFW), Tea processing. In districts such as Ileje, which are more distant, options are more limited, and cash crops such as coffee become more important.

5.1.3 Coffee and cash flow

The timing and predictability of cash flow is an important factor in the ability of SHF to engage in coffee farming, and impacts on all aspects of the livelihood system and household well-being. Income from coffee is used to cover large outlays such as school expenses, upgrading and maintaining buildings, plus buying inputs for use on coffee and essential staple crops (Table 5.5). The study by AGRA/IDH in 2018 found that the cash income from the sale of staples and other crops with only a local market was not enough to cover the cost of inputs for these crops (pers comm). Nearly all sales happen outside of a formal agreement and transactions are almost exclusively conducted in cash.

Table 5.5: The main areas of household expenditure, the source of money which covers these outgoings and who controls this income based on focus group discussions and key informant interviews in Songwe and Mbeya Regions between January – March 2018.

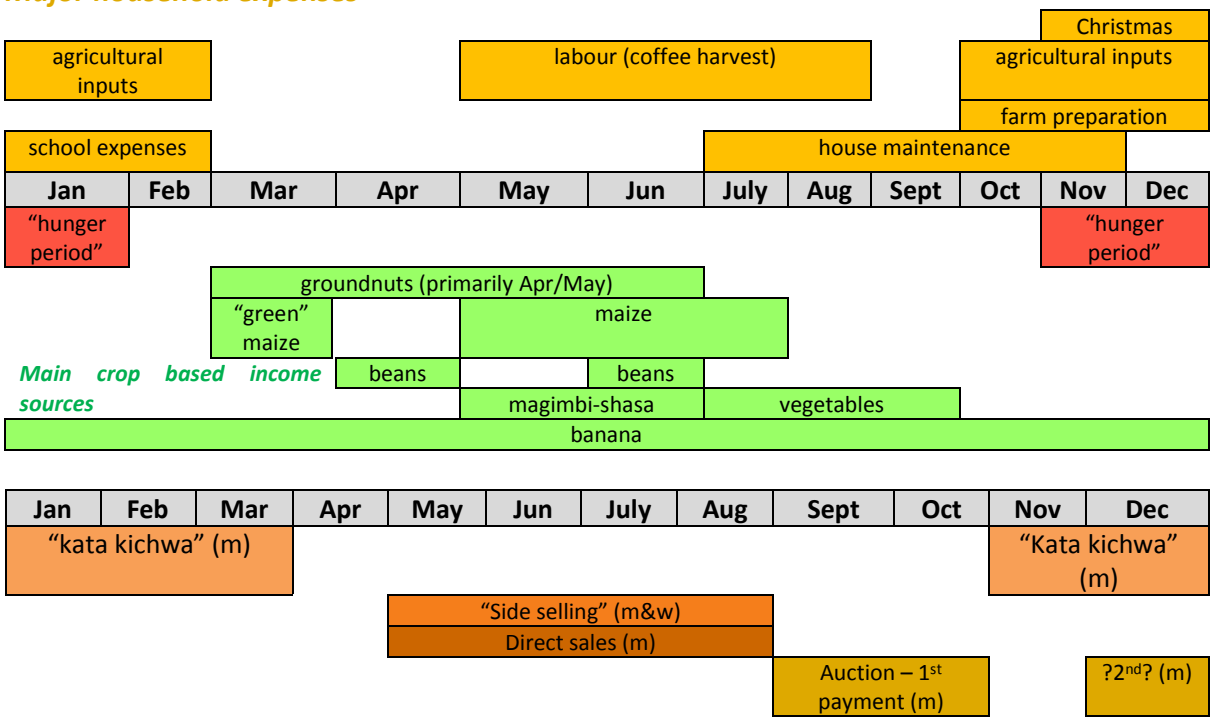
	Main source of income						
	Coffee	**Other agriculture**		**Livestock**	**Labouring**	**Petty trading**	**Brick making**
Expenditure		**Crop**	**Veg**				
School expenses	x (m)	x (w)	x (w)	x (w)		x (w)	
Clothes	x (w)	x (m&w)		x (m&w)		x (w)	
Daily family needs (food, etc)	x (w)		x (w)	x (w)	x (w)	x (w)	x (m)
House construction & maintenance	x (m)						
Healthcare	X (w)	x (m&w)	x (m&w)	x (m&w)	x (m&w)	x (m&w)	
Agricultural inputs	x (m)	x (m)	x (w)	x (m)		x (w)	
Vehicles & maintenance	x (m)						

Key: (m) = men control the income
(w) = women control the income
(m&w) – both men and women control the income

[17] At least one of the estates visited as part of the VCA4D study grew other crops, as well as coffee, including avocado, beans and banana. The estate offers employment opportunities, irrespective of the crops grown

How household expenditure ties in with the agricultural calendar, and specifically coffee production, in Mbeya and Songwe Regions are explored in more detail in Figure 7.2. According to the CGAP (2016) study, 12 percent of SHF in Tanzania reported that they frequently spent more money than they made, and this situation also occurs in Songwe and Mbeya Regions. The final evaluation of CPT (NORC 2017), which included farmers in Songwe and Mbeya Regions, found that only 23 percent of surveyed farmers reported being able to afford all the inputs they needed for their coffee crop, alone, and 65 percent were unable to get any credit to cover these costs. Private companies were found to be the main source of credit. This meant that SHF were often unable to pay other essential bills on time (e.g. school expenses). Smallholder farming households are often forced to make difficult decisions around prioritising their outgoings in order to try and live within their means. Another challenge that emerged during the CPT was the diversion of funds once a loan was received. Households often used some of their loans to cover immediate needs as opposed to productive inputs, again making it harder to pay back the loans.

What is clear is that SHF households in need access to cash at key times of the year, *throughout the year*, and for a range of reasons. With coffee being a key income source for SHF, farmers in Songwe and Mbeya Regions have adopted a variety of strategies to mobilize the value of their coffee crop to cover their needs. Strategies and support systems that can enable SHF to manage their cash flows more effectively in the long term, including access to informal loans and savings facilities, will help reduce the incidence of decisions that impact negatively on coffee production and other key livelihood outcomes.



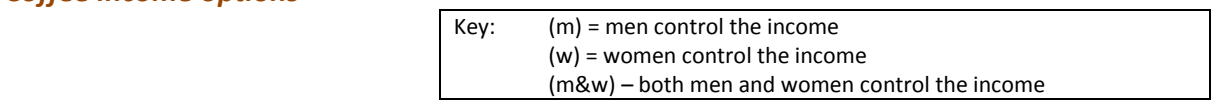


Figure 5.3: Main outgoings and income sources within farming households in Songwe and Mbeya Region over the course of a year, based on feedback from VCA4D study, January – March 2018

The CGAP (2016) study showed that few SHF in Tanzania have an emergency fund and the vast majority of transactions they make are done in cash at the point of purchase, which puts a strain on household budgeting and planning, and the situation is no different in Songwe and Mbeya. The VCA4D study identified a number of strategies used by SHF to access the value of their coffee crop when cash is needed. Selling coffee through the auction in Arusha can provide two, possibly three, payment points; an advance payment to coincide with the application of fertilizer or pesticides early in the season, or more commonly to cover the cost of hired labour at harvest time, and then a final payment once the coffee has been sold (minus all deductions, including the value of any advances, CES and other taxes, plus administrative costs, if sold through a cooperative).

While most SHF (79 percent) in Tanzania have to purchase their own seeds, fertilizers, or pesticides, mainly from local retailers, many coffee farmers in Songwe and Mbeya have benefited from the relationship with private coffee companies, such as CMS, or from bulk purchase of inputs through Farmer Groups or AMCOS. Private buyers have also been operating a similar system of providing inputs or an advance which is then deducted from the final value of the coffee harvest, and frequently offer a better price than has been available through the AMCOS system due to lower overheads. The final evaluation of the CPT project (NORC 2017) found that accessing 'credit' from private companies in the form of inputs or advances were the most common source of credit for farmers participating in the programme,

compared with farmer organisations such as AMCOS and FG. With the recent changes to the coffee regulations, SHF will no longer have direct access to formal private buyers.

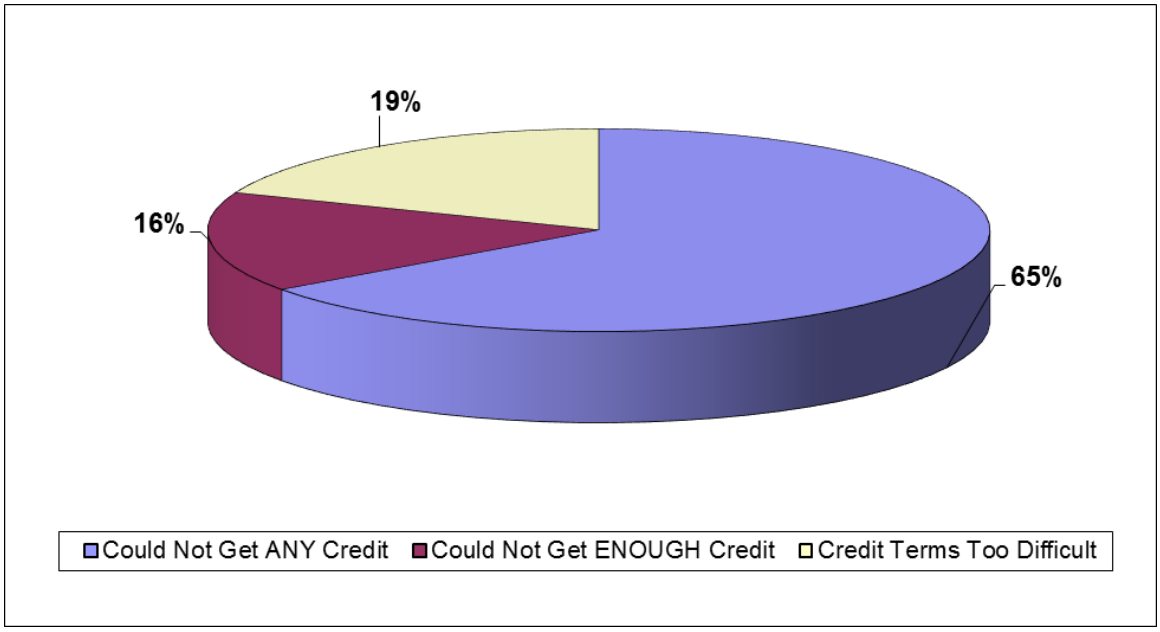


Figure 5.4: Primary reason surveyed farmers could not afford all needed coffee inputs (Source: NORC 2017)

Small scale producers can also gain access to the value of their crop in other ways. The VCA4D study found evidence of "kata kichwa"; a form of distress transaction in which the farmer sells some of his harvest to a local trader (often another farmer or local businessman), while the coffee tree is in flower or very early in the development of the coffee cherry. As the outcome of the harvest and likely market price is unknown at this stage, the lender covers their risk by offering a low value payment. It is almost entirely men who will sell coffee through "kata kichwa", and also benefit from the more formal marketing arrangements for coffee (see Figure 7.2), but women also have a means of informally accessing the value of the coffee crop by keeping a small amount of the harvest to one side and selling it to local traders. This is often done without the explicit permission of their husbands, although they are aware of the practice. More information on the gender aspects of coffee can be found in Section 5.4.

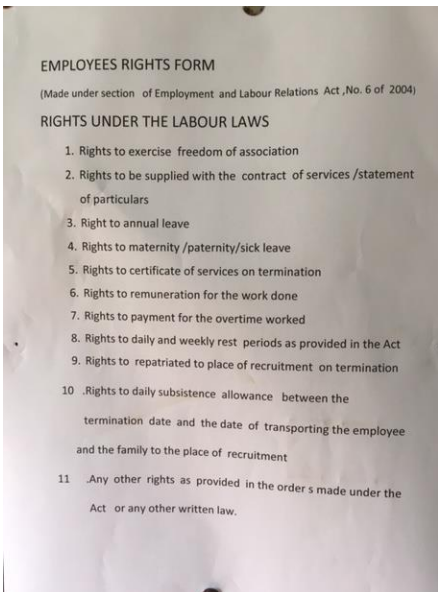
5.2 Working conditions

5.2.1 Respect of labour rights

Tanzania is a signatory to all 8 fundamental ILO international labour conventions, and to a further 28 other conventions, including the right of association and compensation for accidents for agricultural workers. Tanzanian labour law allows for workers to form and join unions, bargain collectively, and conduct strikes. Labour laws are being strengthened, most recently through an update to the labour Regulations, which were gazetted, and came into effect, on 24 February 2017; the Employment and Labour Relations (General) Regulations 2017 (GN 47 2017). Tanzania is also a State party to ICESCR. A National Human Rights Action Plan (2013 - 2017) was prepared based on recommendations and concluding observations of the UN Human Rights Treaty Bodies and commitments made by the Tanzanian Government in the Universal Periodic Review (UPR) of the United Nations Human Rights Council (2011).

