



Growing Trees as Collateral (GTAC)

Assessment of an agrifinance model for the Iringa region in Tanzania

in collaboration with

farip - Fund for African Rural Innovation Promotion

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Date of submission: 22.05.2023

Abstract

Smallholder farmers play an important role in Tanzania's agricultural sector, producing around 75% of the country's agricultural produce (Mwonge & Naho, 2021). The lack of financial resources for smallholder farmers is one of the reasons hindering the potential growth of the sector. This is due to the risks associated with lending to farmers with fluctuating incomes, vulnerability to weather-related crop failures, high transaction costs to reach remote areas, and smallholder farmer's fear of losing valuable collateral such as land that financial institutions require for lending. These challenges have led to a lack of tailor-made financial products for smallholder farmers in Tanzania. In Tanzania, smallholder farmers often also have trees on their land, but they currently use them as personal insurance for short-term financial needs, leading to unsustainable practices such as premature tree felling that negatively impact the environment and local communities. In response, the concept of 'trees as collateral' has emerged but is still relatively new and has received little attention in the global literature (Starfinger et al., 2023). In this case study, the tree collateral approach is applied in the context of the Growing Assets Collateral Management (GRACOMA) innovation in Magunguli, a village in the Iringa region of Tanzania. Based on interviews with relevant stakeholders (n=39), an initial test run of the prototype in Magunguli and a literature review, the study analyses the risks associated with the approach and identifies mitigation strategies. The findings inform the development of the Growing Trees as Collateral (GTAC) model, which highlights the importance of a reliable re-insurance institution, a fully functional GRACOMA institution, a trusted field agent to facilitate communication and trust between smallholders and financial institutions, the local authority acting as a witness, and a more active agricultural value chain that enables smallholders to market their products in a fair and transparent manner. These components are crucial for the successful implementation of the model, which can promote sustainable forestry and agroforestry while providing farmers with access to credit, which in turn can contribute to the country's growth. However, the bottlenecks in the case study so far are that there is no appropriate method for valuing trees and insurance options for agricultural produce or trees used as collateral are limited or too expensive, making it difficult to obtain the re-insurance needed for financial institutions to invest. Other options proposed for this model need to be further explored, the salary of the field agent needs to be assessed for financial feasibility so that it does not exceed the transaction costs of the financial institution, and the fledgling approach does not yet have a track record of encouraging formal financial institutions to invest. Therefore, the case study recommends further investment in GTAC test-runs and research to establish the roles and their relationships.

Table of contents

ABSTRACT	II
LIST OF FIGURES	V
LIST OF TABLES	V
LIST OF ABBREVIATIONS	V
1 INTRODUCTION	1
2 AGRICULTURAL FINANCE IN TANZANIA	3
2.1 CHALLENGES	4
2.2 AGRIFINANCE PRODUCTS	5
2.2.1 CONTRACT FARMING AND THE OUTGROWER’S LOAN SCHEME.....	6
2.2.2 WAREHOUSE RECEIPT SYSTEM (WRS)	7
2.2.1 AGRICULTURAL CREDIT COOPERATIVES	8
3 TREE AS COLLATERAL	10
3.1 RISKS	10
3.2 MECHANISM	11
3.2.1 “THAI TREE BANK” MODEL	12
3.2.2 LOAN VARIABLES AND GROWING ASSET VALUATION	13
3.2.3 TRANSACTION COSTS.....	14
3.2.4 RISK ASSESSMENT.....	15
4 CHARACTERIZATION OF THE STUDY	16
4.1 DATA ACQUISITION	16
4.1.1 PARTICIPANT SELECTION AND INVOLVEMENT.....	16
4.2 DATA ANALYSIS	17
5 STUDY AREA AND BACKGROUND	18
5.1 FINANCIAL INCLUSION	19
5.2 FARIP VENTURES IN TANZANIA	20

<u>6</u>	<u>FACTOR ANALYSIS</u>	<u>22</u>
6.1	RISKS	22
6.2	FACTOR DEFINITION	25
<u>7</u>	<u>GTAC MODEL</u>	<u>27</u>
7.1	GTAC ROLES AND RESPONSIBILITIES	29
7.1.1	MAIN ACTORS	30
7.1.2	GTAC ACTORS	30
7.1.3	RE-INSURANCE ACTORS	33
7.1.4	ENABLING ACTORS	36
7.2	GTAC STEPS	37
7.2.1	RISK ASSESSMENT	38
7.2.2	CONTRACT AGREEMENT	39
7.2.3	LOAN ISSUING	41
7.2.4	MONITORING AND COACHING	41
7.2.5	MARKETING	42
7.3	IMPACT	43
<u>8</u>	<u>PROTOTYPE TEST-RUN IN MAGUNGULI</u>	<u>45</u>
8.1	GTAC PROTOTYPE ROLES AND RESPONSIBILITIES	45
8.2	GTAC STEPS	46
8.3	MID-EVALUATION MAY 2023	51
<u>9</u>	<u>DISCUSSION</u>	<u>52</u>
<u>10</u>	<u>CONCLUSION</u>	<u>59</u>
<u>11</u>	<u>BIBLIOGRAPHY</u>	<u>61</u>
<u>12</u>	<u>APPENDIX</u>	<u>69</u>
<u>13</u>	<u>AUXILIARY MATERIAL LIST</u>	<u>208</u>
<u>14</u>	<u>DECLARATION OF AUTHORSHIP</u>	<u>209</u>

List of figures

Figure 1: Risk importance level own creation based on own data (meeting #1 – 39; appendix D) 22
 Figure 2: GTAC roles and responsibilities own creation based on own data and Starfinger (2021)..... 29
 Figure 3: GTAC steps own creation based on own data and Starfinger (2021) 37

List of tables

Table 1: Risk mitigation and factor definition based on own data (meeting #1 – 39)..... 25
 Table 2: Contract agreement and GRACOMA fee calculation based on own data (appendix E)..... 47
 Table 3: GRACOMA revenue model based on own data (appendix E)..... 49
 Table 4: TSS calculation for bean farmer based on own data (appendix E)..... 50

List of abbreviations

Agricultural Marketing Cooperative Societies	AMCOs
Agricultural Finance	Agrifinance
Backup Refinance Institution	BURI
Bank for Agriculture and Agricultural Cooperatives Thailand	BAAC
Bank of Tanzania	BoT
Certificate of Customary Rights of Occupancy	CCRO
Cooperative and Rural Development Bank	CRDB
Country Strategic Opportunity Program	COSOP
Diameter at breast height	DBH
Forest Stewardship Council	FSC
Government of Tanzania	GoT
Growing asset collateral manager	GRACOMA
Growing trees as collateral loan scheme	GTAC
Loan-to-value ratio	LTV
National Bank of Commerce	NBC
Non-industrial private forests	NIPFs
Non-timber forest products	NTFP
Private Agricultural Sector Support	PASS
Savings and Credit Cooperative Societies	SACCOs
Smallholder Farmer Credit Guarantee Scheme	SCGS
Tanzanian Schilling	TZS
Village Community Bank	VICOBA
Voluntary Carbon Standards	VCS
Warehouse Receipt System	WRS

1 Introduction

The economy of Tanzania is largely dominated by agriculture (IFAD, 2022; Mwonge & Naho, 2021; Kessy, 2021; Wangwe & Lwakatare, 2004). Most of the agricultural production comes from smallholder farms which have great potential for the country's development (FAO, 2005; IFAD, 2022; Sebopetji & Belete, 2009; Weber & Musshoff, 2012; IFC, 2012). It is estimated that around 75% of the countries agricultural outputs are contributed from smallholder farms, which are private smallholder farmers, not estate or big farms, and can sustain Tanzania (Mwonge & Naho, 2021; Salami & Arawomo, 2013). Therefore, smallholder farmers in Tanzania play a crucial role in the country's agricultural sector (Salami & Arawomo, 2013; Mwonge & Naho, 2021; Kessy, 2021; FAO, 2005; Weber & Musshoff, 2012; Swisscontact, 2012). An efficient agricultural sector has the potential to feed a growing population and create jobs (Salami & Arawomo, 2013). Tanzania's agricultural sector employs about 61.5% of Tanzania's labor force but generates only about 26% of the country's GDP (IFAD, 2022). Despite the fact mentioned above, smallholder farmers in Tanzania are facing numerous constraints, including limited access to finance (Pamuk et al., 2021; FAO, 2005; IFAD, 2022; Sebopetji & Belete, 2009; Weber & Musshoff, 2012; IFC, 2012). The development of the agricultural sector could help increase the income of farmers, but the lack of access to finance in rural areas makes it difficult for farmers to plan their agricultural activities, hindering their potential growth (FAO, 2005; IFAD, 2022; Weber & Musshoff, 2012; Swisscontact, 2012; IFC, 2012). One of the main obstacles is the lack of acceptable collateral or the fear of losing it, such as land titles that FIs in Tanzania demand from smallholder farmers (Kadigi & Falanta, 2018; IFC, 2012; Sebopetji & Belete, 2009; Wangwe & Lwakatare, 2004; Bank of Tanzania, 2014; Macha et al., 2018). Therefore, some villagers and entrepreneurs from Magunguli, a village in the Iringa region of Tanzania, came up with the idea of using growing trees, referred to in the literature as standing trees (Starfinger et al., 2023), as collateral to obtain a loan from a financial institution. They set up a company called Growing Asset Collateral Management (GRACOMA), which in turn could bring security for financial institutions to accept growing trees as collateral for providing short-term loans for agricultural production to the local smallholder farmers ([appendix H](#)). The aim of this study is to explore the complexity of this innovative concept in a case study format in the Iringa region elaborating and implanting the needs of the various stakeholders involved and to develop a Growing Trees as Collateral (GTAC) credit model. This is why this thesis poses the following research question: **“What are the factors that determine the credit process and stakeholder roles for building a credit model with trees as collateral for short-term loans for smallholder farmers in the Iringa region?”**. In the literature the use of trees as collateral has been proposed as a new and innovative type of collateral, referred to as 'collateral 2.0' (Macqueen et al., 2018; Starfinger, 2021). In this type of collateral, the current or projected future market value of trees is used as business collateral to obtain credit (Starfinger, 2021). Studies by RCOFTC (2015) have suggested using trees in stands as collateral to slow down deforestation by extending the harvesting period to maximize ecosystem functions, which is also a main goal for the implementation of GTAC in the Iringa

Introduction

region. However, the use of trees as collateral is still rudimentary (Kiptum et al., 2019; Starfinger et al., 2023). To date, there are few scientific publications on the use of trees as collateral on international level, which is confirmed by the research of Starfinger et al. (2023), who conducted a realist synthesis of literature databases and websites of organizations around the world to assess the context, mechanisms and outcomes of tree collateral described in the literature. The African continent, however, was underrepresented in their survey sample. In addition, almost all studies researched on a tree as collateral mechanism for long-term loans for tree growers and forestry companies. As local research institutions (meeting #33,34,37) have confirmed, in the Southern Highlands there is research about tree valuation and operational credit procedures, but there is no research on the combination of forestry and agricultural credit. This study seeks to fill this research gap by presenting a framework for the practical implementation of a credit product that uses trees as collateral (GTAC) to offer smallholder farmers in the Iringa region short-term credit facilities to support their agricultural production. The study begins with a comprehensive literature review on agricultural finance (chapter 2), focusing on the use of trees as collateral (chapter 3). This is followed by the methodology (chapter 4) and an explanation of the case study area (chapter 5). An assessment of the significance of the risks associated with the GTAC model and the corresponding mitigation strategies is conducted through meetings with stakeholders during the field research to determine the essential factors required for the implementation of the GTAC model (chapter 6). The results are the development and explanation of the GTAC mechanism (chapter 7) and a presentation of a preliminary assessment of a test run in Magunguli (chapter 8), where the feasibility of the model was discussed (chapter 9), concludes the findings and identifies potential areas for future research and scalability (chapter 10).

2 Agricultural finance in Tanzania

Small-scale farmers play a crucial role in the development of the agricultural sector by planting, purchasing, processing inputs, innovating, and trying to improve their productivity (FAO, 2005; IFAD, 2022; Weber & Musshoff, 2012; Swisscontact, 2012; IFC, 2012; Mwonge & Naho, 2021; Kessy, 2021). Smallholder farmers need various financial services to improve their farming activities and operate more efficiently. These services include short-term loans to finance inputs, medium- and long-term loans, equity finance, leasing, savings, insurance, payment services and more services along the entire value-chain (Swisscontact, 2012; FAO, 2005). Agricultural credit enables smallholder farmers to access inputs such as improved seeds, fertilizers, and chemicals and often most importantly to hire labor when needed (Mwonge & Naho, 2021; Swisscontact, 2012; IFC, 2012). In addition to production activities, access to agricultural finance (agrifinance) also improves marketing and processing of agricultural products. This in turn improves access to product markets and market information, as well as access to capital investment for agricultural processing, ultimately leading to commercialization, value addition and higher incomes for farmers and farm households (Swisscontact, 2012). Governments generally provide credit to low-income farmers through state agricultural banks and special credit programs (Ledgerwood et al., 2013). The Bank of Tanzania has taken measures to promote lending to agriculture and agent banking. These include lowering the statutory reserve requirement for bank's lending to agriculture and capping the interest rate on agricultural loans at a maximum of 10%. In addition, the requirement of 18 months of business experience for applicants in the agent banking business has been replaced by the requirement of a national ID card or number. These measures are aimed at improving access to credit, lowering lending rates and facilitating deposit mobilization, which ultimately promotes economic growth and financial inclusion (BoT, 2021). Furthermore, agrifinance in Tanzania has been promoted through fintech innovations such as the young Smallholder Credit Guarantee Scheme (SCGS) and community based FIs such as savings and credit cooperatives and village community banks serving 2.5 million smallholder farmers (IFAD, 2022). During his 2020 speech, former President Hon. Dr Magufuli stated that the Government of Tanzania (GoT) initiated the second agricultural development program to modernize, commercialize and increase the productivity of agriculture. To improve agricultural financing, the GoT has provided a TZS 208 billion loan from the African Development Bank to increase the capital of the Agricultural Development Bank and USD 25 million to implement the SCGS through Tanzanian Agricultural Development Bank (TADB) (Hon. Dr. Magufuli, 2020; Mpogole, Dimoso, & Mayaya, 2020; IFAD, 2022). The Smallholder Farmers Credit Guarantee Scheme (SCGS) by TADB is a financial initiative launched in February 2018 that aims to support lending to the agricultural sector by providing guarantees to partner FIs. Under the scheme, partner banks receive cash cover of up to 50% to guarantee agricultural loans, thereby mitigating risk and increasing lending to smallholder farmers in Tanzania (TADB, 2023). Innovative financing, risk mitigation, and distribution models have been identified as potential opportunities to expand financial services to farmers (IFC, 2012; Wangwe & Lwakatare, 2004). Several studies have examined the potential of crop insurance as a risk