An evaluation of the NHRAP was commissioned at the end of 2017. The Government of Tanzania is also a signatory to the United Nations Convention on the Rights of Persons with Disabilities (CRPD) and is working to integrate people with disabilities in national poverty reduction strategies, and most recently, through the enactment of the Persons with Disabilities Act of 2010.

Through these instruments, the Government of Tanzania monitors and enforces the implementation of legislation that regulates the labour market in the formal sector. Where coffee traders sell to a direct exporter (e.g. Starbucks), or sell coffee under internationally recognised certification standards (UTZ, Rainforest Alliance, Organic, etc) their employee welfare will also be audited against any associated third party standards and guidelines. For example; the VCA4D study met with vulnerable women who had been offered employment by City Coffee to hand sort green beans, as a direct result of the premium earned from certified coffee. However, the vast majority of the labour force in the CVC operates within the informal economy, and may therefore not benefit from current laws and guidelines. A recent study by ILO (ILO 2016) estimates that nearly 85 percent of the national workforce is engaged in informal employment.


EMPLOYEES RIGHTS FORM

(Made under section of Employment and Labour Relations Act ,No. 6 of 2004)

RIGHTS UNDER THE LABOUR LAWS

1. Rights to exercise freedom of association
2. Rights to be supplied with the contract of services /statement of particulars
3. Right to annual leave
4. Rights to maternity /paternity/sick leave
5. Rights to certificate of services on termination
6. Rights to remuneration for the work done
7. Rights to payment for the overtime worked
8. Rights to daily and weekly rest periods as provided in the Act
9. Rights to repatriated to place of recruitment on termination
10. .Rights to daily subsistence allowance between the termination date and the date of transporting the employee and the family to the place of recruitment
11. .Any other rights as provided in the order s made under the Act or any other written law.

Photo 1: Photo of Employees Rights on a factory noticeboard, Mbozi District

The VCA4D study could find no evidence for collective bargaining agreements in the coffee sector.

There were 29 trade unions in Tanzania in 2016; although one was deregistered and another three were in the process of being deregistered at the time (ILO 2016). The Tanzanian Plantation and Agricultural Workers Union is the most relevant representative organisation for coffee estate workers with a formal contract of employment. However, the VCA4D study could find no evidence of union membership during the field missions. The 2014 Integrated Labour Force Survey found that only 1.1 percent of private sector employees involved in the agriculture sector were members of trade unions or employees associations, of which 1.2 percent were women. Overall, the private sector has a much smaller proportion of members in trade unions than public sectors.

5.2.2 Child labour

According to the Tanzanian Law of the Child Act, 2009 (Section 4) (1), a child is defined as a person below the age of 18 years. The Tanzanian Employment and Labour Relations Act, 2004 (section 5) (1) provides for the minimum age of employment for children as 14 years and above; 14 years for light work and 15 years for work that is not hazardous to the child's development. The Employment Act only covers the formal sector. Most child labour is found in the informal sector. It is common for children to contribute to the welfare and livelihoods of the household in rural areas of Tanzania. This would not normally constitute 'child labour'

unless it is depriving them of an education or is harmful to their development or health[18]. The Tanzanian Mainland National Child Labour Survey (2014) concluded that agriculture accounted for 94.1 percent of working children, with 24.6 percent of 5 to 14 year olds combining work and school.

In Mbeya and Songwe Regions, the VCA4D Team were told by several key informants that children are known to be involved in harvesting coffee. Older children (<14yrs) were said to be seeking employment as coffee pickers in their own right, but the practice of paying labourers by the bucket full of cherries also encouraged some families to involve younger children in the harvest (see Section 5.2.4). On the principle that "extra hands make light work", it makes economic sense for those households who are most dependent on the income they get from employment during coffee harvest period, to include children in the activity so that more buckets can be filled (or at least, a minimum daily target can be reached). While the VCA4D Team found no actual evidence of child labour, feedback from some key informants suggests that children might also be taking part in work on some of the coffee estates in Songwe and Mbeya Regions.

This is likely to result in some children being absent from school during the harvest period (May – August). During the VCA4D field visits, it proved difficult to collect data that could be used to determine to what extent children might be absent from school during the coffee harvest period. Statistics on daily attendance figures are held by each individual school, and it is difficult to prove a causal link given the underlying issues with school attendance, truancy and academic attainment that exist in Mbeya and Songwe Regions. For example, a study carried out in 2012 (Edina, I.J. 2013) that included three community secondary schools in Mbeya Rural District (Lwiwa, Inyala and Imezu Schools) found that many schools did not keep accurate records of attendance. Without actual data, this study used student and staff perceptions of truancy. It concluded that, amongst the economic factors that may cause absence from school, child labour was seen as the most common (45.8 percent) and parent's inability to pay school expenses (36.1 percent). Some children were also perceived as being involved in petty trading (20.8 percent).

5.2.3 Job safety

The main health and safety risks associated with the CVC include the following:

Production	Exposure to agrochemicals	SHF and estates
	Sharp tools for pruning	
	Lifting heavy weights particularly during harvesting	
	Long working hours & repetitive tasks particularly at harvest	
	Working with agricultural machinery	Estates and larger farms
	Water contamination through irrigation	
Transport	Mechanical condition of vehicles	All
	Road accidents	
Processing	***Water contamination – wet processing of coffee cherries***	***Home processing and CPU***

[18] As defined by the International Labour Organisation

	Working with machinery	Home processing, CPU, factories and warehouses
	Exposure to dust and endotoxins	***Factories and warehouses***
	Lifting heavy weights	CPU, factories and warehouses

Of these, water contamination and dust and endotoxin exposure are unique to the CVC and may not currently be adequately covered by legislation.

A study carried out in 2012 (Sakwari *et al*, 2013) took samples at different points along the processing chain (parchment to green beans), from four separate factories in Tanzania that handled Arabica and Robusta coffee. The study found that individuals were exposure to between 0.24–36mg/m ^{3} of dust, with 17 percent of samples exceeding the reference exposure limit of 5mg/m ^{3} for total organic dust[19]. The task with the highest dust exposure level was sweeping, and those tasks with less contact with coffee beans such as sampling, machine repair, and handling of parchment coffee had a significantly lower exposure. Dust exposure was significantly higher in Robusta coffee factories than in Arabica factories and when handling dry pre-processed coffee compared with wet pre-processed coffee. In terms of endotoxin exposure, all the samples, except two, had higher levels than the health-based recommended exposure limit of 90 EU/m ^{3} (Health Council of the Netherlands, 2010). Endotoxin exposure was found to be significantly higher when handling Robusta coffee compared with Arabica coffee, as well as when handling dry pre-processed compared with wet pre-processed coffee.

Under the Ministry of Labour and Employment, the Occupational Safety and Health Authority (OSHA) is responsible for ensuring the creation and maintenance of ideal work environments that are free from occupational hazards that may cause injuries or illness to all employees in work environment. All formal employers in the CVC must adhere to Tanzanian employment laws and will be audited against any certification or third party standards to which they adhere (e.g. Fair Trade, Utz Certified, Organic, and Rainforest Alliance). The VCA4D Team saw health and safety notices clearly displayed in those factories and estates visited as part of the study (see photo on the right), and evidence of protective clothing and dust masks being used by workers. However, most Tanzanian labourers do not benefit from the relevant occupational health and safety legislation and have limited access to occupational health services (Ezra, J. *et al* 2015).

[19] At the time of the study, Tanzania had no legislation on exposure limits, and so a reference value was set based on the Norwegian Labour Inspection Authority, 2010

The ‘wet’ processing of Arabica coffee uses a considerable amount of water and can contaminate water sources. There are technologies available, such as the Penagos UCBE 1500 machine, which is designed to pulp the coffee cherry without using water and thus reduce the need for water and risk of local water sources becoming contaminated.

5.2.4 Attractiveness

The Tanzanian government established a minimum wage law in 2015, which splits the labour force into 12 sectors and provides a minimum wage for each sector individually. In August 2016, the minimum wage for agricultural workers in the formal sector was:

- Daily wage = TZS 3,846.50
- Weekly = TZS 23,078.70
- Monthly = TZS 100,000

However, as previously stated, the majority of employment in the CVC is on a casual and informal basis, often paid on output (‘piecework’) rather than as a daily wage, particularly at harvest time. For example: in Mbeya and Songwe, the VD4D study found that the current rate for a 5ltr bucket full of coffee cherries picked during the 2016/2017 harvest season was between TZS 800 to TZS 1,000 (equivalent to EUR 0.30 - EUR 0.36 at current exchange rate). In order to achieve the equivalent of the minimum daily wage for the sector, four buckets would need to be filled in a day. Feedback from stakeholders suggests that this is likely to be very difficult for a single person to achieve, which may help to encourage households to adopt strategies that maximise their productivity, such as involving children and other household members to help.

Agriculture as a whole faces the challenge of encouraging youth to remain in, or take up, farming. With just over one-tenth of smallholders in Tanzania under the age of 30, the CGAP study (CGAP 2016) concluded that there was a relatively small presence of the “next generation” within the existing farming population. When asked about their commitment to farming, nearly 90 percent of these young farmers expressed a preference for taking a full time job rather than continue farming.

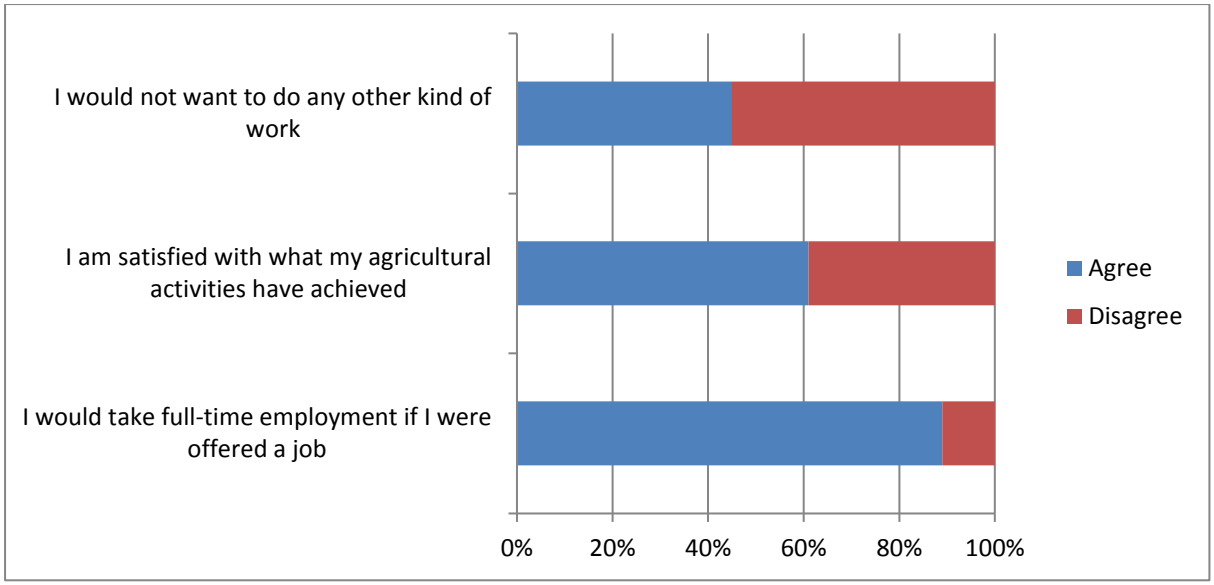


Figure 5.5: Indication of the attractiveness of farming for younger people aged between 15-29 years (source CGAP 2016)

Findings from the VCA4D study highlight some of the challenges facing youth in terms of gaining a foothold in coffee production. The main challenge being access to land, either by purchasing or inheriting it (see Section 7.3), and the time and financial investment needed to create new farms. During the VCA4D focus group discussions, young men expressed a greater preference for other income generating activities, such as 'boda boda' (motorbike taxi), which concurs with the findings of the CGAP study (CGAP 2016). Of the 119 participants in the VCA4D social survey, 20 percent were aged 35 years or younger, of whom 58 percent were women. The youngest contributors were 21 years of age, two of whom were women. However, due to the way in which the survey was carried out, it is not possible to be sure whether the 'youth' contributors were responding on behalf of the household as a whole, or were describing their own farms.