management tool for farmers in Tanzania. Akyoo et al. (2021) noted that there is potential for crop insurance in Tanzania, as risk management and mitigation strategies have proven insufficiently effective in mitigating natural hazard risks. However, imperfect, and asymmetric information on the feasibility and viability of crop insurance among key stakeholders has hindered the development towards a fully-fledged crop insurance system. Osumba et al. (2020) point out that index-based agricultural insurance is gaining traction as a promising tool for adapting smallholder agriculture to climate risks. The authors suggest that loans can be linked to insurance, with insurance payouts explicitly used to repay the farmer's debt (Akyoo et al., 2021; Osumba et al., 2020). Index insurance is a new approach in East Africa that covers risks such as theft, death of livestock and crop destruction. It is a derivative instrument where farmers receive a payment if a threshold for a certain risk indicator is exceeded. The risk indicator can be based on weather conditions such as rainfall, humidity, occurrence of locusts and other factors. Weather data is an essential factor for this type of insurance. In some insurance schemes, crop yields are estimated from samples and agricultural losses are modelled using actuarial methods based on long-term data (Swisscontact, 2012). Index-based insurance products could be adopted by farmers in Tanzania as their lower cost makes them suitable to replace traditional agricultural insurance, making them affordable for low- and middle-income farmers (Ntukamazina et al., 2017). Efforts are also being made to promote digitalization. The new Country Strategy and Opportunities Program (COSOP) gives high priority to digital agriculture and financial services to achieve broad impact. The increasing use of digital technologies such as mobile phones offers the opportunity to extend fintech innovations to a larger rural population (IFAD, 2022). The adoption of advanced technologies in agriculture is crucial for increasing production, but their high cost is a challenge. Accessible credit options are critical to facilitate farmer's adoption of these technologies and services to support the development of the rural economy (Wangwe & Lwakatare, 2004). In addition, several trends present opportunities for the provision of financial services to the agricultural sector. These trends include the growing demand for agricultural products, the impact of climate change and emerging markets for niche products. Financing is needed to promote sustainable farming practices, climate adaptation technologies and investments that link smallholder farmers to value chains and key markets (IFC, 2012). But despite all the initiatives, there are still many smallholder farmers in Tanzania who do not have access to financial resources (Pamuk et al., 2021; FAO, 2005; IFAD, 2022; Sebopetji & Belete, 2009; Weber & Musshoff, 2012; IFC, 2012). Therefore, the following sub-chapters attempt to understand the challenges in the agrifinance landscape (chapter 2.1) and provide a market overview of the most common products offered in Tanzania relevant in the development of the GTAC model (chapter 2.3).

2.1 Challenges

In most emerging economies, the lack of acceptable collateral is often cited as the main barrier to agricultural lending (Kadigi & Falanta, 2018; International Finance Cooperation, 2012; Sebopetji & Belete, 2009). Land and agricultural goods are main types of collateral commonly used to finance agriculture. However, in many economies, the use of farmland as collateral is hindered by a lack of land

titles or inefficient land markets (Kadigi & Falanta, 2018; Ledgerwood, Earne, & Nelson, 2013; NBS Tanzania, 2021; Sebopetji & Belete, 2009; IFC, 2012; FinScope, 2017), especially for women-headed households (Ledgerwood, Earne, & Nelson, 2013; NBS Tanzania, 2021). Ownership and use of property remains a challenge, due to the abundance and affordability of land and most people obtain land through inheritance and family allocation (NBS Tanzania, 2021). As a result, farmers who lack collateral or fear losing their personal assets often turn to informal lenders but are forced to pay excessive interest rates and are exploited by the undervaluation of collateral, resulting in lower profits (Sebopetji & Belete, 2009; Wangwe & Lwakatare, 2004; Bank of Tanzania, 2014; Macha et al., 2018). The use of agricultural goods as collateral is increasingly being explored in several countries, particularly in Latin America, South Asia, and East Africa, where FIs have developed credit products that use goods as collateral for lending (Kadigi & Falanta, 2018). Several authors point out that the high transport costs, incurred by borrowers living far from credit bureaus in remote areas and influenced by lower population density and poorer infrastructure and the additional cost of lost working time make agricultural credit expensive and difficult for both borrowers and financial service providers (IFAD, 2022; Swisscontact, 2012; Sebopetji & Belete, 2009; Wangwe & Lwakatare, 2004; FAO, 2005; Weber & Musshoff, 2012; IFC, 2012). This results in high credit assessment costs for agricultural loans, which could exceed the profits FIs can make on these relatively small loans (IFC, 2012). This is where better infrastructure can help stimulate rural income by lowering trade costs and linking farmers to markets, goods, input supplies, and agricultural extension services (Wangwe & Lwakatare, 2004). Another constraint is the riskier nature of agricultural activities. Many private and public FIs are reluctant to finance agriculture because of the difficulties associated with managing an agricultural portfolio. One difficulty is that with agricultural loans, the loan amount as well as the interest is paid at maturity, rather than at the beginning of the loan or at regular intervals as with normal loans. This is because cash outflows for inputs, capital and labor occur early in the season, while cash inflows occur mainly at harvest time (Ledgerwood et al., 2013; FAO, 2005) and can make short-term loan repayment difficult for farmers (Ledgerwood et al., 2013; IFC, 2012). Therefore, farmers need flexible and targeted savings and loan products that meet their specific needs (IFC, 2012). Another difficulty is externalities that increase the risk of crop failure due to extreme weather conditions (IFAD, 2022; Swisscontact, 2012). Moreover, a major risk is the lack of true risk diversification. Smallholders tend to focus on one or more activities, all of which are exposed to similar main risks, such as weather or price risks. In addition to the loss of income at the individual farm level, FIs are exposed to the risk of default or frequent debt restructuring (IFC, 2012). This also applies to the lack of formal entrepreneurial skills among smallholder farmers and the lack of training in financial matters (IFAD, 2022). Another risk is suboptimal political and regulatory framework conditions for agricultural financing (IFC, 2012).

2.2 Agrifinance products

The financial sector in Tanzania has undergone several reforms since the late 1960s and 1970s. These reforms aimed to increase financial depth, expand the range of financial products, and transform the

economy by privatizing banks, liberalizing interest rates and allowing the establishment of savings and credit cooperatives (Wangwe & Lwakatare, 2004). Agricultural financing models are based on collateral, including cash flow analysis, expected returns, total savings and group guarantees (IFC, 2012). Tailored loan terms, including interest rates and repayment periods, are critical to the viability and profitability of FIs operating in the agricultural finance market. Repayment terms should be designed to allow for longer maturities, as the expected return is only realized after harvest, unlike other loan contracts where borrowers can expect monthly interest payments (FAO, 2005; Wangwe & Lwakatare, 2004). Microcredit, first introduced in Bangladesh by Muhammad Yunus in the last century, is a form of lending that offers small loans using the groups as collateral. Instead of relying on traditional assets as collateral, payment is guaranteed by the borrower's community membership (Mutabaruka, 2021; Ledgerwood et al., 2013). In Tanzania, MFIs are well-positioned to meet the financial needs of agricultural households, but adapting agricultural loans to the typical nature and cost of their services can be challenging (Ledgerwood et al., 2013). Tanzanian MFIs provide small loans for farming activities such as purchasing input products like seeds and fertilizers or providing group loans (Nakano & Magezi, 2020). The National Microfinance Bank of Tanzania (NMB) offers a range of loan products, including the Outgrower's loan scheme and the Warehouse Receipt Scheme (WRS), as well as individual loans for emerging or commercial farmers. To qualify for these loans, farmers must meet standard requirements, such as providing proof of land ownership and securing the loan with appropriate collateral. For individual loans, farmers must also sign a partnership agreement for the supply of inputs and services and a contract for the supply of the crop to a processor or buyer. These terms are similar to those of the Outgrower's loan scheme (NMB, 2023). The following subchapter presents the credit options available to smallholder farmers in Tanzania, such as contract farming with Outgrower's loan scheme, WRS and the various agricultural credit cooperatives that use their groups as collateral.

2.2.1 Contract farming and the Outgrower's loan scheme

Contract farming is a business model in which buyers enter into pre-harvest purchase agreements with farmers or their representatives, such as cooperatives or associations, to secure a supply of produce of a particular quality and at a specified time, with technical support to ensure quality included in the contract (IFC, 2012; Wangwe & Lwakatare, 2004; Swisscontact, 2012). It is more efficient for the contracting companies to work with the leaders of the primary cooperatives, who provide farmers with funds to purchase agricultural products. Working with farmers in a cooperative makes them creditworthy, and input increases if the cooperative can guarantee growth (Wangwe & Lwakatare, 2004). Contract farming can support inclusive market development in thin markets where a lack of liquidity can lead to increased price volatility. It can provide advantages of risk diversification, and access to new, better, or more secure markets, inputs, credit, and practical technical advice (Swisscontact, 2012). However, the disadvantage of these arrangements is the dependence of farmers on a single buyer, which can lead to the breakdown of the supply chain and involve the repayment of farmers if the buyer defaults. Value chain financing, which involves financial transactions between value chain actors, including buyers and

suppliers of inputs, as well as flows of money from FIs into the chain, can be used to reduce this risk. Bankers base their lending decisions on the strength of the value chain and the creditworthiness of individual farmers. However, value chain financing does not cover farmer's needs for other financial services (IFC, 2012). To achieve sustainable and scalable contract farming arrangements, systemic changes are essential. Rather than prescribing a one-size-fits-all business model, it should be tailored to the context and partners. This requires facilitators to understand partner's readiness and capabilities, establish transparent communication about shared responsibilities, and negotiate risk-sharing arrangements that do not involve core business financing (IFC, 2012). The Outgrower's loan scheme of the NMB in Tanzania aims to support farmers in contract farming by providing working capital for production costs such as the purchase of inputs, crop care and harvesting. The loan is repaid through the proceeds from the sale of the crop to the buyer, with the remainder available to the farmer or producer group. The loan is structured in such a way that it considers the seasonal fluctuations of the harvest and enables farmers to increase their acreage and production, resulting in a higher income. A prerequisite for the granting of the loan is the signing of an agreement between the buyer of the crops, the grower, and the bank, as well as the provision of collateral to secure the loan and a cultivation contract between the buyer and the farmer (NMB, 2023).

2.2.2 Warehouse receipt system (WRS)

WRS is a post-harvest agrifinance model and allows farmers to store their agricultural produce in licensed warehouses and receive a receipt showing the quality and quantity of goods stored. These receipts can be used as collateral for loans or as proof of the existence of stock to potential buyers and can only be issued by licensed warehouses (IFC, 2012; Swisscontact, 2012; Kadigi & Falanta, 2018; William & Kaserwa, 2015; Onumah, 2010). The WRS model is widely used by farmers, traders, and FIs (Kadigi & Falanta, 2018). To access credit, the farmer provides the warehouse receipt to a bank as collateral. The bank discounts the value of the produce in storage by between 70%-80%, which is then given out as credit to the farmer. When the farmer sells the produce, they notify the bank, which then obtains repayment from the buyer in return for the warehouse receipt. The buyer can then present the receipt to the warehouse to retrieve the product (Swisscontact, 2012). Using existing commodities as collateral is less demanding and helps mitigate the risks of crop failure or price volatility. This allows lenders to seize the pledged crops in the event of a default. The use of inventories as collateral provides borrowers with safer and cheaper credit after harvest, which benefits traders and processors during the harvest season when seasonal financing needs are significant and not usually covered by fixed assets (Kadigi & Falanta, 2018). Farmers benefit from the WRS by gaining access to finance, collective marketing, and lower unit costs (Kadigi & Falanta, 2018). By using primary cooperatives to aggregate and deposit commodities, farmers can increase their bargaining power and reduce procurement time (Swisscontact, 2012; Kadigi & Falanta, 2018; Varangis & Saint-Geours, 2017). It also allows them to pay members without waiting for the actual sale of produce, similar to the AMCOs system (Kadigi & Falanta, 2018; Varangis & Saint-Geours, 2017). The WRS guarantees the quantity and quality of stored

commodities, reduces post-harvest losses and inefficiencies in agricultural markets, and improves food security (Swisscontact, 2012). Farmers choose WRS as a source of loan, to acquire markets for their produce, or to obtain a good price when their produce is sold (William & Kaserwa, 2015). As WRS is a post-harvest financial product, the first harvest cycle must be financed with farmer's funds or other loans, which is often not accessible and therefore carries a risk (Swisscontact, 2012; Kadigi & Falanta, 2018). Further challenges include fraud, credit risk, storage risk, due to misappropriation by storage operators, price risks given the volatility of agricultural commodity prices and government price interventions, marketing or buyer risks, and legal risks related to the perfection of the collateral, registration of prior claims and enforceability (IFC, 2012). The warehouse receipts issued under this system are mainly non-transferable, limiting their benefits to the domestic agricultural trade in most African countries (Onumah, 2010). Operational bottlenecks include lack of appropriate WRS infrastructure, inadequate funding, unreliable markets, high operational and transaction costs, lack of awareness and understanding of WRS, and political interference and conflicts of interest between village leaders and farmer groups regarding WRS infrastructure (Kadigi & Falanta, 2018). Addressing these constraints is critical to making WRS more inclusive and sustainable for smallholder farmers and traders. The WRS goes with technological adoption, aiming at increasing the output, thereby improving the general total socio-economic well-being of smallholder farmers (William & Kaserwa, 2015). A complete warehouse receipt system for smallholder farmers requires significant inputs, including legal enforceability, reliable high-quality warehouses, licences, monitoring, performance guarantees, trustworthy banks, reflective market prices, supportive authorities, and trained participants (IFC, 2012). The key innovation in warehouse receipt finance is that it solves a financing and collateral problem for the farmers while it offers the bank a safe and liquid collateral asset, which is easy to monitor (Swisscontact, 2012). Overall, the WRS is a sustainable mechanism for improving agricultural production, quality, and access to financial services (Kadigi & Falanta, 2018).

2.2.1 Agricultural credit cooperatives

In the agricultural sector, small-scale farmers forming groups or associations to gain access to credit, technical knowledge, and markets is a popular model (Swisscontact, 2012). In Tanzania, there are different types of cooperatives operating in different sectors, including agricultural cooperatives and savings and credit cooperatives, all controlled and managed by members (Shirima, 2022). SLAs are financial organizations that provide access to financial services mainly informal to smallholder farmers in regions with limited formal financial services. The names of these organizations vary based on the region and institution, such as Rotating Savings and Credit Association (ROSCAs), Village Savings and Loan Associations (VSLAs), Village Community Banks (VICOBAs) or Savings and Credit Cooperative Societies (SACCOs) (Pamuk et al., 2021; Wangwe & Lwakatare, 2004). The formation of Savings and Credit Cooperative Societies (SACCOs) was advocated and encouraged by the GoT as a way of promoting access to financial services in rural areas, allowing members to make withdrawals from their accounts and be loaned amounts related to the size of their savings (Wangwe & Lwakatare, 2004).

SACCOs are also known as a formal financial institution, that accept as loan collateral not only title deeds but also proof of ownership, such as a tender or a letter from the local government, provided other members or neighbors can confirm ownership (FinScope, 2017). The major players in this model are the farmers, who are usually organized into a group, the produce off-takers or exporters, a financial service provider providing loans to the group taking the group as collateral, and a facilitator who is involved in mobilizing farmers and forming groups, as well as creating linkages with FIs, buyers, input suppliers, and government agencies (Swisscontact, 2012). Among agricultural cooperatives, Agricultural Marketing Cooperative Societies (AMCOs) are responsible for marketing member's products and adding value to them (Shirima, 2022; Rwela, 2023). AMCOs play an important role in strengthening farmer's bargaining power in marketing and provide access to farm inputs and other support services (Rwela, 2023). AMCOs are structured in a four-tier cooperative system that includes primary, secondary, unions and federations. Primary societies are those located at the lowest level and operate at the village level, while secondary cooperatives are located at the district level (Rwela, 2023). A study conducted by Rwela (2023) found that most AMCOs members cited marketing schemes and better prices as reasons for joining AMCOs and that some farmers find it difficult to join AMCOs due to the stringent membership requirements, including high fees. To increase member engagement, cooperatives should continue to work with the government while maintaining their autonomy, and members should select the right leaders to formulate strategies and plans for the future (Shirima, 2022). One important aspect is the social ties among members. Members of these cooperatives interact continuously and share information about each other's lives and business activities, reducing the cost of monitoring borrowers. Joint liability contracts and increasing interest rates for group members in case of loan default intensify monitoring activities, and social sanctions such as loss of face and exclusion from the cooperative or social events can raise the cost of not repaying for a borrower (Pamuk, et al., 2021). However, group guarantees also have weaknesses, as group members are often exposed to similar risks. Therefore, such guarantees work best when the group or its members are not dependent on similar sources of income such as agriculture (FinScope, 2017). The lack of proper credit risk management techniques also led to high credit arrears (Magali, 2013). The study by Magali (2013) found that lack of investment analysis skills, political interference and non-compliance with policies and regulations by SACCOs staff contributed to the risk of loan default. The study also found misappropriation of funds by some SACCOs staff. Magali & Qiong (2014) compared the credit risk management practices of banks and rural SACCOs. The results showed that banks were more effective than rural SACCOs in credit risk management, with all banks being profitable while only 30% of rural SACCOs were profitable. The study recommended that SACCOs should emulate some of the best credit risk management practices of banks and that the government should consider introducing credit risk regulations for rural SACCOs to reduce non-performing loans and improve profitability.

3 Tree as collateral

The use of trees as loan collateral is becoming increasingly important to governments, development institutions, practitioners, and scientists worldwide (Besacier et al., 2021; Wandira and Emmanuel, 2021; RECOFTC, 2015b; Soedomo et al., 2022; Starfinger, 2021; Xu et al., 2020). Starfinger (2021, P.8) defines tree collateral, “such as the formal or informal use of living trees with their current or projected future (net) market value, meaning their innate liquidity less a risk deduction, as a business security i.e., collateral “. The study conducted by Starfinger et al. (2023) analyzed 46 tree collateral mechanisms found in the literature in 23 different countries around the world. While this is still a young area of research, there is growing recognition that trees and standing timber can serve as collateral, providing credit opportunities for previously excluded groups such as smallholders (RECOFTC, 2015). Trees as collateral are typically used for lending, mostly in aggregated but financially marginalized smallholder forestry contexts, often in combination with land tenure or land titles as conventional collateral or with joint and several debtor arrangements (FAO, 2005; Starfinger, 2021). So, the mechanisms found tend to focus on providing financial access to individual small forest producers and not especially for agricultural production. This is because also smallholders in the forestry business face a significant financial dilemma, especially when long rotation periods collide with immediate financial needs (Starfinger et al., 2023). A study from Kenya by Kiptum et al. (2019) shows that using trees as collateral for sustainable forest management is a viable conservation strategy. The importance of trees for mitigating climate change and sustaining livelihoods has long been recognized (FAO, 2005). Nevertheless, deforestation remains a significant threat to global sustainability efforts, as rural households, often tempted by their acute cash needs to engage in unsustainable resource use such as cutting trees before they reach maturity (Kiptum et al., 2019; FAO, 2005; Starfinger et al., 2023; Yonika & Ngaga, 2011). Fortunately, examples from around the world suggest that treating trees as collateral could slow deforestation by extending the growing season of trees and providing incentives for farmers to participate in plantation management, such as thinning and increasing productivity (FAO, 2005). This chapter provides an overview of the research findings on trees as collateral and identifies where there are bottlenecks and the potential to use the research findings as a basis for the development of the GTAC model.

3.1 Risks

FI's are reluctant to accept unconventional assets such as trees as collateral for loans (Soedomo et al., 2022; Starfinger et al., 2023). One risk factor is the long gestation period of trees compared to other sources of capital (RECOFTC, 2015; Starfinger et al, 2023; Zhu et al, 2020; IDB, 2015; Bautista, 2006; FAO, 2005; Starfinger, 2021). In addition, unclear valuation procedures pose a challenge for financial institution to assess the creditworthiness of trees in forest stands (Kiptum et al., 2019; Starfinger et al., 2023; Berger and Stilma, 2012). These procedures pose financial risks such as overvaluation or inaccurate valuation of forest assets (Starfinger et al., 2023; Lu et al., 2020; RECOFTC, 2015b; Berger

Tree as collateral

and Stilma, 2012; Zhu et al., 2020). There have even been calls for a global assessment standard. But despite the potential benefits of this approach, legal regimes have largely excluded trees as collateral (FAO, 2005). Another reason for the exclusion of trees as collateral is the lack of documentation and certification (Starfinger et al., 2023; Wandira and Emmanuel, 2021; Ekman, 2020; RECOFTC, 2015). These include a lack of track record with banks or insufficient information on debtors and their assets, resulting in buyers not having guarantees such as land rights and secure tenure (Pokorny et al., 2010; Starfinger, 2021). FIs working with this type of collateral lack experience (Starfinger et al., 2023; Benavides et al., 2014; Soedomo et al., 2022; Wandira and Emmanuel, 2021; RECOFTC, 2015), and the restriction to formal valuation services increases creditor uncertainty and can lead to higher interest rates for smallholder forest producers (Starfinger et al., 2023; Flanagan et al., 2020). Limited accessibility to stocks or premature harvesting were other risks mentioned (Cairns, 2000; FAO/Academia de Centroamérica, 2016), including remoteness of the resource and the debtor (Ayyagari et al., 2017; Starfinger et al., 2023). Another factor contributing to the exclusion of trees as collateral is the lack of knowledge of smallholders in economics and plantation management (Pokorny et al., 2010; Starfinger, 2021; Yonika & Ngaga, 2011). Premature felling is a risk that can lead to significant variations in tree quality and an incorrect assessment of the tree's current value. Poor thinning and pruning practices pose another risk to teak plantations (Kiptum et al., 2019). RECOFTC (2015) note that these practices can result in high potential trees being felled while low potential stands are left behind. Other factors for smallholder in the forestry business include high logging costs (Starfinger et al., 2023; Nugroho et al., 2013), costly marketing, limited access to markets (Starfinger, 2021) and lack of market price certainty (Nugroho et al., 2013; RECOFTC, 2015; Yonika & Ngaga, 2011). In addition, forest stands are at high risk of theft, fire, accidents, and improper management (Starfinger et al., 2023; Pokorny et al., 2010; RECOFTC, 2015; Yonika & Ngaga, 2011). In summary, collateralizing loans with trees carries significant risks related to valuation uncertainties, the biological nature of trees and the remote locations of forest stands, making it difficult for FIs to extend their services to the rural poor.

3.2 Mechanism

In recent years, a variety of innovative mechanisms related to forest-based finance have emerged. According to Starfinger et al. (2023), these mechanisms go beyond the traditional creditor-debtor relationship and often involve local associations of creditors or the involvement of intermediary parties such as NGOs, stock managers or third parties that provide certificates. The authors note that collateralized assets in these mechanisms are not limited to timber or trees, but also include non-timber forest products (NTFP) and other forms of collateral such as liens on future harvests. Tree collateral mechanisms are already available in several countries, such as China (Liu et al., 2017), and Thailand, where 82 cases were recorded (Starfinger, 2021). In their study, Starfinger et al. (2023) identified various lending institutions, including banks, non-bank FIs, the private sector, and NGOs. Credit mechanisms with trees as collateral exist both for production for self-sufficiency or commercialization and for conservation or restoration of resources or environmental services. Debtor programs have been found

Tree as collateral

for individuals or families, as well as for companies and associations, including cooperatives, clubs, and mixed organizations. In Indonesia a cooperative approach has been introduced. According to Windratmo et al. (2015), individual members can obtain loans from a credit cooperative, with the cooperative acting as a guarantor for the bank and using the debtor's trees as collateral, similar to the AMCOs or SACCOs model in Tanzania. In addition, Starfinger et al. (2023) describes a contract-based mechanism in Indonesia where smallholders receive quality clones from an industry partner and a loan from a financial institution to establish and maintain plantations for pulpwood production. This mechanism works as a four-part market-based system where the industry partner provides a buy-back guarantee at a fixed minimum price. In addition, the industry partner guarantees repayment to the creditor, thus fulfilling important functions for this transaction (Starfinger et al., 2023). This scheme is similar to the Outgrower's loan scheme in Tanzania. Finally, the authors discuss management plan and certificate-based mechanisms related to forest-based finance. These mechanisms provide the lender with important information about the location, tenure and value of the stand that can be verified for reliability by a third party. While the certificates are usually issued by public actors, the management plans are prepared by the creditors themselves. The aspect of clarifying tenure is central to proving ownership and guaranteeing marketing rights (Macqueen et al., 2018; Mohns et al., 2011; RECOFTC, 2015; FAO/Academia de Centroamérica, 2016). Starfinger (2021) evaluated another model from Thailand using local tree banks, which is internationally one of the most developed financial models for trees as collateral and is explained in more detail in the next sub-chapter. At this point, it should be emphasized that not only does the country of Thailand, with its different regulatory landscape compared to Tanzania, introduce differences into the evaluation process, but also the fact that the Thai Tree Banks model focuses on forestry financial services and does not directly involve smallholder farmers who also happen to have trees, as in this case study in the Iringa region of Tanzania.

3.2.1 “Thai Tree Bank” model

According to Starfinger (2021), key factors for the success of the tree as collateral model in Thailand include bringing together smallholders and implementing new and reformed policies and regulations. A clear and conducive policy environment is crucial for the forestry and financial sectors. This relates to the legal procedures for harvesting and marketing timber. There must be clear and comprehensive collateral laws and a central collateral registry. A prerequisite for the functioning of the model is locally installed tree banks for monitoring and administrative tasks. However, in addition to the formal requirements, the context or environment in which trees are used as collateral should also have some clear characteristics. The tree collateral process in Thailand involves several important steps that smallholders must follow. First, they need to establish a local Tree Bank branch and become a member by purchasing a minimum number of shares. Then the local committee, trained by the Bank for Agriculture and Agricultural Cooperatives (BAAC), is responsible for checking the measurements and assessing the geotagging data. The next step is to identify and demarcate the trees that will serve as collateral from the rest of the stand, requiring both the land and tree tenure documents. Once these steps

Tree as collateral

are completed, the loan is transferred to the smallholder's BAAC account. The smallholder is then responsible for managing the plantation, including annual inventory, and reporting, obtaining a harvesting permit, and conducting harvesting and marketing activities, either personally or through an intermediary. The final step is the repayment of the loan, which may involve repeating some steps depending on the type of management. Finally, repayment of the principal and interest takes place after a grace period of up to 5 years (Starfinger, 2021). As BAAC (2018) notes, smallholders must meet certain criteria to qualify for tree collateral. These include being BAAC's bank clients, having technical knowledge of inventory and silvicultural treatments, and having plantations that are at least one year old and have a diameter at breast height (DBH) of ≤ 3 cm. In addition, local tree bank branches could play an important role in assisting smallholders in harvesting, processing, and marketing their produce, thus exploiting opportunities for value addition (Starfinger, 2021). The introduction of trees as collateral in Thailand involved several important steps and was made possible by various legal and political factors. The BAAC was the first bank to offer this service in Thailand (BAAC, 2011).

3.2.2 Loan variables and growing asset valuation

A decisive question for tree collateral is the point in time at which the loan is issued and how the value is calculated as different approaches could cater different financial needs (Starfinger 2021). According to the loan conditions Startfinger et al. (2023) mention the loan-to-value (LTV) ratio, which determines the amount of credit granted based on the value of the collateralized assets. In his analysis of various studies on trees as collateral, LTV ratios for renewable resources ranged from 50% to 80% and were quite flexible. Loan volumes vary depending on factors such as lender regulations, regional level of development and the size of the borrower's business. Interest rates range from 5 to 12%, depending on the lender, country, and inflation rate. The loan or transaction period varied widely, depending mainly on the purpose of the loan and the expected cash flow from the land use system.