There are a number of NGO led initiatives which are attempting to address some of the issues facing potential young coffee farmers, such as 'Coffee Kids', which started as a project run by the NGO, Hanns R. Neumann Stiftung North America in 2015. It is focused on working with the next generation of coffee farmers in order to secure the future of coffee farming. Coffee Kids is active in Kilimanjaro Region. Twin and Hivos are supporting the Vuasu Cooperative Union, with a particular focus on women and youth. Technoserve is also targeting young entrepreneurs involved in the CVC with support to develop their businesses.

5.3 Land and water rights

Large land holdings and VGGT

The VCA4D study found no explicit reference to VGGT[20] in the CVC, and no examples of its use. If estates become more prevalent, this may change in future, as the level of awareness of these guidelines is growing in Tanzania. A two day seminar was held in Dar-es-Salaam in

[20] The Voluntary guidelines on the responsible governance of tenure of land, fisheries and forests in the context of national food security (VGGT)

November 2017[21], organised by the FAO and Ministry of Lands, Housing and Human Settlements Development with the intention of creating a create a critical mass of informed stakeholders and pave the way for discussion on how VGGT might be implemented in Tanzania in future.

With estates estimated to contribute only 10 percent of total annual coffee production, the CVC is not currently dominated by extensive landholdings. The coffee estates visited in Songwe Region as part of the VCA4D study were large, typically over 100 acres, and one being 700 acres. Their size and location appeared to have a historical origin (dating to the establishment of coffee in the country during the colonial period), rather than being a recent development. Without access to an example of a recent large scale land purchase within the CVC, this study is not able to draw any conclusions as to the process and level of engagement and consultation.

Land tenure and smallholder farmers

Smallholder farmers in Tanzania typically own their plots of land as individuals, either through a lease or certificate, or under customary law. The CGAP study (2016) found that, nationally, 49 percent of SHF own the land on which they farm by lease or certificate. Roughly two-fifths of these farms fall under customary law (Table 5.6), which means there is no official documentation of ownership. State and communally owned farms are in the minority, and are mostly concentrated in the Dar es Salaam region.

Table 5.6: The proportion of land ownership type across five sample regions (Source: CGAP 2016).

	Form of Ownership of Land (% of sample)					
	Mbeya	**Dar es Salaam**	**Morogoro**	**Kagera**	**Mwanza**	**Total**
Individual ownership with lease or certificate	34	57	39	45	54	**49**
Individual ownership under customary law	61	25	54	51	38	**44**
Communal (resources are shared)	4	2	0	0	0	**2**
State ownership	1	7	4	0	0	**2**
Other	0	9	3	2	3	**3**
Don't know	0	0	0	1	5	**0**
	100	***100***	***100***	***100***	***100***	

The Tanzanian Bureau of Statistics estimates the number of small scale coffee farmers in Tanzania to be 450,000, and this figure is often cited in current literature. However, the exact number of coffee farmers is not known. The Tanzanian Coffee Board is in the process of registering all coffee farms in the country, but so far only holds records of 259,000. It is estimated that this represents 70 percent of existing farms. The Government is encouraging all farms to be registered in order to obtain an official certificate of ownership or lease. The number of registered farms in Songwe and Mbeya Region is one of the lowest in the country. The 2014/15 Annual Agricultural Sample Survey (AASS) estimates that 95 percent of all farms in the Songwe and Mbeya Regions are still unregistered, which accounts for an estimated

[21] http://www.fao.org/tanzania/news/detail-events/en/c/1069238/ accessed 29/3/18

667,244 farms. This compares to only 58.7 percent of farms remaining unregistered in Kilimanjaro region, and 51 percent in Arusha region. The proportion of registered farms among participants in the CGAP study (CGAP 2016) was higher (34 percent), but serves to highlight the difficulties in confirming exactly how many farms are participating in the CVC.

5.4 Gender equality

Women are very active participants in all aspects of smallholder farming, including coffee production, as they provide the majority of the labour capacity within SHF households and also as hired labourers. For example, at coffee harvest, women make up around 80 percent of the workforce in Songwe and Mbeya. However, many women in the region do not appear to have commensurate access to, or control over, the crop itself or the income derived from it. While considerable work is been done in the region by both NGOs and District Government to improve household financial literacy, promote shared and equitable decision making over household budgeting (e.g. the Coffee Partnership for Tanzania project supported by the Bill & Melinda Gates Foundation), and land tenure, women still appear to have limited access to, and control over coffee both as a crop and as a source of income in Songwe and Mbeya Regions (see Section 7.1.5).

Photo 2: *Photo of Bill & Melinda Gates poster promoting joint financial planning within the household*

Coffee has traditionally been considered a 'mans' crop and is still perceived as such by many of the people who contributed to this VCA4D study; it is men who inherit and own the land on which the vast majority of it is grown. Men are responsible for marketing the coffee produced, and therefore receive the money earned from its sale. Men are more likely to have a bank account, be active members of farmers groups and AMCOS and as the head of the household, have the greatest influence over how the money is spent.

5.4.1 Economic activities

Women are crucial to the successful of SHF coffee in Mbeya and Songwe Regions as they provide the majority of farm labour, both on their own farms throughout the year and also as hired labour. Both the estates visited by the VCA4D Social Specialist reported that women made up around 80 percent of the workforce employed during harvest time, but this proportion was lower for other activities. Estates employ 'pickers' on a piecework basis during harvest season, and on a more casual basis throughout the rest of the year in addition to a core, more permanent staff such as security guards, machinery operators and sprayers. These roles, and the more physically demanding jobs such as heavy lifting (e.g. sacks of coffee), tend to be done by men. Both men and women are involved in pruning, although it is most frequently done by men.

The processing of coffee involves removing the outer 'cherry' flesh to reveal the coffee bean in its 'parchment' stage, which either takes place at home using a hand processor or at a CPU. During pulping cherries to parchment, men are responsible for operating the hand pulper and women fetch water, wash and ferment, while during CPU processing they are mainly involved in drying the beans. Parchment is then transported to the nearest processing factory where the parchment casing is mechanically removed and green beans are graded, packed in hessian sacks and stored in the warehouse ready for sale and transportation.

The VCA4D Team visited two coffee curing factories in Mbeya and Songwe; one owned by City Coffee and the other by Coffee Management Services. At the time, women were largely absent from the workforce on the factory floor, as it involved handling industrial machinery and much heavy lifting (60kg hessian sacks of green coffee beans were being stacked in the warehouse by hand). The majority of administrative staff were women, however, and at CMS a workforce of around 200 women (mostly widows) were being employed to hand sort green beans to remove stones and those of poor quality. This work was funded through the premium earned by the coffee having certification. It is also sometimes paid for by the customer who has purchased the coffee at auction, as they insist that the coffee is hand sorted before it leaves the warehouse.

Many private companies have provided direct support to small scale coffee farmers, and through NGOs are also engaged in providing broader support to farming households and the local economy. In some cases, private companies have set up their own NGOs (and vice versa). For example; the Karagwe Development and Relief Services (KADERES) is an NGO based in the Kagera region of North West Tanzania that has established a business wing for registered farmers called Kaderes Peasants Development (KPD) so that they can focus on support for poor and marginalised smallholder farmers through the NGO while using the business wing to grow the coffee sector and improve the overall economy of the area.

Tchibo Coffee is providing funding to Save the Children in Mbozi District, Songwe region for a Childrens Education and Youth Livelihood Programme working to improve; literacy amongst children and the standard of teaching, plus provide support and vocational training to young people between the ages of 14 – 22 years. The German NGO, HNRS, is very active in Songwe and Mbeya, working with smallholder coffee farmers to improve organizational development, sustainable agriculture, food security, climate, gender and youth. Their team also promote viable business opportunities and support farmers in transforming these into economic activities, in order to increase income and employment. HNRS also supports first and second tier farmer organizations and have assisted farmers in establishing the company Tanzania Coffee Farmers Alliance, which acts as an Apex organization and marketing platform for all project beneficiaries and is an essential partner for HRNS Tanzania. NGO supported initiatives will be more gender sensitive, and work with both men, women and youths. CMS is doing the same, it operates both as coffee traders and service provider.

During the VCA4D study, the Team met with several women members of farmers groups and AMCOS who were presented as 'coffee farmers' in their own right. Many were widows, who had inherited their husbands place in the group along with responsibility for managing the coffee crop and farm, itself. Despite considerable progress towards more equal land rights, most widows are unlikely to have legal title to the land, and instead will be farming it on behalf of the family, and with the permission of the family member who has inherited the controlling interest in the farm (traditionally the first born son of the first wife, but almost always a male member of the family). There have been cases where women have bought land, and planted coffee but this does not appear to be very common in Songwe and Mbeya Regions (the VCA4D Team did not encounter any during the study). Further investigation will be necessary to establish how common this is. Women most frequently gain access to rented land in their own right, and plant annual staple crops for domestic consumption and local sale.

The opportunity for women to explore and pursue livelihood strategies was found to be quite limited. Constraints are often imposed on women by culture. For example, some young women complained that 'boda boda' (motorcycle taxis) was not seen as a suitable job for women, and they were constrained by their household and reproductive responsibilities which limited any income generating activity to something that can be done in conjunction with their other domestic duties.

One area where women are active in their own right is in the local trading of harvested coffee. In order to gain access to some of the cash value of the coffee grown on their husband's farm, it was reported that women would often 'hold back' a small proportion of the coffee cherries or 'parchment' that they had picked or processed. They would then sell this to local traders for cash, which could then be used for immediate expenses such as food, medical care or cloths. This form of 'side selling' is mostly done without consulting their husband, although they are well aware of the practice. The VCA4D Team also met with the Tumani (meaning "hope") and Amani (meaning "peace") Women's Groups (see Section 2.5 for more details), who were trading in coffee. Both women's groups were buying small quantities of parchment coffee from local farmers, bulking it together and selling it on for a small profit to local traders. It took a year or so for the groups to reach the point where they could buy and sell coffee, but with it, and the produce from the 30 acres of land they rent as a group, has allowed

Tumaini Women's Group to save TZS 400,000 since 2014. However, this channel of income generation is potentially under threat from the recent Prime Ministerial Decree preventing small-scale coffee farmers from selling coffee direct to the private sector.

Women are not the only beneficiaries of local coffee trading; the VCA4D Team also met with the entrepreneurial Tumani Youth Group, who had set themselves up as food processors with very minimal external support. The group offered a range of products for the local market, including "Songwe Coffee"; a roasted and ground coffee (see photo). The group were buying parchment coffee from local farmers, processing and grading it, then roasting and grinding the best quality beans using their own (basic) equipment. The intended market for "Songwe Coffee" is initially local Tanzanian coffee drinkers (most SHF coffee farmers will drink coffee at home). The group was planning to establish a coffee club in Vwawa, Mbozi District called the Songwe Coffee Club, to encourage more consumption locally. Again, this initiative is under threat from the recent Prime Ministerial Decree. In an attempt to mitigate any future difficulty in accessing coffee direct from the farmer, Tumani Group had managed to purchase an acre of land and plant coffee. However, it will be another 2-3 years before this yields coffee.

5.4.2 Access to resources and services

Land tenure

Under the 1998 Land Act, Tanzanian law grants women the same rights as men to access, own and control land, and allows them to participate in decision-making on land matters. Several women's rights groups formed the Gender Land Task Force (GLTF), which effectively targeted policy makers and consequently ensured the inclusion of gender-sensitive provisions in the Land Act and Village Land Act. However, women rarely buy land. According to USAID, only an estimated 20 percent of women in Tanzania possessed land in their own names in 2015[22]. Instead, most farm land is owned by the male head of household, either through the traditional system or formal legal title. The legal basis for land tenure, marriage and inheritance in Tanzania are treated as distinct categories in their own right within legislation. However, in practice, they are still inseparable (see Box 4, below). Women only have access to land through their husband, and they risk losing access altogether depending on the intentions of the family member who inherits it on his passing. Also, women are not only significantly less likely to own land than men, the land they do own is usually smaller and of poorer quality.

Women do not appear to inherit land on the passing of their husband or parents. By tradition, the farm would pass to the first wife's oldest son (polygamy is common in Songwe and Mbeya

[22] https://www.reuters.com/article/us-tanzania-rights-women/smartphones-help-tanzanian-women-secure-land-rights-idUSKCN0QU11420150825 Accessed 21/3/18

regions) or be shared between all the male heirs if there is agreement between them. Disputes over inheritance are not uncommon, as the head of household may wish to see the farm pass to the heir who shows the greatest interest in farming irrespective of their birth sequence, and this can cause tensions when the traditional heir is perceived as having been 'passed over'. The husband will frequently 'grant' a portion of the farm to the wife for her own use, on which she will grow maize, bean, groundnuts, vegetables and other annual staple[23] and cash crops. If they have the means, many women also rent additional land nearby in order to expand the area under cultivation. During the VCA4D study, it was common to find that 'women coffee farmers' were actually widows who continue to farm their husbands land on behalf of, the son(s) who have inherited the land. The inheritor may not be resident on the land themselves, but will have ultimate control over its use and the sale of coffee produced. Most of the women coffee farmers from Mbeya and Songwe region who took part in the VCA4D study were widows.