Tree valuation is an essential aspect of forest management. Forest stands have an economic value and must be properly managed to maximize their economic potential and to use them as collateral. There are various approaches to determining the value of a forest stand, including current or projected value, fixed rates per hectare or per tree, or alternative methods (Starfinger et al., 2023; RECOFTC, 2015). When valuing a forest stand, the choice of financial valuation method depends on the purpose of the valuation, the availability of data and various socio-economic conditions that influence the risk profile. The two values most used in commercial forestry are stumpage value and projected value (Zhu et al., 2020; RECOFTC, 2015; Staringer, 2021). Stumpage value estimates the value of a stand based on today's market price for that tree species, while projected value calculates the expected future financial return from harvesting a mature stand at today's value, adjusted for expected inflation (RECOFTC, 2015). Market prices can be used to determine the current value of a forestry asset (Kamara, 2011), while others rely on publicly published lists (Starfinger, 2021; FIRA, 2010b). Another way to determine the current value of a forestry asset is to use a price index that takes into account the costs of harvesting

Tree as collateral

and processing (Haryadi and Kusumo-wardhani, 2017). For smallholders with a higher risk of loan default, stumpage value in these cases provides a more accurate estimate of the amount a farmer will receive at a given growth stage if he decides to liquidate the trees. The financial risk of using stumpage value is lower than using predicted value, as the latter method assumes that the trees will always be felled at the expected DBH value and maturity (RECOFTC, 2015). In addition, a plantation certificate can be used to determine the current value of the asset through a stand-based valuation. RECOFTC (2015) introduced teak tree certificates that include both a stock assessment and a financial assessment. The stock assessment includes an assessment of site quality based on age to height ratio, diameter and height distribution, and an estimate of trade volume. The financial assessment considers the harvesting costs depending on the distance to the road and the relationship between volume and number of pieces. The certificates consist of several components, i.e. a description of the land user or owner and a land register number, a site sketch with cadastral or GPS coordinates, a list of standing trees according to diameter classes, the financial valuation of the trees and a short descriptive part (RECOFTC, 2015). As for the projected value the business plan and the cash flow analysis contained therein can be used to project the value of the asset (FAO, 2011), while sales forecasts can also be used (White and White, 2007). Other approaches rely on fixed prices per hectare or per crop to determine an average value (Nugroho et al., 2013; Sanudin et al., 2016; Ekman, 2020; Starfinger et al. 2023). In the case of Thailand, a simplified stumpage value is used for the valuation calculation, which excludes quality valuation. A risk and harvesting cost deduction of 20-50% is then applied. However, this method does not take into account the expected rotation period and future development of the trees, resulting in lower loan volumes for trees allocated at an early stage of stand development. If smallholders opted for a longer rotation period, they could theoretically receive significantly higher loans (Starfinger, 2021).

3.2.3 Transaction costs

Transaction costs can play a crucial role in the decision-making of both creditors and debtors. One important type of cost that creditors need to consider is the fees for appraisals or valuations required to determine the exact value of the assets. According to Starfinger et al. (2023), an important type of transaction cost was the appraisal or valuation fees incurred when an accurate valuation of the assets was required. These could range, for example, from 0.01 to 0.6% of the estimated stock value (Qin et al., 2014) and 3.3% of the loan volume (World Bank, 2016), and other mechanism calculated per plot or hectare. In addition, insurance costs are also usually included in transactions, although the exact costs are rarely specified. In addition to these costs, there may be other fees, i.e. for a guaranty company, commission, payout, commission for repayment to the cooperative and administrative costs. Obtaining the necessary land certificates can also be costly for producers. The lack of local credit management agencies can increase costs, especially in rural areas. In addition, transport costs can be high. To reduce these transaction costs, pooling of borrowers and decentralization were the most frequently mentioned strategies (Starfinger et al., 2023). Aggregation of producers has been shown to facilitate production, management and marketing, thereby reducing transaction costs for both forestry and agricultural

Tree as collateral

produce (FAO, 2012; Starfinger et al., 2023). Another possible approach to minimizing transaction costs is to implement distribution models that include mobile banking, branchless banking, and mobile payment systems. This approach can reduce bank's transaction costs by streamlining loan disbursement and repayment procedures while providing access to a previously unreachable customer base. By using these technologies, banks can offer low-cost financial services to smallholder farmers and build lasting relationships with them by gaining insights into their needs and developing connections that are critical to maintaining and managing a lucrative loan portfolio (IFC, 2012).

3.2.4 Risk assessment

When lending to smallholder farmers, appropriate risk assessment by the financial institution is crucial. Personal risks, such as severe health shocks or deaths in the family, can jeopardize the viability of the smallholder farmer for years to come. Researchers such as Miller and Jones (2010) and Ledgerwood, Earne & Nelson (2013) present the 5-C model of credit analysis that can be used as a risk assessment tool: Character, Capacity, Collateral or Capital Terms and Cash Flow. While character and collateral are still important, cash flow and capital terms are of much greater importance in agricultural lending. It is also important to assess the capacity of the borrower and the strengths and weaknesses of its agricultural partners in terms of their financial, managerial, and technical capacities. The character of the borrower and its relationships with the various participants in the value chain also need to be assessed (Kessy, 2021). Collateral is an important instrument for reducing risks and information problems in lending. Collateral has two important functions: They serve as a control tool to reduce loan defaults and they reduce credit risk by providing lenders with an additional source of repayment. Smallholders in agriculture and forestry are likely to face more frequent demands for collateral because their ability to repay is more uncertain due to the longer-term nature of the financed investment, especially in forestry, and the higher likelihood of an unexpected negative event during that period. Investments in immovable assets such as land and buildings tend to be less risky for the lender, as the assets do not disappear as easily and can be used as collateral (FAO, 2005). Risk transfer instruments such as insurance, third-party guarantee funds, securitization, trust funds and derivatives are not widely used or known in the agricultural sector (Kessy, 2021). Farmers face a variety of production risks that cause their incomes to fluctuate from year to year. Systemic risks, especially those associated with catastrophic losses, bring difficulties and costs. Thus, production insurance, such as crop insurance, can be a solution to protect smallholders. To mitigate the risk to production quantity and quality resulting from adverse weather conditions, weather insurance or contract farming can help (IFC, 2012). In general, to reduce default rates for the bank, insurance to cover these risks, including credit life insurance, health insurance, forestry insurance and crop insurance, can greatly enhance the security package (IFC, 2012; Kessy, 2021).

4 Characterization of the study

This study used a holistic and explanatory single case study approach. This allowed for a focused and in-depth discussion on growing trees as collateral in the Iringa region of Tanzania. Various data sources, including interviews, focus group and brainstorming events, documents, and literature, were used to provide a comprehensive understanding of the case. The holistic approach emphasized the importance of understanding the case in its entirety, including its context, history, and the interrelationships between different factors, while the explanatory approach focused on identifying the causal mechanisms and processes that explain the case (Yin, 2009; Starfinger, 2021). The case study aims to understand the needs of the different stakeholders and their interactions and thus define the factors, i.e. the roles and steps that explain the GTAC mechanism that shape the development of trees as collateral in the Iringa region, according to the research question: “What are the factors that determine the credit process and stakeholder roles for building a credit model with trees as collateral for short-term loans for smallholder farmers in the Iringa region?”.

4.1 Data acquisition

In this case study, a qualitative research approach was used to collect primary data using a diary method. Regular interviews, focus group discussions and brainstorming sessions were conducted with various stakeholders including smallholder farmers, farmer and tree grower associations, cooperatives, local government officials such as village and district authorities, banks and other local FIs, institutions involved in the agricultural value chain, local research institutions and other relevant parties. These meetings were documented in the form of a diary to record the opinions and statements of the participants. The interviews and focus group meetings were used to explore the needs, attitudes, and opinions of stakeholders, and to explore the potential impact of the financial model on the lives and livelihoods of local smallholder farmers. An agile approach was adopted throughout the research process, including interim brainstorming sessions with the research team. The meetings were used to develop and refine the financial model based on new ideas and perspectives that emerged during the research process. Additional stakeholder meetings were also scheduled to ensure that all relevant parties had the opportunity to provide feedback and input into the development of the GTAC model.

4.1.1 Participant selection and involvement

Participants for the expert interviews were carefully selected through purposive sampling and snowballing. Purposive sampling allowed for the selection of individuals who met certain characteristics or criteria relevant to the research question, while snowballing was used to identify potential participants through referrals from existing participants (Etikan et al., 2016; Starfinger, 2021). The use of a sector-specific guidelines and open-ended questions helped to structure the interviews and focus group sessions and ensure that the data collected was relevant to the objectives of the study ([appendix B](#)). The use of these carefully considered methods enabled the study to obtain a diverse and informative range of expert

Characterization of the study

perspectives. Questions to the banks covered market analysis of the local agricultural credit landscape, the opportunities, and limitations of the GTAC model, while smallholder farmers were asked about their needs in terms of an agricultural credit product, their tree planting and agricultural business opportunities, and their views on trees as collateral. The most important thing is to understand the needs of the smallholder farmers and the FIs in order to develop a financial model that is tailor-made for both parties. Their perspectives determine the direction of the development of the GTAC mechanism. In addition, members of the private sector dealt with marketing, while other value chain partners were consulted to address the issue of reinsurance in the event of a smallholder farmer default - an open question that evolved during the case study. Village and district leaders were consulted about the legal framework for smallholder farmers, as this defines the environment in which the GTAC model can be implemented. Finally, researchers and academics were interviewed about the design of the GTAC product and its feasibility. 39 meetings were conducted in Iringa, Morogoro and in Dar es Salaam, Tanzania. Throughout the paper, experts are referred to as "meeting # (number in [appendix A](#))" and further appendix documents are referred to as "appendix (letter)". In addition to the interviews, academic sources and documents provided by the experts were analyzed to gain a comprehensive understanding of the agricultural finance model with trees as collateral.

4.2 Data analysis

After data collection, the diary was structured and analyzed in an Excel file ([appendix C](#)) to identify common themes and patterns that emerged from the data. The risks and mitigation strategies identified by stakeholders were collected and stakeholders were categorized as smallholder farmers, FIs, value chain actors and government actors ([appendix D](#)). Based on the identified risks and mitigation strategies (table 1), the factors that are critical to the GTAC credit process and the necessary stakeholders involved in the process were defined (chapter 6). The risks identified by each stakeholder were summarized and visualized using a radar chart to create a risk assessment diagram. An additional pie chart was used to highlight the factors determined by the identified risks (figure 1). Using the model visualization of Starfinger (2021) as a supporting resource, a stakeholder diagram was created to show the roles and responsibilities of the different stakeholders involved in the GTAC process (figure 2), as well as another model visualization explaining the process steps and necessary conditions for GTAC (figure 3).

5 Study area and background

Iringa is a region in the Southern Highlands of Tanzania, bordering the regions of Mbeya, Njombe, Morogoro, Dodoma and Singida. The region lies between 900m and 2300m above sea level and is surrounded by an escarpment up to 800m high, which forms the eastern part of the Great Rift Valley. The region is rich in water sources, such as the Mtera Dam, the Little Ruaha River and the Great Ruaha River. The climate is mild, with average temperatures of 10 degrees Celsius in May/June and up to 25 degrees Celsius in October. Rainfall ranges from 500mm to 1,600mm per year (Ayubu, 2013; FinScope, 2017). About 4 out of 10 adults in Iringa depend on agriculture for their livelihoods, and the region is one of Tanzania's leading grain-producing regions, the so-called 'Big Five'. Favorable geographical and climatic conditions make the region suitable for growing a range of food and cash crops, including maize, beans, potatoes, tobacco, tea, pyrethrum, coffee, vegetables, sunflowers, and timber (FinScope, 2017). Additionally, forestry is key to Iringa's economy. The sale of timber products accounts for up to 80% of household income, with Mufindi and Mafinga, the main timber producing areas, generating almost half of the region's GDP (FinScope, 2017). Tanzania has a forest cover of 54.4% of its total land area of 88.3 million hectares. To reduce pressure on the remaining natural forest areas, the country has established tree plantations, of which about 250,000 hectares are located in the Southern Highlands, including the Iringa region. The main tree species planted are *Pinus patula*, *Eucalyptus* species and *Acacia mearnsii*, which provide the raw material for most wood processing industries. It is estimated that in 2016, small and medium tree growers owned about 174,000 hectares of forest land, representing 54% of the total forest area (Lusambo et al., 2021; FDT, 2017). While donor-funded tree planting activities focus on environmental aspects such as carbon trading, industrial planting programs are mainly implemented by the government and large companies. However, private forestry, especially non-industrial private forestry, is becoming increasingly important in Tanzania (Lusambo et al., 2021; Yonika & Ngaga, 2011). In general, tree planting has long become indispensable for smallholders in Tanzania's Southern Highlands. Smallholders own more trees than the large plantations combined such as Sao Hill (state-owned) and commercial private companies such as Green Resources Ltd. (REFOREST, 2021; Lusambo et al., 2021). A report from 2021 states 64% of the forests are owned by smallholders, 36% are owned by the government and private commercial timber companies (REFOREST, 2021), with Sao Hill Forest Plantation being the largest plantation with a total area of 135,903.35 hectares (REFOREST, 2021; TFS, 2023). Sao Hill forest plantation is a huge forest reserve in Mufindi district in Iringa Region and a small part in Kilombero district in Morogoro Region (TFS, 2023). In a discussion with the District Commissioner of Iringa Mtambule and the Head of Saw Hill Estate Dotsabida (meeting #23), it was noted that the tree cover of smallholder farmers in the Southern Highlands is far greater than government-controlled land. The importance of investing in smallholder agriculture and forestry was highlighted as a key driver for development in the country. Privately owned forest land is also called non-industrial private forests (NIPFs). Unlike industrial plantations, NIPF owners do not operate wood-processing businesses only (Lusambo et al., 2021). Most of these private

Study area and background

individuals own relatively small areas of forest, ranging from a few dozen hectares to single clusters of trees. A study conducted by Singunda (2009) in Mufindi district found that the average land area per household in the area studied was 6.8ha, of which an average of about 2.6ha was planted with forest and the rest used for agricultural purposes and more (Yonika & Ngaga, 2011). After an overview of the Iringa region with a situation analysis showing the potential of the agricultural and forestry sector at the smallholder level that needs to be improved, such as better access to financial resources for smallholders, this chapter critically discusses the local financial situation and financial inclusion (chapter 5.1.1). The background of the case study is then explained (chapter 5.1.2) and the different ventures, coached and supported by farip, operating in Magunguli with their linkages in the GTAC model are presented.