Box 4: Case study of a woman who owns her own coffee farm
The VCA4D Team were told of a woman whose husband had abandoned her and sold the farm without any consultation. Finding herself without a means of supporting herself, the woman had managed to raise enough money to buy land in her name. On this land she planted some coffee, which was now earning her a reasonable income. The husband then returned, and laid claim to his wife's land because they were still legally married. The wife was planning to fight through the courts for her right to retain legal title, but the case has caused a dilemma because of the way in which marital assets are perceived both in law and in tradition.

Male youth[24] in Songwe and Mbeya may also be granted a small portion of their father's farm while he is still alive, so that they can start their own farm. This is often the case when they get married, but it rarely includes any existing stands of coffee, unless the father owns a sufficiently large enough area that he can afford to give some away (i.e. and lose a part of his own income in the process). In this situation, most 'youth' farmers will have to plant their own coffee but as their land holdings are very small, the income generated may be insufficient to sustain the household. Buying or renting additional land will come at a cost. The VCA4D Team were told of youth farmers who had planted coffee, had used it as collateral against a small loan in order to buy a '*boda boda'* (motorbike taxi). They then left their wives to manage the day-to-day farming activities while they pursued other income generating activities in the nearest town.

Access to financial services

Feedback from the 119 people who responded to the VCA4D social survey in February 2018 (see Table 5.7, below) suggest that while there are distinct differences in use of banking services between men and women, there is a more important underlying problem that represents an additional barrier to sustainability for farmers in the Songwe and Mbeya regions; that of access to financial services more generally. Irrespective of gender, less than half of all respondents (44.5 percent) confirmed that they had a bank account and/or used a mobile banking service, suggesting that the majority of people do not have access to financial services in the region and are dependent on cash transactions.

[23] Women traditionally take responsibility for household food security and wellbeing, and use the land they farm to grow food crops and earn additional money from the sale of crops in the local market

[24] Tanzanian Government define 'youth' as someone aged between 18 – 35 years old

Table 5.7: Proportion of men and women who had a bank account or mobile banking in their name, based on a survey of 119 people from Mbozi, Mbeya Rural and Ileje Districts in Songwe and Mbeya regions.

District	Gender of respondent		Mobile Banking only	Bank Account only	Both mobile and bank account	Total in sample
	M	W				
Ileje	[redacted]	25	3	0	0	3
	20	[redacted]	2	2	4	8
District Sub-total			***5***	***2***	***4***	***11 (24.4 %)***
Mbeya Rural	[redacted]	15	1	3	0	4
	29	[redacted]	0	15	0	15
District Sub-total			***1***	***18***	***0***	***19 (43.2 %)***
Mbozi	[redacted]	18	8	3	0	11
	12	[redacted]	2	8	2	12
District Sub-total			***10***	***11***	***2***	***23 (76.7 %)***
	119		**16 (30.1 %)**	**31 (58.1 %)**	**6 (11.3 %)**	**53 (44.5 %)**

In terms of geographic differences, 76.7 percent (23) of respondents in Mbozi District reported having access to financial services, compared to Ileje District where fewer than a quarter reported having access. This ties in well with feedback from the focus group discussions in Ileje District, where participants admitted that the distance to 'town' prevented them from making practical use of a bank account. Mobile banking (particularly MPESA) is clearly accessible in Ileje District, and very important as 81 percent (9) of respondents were making use of the service, although only 33 percent (3) were women. None of the women from Ileje District had a bank account. Both Mbeya Rural and Mbozi have large, vibrant urban centres in Mbeya City and Mwolo/Vwawa respectively, and are better connected, in terms of road access (Mbozi also has the main trade highway to/from Zambia running through it) and so it is not unexpected that they also have the highest incidence of bank account use amongst respondents with 94.7 percent (18) in Mbeya Rural and 56.5 percent (13) in Mbozi Districts respectively.

The 2015 nationally representative Financial Inclusion Insights survey of Tanzanian adults showed that only 10 percent of smallholders in Tanzania have a bank account registered in their own name, characterizing them as "financially included". Of these farmers holding bank accounts, only 8 percent are women while 11 percent are men. Compared to the total population, smallholders are lagging behind in financial inclusion.

5.4.3 Decision making

Men, women and youth often have different roles in coffee producing households. In addition to providing the majority of labour capacity, the VCA4D study confirmed that in Mbeya and Songwe, women traditionally are responsible for much of the food, water and energy security for their families, as can be seen by who controls any income generated from a range of crops. Feedback from households participating in the CPT project in Southern Highlands (NORC 2017) indicate that while women are included in many decisions around agricultural production (see Figure 5.6), their inclusion in those related to coffee production has largely increased only through engagement in the project.

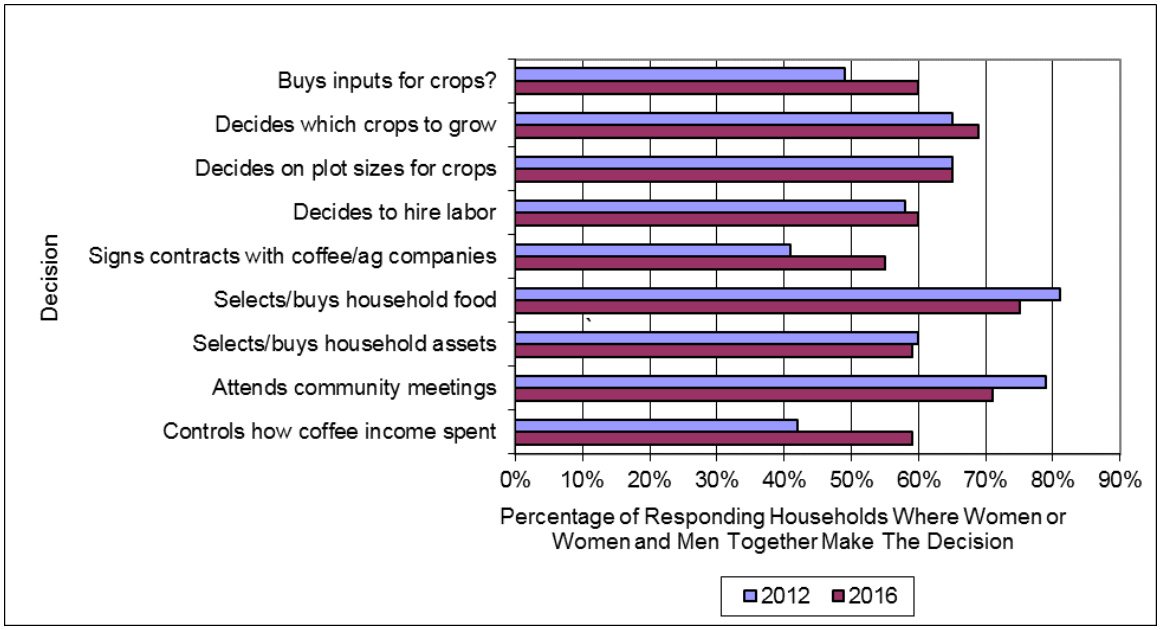


Figure 5.6: Responsibility for farming and household tasks within coffee farming households participating in the Coffee Partnership for Tanzania Project (Source NORC 2017)

When women are excluded from decision making, family needs such as clothing, school expenses and health care, are frequently underrepresented in financial planning. The lack of transparency and sharing of coffee proceeds can, and often does, lead to conflict within the household (Newcourse 2015). During the VCA4D study, women had complained of men taking the proceeds from coffee sales and using much of it for drinking and in some cases taking other women. Feedback from VCA4D study key informants suggests that this lack of control over coffee income, and high burden of responsibility and workload, was responsible for relatively high levels of suicide amongst rural women in Mbeya and Songwe in the past. However, it was noted that this issue has been very much on the decline but no supporting data could be found demonstrate this.

It is important for women to be included in coffee producer organisations, such as AMCOS and Farmer Groups, so that their needs in terms of resources and training, can be incorporated into decisions about the allocation of resources.

5.4.4 Leadership and empowerment

The VCA4D study found that group membership was equally important for both men (52 percent) and women (48 percent) (Table 5.8) with SACCCOS and VICOBA savings and loan groups being most popular amongst women. The study found that many women 'inherit' their membership of AMCOS and FG on the passing of their husbands, and a great deal of work has been done by NGOs and development programmes in Mbeya and Songwe to promote womens involvement in groups.

Table 5.8: Proportion of men and women who reported being members of a group based on a survey of 119 people from Mbozi, Mbeya Rural and Ileje Districts in Songwe and Mbeya regions.

District	Gender of respondent		Member of a Group	Not a member	percent membership	
	M	W				
Ileje		25	22	1	88	
	20		19	1	95	
District Sub-total						
Mbeya Rural		15	12	3	80	
	29		23	4	79	
District Sub-total						
Mbozi		18	17	1	94	
	12		12	0	100	
District Sub-total						
	199					

5.4.5 Hardship and division of labour

The VCA4D study confirms that among small scale coffee producers in Mbozi, Mbeya Rural and Ileje Districts, women have a heavy workload, taking care of family and daily household needs, in addition to contributing up to 80 percent of the labour needed for coffee production, as well as other farm labour. This 'time poverty' could potentially restrict women's participation in training, decision making, participation in community groups, schooling and income generating activities. A recent study carried out on behalf of Newcourse (2015) concluded that Tanzanian women in coffee producing households spend significantly more time on coffee farming at the expense of other household activities including subsistence farming. As a result, women and children in coffee producing households can experience higher levels of food stress, as well as poorer diets, forcing them to mobilise cash to buy food, which means that their gains in income are unlikely to meet their household needs. Similarly, while women coffee producers may have better access to health care because of their increased income, this does not necessarily translate into healthier wellbeing for themselves or their families and, in fact, women from coffee growing communities report higher levels of chronic illness, worse dietary patterns and greater stress over food security.

5.5 Food & nutrition security

The Tanzania Demographic and health Survey and Malaria Indicator Survey (TDHS-MIS) 2015-16 shows that in Mbeya Region, 37.7 percent of children under 5yrs old were stunted[25], compared to the national average of 34.7 percent, despite the region being among the top 10 food producers in Tanzania. There is a strong link between undernourishment and reduced educational attainment, although there are a number of other factors that must also be considered. According to the National Examinations Council of Tanzania (NECTa), pupils achieved a 56.7 percent pass rate in the 2016 primary school leaving examinations (PSLE) in Mbozi District, a 54.18 percent pass rate in Mbeya District and only 53.4 percent pass rate in Ileje District. This is an improvement, as Mbeya Region achieved only a 48.89 percent pass rate in 2014 making it one of the 10 worst performing regions in Tanzania. As a result, NGOs

[25] Stunting is a ratio of height-for-age, and is defined by the World Health Organization as a ratio two or more standard deviations or Z-scores below the reference population's median.

such as Save the Children are working with families in Mbeya and Songwe Regions to raise awareness of appropriate nutrition for pregnant and breast feeding women, and for mothers with children up to 2 years old. Work is also being done to raise awareness of appropriate child care and supervision for children up to 8 years old.

While coffee is not perceived to be the cause of these issues, it does contribute to them as a component of the overall workload that SHF, especially women, have to cope with (see Section 5.4.5). Stakeholders interviewed as part of the VCA4D study cited workload as one of the main underlying causes of stunting and poor nutrition. Adults were often absent from the house from 6am to work in the fields, leaving small children in the care of their older siblings. As adults are absent, and unable to prepare meals, children are left with basic food that was prepared (or left over from) the night before. The staple meal of maize and beans, although nutritious, is not a balanced diet for gowth as it lacks essential micronutrients that the addition of fresh vegetables, fruits and other protein sources would provide. Therefore, children are unsupervised at mealtimes and lack a nutritious diet. The Tanzania National Nutrition Survey (2014) found that Mbeya had one of the lowest rates (10 percent) of children receiving the timely introduction of complimentary foods between 6 to 8 months of age; a critical stage in child development, and this was largely due to mothers workload. Many mothers take their infants with them to the field while they are still dependent, but are unable to give them the care they need and will rely on breastfeeding alone during this stage in their development.

Depending on the dynamics of household finance (see Section 5.1.3), the income from coffee production has the potential to improve access to food in the local market, improve the productivity of staple crops (through the purchase of inputs) and a potential safety net for difficult times, providing households are enabled to save and budget appropriately.