5.1 Financial inclusion

Despite the increasing popularity of formal financial services in Iringa, borrowing money from family and friends remains a common practice due to the need of quick access to money. However, this scheme poses a challenge when it comes to making sophisticated financial investments (FinScope, 2017). Thus, to provide financial access to smallholder farmers financial inclusion plays an essential role. A study conducted by Mwonge & Naho (2021) revealed, that access to agricultural credit among smallholder farmers in Tanzania was determined by several factors, including respondent's age, gender, number of years of schooling, household size, distance, awareness, collateral, type of crops, farm size, contact with extension services, membership in economic farm groups, farm location and interest rate. The gender of the respondent, distance, collateral, and interest rate had a negative influence on the decision of smallholder farmers to apply for and avail of agricultural credit (Mwonge & Naho, 2021). The strict requirements of FIs for high collateral such as land and other documents for smallholder farmers pose a challenge to accessing financial resources. The Finscope survey (2017) found that in Iringa, only 36% of respondents had land ownership documents, with most land acquired through inheritance and family allocation. Possession of a recognized identity card is mandatory to access formal financial services, and 90% of respondents in Iringa possess a voter ID card, the most trusted identification document for financial services. Although it is more complicated to obtain a title deed for land, some formal FIs such as SACCOs accept other forms of proof of ownership, such as offer letters from local governments (FinScope, 2017). Gender inequality in land ownership and resource distribution remains a widespread problem in Tanzania. Despite legal reforms to address gender inequalities, the impact on women's access to, ownership of and control over land has changed only slightly, especially in areas where patriarchal systems still prevail. Women are exposed to symbolic violence through traditional inheritance practices that limit their control over land (Lusasi & Mwaseba, 2020). In addition, there are unequal power dynamics within married couples, where men make the final decisions on the distribution of resources, including labor and income (Nsenga & Mwaseba, 2021). It is noteworthy that women in Iringa have higher land ownership than the national average, which is in line with the goals of empowering women through access to productive resources, including land (United Republic of Tanzania, 2010). Improved access to productive resources such as land can increase women's participation in economic activities

Study area and background

and their access to formal financial services. The distance from smallholder farmers from rural areas to FIs are still a main obstacle in promoting access to financial resources. Results from FinScope (2017) revealed that Iringa was well covered with financial access points, with almost 89% of adults living within 5 km of a formal financial access point. However, field research conducted in Magunguli, Isaula and Kiyowela villages indicated a discrepancy between official statistics and the lived experience of some residents. In interviews with smallholders, it came out, that none of them know of any close financial access points meaning they had no knowledge of any financial institution they could get loans from (meeting #17,25,26). The nearest access point for them is 40-50km away in Makambako. Financial exclusion remains a major challenge for residents of Iringa, Tanzania, due to factors such as lack of financial literacy and incapacity. Low financial literacy and literacy rates, together with irregular cash flows, result in low use of formal financial services. The adequacy and affordability of financial services and products are important to clients using financial services, which poses challenges for service providers to keep transaction costs affordable. While most adults in Iringa demonstrate good financial management, there is room for further improvement through increased use of formal financial services (FinScope, 2017). Encouraging and supporting innovation and partnerships among key stakeholders is essential to providing financial services that are convenient and affordable (Mwakatobe et al., 2020). According to FinScope (2017), mobile money is the most popular channel for financial services among adults in Iringa, with 73% of them using this platform, followed by banks (27%), insurance (25%), pensions (8%) and microfinance institutions (4%). This trend is due to the increasing penetration of digital financial services and mobile phone ownership. Banks in Iringa have introduced SIM banking and mobile apps that allow customers to deposit and transfer money, expanding the range of financial products. Although 65% of adults in Iringa own a mobile phone (FinScope, 2017), mobile network reception efficiency is still a challenge, as the case study found in areas such as Magunguli village. Nevertheless, financial service providers should take advantage of the high number of mobile phone owners and ensure accessibility of their services through mobile channels. It is essential to support and strengthen the contributions of private smallholders in Tanzania's forestry sector and agricultural sector. So, to improve financial inclusion, it is important to address the challenges that limit access to financial services, such as lack of proper collateral.

5.2 Farip ventures in Tanzania

The Fund for African Rural Innovation Promotion (farip) is a Swiss-based foundation that acts as a mentor and angel investor for several ventures in Tanzania. This chapter provides a comprehensive account of the development of the case study and outlines some ventures that show promising prospects for alignment with the GTAC model. The GRACOMA idea came about when villagers faced the challenge of raising the capital to build dormitories for their children attending the new secondary schools established by the government. Their idea is that the villages designate land as forest, which is reserved to finance the needed infrastructure. This land is then planted with forest trees. The growing trees then serve as collateral for infrastructure loans, which are repaid when the trees are felled after 5-

Study area and background

25 years. As the idea evolves, a bigger picture emerges; in short, it can mean that poor households such as smallholder farmers can plant trees and receive productive loans with their own growing trees as credit collateral. The challenge is that no one will grant a loan for collateral that takes at least 15 years to grow and mature and is exposed to many risks, such as illegal logging, frequent fires, etc. The growing trees need to be reliably protected and monitored to fulfil the creditor's duty of care, what is called "collateral management". GRACOMA was founded as a small local enterprise by Bahat Tweve, mentored by farip. A forest steward "Mtunza Misitu" in Swaheli from Magunguli village has already been recruited for a pilot project. He has started setting up the operational elements of the GRACOMA service, i.e. land registration, monitoring and experimentation in forestry for smallholders, both for timber and energy and is involved in the GTAC prototype test-run in Magunguli. The start-up is still in its infancy and needs research support, including the development of a credit system using trees as loan collateral, GRACOMA is thus one of the main stakeholders in this case study and an important role in the GTAC model. Tanzania Biashara Mapema (TBM) is a registered company in Tanzania that has developed a business model called Transaction Security Services (TSS) to address the challenges faced by smallholders in Tanzania. TBM was founded by Bahat Tweve. The aim of TBM is to achieve a degree of predictability for farmers and to overcome opportunism. TSS provides a service to all actors in the value chain of agricultural products by organizing and monitoring all transactions along the chain on behalf of the producers. This provides transparency, builds trust, and enables transactions to be planned, errors to be identified and rectified, and fair payments to be negotiated. The TSS model has worked well for small transactions, but challenges such as drought, government bans and disruptions from COVID-19 have caused significant problems for larger transactions. Despite its success in the small business sector, TSS has not yet achieved commercial viability as it has been forced to engage in additional areas such as transport, warehousing, and advance payments due to constraints encountered outside its original business area. Current challenges for TSS include the data-intensive nature of the business model, lack of efficient tools for documentation, communication, data management and finance, and insufficient management capacity and skills. In this case study, it plays a supporting role in the GTAC model by providing smallholder farmers in the Iringa region with a fair way to market their agricultural products. TECASESO is an innovative business model that combines different elements to sequester carbon in the soil while generating income for farmers. The idea is to produce charcoal dust from biomass waste and mix it with cow dung to create a nutrient-rich mixture that is then used for intensive horticultural plots. The aim is to set up a carbon credit model where smallholders are rewarded with carbon credits for sequestering carbon in the soil. However, organizing and certifying the trading of carbon credits and expanding the model to the whole country are still a challenge ([appendix H](#)). Using carbon credits to provide an additional source of funding for villagers in Magunguli could be an option, and this is explored in chapter 7.3.

6 Factor analysis

This chapter provides an analysis of the risks and mitigation strategies identified in the development of the GTAC model. The analysis divides the surveyed stakeholders that have some form of influence on the GTAC model into groups such as smallholder farmers, financial institutions, value chain actors and government, and examines the risks and mitigation strategies identified by each group. By identifying these risks and mitigation strategies, the chapter aims to define the factors that are essential to consider in the GTAC process.

6.1 Risks

The biggest challenge is the lack of financial resources for smallholder farmers in the Iringa region. This was highlighted in the focus group meetings with various farmer and tree grower associations in Iringa, but also Mtambule (meeting #23) is aware of this problem as the government has been trying to support access to financial resources for the agricultural sector for many years with little success. Figure 1 shows the level of risk importance calculated by the stakeholder’s mention of each risk, the pie chart below highlights the factors arising from the risks, which are explained in more detail in table 1.

Risk importance level

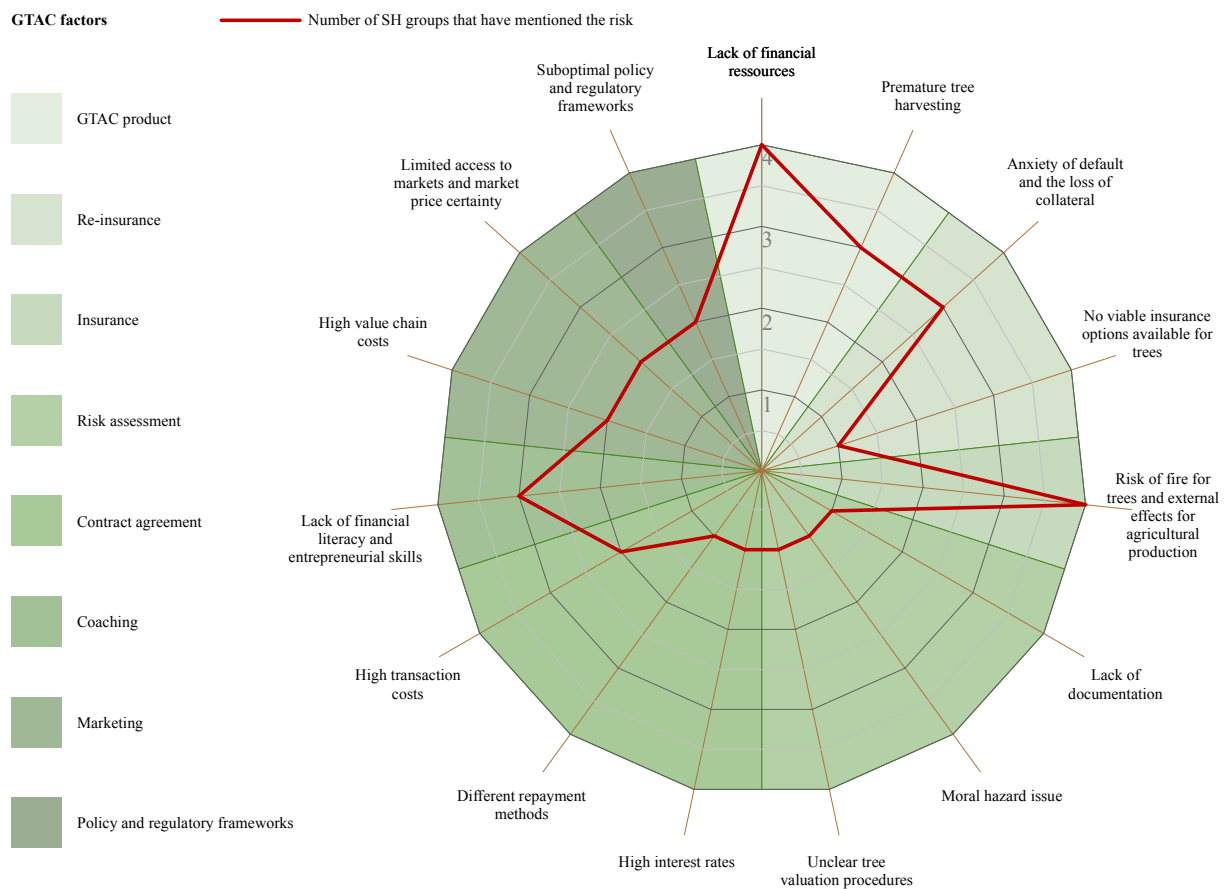


Figure 1: Risk importance level own creation based on own data (meeting #1 – 39; [appendix D](#))

Factor analysis

As figure 1 shows another challenge mentioned by all the stakeholder groups is that smallholder farmers face risks such as crop failure, pests and changing weather conditions that could affect their ability to repay loans (meeting #3, 18, 19, 21, 24, 25, 29, 31, 32, 33, 34 38, 39). Further recent external effects made the agricultural business for smallholders hard, such as closed borders due to covid 19 and the Russian war or Ebola from Kongo. Smallholders were not able to sell their produce to proper prices anymore (meeting #3). Daniel, the village head of Karadas (meeting #7) is leasing a silo from Bahat's company TBM to store agricultural produce. He mentioned, that due to the border closure, they were not able to sell their produce and could not pay back the leasing fee, but he was very happy to have had the silo, as in times of COVID 19 the produce in the silo was able to feed his family. Further challenges faced by farmers in the different regions are unique to their respective areas. For example, farmers in Kiyowela (meeting #25) struggle with a lack of capital for inputs such as improved seeds, that are highly competitive on the market while farmers in Isaula (meeting #26) face problems in also needing fertilizer but also protecting crops from monkeys. These challenges have resulted in farmers being less productive and needing a lot of fertilizers to increase their production. Financial institutions confirmed that a major concern for smallholder farmers is, that they lack the money to buy fertilizers and manure needed to grow their agricultural produce and to be able to plan their harvesting more efficiently, resulting in lower productivity and low crop yields (meeting #17, 18, 25, 26, 32). This low productivity is a major problem for banks as they may lose interest due to the high risk and low compensation (meeting #18,32). Specifically for the tree business, several risks were mentioned, one of the biggest problems for farmers is the lack of control over young trees, which can easily catch fire (meeting #3, 25, 29, 33, 34) and are often felled prematurely because farmers need money due to short-term financial constraints (meeting #17, 21, 25). They have no other way to get money and need it for their children's school fees and/or when relatives fall ill, and they must pay for hospital costs, and they have no other way to get money. Planting trees without a purpose is also a problem because they have neither planning nor forestry skills (meeting #17, 29). In both agriculture and forestry, smallholder's fear of losing their collateral such as land and other assets is high, as they usually risk not only their business but also the livelihood of their families (meeting #17, 25, 29). They see the potential of trees as collateral and pointed out that this is less risky. And although the need for funds is so urgent that they would even give their land as collateral, they simply have no other options (meeting #25). "Banks are reluctant to take risks", this was mentioned by Dr Shirima (meeting #35) and highlights why smallholder farmers still lack financial resources. Financial institutions must insist on several conditions before granting loans and many farmers are not able to prove their eligibility, often having cash flow problems, which further exacerbates the problem (meeting #18). The lack of title deeds or structured business models combined with the absence of insurance exposes farmers to significant risks, especially related to fire hazards and bad weather (meeting #24, 32, 35, 38). The lack of tailored insurance products for credit products or for collateral are a major challenge, further exacerbating farmer's problems (meeting #32,33, 38). Interesting is that Mmomi (meeting #38), an officer from the private agricultural sector support (PASS), mentioned, that