In addition to poor supervision of children at mealtimes, CVC stakeholders cited parents knowledge of nutrition as a second underlying issue causing stunting. Despite Mbeya and Songwe Regions being highly productive, the range of foods eaten within the household is often limited. There are also a number of cultural traditions in Mbeya and Songwe which restrict dietary diversity, such as women not eating eggs during pregnancy, and also restricting access to foods such as milk, chicken and gizzards along gender lines.

Data from Twaweza's flagship *Sauti za Wananchi* survey (2016-2017) found that 87 percent of rural households in Tanzania keep a stock of food in reserve in case a food shortage arises. The rate is higher for poorer households (85 percent) than richer ones (64 percent) and was much higher for those household that were dependent on agriculture (92 percent) compared to those with other income earning sources (49 percent). The VCA4D study was informed that November to January were the main 'hunger' months in Mbeya and Songwe Regions (see Figure 5.3), when many households began to run out of staples, but were also short of cash to buy food from the local market. This impacted on the local economy, as it also meant fewer customers for those households relying on petty trading as a component of their livelihood system.

5.6 Social capital

5.6.1 Strength of producer organisations

The VCA4D study confirmed that group membership was an important part of small-scale coffee production in Songwe and Mbeya, as it conferred a number of benefits that it was not possible to achieve as an individual smallholder farmer. The principle rationale for group membership was to gain access to the market, either through direct sales to private buyers or through the auction. In Songwe and Mbeya, the study found that smallholder farmers were most likely to have been members of a Farmers Group (FG), than to be a part of a primary cooperative society (AMCO). At the time of the VCA4D study, there were only 5 active AMCOS in the Mbozi, Mbeya Rural and Ileje Districts. Several of these were reported to be largely inactive or non-functional, with at least two AMCOS in the processes of merging together in order to prevent them closing altogether. It was clear that the popularity of AMCOS had been in decline for some time, and the reasons cited by farmers for this included; mismanagement, lack of transparency, slow (or no) coffee payments, large deductions for administration fees (taken from the payments made for coffee sales) and a general feeling that AMCOS were often operated for the benefit of the management team rather than the members.

The main differences between an AMCO and FG are:

Farmer Group	AMCO
Farmers Groups register with the Community Development Department	AMCOS are registered with the District Cooperative Officer and are governed by legislation
Relatively small membership numbers	Large membership often well over 100+
Little or no operational costs	High operational costs due to management structure and activities
No deductions from coffee payment	Operational costs deducted from coffee payments
Able to market coffee through a range of channels and at different times	More inflexible marketing channels, limited primarily to the auction
Members are well known to each other, either through family ties or to be friends and neighbours	Members are unlikely to know each other, and will have no choice over who else can be a part of the cooperatives

Of the 119 farmers who took part in the social survey, the greatest number described themselves as AMCOS members. However, with the recent announcement of changes to the coffee sector making AMCOS the primary means of marketing coffee, the VCA4D Team observed that many FG had begun to re-register as AMCOS, and farmers were sometimes reluctant to describe themselves as a FG member during interviews. It is therefore difficult to get a clear picture of the situation, prior to February 2018.

Table 5.9: The prevelance of group membership amongst 119 men and women from Mbozi, Mbeya Rural and Ileje Districts in Songwe and Mbeya regions who took part in the VCA4D social survey during February 2018

	Songwe Region		Mbeya Region				Total
	Mbozi		Mbeya Rural		Ileje		
	M	W	M	W	M	W	
AMCOS*	13	12	6	3	5	16	55
Farmer Groups	6	2	13	5	5	4	35
Saccos	-	9	-	1	-	1	11
VICOBA	-	-	-	-	1	2	3
Youth groups	-	-	2	1	-	-	3

**Many describing themselves as AMCO members are likely to have been FG or groups that were in the process of re-registering*

The CGAP study (2016) found that the majority of smallholder farmers in Tanzania felt they were not getting the current market price for their goods. The most common reason given was that they are taken advantage of by middlemen and agents. While this was also found to be the case during the VCA4D study, those SHF interviewed also complained that the price paid by cooperatives for their coffee was often much lower (as low as TZS 2,500) compared to the money they had received from private buyers (up to TZS 4,000). One possible reason for this perception is the number of deductions made from cooperative payments (for inputs, loans, administration fees and taxes), which were poorly understood by farmers and not perceived to be transparent.

VCA4D study participants also reported being members of Savings and Credit Co-operative Societies (SACCOS) whose main objective is to mobilize savings from members and in return provide credit facilities. They are constituted, registered, regulated and supervised under the Co-operative Societies Act. This is a general Act which governs all types of co-operative societies. This Act does not address the needs of financial service co-operative societies since it lacks adequate provisions for the regulation and supervision of financial service co-operative societies which is central to the development of a safe and sound financial alternative. It is worthwhile to note that other players in the financial service sector, except SACCOS, are governed by specific Acts. These include banks, insurance companies, building and mortgage finance companies, post office savings banks and micro-finance institutions. VICOBA are a non-traditional form of money-lending group of up to 30 people that meet regularly, usually once per week, to save shares in the VICOBA and give loans to the members. Among the 30 people there is one chairperson, one secretary and one accountant. The members within the group are divided into sub-groups of five people to work as each other‘s referees when someone wants to take a loan, which together with the savings works as a collateral instead of other assets. VICOBAs are, as mentioned above, informal and not regulated or controlled in any governmental act or policy and the VICOBAs form their own rules and regulations.

Table 5.10: The benefits of group membership, as expressed by the 119 men and women from Mbozi, Mbeya Rural and Ileje Districts in Songwe and Mbeya regions who took part in the VCA4D social survey during February 2018.

Benefit of group membership	Men	Women	Total
Selling coffee (marketing)	**30**	14	**44**
Access to savings and loans	10	**19**	**29**
Accessing inputs and seedlings	10	**17**	**27**
Training	7	6	**13**
Shared coffee processing	**5**	2	**7**
Social capital	2	2	**4**
Market information	0	2	**2**
Empowerment in decision making	1	0	**1**
Transporting coffee	0	1	**1**
No benefit	0	1	**1**
Didn’t answer	4	2	**6**

5.7 Living conditions

5.7.1 Housing and health services

While it is difficult to prove attribution, the final CPT evaluation (NORC 2017), which included Mbeya Regino, found that participants had gained improved roofing and wall materials over the course of the project (see Figure 5.7).

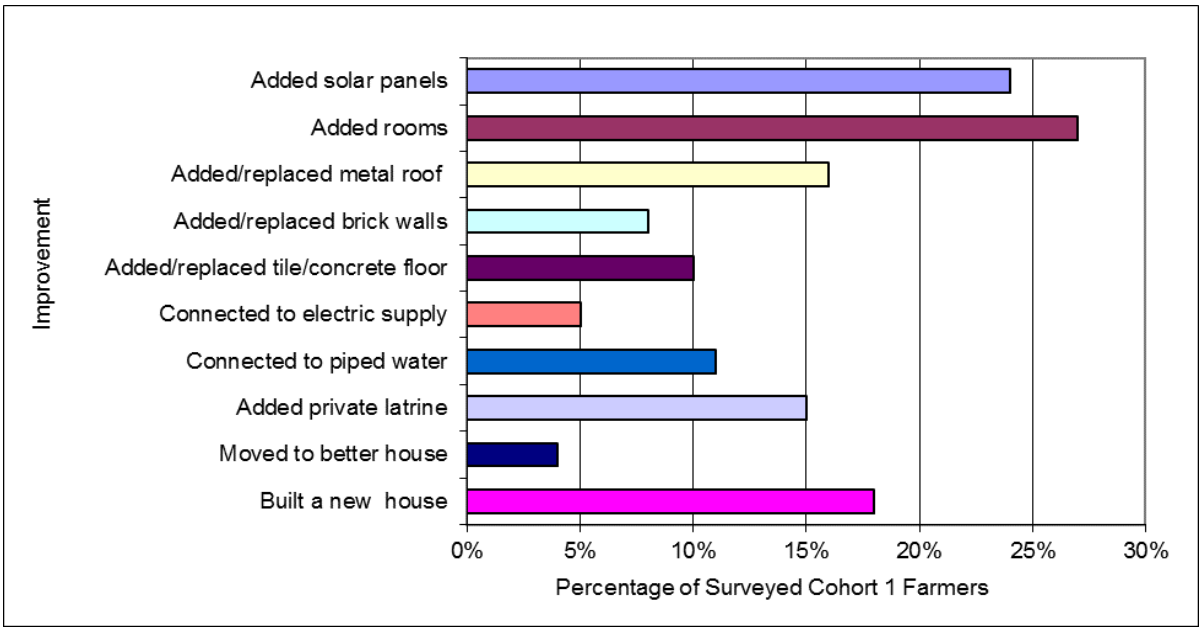


Figure 5.7: Change in building materials used by surveyed households who participated in CPT Major home improvements made by households who participated in the CPT project since 2012 (NORC 2017)

5.7.2 Education & training

Smallholder heads of households typically have at least a primary education, and most completed primary school (CGAP 2016). This complements the findings of the VCA4D social survey which found that 90.75 percent of respondents had completed only primary education (see Table 5.11). However, all farmer feedback received during the VCA4D study suggests that investing in their children's education was one of the primary benefits of coffee production, and SHF observed that children were staying longer in the school system than before.

Table 5.11: Educational attainment of social survey participants from Mbozi, Mbeya Rural and Ileje Districts in Songwe and Mbeya regions.

Highest education level achieved	Total	Men	Women
College or University	1	1	0
Secondary	6	6	0
Primary	108	52	56
No formal education	4	2	2

Although again, it is difficult to attribute any change to coffee income, the final evaluation of the CPT project (NORC 2017) found that participating coffee farming households showed an increase in primary school attendance rates of 22 percent for boys and 19 percent for girls, compared to the project baseline in 2012.

5.7.3 Mobile communication and financial services

Despite significant investment in financial infrastructure on the part of the public and private sectors in Tanzania, the provision of credit, insurance, and payments facilities for SHF is still limited (CGAP 2016). Mobile money is established and maturing in Tanzania overall, serving new business areas and enabling a wider range of digital payments, including among some smallholder households.

Nationwide, 96 percent of all Tanzanians have used a mobile phone and over three-quarters (77 percent) have their own phone, making Tanzania one of the African countries with higher mobile phone ownership. Smallholder farmers in Tanzania reflect the national trend with 66 percent having their own mobile phone. The most common phone is a basic phone without internet capability. The use of feature phones and smartphones is quite low (13 and 7 percent, respectively) among smallholders in Tanzania. This is most likely due to educational attainment and literacy since most of the applications in smart phone are in the English language which most of the respondents at village do not speak, read or write.

Phone ownership is inclusive of both genders and spans regions, with only a small gap. Eighty-four percent of men and 77 percent of women have their own mobile phones. Those with a mobile phone typically use it to make calls or send texts, with 47 percent having made financial transaction with their phone. These types of transactions are not as frequent as calls and texts. Men and women are equally as likely to have made financial transactions with a mobile phone (46 percent and 47 percent, respectively) and with the same frequency. This suggests that gender is not a barrier to accessing a financial account via a mobile phone for those smallholders who currently have a handset, and this is borne out by the findings of the VCA4D social survey which found that both men and women use mobile banking facilities more frequently in Mbeya and Songwe than a regular bank account (see Section 5.4.2).

The 2015 Financial Inclusion Insights study in Tanzania shows that the access to mobile money services and their registered and active use saw a steep increase after a slight drop in 2014. Bank use, in contrast, dropped sharply in 2015.

- 62 percent of adults in Tanzania now have a registered financial account (vs. 50 percent in 2014).
- 61 percent of adults now have a registered mobile money account, up from 38 percent in 2014 and 44 percent in 2013.
- 53 percent of adults are now active mobile money account users, up from 34 percent in 2014 and 38 percent in 2013.
- 8 percent had access to a full-service bank account in 2015 compared with 24 percent in 2014, while 5 percent actively used bank accounts, a drop from 16 percent in 2014. (Directly comparable data from 2013 are unavailable.)

Bank account access and ownership in Tanzania fell between 2013 and 2015, most notably among rural and lower-income groups. This decline occurred as mobile money use increased among the same consumer groups. Bank account access fell most sharply among the rural population (5 percent in 2015 from 24 percent in 2014) and among those below the poverty line (6 percent in 2015 from 24 percent in 2014). The number of bank account holders also fell most sharply among the rural population (5 percent in 2015 from 19 percent in 2014) and among those below the poverty line (6 percent in 2015 from 19 percent in 2014). Women also showed a decline in bank account access in 2015, dropping to 6 percent from 21 percent in 2014. This group also showed a decline in bank account ownership in 2015, dropping to 6 percent from 16 percent in 2014.

5.8 Conclusions and recommendations

The CVC contributes to inclusive growth through the involvement of small scale coffee producers, who are currently responsible for approximately 90 percent of all coffee produced in Tanzania. The CVC benefits an estimated 370,000 – 450,000 small-scale farmer producers and a mostly informal workforce, of whom up to 80 percent are likely to be women. Coffee income can contribute somewhere in the region of 80 percent to total household annual cash income, and represents one of the highest earning livelihood options for most SHF at present. Coffee income benefits the local economy as a whole and at SHF level, is often invested in farm improvements, housing and children's education. It can also provide access to credit, enable savings and act as a safety net against food insecurity and health care needs. The CVC also present opportunities for small-scale investment, small businesses and entrepreneurs. Women do not appear to receive commensurate access to the benefits of coffee production, compared to their contribution to its production and processing. While considerable work has been done to include youth in coffee related initiatives, they face a number of barriers. Cash flow and access to financial services, including credit and loans, are also potential barriers to SHF realising the full growth potential of coffee.

In terms of social sustainability, the VCA4D study highlights a number of areas which suggest there are inherent vulnerabilities within the CVC that pose a risk for long-term sustainability, in addition to any challenges posed by climate change. Coffee has the potential to allow SHF to develop positively, in terms of investment in the education of the next generation, in improved farming practices and other assets including housing and transport. However, the current dynamics of cash flows at household level, workload and gender issues around access to and control over assets and the income generated from coffee prevents the CVC from achieving its full potential.

Tanzanian legislation is evolving positively in the key areas of labour and land tenure, although there are challenges in implementation. Women are disadvantaged in terms of land tenure and control over cash and assets. They are also responsible for a disproportionate share of the workload at household level. The majority of paid work is done on an informal basis, and there is evidence of child labour in coffee production. Women are becoming more evident in producer organisations and decision-making, and achieve a degree of financial independence, although Tanzania is still a predominantly patriarchal society. The recent changes to coffee regulations in favour of AMCOS, which had previously fallen out of favour as a representative producer organisation in Songwe and Mbeya Regions, may result in a period of instability for

SHF as these groups are established and build capacity for effective operation. A number of reasons for the decline in AMCOS prior to January 2018, were cited by farmers who took part in the VCA4D study, and these will need to be taken into account in order to build strong and effective AMCOS for the future.

Recommendations

- With the increasing emphasis on the role of AMCOS in coffee marketing, they will require considerable support to develop the skills and capacity to perform the role that is required of them, in terms of; good governance, financial management, transparency and accountability. Access to timely inputs and sufficient cash to support members to cover outgoings during peak times of labour need and agrochemical inputs will be critical activities for the new AMCOS.
- Smallholder farmers face challenges managing their household budget over time, and are often forced to trade-off between different priorities. Better access to savings and loan facilities, along with building their capacity to budget and work together will have a positive impact on farm productivity and food security. Improved access to mobile banking services for SHF, and the promotion of their use by AMCOS and other actors in the CVC will help support better financial management at household level, particularly savings and budgeting.
- Adopt a 'whole farm' or 'livelihood portfolio' approach to the support of SHF within the coffee value chain, to enable producers to achieve realistic improvements in productivity for coffee and staples, while also managing household cash flow.

6 Conclusions and outlook

The coffee sector in the Southern highlands of the United Republic of Tanzania has been slightly growing and is recently further expanding, whereas national coffee production is stagnating and the importance of the coffee sector in the national economy is declining. Most of the coffee development is based on extensive growth (area expansion), whereas coffee yields are still very low (and far below their potential) and have not substantially increased during the last decades. Some coffee renovation has taken place with more disease resistant and drought tolerant varieties, but rising temperatures and uncertain rainfall patterns related to climate change threaten the coffee development. Moreover, market uncertainties and changing governance rules do not favour investments into coffee upgrading.

6.1 Key findings

Against this background, the VCA4D study looks at the economic, social and environmental dimension of the coffee value chain in Southern Tanzania. Major findings refer to:

- Coffee production remains important for many smallholder farmers, and temporary wage workers, being a critical source of cash income. Returns from coffee are typically low but can be used for key household expenditures. Smallholder coffee production is almost entirely embedded in mixed farming systems that includes other staple crops (maize and beans), along with horticulture and small livestock.
- Coffee may represent between 40– 80 percent (occasionally more) of household cash income, but household that are more specialized in coffee are also more vulnerable for price changes and erratic weather events. The social survey found that there was a negative relation between farm size and the *proportion* of the farm given over to coffee. While the area under coffee increases with farm size, the actual investment in coffee, expressed as the proportion of the farm given over to it, does not follow the same trend.
- Whereas most labour for coffee maintenance and harvest is provided by women, coffee trade is usually controlled by men. This means that coffee barely contributes to changing bargaining power relationships, whereas its impact on household nutrition and welfare might be lower than expected. Women's access to finance and banking is also constrained.
- Coffee production requires a large number of support services that enable production, processing and trade. Seedlings for improved varieties have become available, but the availability of suitable formulas of fertilizers (from local agro dealer shops), access to credit and/or financial services to enable input purchase, and technical assistance and extension services are scarcely available and thus limit the intensification of coffee production.
- Local organization of the coffee sector is rather decentralized, with market and voluntary agents playing a major role. Private buyers and curing companies are vital for timely coffee bulking. Coffee is also important for community development, but opportunities for certification and other services that link coffee farmers to more rewarding value chains show limited progress. Since the effectiveness of the coffee chain depends to a great extent on the availability of adequate support services,

recent policy measures may reduce prospects for adequately linking input supply with output processing.

- Smallholder farms using irrigation and a combined-use of mineral and organic fertilizers have the lowest impact for the environmental endpoint and the midpoint categories. This is mainly due to the higher yield, the lower use of mineral fertilizers and the non-utilization of herbicides/fungicides/pesticides. However, this production system may require more manual work (weeding). In general, the yields in very small farms are higher because of the possibility for the farmer to invest more time in maintaining the farmland. Organic coffee from small farms will have lower environmental impacts than conventional coffee. Shifting from conventional wet processing to eco-pulping could also considerably reduce the impact of the coffee value chain on water consumption and non-carcinogenic human health.
- Socio-economic linkages of the coffee value chain with the local and regional development are constrained by the centralized auction systems (with delayed payments up to 3 months) and limited farmers' access to rural finance and input provision. Otherwise, public intervention in exchange systems is increasing. Therefore, experiments with warehouse receipts and opportunities for harvest pre-finance are considered critical to provide incentives to smallholder producers to remain engaged in coffee production and trade.

6.2 Future perspectives

Taking into account these considerations, future perspectives for the development of the coffee value chain in Southern Tanzania mainly depend on 4 key factors:

1. Strengthening the economic viability and attractiveness of coffee production requires a substantial improvement in coffee yields (and related labour productivity). There are considerable technical margins for improving yields, but economic incentives are not always in place. Farmer's training in GAP is considered to be more effective than voluntary certification. The latter only pay off for organic production.
2. Enhancing the quality of coffee and upgrading of the consistency are central elements for reinforcing net returns derived from coffee production. Stable relations between local producers organizations and coffee curing companies deserve to be strengthened, preferably through suitable financial mechanisms for pre-finance input purchase and harvesting costs.
3. Coffee is marketed through a diversity of market outlets that tend to rely on interlinked exchange relationships. Strategies for improving market efficiency should be based on shorter chains and more transparent contracts. Tax rates and payment terms need careful consideration. Input provision with insurance might be a promising market support strategy. Otherwise, increasing processing for local market outlets is also attractive.
4. The coffee auction should be voluntary, substantially reducing the costs of vertically integrated exporters and enhancing cross-border trade. The Tanzanian Coffee Board should be responsible for disseminating price and other information and for monitoring the quality of auction coffee sales and other coffee statistics. The power of the Board and the Ministry ought to be substantially reduced and their respective roles clearly defined.
5. The performance of the coffee sector is heavily dependent on the surrounding governance arrangements. Provisions for inclusive local community organization around

social issues are in place, but their effectiveness for strengthening economic relationships is not proven. Public agencies are critical for infrastructure provision, whereas there is a broad experience with linkages to input and output markets through voluntary cooperative organizations. Given the large heterogeneity at farm household level, some competition between different organizations might be appreciated.

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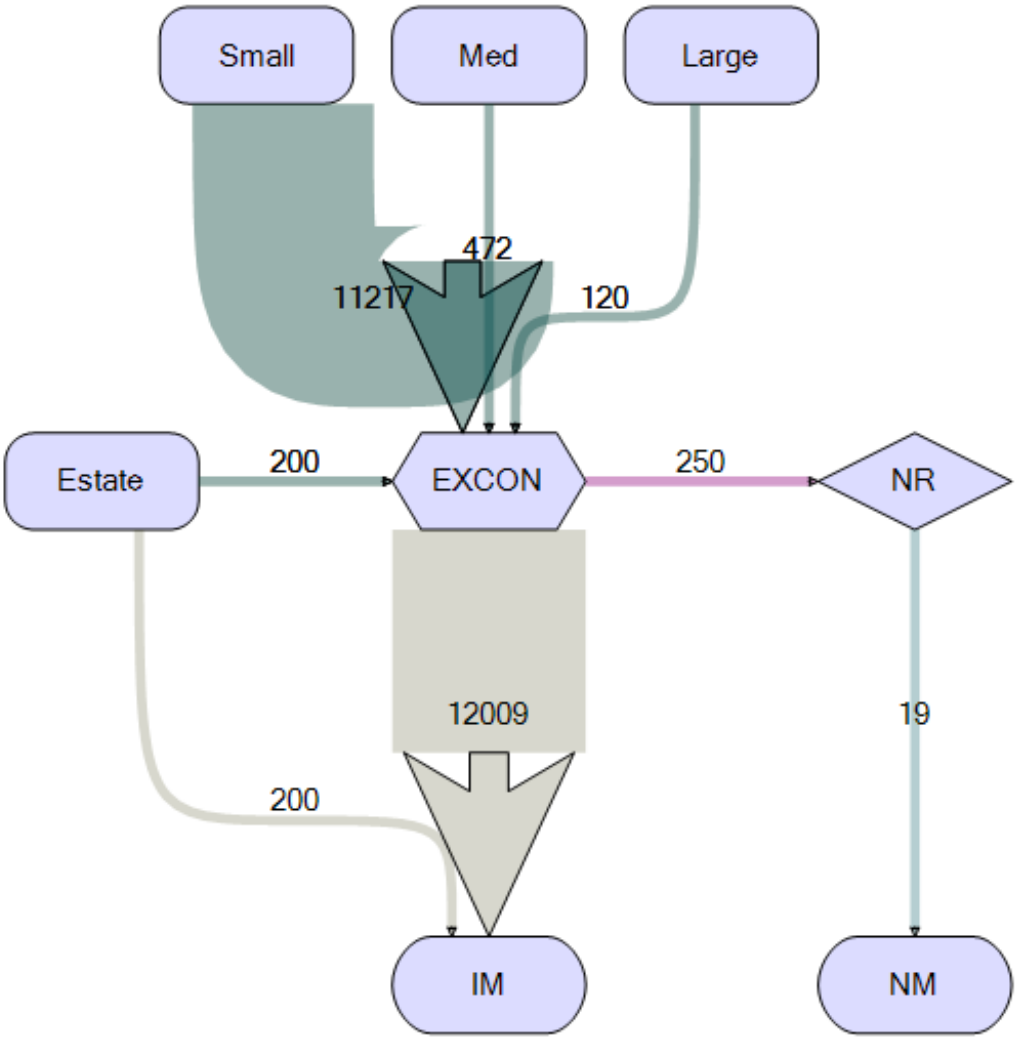
Annexes

Annex 1: Flow chart



Source AFA

Annex 2: Assumptions as input for the PAM Matrix (source AFA)

Category	Item	Depreciation	Value	Exc	Labour	Capital	Control
AMORTIZATION	AMORTIZATION	8.67	549,440,804	0.00	0.00	1.00	1.00
Input	INPUTS	0.00	11,473,057,580	0.40	0.30	0.30	1.00
Output	green_beans for domestic market	0.00	205,882,352	1.00	0.00	0.00	1.00
Output	green_beans export market	0.00	72,053,997,568	1.00	0.00	0.00	1.00
Output	Roasted beans	0.00	2,363,760,128	1.00	0.00	0.00	1.00
Labour	LABOUR	0.00	10,210,592,661	0.00	1.00	0.00	1.00
Service	BAGS	0.00	1,517,674,674	0.50	0.00	0.50	1.00
Service	DRY PROCESSING	0.00	2,030,759,329	0.30	0.20	0.50	1.00
Service	OPERATIONAL COSTS	0.00	3,512,870,528	0.40	0.30	0.30	1.00
Service	ROASTING	0.00	50,037,504	0.40	0.30	0.30	1.00
Service	TRANSPORT	0.00	2,007,699,890	0.40	0.20	0.40	1.00
Service	WET PROCESSING	0.00	7,070,625,028	0.40	0.35	0.25	1.00

Annex 3: Organic production of coffee in the Southern Region of Tanzania

Estimated added value of the organic coffee value chain

Basic assumptions:

- Total production Ileje District 397 ton = initial value
- 100% organic in this area = assumption
- Total area 6,225ha
- Production per farm is 0.10 ton per ha
- Total estimated number of farmers +/- 4,000
- Organic price premium at farm gate of TZS 4,600 (+TZS 300)
- Export price is estimated at TZS 6,300 per kg of organic coffee (+TZS 300)

Based on the data estimated for the organic VC we have calculated the following profitably ratios:

- Small organic producer: 16%
- TRADER in organic coffee: 7%
- Exporter organic coffee: 12%

The table below gives an overview of the major costs times per actor and is graphically presented in figure 1. The trader is also providing the wet processing services and this deduced from the farm gate price. Dry processing in the curing factory is considered as an extra service since it done by a an independent service provider.