Factor analysis

he sees moral hazard as a critical issue, meaning that if there is no risk in the model such as losing a collateral, because they receive an almost free support such as an insurance for the collateral, that smallholders have no motivation to actually use the loan for their agricultural business and to finally pay back the loan. The character of farmers is often seen as a major problem for financial institutions, as they usually lack an entrepreneurial mindset (meeting # 18, 32, 38). They fear out of experience, that farmers might use the money for something other than its intended purpose (meeting #18, 19, 24, 32). Jovita (meeting #31) pointed out that contracts between banks and smallholders often dictate what farmers must harvest, which does not necessarily match what is profitable and leads to smallholders defaulting on payments. This is because smallholders know their land and conditions and know best what to harvest, when and under what conditions. Due to the nature of agricultural production, conditions have to be adapted, i.e. repayment periods have to be longer than usual, interest cannot be paid monthly but only after the harvest, which makes the investment riskier for the banks (meeting #19, 24, 32). The high transaction costs of controlling smallholders for the purpose of risk mitigation by financial institutions in faraway rural areas with the risk of transportation problems caused by poor infrastructure is another significant constraint for financial institutions to lend to smallholder farmers (meeting #18, 32, 34, 39). Having all those risks in mind the biggest concern for banks is the risk of clients not repaying their loans, which can lead to significant financial losses for financial institutions (meeting #18). In addition, the long-term nature of growing and harvesting trees is another risk that banks are reluctant to take according to the growing trees as collateral model (meeting #19, 32, 33, 37). The timber market is difficult to predict and the government levies taxes, making it difficult to make informed investment decisions (meeting #18, 32). Finally, the future of trees as a commodity is uncertain, especially due to the impact of the Chinese market (meeting #32). In general, it was mentioned by Hebel & Kenneth (meeting #19) that they can only use trees as collateral if the loan model, such as growing trees as collateral, has a track record. Government stakeholders also highlighted the instability of the agriculture and forestry sector, which leads to price volatility and high taxes for marketing produce, made more volatile by the increase in inflation (meeting #23). There is also a lack of a proper tree assessment tool, as TAFORI pointed out in an interview and the Iringa District Authority confirmed (meeting #23, 37). Furthermore, the research institutes pointed out that there is no research for a financing model that uses growing trees as collateral (meeting #33, 34, 37), highlighting the fact that there is research based on tree valuation methods and agrifinance but not in combination (meeting #37). The lack of knowledge about the value chain and the actors involved in it also makes it difficult for smallholders to determine the value of their trees, leading to fraud and low prices (meeting #34, 37).

Factor analysis

6.2 Factor definition

An overview of the ideas collected to mitigate these risks is presented in this chapter. Figure 2 provides an overview of the risks and mitigation strategies discussed at the different meetings during the field research. The factors have been mapped to the risks and mitigation strategies.

Risks	Risk mitigation strategy	Factor definition
Lack of financial resources	Tailored loan options such as GTAC model, input loan options, WRS etc.	GTAC product
Premature tree harvesting	Use of trees as standing collateral for raising loan options for agricultural business	GTAC product
Anxiety to default and the loss of collateral	Smallholder farmers credit guarantee scheme (TADB or PASS)	Re-insurance
No viable insurance options available for trees	New business model where a company settles the debts of the smallholder in case of default and receives the trees as collateral and sells them until they reach their maximum value	Re-insurance
Risk of fire for trees and external effects for agricultural production	Find or develop crop insurance options tailored to smallholder farmers needs or fire insurance option for trees as collateral (Ecre Africa)	Insurance
Lack of documentation	Involvement of village authorities who need to sign the loan agreement and who are allowed to work with the CCRO	Risk assessment
Moral hazard issue	The re-insurance company should not guarantee the full value of the collateral, some risk has to be defined with the smallholder	Risk assessment
Unclear tree valuation procedures	Introduction of clear methods for valuing trees through a growing asset collateral manager such as GRACOMA	Risk assessment
High interest rates	Policy schemes and regulations	Contract agreement
Different repayment methods	Contract with at least 6-month repayment option, risk compensation through interest rate regulation per loan term	Contract agreement
High transaction costs	Field agent as interface between smallholders and financial institution, better infrastructure	Contract agreement
Lack of financial literacy and entrepreneurial skills	Adequate training for smallholder farmers and coaching	Coaching
High value chain costs	Collecting produce from different smallholders in the village and joint marketing to reduce costs in the value chain	Marketing
Limited access to markets and market price certainty	Work with TBM as local and fair marketer of agricultural production	Marketing
Suboptimal policy and regulatory frameworks	Establish track record and show government what action is needed	Policy and regulatory frameworks

Table 1: Risk mitigation and factor definition based on own data (meeting #1 – 39)

Various approaches have been made to offer to smallholder farmers tailored products. Thus, banks have developed **risk assessments** and mitigation strategies. Kisanga (meeting #32) explained, banks such as NMB assess the risks and try to mitigate them by collateralizing stocks, providing working capital loans, and using the farm as collateral. The aim is to measure and mitigate risks on a case-by-case basis. The use of commodity-backed financing is one strategy that banks use to assess risk. For crops such as rice and maize, for example, they can assess risk through the WRS. Another option here shows the **GTAC model**, that provides a less risky form of collateralizing for the smallholder farmer. PASS, an organization that works with banks to promote lending to smallholder farmers, offers a SCGS to further reduce the risk for banks, acting as a hidden **re-insurance company** for smallholder farmers. In agriculture, smallholder farmers can use different strategies to increase their productivity. Dr Mwaseba (meeting #34) and Dr Nyamoga (meeting #33) pointed out that smallholder farmers are usually told that if they want to harvest more successfully, they need to adopt methods such as firebreaks, clearing and the use of fertilizers. These strategies help farmers mitigate the risks associated with climate change,

Factor analysis

pests, and diseases. Another strategy here is to invest into an **insurance** for the collateral as trees, but it needs to be affordable for smallholder farmers (meeting #33). To adapt the agricultural credit model, interest rate and repayment term need to be adjusted in the **contract agreement**. A longer loan term than usual is needed, as smallholders receive their return only after selling their produce, i.e. after about 6-12 months (meeting #19, 24, 32) and the bank can receive risk compensation through interest rate regulations, depending on how long the loan term is (meeting #32, 17). A field agent working for the financial institution at the local level can reduce **transaction costs**, i.e. transport costs and time for loan officers to remote areas to conclude loan agreements, carry out control mechanisms and promote a sustainable relationship between smallholder farmers and the financial institution, which could increase the number of clients for the bank (meeting #18, 33, 39). Another important aspect of mitigation is **coaching**. Dr Bakengesa and Dr Pilly (meeting #37) pointed out that the 'farmer school' methodology is a strategy for training smallholder farmers. In this method, farmers teach themselves how to plant forests. Farmers are not usually reached through official educational events, so it is important to invite them personally. By using this method, smallholder farmers can learn from each other, improve their skills, and increase their productivity. The goal for **marketing** should be to keep costs low in the value chain. This could be reduced through a joint marketing activity where the products of the members of a village smallholder and tree grower association are collected and sold to one buyer. Marketing their products through TBM could also be a solution as they try to provide a fair and transparent way to sell agricultural products (meeting #17; [appendix H](#)).

7 GTAC model

In interviews with smallholder farmers from the Iringa region it was highlighted that they need money to buy inputs so that they can farm properly and feed their families (meeting #17, 25, 26, 29). Access to credit and finance is crucial for the development of smallholder farmers who also grow trees in rural areas. Despite the great need for credit, most smallholder farmers from villages in the Southern Highlands do not have access to it (meeting # 15, 17, 25, 26, 29). According to the village chairman of Magunguli, only 25% of villagers have experience with a credit system (meeting #15). Surprisingly, to his knowledge, there were no defaulters. However, several financial institutions interviewed said they were reluctant to lend to smallholders because of the high risks involved (meeting #18, 19, 32). But there are indeed different financial products offered by different institutions in Tanzania, as mentioned by diverse stakeholders. Microfinance is a financial service that aims to provide loans and other financial products to small entrepreneurs and farmers who are usually excluded from traditional banking services due to their low income (Mutabaruka, 2021; Ledgerwood et al., 2013). In Tanzania MFIs offer various financial products tailored to the specific needs of the agrifinance landscape, as confirmed by various interviewees (meeting #1, 2, 11, 18, 19, 32). Hebel and Kenneth (meeting #19) describe the usual loan process from the NMB bank. The process begins with an initial enquiry by the client at the bank's office, followed by an assessment of the viability of the enterprise. If the business is deemed viable, the branch manager and loan officer visit the farmer to review the information provided. This process offered by banks to obtain credit in the agricultural sector is widespread in the Iringa region but has so far only reached a small proportion of local smallholders, as it still poses many challenges for smallholders from remote villages such as Magunguli, as outlined in chapter 6. Generally, NMB offers agricultural loans where the lump sum including the interest rate is collected every six months. These loans are tailored to the type of crops grown and a seasonal cashflow and similar options are available for other businesses with different cash flows (meeting #32). National bank of commerce (NBC) and NMB Bank offers smallholder farmers with cash for inputs such as seeds, fertilizer, and pesticides (meeting # 18, 19), but input financing usually requires greater security such as land title or a house (meeting #19). Another common loan product offered by NMB is the WRS (see chapter 2.2.2). The loan amount provided by the bank would be a maximum of 65% of the value of the crop stored in the warehouse (meeting #19). Local private microfinance institutions have been established in some villages such as Msowero and Makambako, but they are usually privately owned and provide short-term loans to small entrepreneurs (meeting #9). The short-term credit model offered to small-scale entrepreneurs or even "day laborer's" is not suitable for small-scale farmers as the credit period would be too short. Smallholder farmers in the Iriga region mainly need credit for preparation and harvesting (meeting #17, 25, 29) or in general to be able to plan their farming operations more efficiently (meeting #30) and specifically to buy improved seeds, which are slightly more expensive but less risky to plant and produce (meeting #25). Furthermore, SACCOs are FIs that offer loans and other financial services to their members. Amani (meeting #2) notes that SACCOs operate on a system where members deposit a certain amount of money into a pot

GTAC model

and can borrow money from that pot on a set basis. The security of SACCOs lies in their formal operation, where the money is kept in a bank and members' signatures are required for withdrawals. However, one challenge is that members who invest more may not need a loan, while members who invest less are more likely to need a loan, resulting in some members not having access to the funds they need. In addition to being able to receive dividends on savings, pay lower interest rates on loans and access financial knowledge, SACCOs offer other benefits. Jovita (meeting #31) emphasizes the importance of promoting a savings culture for individual's financial stability. SACCOs differ from village community banks (VICOBAs), which are a trust-based model. Amani (meeting #2) notes that VICOBAs is more suitable for low-income groups because there are no additional costs for office staff. Members deposit a certain amount of money each week and can borrow up to three times their share. However, the requirement that members deposit money for three months before they can borrow may make it difficult for some villagers to participate (meeting #2, 25). The VICOBA model faces challenges such as the lack of trust between members, which can lead to failure over time, and cases where a member runs off with all the money from the pot (meeting #1, 11). AMCOs are another group-based association that provides loans and marketing services to smallholder farmers. AMCOs have a storage system that solves the problem of farmers needing money at harvest time. Farmers deliver their produce to AMCOs and receive 60 % of the market price, and from the profit they make selling the produce, they receive another percentage. The AMCOs sometimes give loans to farmers, with the group serving as collateral and the AMCOs paying for any defaults (meeting #30). By considering the needs of the different stakeholders involved in the GTAC model, the roles were developed, and their responsibilities defined in chapter 7.1, the guiding principle of the GTAC model was created based on the different prerequisites that need to be in place, and the steps in the life cycle of the financial model using trees as collateral in the Iringa region were defined and explained in chapter 7.2. The aspect of impact and sustainability is further discussed in chapter 7.3. The model is applied in a first prototype test run, which is still ongoing in Magunguli, and explained in chapter 8.

7.1 GTAC Roles and Responsibilities

This case study is about growing trees serving as collateral for short-term loans for agricultural production. Therefore, repayment is not done by selling trees many years from now, as in the Thai case of Starfinger (2021) explained in chapter 3.2.1, but in the short term with the proceeds from agricultural production financed with loans where growing trees serve as collateral. In the GTAC model, different actors play different roles and responsibilities, as shown in figure 2. The model was developed based on Starfinger's (2021) tree as collateral mechanism to further develop and adapt the model to the needs of the actors involved in the case study in the Iringa region of Tanzania. The roles are divided into the main actors, the GTAC actors developed or added for this model, the re-insurance actors that support smallholder farmers in case of default and the GTAC enabler roles, such as the public sector and agricultural value chain actors.