Table A4.1: Value generated in the value chain per actor (x1million TZS)

	Subsidy	Final output	Output in process	Input in process	Goods	Service	Salary	Taxes	Financial costs	Fixed capital	Net Operating Surplus
Small organic producer	0	0	1,588	0	635	371	222	98	0	0	261
TRADER	0	0	1,866	1,588	0	19	44	65	0	25	125
Exporter ORGANIC	0	2,501	-	-	0	157	45	5	127	2	299
Total Value chain	0	2,501	-	-	635	548	311	168	127	27	685

Source: AFA

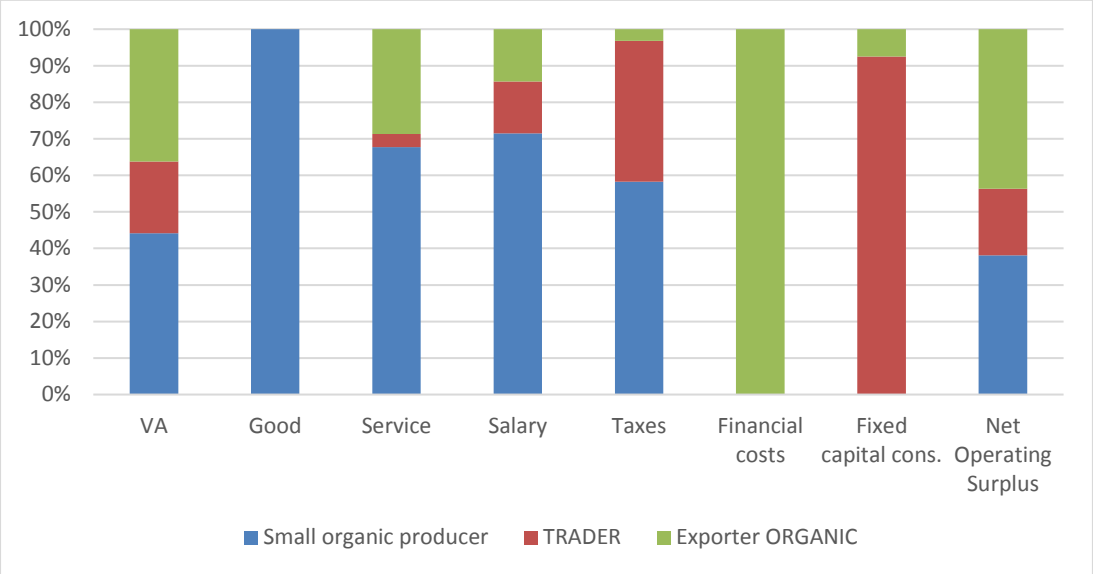


Figure A4.1: Contribution of each actor to the different cost items.

All the major costs in the entire value chain are aggregated into various items and are divided into various economic sources (Table 2). This is used to compute the total added value as presented in Table 3.

Table A4.2: Distribution (%) of value among major cost items

Category	Item	Value (TZS)	IMPORT	VA	Labour	Tax	Finance	Amort	Return
Inputs	MANURE	635,200,000	0.00	1.00	0.80	0.00	0.00	0.00	0.20
Service	BAGS	39,700,000	0.90	0.10	0.40	0.20	0.10	0.20	0.10
Service	TRANSPORT	311,980,320	0.50	0.50	0.30	0.20	0.10	0.30	0.10
Service	DRY PROCESSING	53,595,000	0.30	0.70	0.30	0.10	0.10	0.30	0.20
Service	OPERATIONAL AND ADMIN	142,515,217	0.10	0.90	0.50	0.40	0.00	0.00	0.10

Source: AFA

Total added value in the studies organic coffee value chain is estimated at TZS 2.3bn. This is equal to USD 1m.

Table A4.3: Total added value of the organic value chain (TZS)

	Direct effect	Indirect effect	Total
Imports	222,050,183	0	222,050,183
Labour	311,077,344	631,931,842	943,009,186
Tax	168,275,652	87,049,158	255,324,810
Finance	126,988,496	19,747,666	146,736,162
Fixed Capital	26,626,410	58,845,998	85,472,408
Net earnings	685,141,488	163,365,685	848,507,173
Total added value			2,279,049,739

Source: AFA

Feasibility of processing organic coffee

In order to successfully process organic coffee it has to be segregated from the conventional coffee. For processing or curing factories this is only feasibly if the volume is significant. Curing factories have to maintain a dedicated organic line for a certain period. In this paragraph we give a rough indication of the feasibility of processing organic at this stage in the value chain.

There are a number of curing plants in the region. For simplicity reasons we assume that they have an average capacity of 3,000 ton per year. For the peak season, lasting 3 months, this

implies that they work with a daily capacity 42 ton a day. Given the annual production of 397 tons a year this will require a capacity of the factory to process organic coffee of 9.5 days.

Annex 4: Economic and financial parameters

0. Input supply

- Land lease (costs/acre)
- Credit (interest rate short-term loans)
- Source of credit (bank, cooperative, trader, family/friends)
- Extension service (source & frequency)

1. Farm level

Basic data:
- Total Farm Area (in acre)
- Total Coffee Area (in acre)
- Tree density (trees/acre)
- Tree age (years)
- Tree productivity (kg/tree)
- Total coffee yield

Total household revenues
- Income other crops (TZS)
- Income livestock (TZS)
- Income off-farm work (TZS)

Coffee production costs (for total coffee area):
- Nursery/seedlings
- Irrigation
- Fertilizers
- Pesticides
- Herbicides
- Credit
- Family labour
- Hired/exchange labour
- Implements

Production returns:
- Coffee (kg by grade)
- Cupping qualification
- Price (TZS/bag 60 kg)

2. Home Processing (HP)

Basic data:
- Installed capacity (in TM)
- Used capacity (in TM)

- Value of equipment (TZS)

Costs:
- Depreciation (= Value of equipment ./. life time)
- Water use
- Wastewater treatment
- Electricity
- Family labour
- Hired labour
- Bags
- Transportation

3. Central Processing Unit (CPU)

Basic data:
- Installed capacity (in TM)
- Used capacity (in TM)

Costs:
- Depreciation (= Value of equipment / life time)
- Water use
- Wastewater treatment
- Electricity/Diesel
- Labour
- Taxes/fees
- Certification costs
- Bags
- Transportation

4. Curing & Warehousing

Basic data:
- Installed capacity (in TM)
- Used capacity (in TM)

Costs:
- Depreciation (= Value of equipment / life time)
- Electricity use
- Water
- Permanent Labour
- Temporary labour
- Taxes/fees
- Certification costs
- Bags
- Transportation

Warehousing:
- Storage costs

Returns:
- Coffee (kg by grade)
- Cupping qualification
- Price (TZS/bag 60 kg)
- Premium (certified coffee)

5. Toasting

Basic data:
- Installed capacity (in TM)
- Used capacity (in TM)

Costs:
- Purchase of gree coffee
- Depreciation Equipment
- Other inputs
- Labour
- Packaging material
- Distribution costs
- Marketing costs

Returns:
- Total sales (units)
- Sales price (by unit)

6. Exporting

Costs:
- Container
- Export licence
- SPS certificate
- Taxes/fees
- Insurance
- Administrative costs
- Harbour costs

Ship loading (by container)

Annex 5: Scope of social field research

District	No.Communities	Sampling
Mbozi	3-4	• At least one community adjacent/very close to one of the coffee estates • A FG with one of the AMCOs
Mbeya	3-4	• ibid
Ileje	3-4	• At least one community from each of two different coffee growing areas (1) high-highland – Sange/ Lubanda and Luswisi, and (2) high potential – Ikinga, Malangali, Kafule, Ngulugulu, Kalembo and Ndola. • At least one community growing organic coffee • A FG with one of the AMCOs

Small Farmer 0-3a	Medium Farmer 3-10a	Large Farmer 10+a
Local definition of small, medium and large farmer		
Outside support (e.g. HNRS, CMS, City Coffee, etc)		
Certification (Organic, Rainforest, UTZ, etc)		
Home processing / CPU		
Coffee variety (traditional or improved)		

Key Topics to Explore

- Money flows within the household (and between men and women)
- Workload and labour within the household – competing priorities
- Farmers groups and AMCOs – formation, governance, effectiveness
- Nutrition – impact of coffee on diet
- Impact of coffee on education & housing
- Ownership and control over assets & decision making

Field Plan/day/community

- 1 x focus group – women
- 2 x focus groups – Farmers Group / AMCO
- 1 x focus group – youth
- Short, individual farmer interviews.

<u>Before starting any session</u>

- Date
- Number of people in the focus group
- Names / Age
- Name of community
- How big is their farm in total? How much coffee is grown?
- Level of education

- How many people in their household (adults, children)

Focus Group – Women

- What is your role in coffee farming? And what activities do you do?
- Who has control over the assets in the home?
- How does coffee contribute to your lives?
- How many women have access to land? Do they own it, and control it?
- What are your sources of income?
- Do you sell any coffee to private traders? Does your husband know? Why?
- Who is responsible for paying school fees, buying food, buying clothes, etc? Where does the money come from?
- What changes have you seen in your diet? What do children eat and how many times/day?
- Do you send your children to school?
- How do your children help you in coffee farming?
- What challenges do you face, in coffee farming?

Tools: calendars

Focus Group – Youth

- What are your main activities / sources of income?
- What is your role in coffee farming? And what activities do you do?
- What is your role in making decisions about coffee farming?
- Do you benefit from coffee farming? How?
- How do you think coffee farming have an impact on your life?
- Do you have access to/control over any land? What are you growing on it?
- What do you think is the future for coffee farming?