GTAC roles and responsibilities

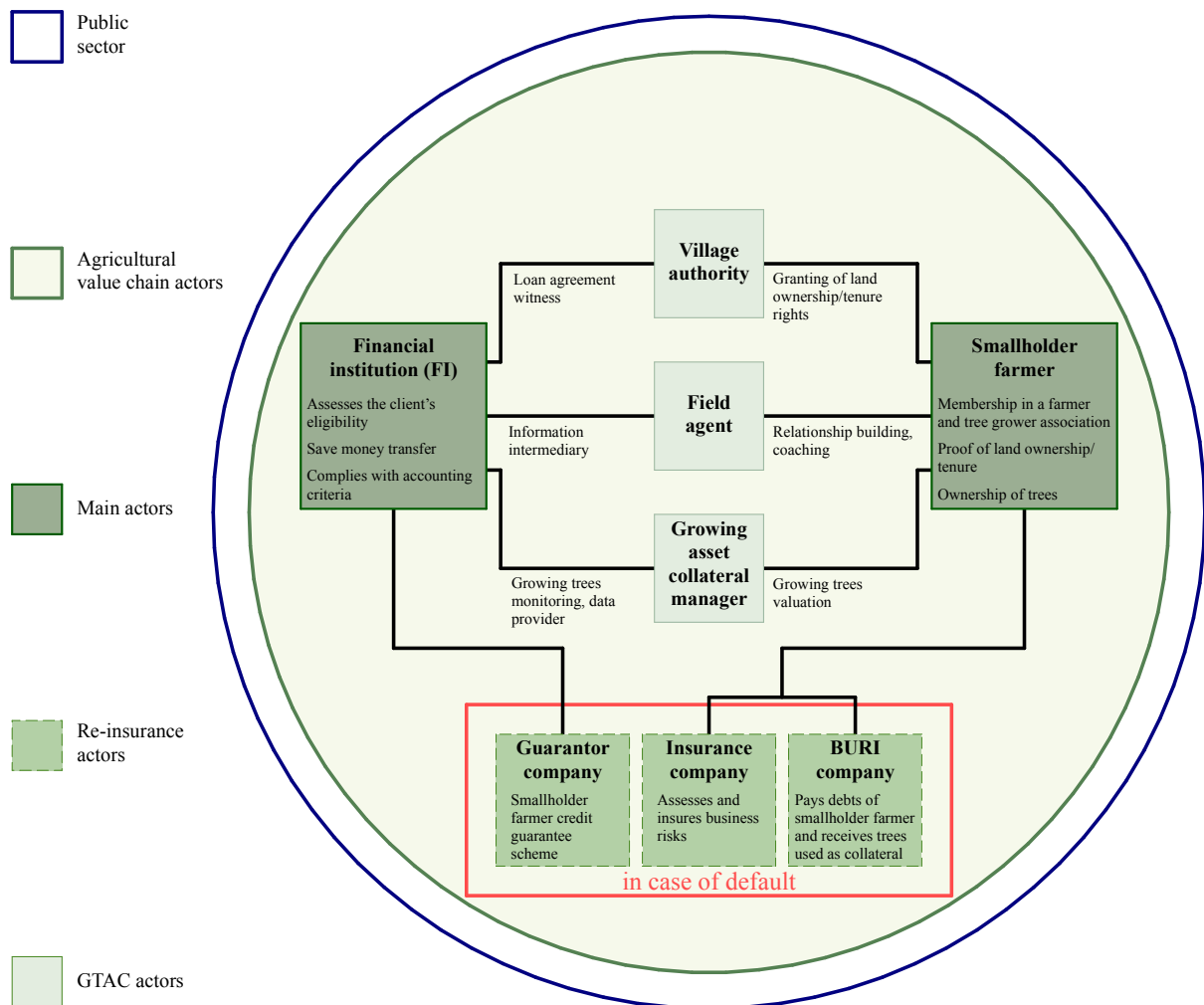


Figure 2: GTAC roles and responsibilities own creation based on own data and Starfinger (2021)

7.1.1 Main actors

In the GTAC model, the **smallholder farmer** plays the role of the customer, who needs financial resources for pre-financed products along the entire value chain of his agricultural production. The smallholder farmer not only owns land for agricultural purposes, but also trees on his property. Membership of the village farmer and tree grower association is compulsory for the smallholder farmer, as it provides the necessary assurance that one will not be cheated in the early stages of the model when results are still uncertain (meetings # 17, 25, 26). Due to limited access to insurance options in the Iringa region or options that smallholder farmers cannot afford (Kessy, 2021; meeting #18, 24, 32), taking out insurance against fire or theft of tree stands and/or for agricultural production due to weather-related hazards is considered optional and defined on a case-by-case basis. Another reinsurance option for smallholders that could provide security for both the farmer and the financial institution is the Backup Refinance (BURI) model, which is explained in chapter 7.1.3.

The **financial institution** offers the GTAC product to the smallholder farmer and is responsible for assessing the client's eligibility, transferring the loans, and ensuring that the accounting criteria are met. In the case of Magunguli, the nearest town is 60km away in Makambako, with branches of official banks such as the NMB, NBC and the Cooperative and Rural Development Bank (CRDB), among others. However, there are also several unofficial private banks referred to as microfinance banks, such as the Bank of Mville (Meeting #24). In this case, the only bank that mentioned a possible further discussion on the GTAC model was Hebel & Kenneth of NMB's Makambako branch (Meeting #19). Other banks such as NBC emphasized that currently trees can only be used as collateral in combination with other assets to increase the loan amount (Meeting #18). The banks first need a track record to decide if the model will work, and once they have these documents, they can discuss further about investing. Mville (Meeting #24), on the other hand, expressed interest in the GTAC model and would be interested in collaborating as he sees the potential to provide credit to smallholder farmers. Another source of loans are government loans. Kastor (meeting #10), for example, receives a loan from the local municipality, but the conditions here are selective, be max. 35 years old and a youth group registration must be submitted.

7.1.2 GTAC actors

Unlike the Thai model of Starfinger (2021), where a local tree bank branch was introduced to manage and monitor asset registration and build capacity between smallholders and the financial institution. Establishing a village bank branch in Tanzania requires a license from the district and compliance with government regulations, including the storage of cash, which comes with various risks such as potential theft and therefore high protection costs, making it unattractive to set up (meeting #5).

GTAC model

In the GTAC model, the **growing collateral asset manager** plays a crucial role in the successful implementation of the financial model. The main tasks of the growing asset collateral manager include valuing the trees and registering and monitoring the forest plots owned by the smallholders, which serve as collateral, and to provide data to the financial institution. For this purpose, a local forest manager is hired to take care of the growing assets, such as monitoring the growth of the trees, estimating their value, and ensuring their maintenance. To facilitate the effective management of these assets by the growing asset collateral manager, a set of village-level procedures for remote properties in Magunguli were introduced on a trial basis in this case study, explained in chapter 8. These procedures include the appointment of a trusted person in the village to keep an eye on the forests, such as the forest manager known locally as "Mtunza Misitu", in Swaheli the character of the forests. The Mtunza Misitu is a trained and contracted person who ideally runs his own tree nursery and provides services such as planting, pruning, replanting, harvesting support and management advice to the villagers who own the plots registered by the growing collateral asset manager. In addition, the growth of the forest plot is regularly monitored through photo surveillance. The Mtunza Misitu takes photos of the trees with smartphones and sends them to the growing collateral asset manager, which enables analysis and verification even in distant places. A procedure for registering the collateral forests has also been introduced. This involves identifying the exact location, proving ownership, and assessing the trees. The procedures developed in this case study serve as recommendation strategies that can be extended to other villages in the Iringa region. Overall, the role of the growing asset collateral managers is critical in the GTAC model, as they are responsible for effectively managing growing assets in remote locations and providing accurate data to financial institutions ([appendix G](#)).

The **local field agent** role has been developed, due to transaction costs and high monitoring burden, that makes it difficult for commercial banks to invest in the agricultural business (meeting #18, 32). Various financial institutions agreed that loan officers cannot reach all villages due to the distance to remote areas. Transaction costs are often underestimated for smallholder loans, which likely contributes to credit constraints in rural Tanzania. Therefore, financial institutions working with growing trees as collateral need to adopt a deliberate and targeted capacity-building strategy to keep transaction costs low. This is particularly important in Iringa region given the vast and sparsely populated landscape. The village chairman from Kiyowela (meeting #25) also noted that the lack of an NMB representative in his village has made it difficult for farmers to access credit. Godfrey (meeting #18) suggested appointing a trusted person from the village as field agent to monitor the loan process and provide security to the bank. The field agent could also act as a bank agent providing financial services on behalf of the financial institution. This has been simplified as BoT (2021) has replaced the requirement of 18 months of business experience for applicants in agent banking with the requirement of a national ID card or number. For this reason, and due to trust issues between smallholder farmers and financial institutions, it is essential to have a local agent on the ground to take care of monitoring smallholders and their use

of credits, and to build capacity of the smallholder farmers. Different options were discussed on who could take that role for GTAC to work in the Iringa region. A local branch, as described in the "tree as collateral" model from Thailand by Starfinger (2021), has proven too difficult. A local field agent employed by the bank also seems unrealistic, as it would be too expensive to hire and train such an employee and the territories are likely to be already distributed by the loan officers working in the nearest town (meeting #32). Two options of the field agent role were elaborated. The local smallholder and tree farmer associations could either work with the nearest AMCOs or SACCOs or the FI loan officer could work with a village member who could act as sole informant between the smallholders and the loan officer or a banking agent of the FI. The latter, however, requires a person who can manage his own agent banking business. In this case study, it has been suggested that Mtunza Misitu plays two roles, that of an employee of the growing asset collateral manager and that of an employee of the loan officer. However, this needs to be discussed on a case-by-case basis.

1. Groups such as AMCOs or SACCOs

Due to the high transaction costs of controlling smallholder farmers, many commercial bank interviewees mentioned group lending as a trusted model for agricultural lending (meeting #18, 19, 32). The formation of groups offers banks an alternative collateral solution, as they can retain the group's collateral even if individual farmers default on their loans. This is confirmed by Starfinger et al. (2023), who point out that grouping borrowers and decentralization are strategies to reduce transaction costs. SACCOs employ loan officers who visit clients in their villages to assess their transactions and ensure compliance (meeting #18). The role of AMCOs in credit monitoring and business transactions such as lending and marketing has helped them build trust and relationships with financial institutions (meeting # 19, 39). Various interviewees from financial institutions such as NBC, NMB and TADB mentioned that they prefer to work with AMCOs rather than with individual smallholder farmers (Meeting # 18, 19, 32, 39). The success lies in the relationship between AMCOs leaders and smallholder farmers because they know the character of the farmer and can easily lend money based on local trust, and members benefit from a trusted base price according to the market for inputs such as fertilizer. Farmers generally prefer AMCOs to traditional banks because they are reluctant to put up their houses or land as collateral. AMCOs also provide farmers with a warehouse where they can bring their produce, which is then inspected and bagged by an employee. The aim is to help farmers build a foundation so that they can later farm independently (meeting #30). It is important to note that the formation of groups requires a high investment of "social" capital, i.e. in organization and trust between members. Regulatory hurdles can limit their operations, while mismanagement and corruption can cause members to lose their savings and trigger fraud and collapse (meeting #19, 32), a wide-spread phenomenon. In addition, the social capital, that needs to be invested becomes unbearable when smallholders must secure themselves because when they fail, they feel ashamed, and some smallholders feel disadvantaged because they are more successful and pay more for those who fail once (meeting #2).

2. Trusted village member

To reduce the transaction costs associated with loan appraisal and extension, another possible approach is to match the remotely located loan officer in the far-away town with a trusted village member in the village, such as the forest steward in this case study, who acts as an intermediary between the farmer and the loan officer. In this approach, farmers can apply for a loan through the forest steward, who forwards the application to the loan officer. This partnership enables effective risk assessment and forwarding of documents by the forest steward directly from the smallholder to the loan officer. In addition, the forest steward regularly updates the loan officer on the status of the loan by sending photos of the fields to show that the loan is being correctly used for agricultural activities in accordance with the contract. While the village agent does not make any decisions about loan assessment or allocation, training the same person to take on both the roles of forest steward and village agent of the loan officer can reduce transaction costs, provided there is a strict separation of roles and separate compensation channels.

In this case study, the contract agreement and lending are closely monitored and witnessed by the **local authorities** to build trust among smallholder farmers who are not yet familiar with the product. This strict control is necessary because both the farmers and the financial institution are uncertain due to lack of track record of the model. The village authority is involved as a witness in the loan agreement and lending process to ensure land ownership or tenure, which gives more confidence to the key stakeholders. This involvement of the local authority is crucial for building trust at the beginning of the implementation of the GTAC model. As the product becomes more established, the level of monitoring can be made more flexible to meet farmer's needs.

7.1.3 Re-insurance actors

Defaults on loans remains a major problem, especially in the agricultural sector, due to the many risks explained in chapter 6. In the event of default, the borrower's collateral is seized, and the bank may only recover part of the loan. This makes lending to smallholders not very attractive from a loan manager's point of view. Godfrey (meeting #18) mentioned that a loan officer is likely to receive a lower salary if his book is full of defaulting clients. To mitigate this risk, the following actors could offer their services for re-insurance. Firstly, there is the role of an **insurance company** where the farmer takes crop insurance or collateral insurance. Another strategy to mitigate this risk is for some private companies to offer **credit guarantee products** to FIs. In general, it was mentioned that banks accept the tree as collateral if it is insured or a private company guarantees at least 50% of the loan amount (Meeting #18, 19, 24, 32). Only a few companies were found offering tailor-made insurance products and some companies offering the credit guarantee scheme for smallholders, which are discussed in this chapter. In addition, another business model for a **re-insurance company**, BURI, is presented in this chapter.

GTAC model

Overall, it is recommended that the GTAC agreement between the smallholder farmer and the financial institution includes a re-insurance option.

Acre Africa is an insurance company in Dar es Salaam that is piloting various affordable insurance products tailored to agriculture (meeting #35). Dr Shirima (meeting #35) mentioned one possible solution to the affordability problem of an insurance is to offer a bundle of insurance policies, including life insurance and forestry insurance, which can be reimbursed through various package deals. One potential insurance mentioned is acre Tanzania. Acre Tanzania has developed an innovative financial product that bundles insurance with credit from credit institutions. This product protects credit institutions from widespread defaults due to severe weather that negatively affect farmer's ability to repay their loans. The insurance premium is pre-financed by the financial institution and repaid by the borrower as part of the loan instalments. In addition to financial products, acre Tanzania also offers mobile-based products to take advantage of the increasing number of mobile subscribers in Tanzania. One of these products is the Replanting Guarantee Product (RPG), which protects farmers from drought during the crop germination phase. Farmers who buy high quality seed or fertilizer can sign up for the insurance, which is pre-funded by the company. The farmer receives a unique card with a code that shows them how to register on the mobile platform, and the insurance period begins. If a drought affects the crop, the farmer can either receive a mobile money transfer or a discount on the next seed or fertilizer purchase (acre Africa, 2023). Several insurance companies offer crop insurance to protect farmers from crop losses due to natural disasters, pests, theft, and fire. For example, crop insurance providers in Tanzania include Jubilee Insurance and UAP Tanzania (UAP, 2023; Jubilee Insurance, 2023). Coverage is based on the sum insured, which is determined by the value of the inputs or the pre-agreed market value of the harvested crops (UAP, 2023; Jubilee Insurance, 2023). The problem is that the insurance companies acre Africa, jubilee and alliance only have an office in Dar es Salaam, which is out of reach for smallholder farmers in the Iringa region, because of the high transport costs. So, a solution such as insurance cover offered via mobile phone would be most convenient. Dr Shirima (meeting #35) pointed out that there were no forestry insurance products on the market, and none had been found in the literature. Nyamoga (meeting #33) confirmed that the Tanzania Forest Service (TFS) is considering tree insurance. Sokoine University of Agriculture is also working with Acre Africa to support a forest insurance policy initiative and mentioned: "forest insurance policies covering standing timber can play an important role; they have gone largely unnoticed in Tanzania's forestry sector for a long time" (SUA, 2022, p.1). A first approach, according to Dr Shirima (meeting #35), could be to have the forest certified by organizations such as the Forest Stewardship Council (FSC) to better qualify for insurance. FSC's forest management certification confirms that individuals, governments, and private companies manage their forests in a way that protects water, soil, and wildlife, and promotes the well-being of local communities and workers while ensuring economic viability (FSC, 2023). Until the market for forest insurance is established, it is advisable to work with other insurance options.