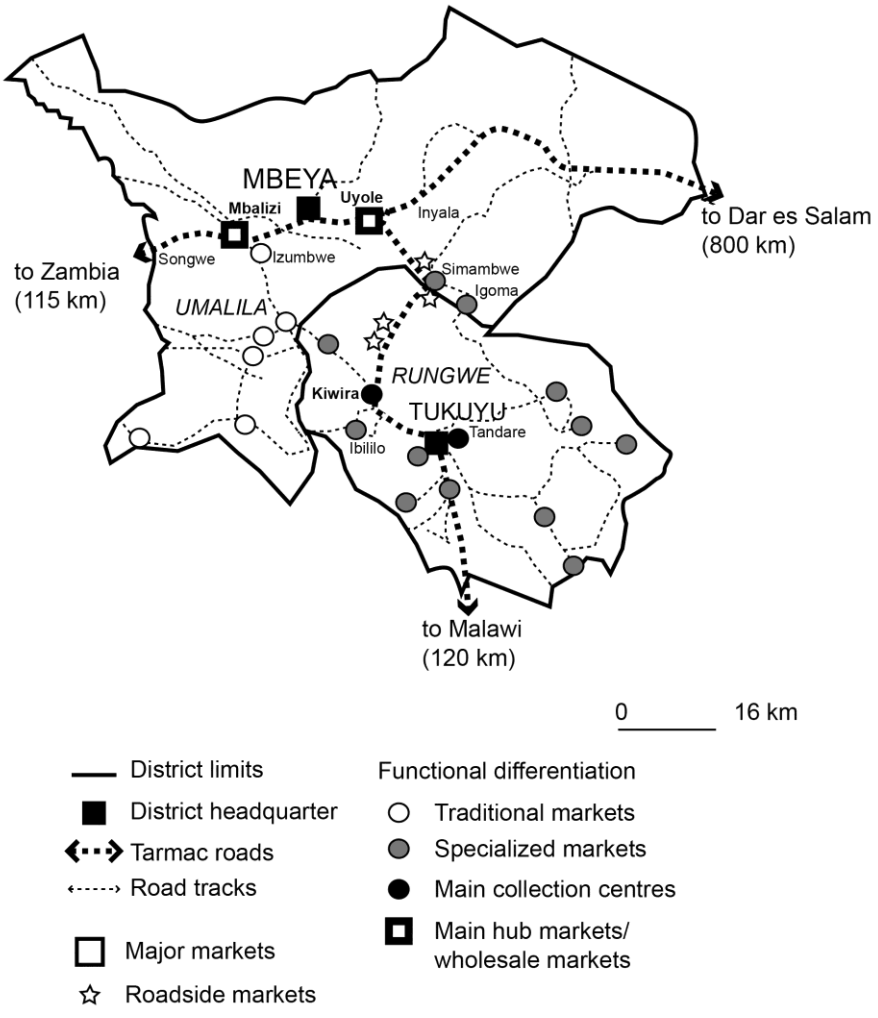
Focus Group – Farmers Group/AMCOs

- How did your group come together?
- How old is your group?
- How many people in your group? How many men/women?
- What is your relationship to each other?
- What kind of activities do you do together as a group?
- What are the main activities of this group?
- What outside help are you receiving (e.g. from NGOs, etc)?
- What benefit do you get from being a part of this group?
- How do you help each other in coffee farming?
- How have you chosen your leaders? How long have they been in office?
- If there was a problem within the group, what would you do to sort it out?
- Where do you sell your coffee? Who to?
- How much “kata kichwa” is there?

- Which private traders do you sell to?
- How many women have access to land? Do they own it, and control it?
- Who is responsible for paying school fees, buying food, buying clothes, etc? Where does the money come from?
- How does coffee contribute to your lives?
- What are the main challenges you face in future?

Individual Farmers

- Date / Name of Community
- Respondents name
- Age / Sex
- Education level
- Number in household (age, sex & relationship)
- Farm size & coffee area
- Member of a group or coop? Name
- Processing – HP or CPU



Value chain: *Coffee*	Country:	*Tanzania*		Date Last Modification: 27/04/2018				Explanations
Question	**Source**	**Score level**	**Count**	**Comments**				
1. WORKING CONDITIONS								
1.1 Respect of labour rights								
1.1.1 To what extent do companies involved in the value chain respect the standards elaborated in the 8 fundamental ILO international labour conventions and in the ICESCR and ICCPR?		Substantial	3	*Tanzania is a signatory to all 8 fundamental ILO international labour conventions, and to a further 28 other conventions the right of association and compensation for accidents for agricultural workers. New labour law Regulations were gazetted and came into effect on 24 February 2017; the Employment and Labour Relations (General) Regulations 2017 (GN 47 2017). Tanzania is a State party to ICESCR. A National Human Rights Action Plan (2013 - 2017) was prepared based on recommendations and concluding observations of the UN Human Rights Treaty Bodies and commitments made by the Government in the Universal Periodic Review (UPR) of the United Nations Human Rights Council (2011). An evaluation of the NHRAP was commissioned at the end of 2017.*				
1.1.2 Is freedom of association allowed and effective (collective bargaining)?		Moderate/Low	2	*Tanzanian labour law allows for workers to form and join unions, bargain collectively, and conduct strikes. The 2014 Integrated Labour Force Survey found that only 1.1 percent of private sector employees involved in the agriculture sector were members of trade unions or employees associations, of which 1.2 percent were women. The study found no evidence of CBAs related to the coffee sector. With the vast majority of employment within the coffee sector falling within the informal sector, or casual employment, the majority of the workforce will not benefit from this element of the Tanzanian labour laws.*				
1.1.3 To what extent do workers benefit from enforceable and fair contracts		Moderate/Low	2	*Those formally employed by coffee states and processors fall under the protection of Tanzanian labour laws. Where the Tanzanian companies sell to a direct exporter, or sell coffee under internationally recognised certification standards (UTZ, Rainforest Alliance, Organic, etc) their employee wellfare will also be audited against any associated third party standards and guidelines. The VC4D study met vulnerable women who had been offered employment to hand sort coffee beans, as a direct result of the premium earned from certified coffee. However, the majority of the labour force in the coffee sector is employed on a casual or informal basis, and the terms of employment are more locally applied.*				
1.1.4 To what extent are risks of forced labour in any segment of the value chain minimised?		n/a	n/a	*The VC4D study found no evidence of forced labour during the study*				
1.1.5 To what extent are any risks of discrimination in employment for specific categories of the population minimised?		Moderate/Low	2	*The Government of Tanzania is a signatory to the United Nations Convention on the Rights of Persons with Disabilities (CRPD) and integrating people with disabilities in national poverty reduction strategies, and most recently, through the enactment of the Persons with Disabilities Act of 2010. However, the Government of Tanzania has limited resources to ensure the implementation of legislation that regulates the labour market in the formal sector, and does not cover the vast majority of the labour force that operate in the informal economy, estimated to be nearly 85 percent (ILO 2016).*				
	Average:	**Moderate/Low**	**2.25**	**2.25**	**Final:**	**Moderate/Low**	**2.25**	*Justification if adjustment of the score level = ...*
1.2 Child Labour								
1.2.1 Degree of school attendance in case children are working (in any segment of the value chain)?		Moderate/Low	2	*According to the Tanzanian Law of the Child Act, 2009 (Section 4) (1), a child is defined as a person below the age of 18 years. The Tanzanian Employment and Labour Relations Act, 2004 (section 5) (1) provides for the minimum age of employment for children as 14 years and above; 14 years for light work and 15 years for work that is not hazardous to the child's development. However, the capacity to monitor implementation is limited, and the Employment Act only covers the formal sector. The Tanzanian Mainland National Child Labour Survey (2014) concluded that agriculture accounted for 94.1 percent of working children, with 24.6 percent of 5 to 14 year olds combining work and school. In Mbeya and Songwe Regions, the VC4D Team were told by several key informants that children are known to be involved in harvesting coffee. Older children (<14yrs) were said to be seeking employment as coffee pickers in their own right, but the practice of paying labourers by the bucket full of cherries also encourages some families to involve younger children in the harvest. A study carried out in 2012 surveyed pupils and teachers from three community secondary schools in Mbeya Rural District regarding perceptions of truancy. It concluded that, amongst the economic factors that may cause absence from school, child labour was seen as the most common (45.8 percent) followed by*				Cf. Guidance
1.2.2 Are children protected from exposure to harmful jobs?		Moderate/Low	2	*The vast majority of stakeholder feedback linked to child labour was associated with harvesting coffee. While it may be hard work, it is not an inherently risky activity. Thre was no evidence of child labour in processing factories, where machinery and heavy lifitng pose the greatest risks. There may be a small risk of exposure to agrochecmicals in the*				Cf. Guidance
	Average:	**Moderate/Low**	**2.00**	**2.00**	**Final:**	**Moderate/Low**	**2.00**	*Justification if adjustment of the score level = ...*
1.3 Job safety								

Annex 7: SWOT Analysis Coffee Sector Tanzania

Strengths	Weaknesses	Opportunities	Threats
Abundant suitable land for coffee production	Low productivity	Tanzania is in Colombian mild group	Climate change/ Weather fluctuations
Favourable growing conditions	Inadequate extension and advisory services	Potential to gain price premiums	Increasing costs of inputs
Excellent potential coffee quality	Inadequate credit and supply systems	Coffee is traded in USD	Outbreak of new pests and diseases
Availability of improved coffee varieties resistant to CBD , CLR and CWD	Unstable local currency	Extend stakeholder funding of shared functions in the industry	Fluctuations of world coffee market prices
Liberalized coffee market	Poor infrastructure	Potential to develop washed Robusta	Emergence of additional certification standards
Willingness of stakeholders to support and fund coffee research	Inadequate dissemination of market information	Potential to increase local consumption	Competition with other crops
Political stability	Business environment can be improved	Training of institutions on crop husbandry	High interest rates

Source: TCB analysis, Stakeholder meetings, 2010

Annex 8: Program of visits

Dates	Place	Organisation	Person	Designation
Monday January 29	Moshi, Kilimanjaro	Tanzania Coffee Board (TCB)	Frank Nyarusi and	Acting Director General and
		Tanzania Coffee Board (TCB)	Desideri Mboya	Chief liquorer and Auctioneer
		Tanzania Coffee Research Institute (TaCRI)	Fr. Kilambo	Executive Director
		Tanzania Coffee Research Institute (TaCRI)	i. Filbert Lema ii. Mr. Shirima iii. Richard Kiwera iv. Damian Mtenga v. Jeremiah Magesa	
		Kilimanjaro Natives Cooperative Union (KNCU	Godfrey Massawe	Commercial Manager
		G32	Godfrey Olomi	General Manager
		Café Africa	Catherine Mwangata	Ex-Manager
Wednesday 31 January 2018	Mbozi District Council	District Agricultural and Irrigation Officer	Richard Siriri	
		District Coffee Inspector	Mr. Kabale	
Wednesday 31 January 2018	Mbeya Town	Hanns R. Neumann Stiftung	Webster Miyanda	Field Operations Manager
		City Coffee Curing Company	Rose	
Thursday, 1st. February 2018	Mbozi	Coffee Management Services (CMS)	Simon Kamau,	General Manager
		Igamba Farmers group	Zerubab Nzowa and 11 members	Chairperson
		Lalji Coffee Estates	Martine Mwambia (Manager)	
Friday 2nd February, 2018		Hanns R. Neumann Stiftung	Webster Miyanda	Field Operations Manager
		Hanns R. Neumann Stiftung	Amani Fungo January Lubanga Lized Cope Christian Antipas	HRNS officers
		Starbucks Coffee, Farmers Support Centre Tanzania Ltd	Bahati Mlwilo	Agronomist
Saturday 3th February 2018		Mbeya	Team Meeting	VCA4D team
Sunday 4th. February, 2018		Igamba Village	Siwale Rashid Rose	Coffee farmers, CPU owners
Monday 5 February 2018		Mbozi District Council	Frida Muhindi	District Health officer
		Mbozi Coffee Curing Company	Oscar Mvanda	General Manager
			Gerald Manongi	Operations Manager
Tuesday 6th. February 2018		Ileje District Council	Herman Njenje Kassim Mtilimbanya	

Dates	Place	Organisation	Person	Designation
			Mr. Mnzava	
Wednesday 7th February 2018		Save the Children, Mbozi Office	Michael Magembe and Hidaya Haonga	Manager of StC Mbozi Distric and Child Protection & Child Rights Governance Coordinator
		Mbozi District Council	Atu Dzombe	Community Development Officer
Wednesday 7th February 2018		Arusha, Hans R Neumann Stiftung	Blaga Zlateva Ina Walter	M&E Manager; Country manager
Friday 9th February 2018		EU Delegation Dar es Salaam Debriefing	Jenny Correia-Nunes Liesl Inglis Erika Pasquini Desddelit Kilambo Primus Kimaryo Leopold Lwajabe David Geofrey Paul Picot Philippe Couteau	EU Delegation EU Delegation EU Delegation TaCRI TCF Min of Finance Min of Trade AFD AFD
Tuesday, 27 February 2018		AMCOS Ibemba village	Members of AMCOS	
		Women group	Members of the group	
Wednesday, 28th. February 2018		Igamba village	Members of a farmer group	
		Igamba village	Farmers who own a CPU	Big farmer and owner of a CPU
Thursday, 1st. March, 2018		Igamba Village	Mr. Nzowa	Chairperson of the farmers group
		Lima estates		Assistant Manager
Friday, 2nd March, 2018		Mbozi Coffee Curing Company Ltd	Mr Oscar Manongi	General Manager
		Utengule coffee Estates		General Manager
Friday, 9th March, 2018		EU Delegation Dar es Salaam Debriefing		
Wednesday, 14th. March, 2018			Agostine Kaduma	
Thursday, 15th. March, 2018		Magamba village, Isansa ward	Women group	
Thursday, 15th. March, 2018		Techno serve	Mr. Aron Mwaulanga	Manager
Friday, 16 March 2018 Friday, 16 March, 2018		Tumaini Group	Moses Mkumbwa Benedictao Mwashiuya	Chairperson and secretary
		Lima Estates	Bukuntufya Katisa	Accountant
		Kanji Larji	Martine Mwambia	Manager