PASS Trust's traditional guarantee product enables agribusiness owners who do not have sufficient collateral to obtain loans. Clients can apply for a guarantee directly from PASS or through partner banks with a bankable business plan. The terms of the facilities are negotiated and agreed between the customer and the respective bank, without any influence from PASS Trust. A customer can apply for this product directly at the nearest PASS branch or through the branch of the PASS Trust partner bank where they use banking services (PASS, 2023). According to Mmomi (meeting #38), this product is only offered to bigger agricultural businesses and not to smallholder farmers. PASS Trust's portfolio guarantee, on the other hand, guarantees credit facilities applied for by qualified partner banks on behalf of their clients, either individually or in groups. The clients apply for a loan from a bank and if the qualifying projects are not adequately secured, the bank applies for a portfolio guarantee from PASS Trust. The client contacts the bank only for the loan application, while the guarantee coverage is applied for by the bank (PASS, 2023). PASS offers loan guarantees, with up to 60% of the loan being covered by them. However, the client must also bear some risk for the project to work, as clients would lose motivation to repay the loan if they did not bear any risk at all, as Mmomi pointed out (meeting #38). PASS Trust works with 14 banks, each offering different conditions for legal entities such as individuals, groups, and companies. PASS does not charge interest, but only a fee of 0.5% per quarter for the guarantee. The Danish government provides the money for the facility (meeting #38). As mentioned in chapter 2, TADB offers a Smallholder Credit Guarantee Scheme (SCGS). The program aims to encourage other banks to improve access to credit for smallholders (TADB, 2023). TADB works with commercial banks to provide guarantees. According to Masaki (Meeting #39), an officer from TADB, in the event of a default, the bank such as NMB receives 50% of the loan amount from TADB, if the lender cannot obtain the collateral. However, if there is no default, the TADB receives a fee back. The TADB serves as an interface between the commercial bank and the borrower. The smallholder applies for a transaction at the bank and, if not eligible, the bank forwards it to the TADB. The borrower has no direct contact with the TADB (Meeting #39). It was highlighted by Masaki (Meeting #39), that TADB mainly offers SCGS for groups such as AMCOs, where the group additionally serves as collateral.

Scheuermeier proposed a new idea for a business model that could allow local banks to invest in loans for smallholders. The idea is that if a smallholder farmer defaults, a Backup Refinance Institution (BURI) would pay off the farmer's debt to the bank in exchange for the smallholder farmer's collateral, in this case the standing trees. The trees would remain standing until they are mature and ready for harvesting, which would increase their value over time. The proposed business model is similar to the carbon credit model, where trees are planted to receive carbon credits and then harvested. BURI's assets would therefore consist of growing trees that increase in value each year and generate income through the sale of mature trees, carbon credits and the repurchase of trees from farmers. The market for BURI includes the global timber market, the carbon market and farmers who want to buy back their trees,

which requires further research to develop or a strategic partnership with an international potential BURI company for the GTAC model. The new approach has the potential to solve the problem of credit for smallholder farmers while promoting sustainability and investment in increasing the value of the tree plots. Implementation of the proposed business model will require effective communication and collaboration between BURI, financial institutions, and smallholders. A pilot project may be required to test the feasibility of the idea and ensure its success. If successful, Buri, which knows the tree business inside out, could enable local banks to enter this business model ([appendix G](#)).

7.1.4 Enabling actors

The **public sector** plays an important role in the implementation of the GTAC model. Its roles include creating an enabling policy environment and ensuring transparent pricing arrangements for the agricultural sectors. As defined by Startfinger (2021), a supportive policy framework for the forest sector is also crucial. This should include provisions that regulate the use of trees as collateral and the legal procedures for their harvesting and marketing. There is a need for clearly defined and comprehensive collateral laws and a central registry for collateral. On the other hand, **agricultural value chain actors** also play an important role in the GTAC model, as innovations and enterprises that offer fair marketing of smallholder agricultural products and other innovations can create an environment in which the agricultural value chain can operate more efficiently. By working together, these two actors can create a sustainable and profitable environment in which the GTAC model can develop.

7.2 GTAC steps

The GTAC model allows for a tailored approach to the needs and circumstances of the different case study stakeholders in the Iringa region. Figure 3 provides an overview of what is required for the model to work and what steps need to be taken to make the GTAC model work in the Iringa region of Tanzania. As explained in the previous chapter, the model was developed for individual smallholders who are members of a local association of farmers and tree growers, and the model can only be applied if the smallholder owns land and trees. Reinsurance in case the smallholder defaults is also a requirement for a financial institution to participate in the model. The role of re-insurance will be discussed by the main stakeholders on a case-by-case basis. The following sub-chapters provide more detailed explanations and guidance on how to apply the steps of the GTAC model.

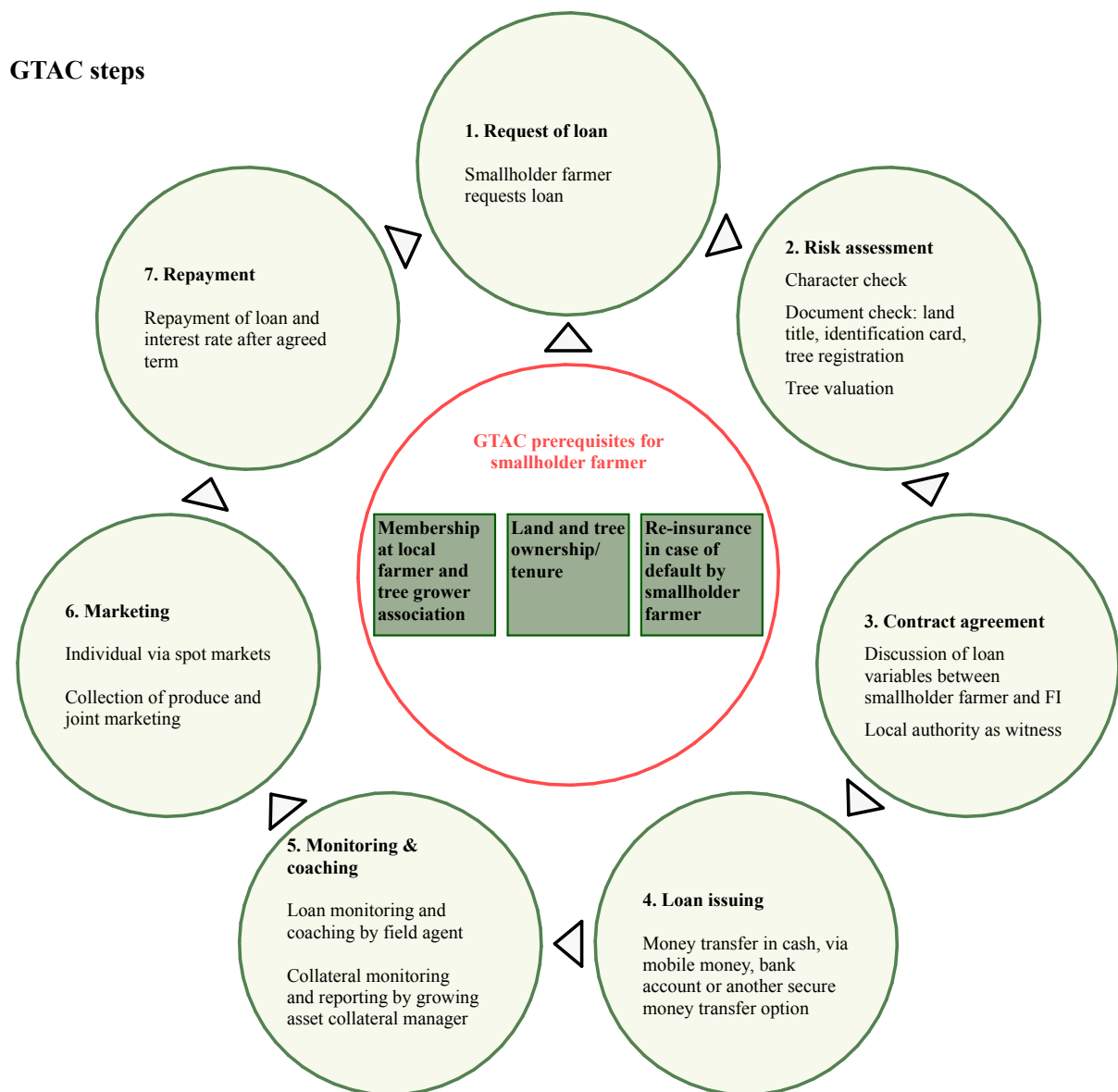


Figure 3: GTAC steps own creation based on own data and Starfinger (2021)

7.2.1 Risk assessment

Trees can serve as collateral for loans to smallholder farmers, but banks such as the NMB require specific documentation and proof of ownership before granting loans (meeting #32). Therefore, risk assessment is a crucial factor in avoiding loan defaults and is carried out before contracts are signed. One important aspect for banks is to assess the smallholder farmers eligibility. Kisanga (meeting #32) explained, that as a field agent, he needed to visit their clients regularly to assess their performance, advise them and ensure that their land is being cultivated and generating income, while doing that he also checked the character of the farmer by finding out what other activities he is engaged in business-wise, thus getting a personal picture of whether the smallholder has the experience and knowledge to work efficiently with a loan and be able to repay it. Here, the positive aspect of diversified production by smallholder farmers in Magunguli was highlighted, as they have learnt that they lose more often if they invest in only one crop. This strategy should also be considered for other locations if the conditions are met (meeting #16). So, securing land ownership for the trees used as collateral is essential (meeting #25, 32). Farmers must provide proof of ownership of their land, whether through an official land title, a title deed issued by the local authority, or some other form of documentation. Davies (meeting #13), the village executive officer from Magunguli notes, that farmers have various titles to agricultural land, and if they do not have a title, the village authority has the right to hand out a Certificate of Customary Right of Occupancy (CCRO). This is a legal document issued in Tanzania by local authorities to individuals or communities who have the right to use or occupy land under customary law. It certifies ownership or use rights and can be used as security for loans or other legal purposes (Kabigi et al., 2021; meeting #25, 32). The CCRO is only valid for customary land, i.e. land that is not registered under the formal land tenure system. In Tanzania, customary land is subject to traditional norms and practices, and ownership or use rights are usually passed down through generations within a community. The CCRO thus serves as a legal recognition of the land rights of individuals or communities and offers these groups the opportunity to use the land as collateral for loans or for other legal purposes (Kabigi et al., 2021). In addition to a title or proof of ownership from local authorities, a document granting permission to cut down trees and personal identification papers are also required (meeting #32). Specifically, for the "trees as collateral" loan model, a special procedure for valuing the trees is required to determine the value of the collateral and thus be able to set the contract in a next step. Starfinger's Thai model (2021) requires smallholders to have technical knowledge of inventory and silvicultural treatments; in the GTAC model, the valuation and management of the trees can be done by an external asset management company, such as GRACOMA in this case. The data, such as value calculations of the trees serving as collateral and documentation such as photos as proof of stock and maintenance serve for the representative loan officer in the risk assessment. The interviews with Dr Bakengesa and Dr Pilly of TAFORI (meeting #37) discuss how difficult it is for farmers to understand the valuation process for trees to be used as collateral and highlight the need for a valuation tool, which they are currently researching. Other proposed methods include stumpage value or predicted value (RECOFTC, 2015) and

GTAC model

in the Thai model a simplified stumpage value was used (Starfinger, 2021), as explained in chapter 3.2.2. As there is yet no proven method for valuing trees that is commercially viable in the Iringa region of Tanzania, local methods are based on market price assumptions, using selling prices in the local timber market, as the prototype test-run in chapter 8 shows. Requirements can also vary. Unlike Starfinger's (2021) Thai model, smallholders must meet criteria such as plantations that are at least one year old and have a diameter at breast height (DBH) of ≤ 3 cm. In this context, the Iringa District Authority mentioned that the minimum age of trees to be used for collateral is 18 to 25 years (meeting #23). However, they are about to rethink the regulations. In the prototype, smallholders have trees with a minimum age of 9 years, a minimum DBH has not been defined. A growing asset manager is also needed to control the forests and ensure that they are protected from fire. As mentioned in chapter 6, one of the biggest risks in using trees as collateral is fire. District officials Mtambule and Dotsabida (meeting #23) opined that the fire situation has improved as fire has also become a national issue. They suggested that to prevent fires, firefighting measures should be implemented in natural forests, considering factors such as different species, diseases, and soils. To be able to use growing trees as collateral the trees need to be properly monitored and managed by reliable people. These could be done, as discussed in 7.1.2, by the forest steward hired by the growing asset collateral manager or if the smallholder farmer is reliable enough himself.

7.2.2 Contract agreement

Once the requirements from the risk assessment have been met and reviewed by the FI, the contract details need to be discussed. Specifically, the GTAC model recommends that the village authority be present as a witness when the contract agreement is made, and the contract is signed. Furthermore, not only the credit variables need to be defined, but also the financing of the other actors involved in the GTAC model, such as the field agent, the growing asset collateral manager and the reinsurance option. It is important to ensure that the contract accurately reflects the purpose of the loan. In the case of agricultural loans, it is essential to make it clear that the loan is for agricultural purposes. In practice, the loan may also be used for other purposes such as forestry production. In this way, misunderstandings or disputes between lender and borrower can be avoided. The case study has resulted in the following requests from smallholder farmers and offers from financial institutions. BoT has taken steps to increase credit to agriculture and reduce interest rates on loans to the sector (BoT, 2021). Formal banks such as NMB and NBC have adopted an interest rate of 9-10% per annum for the agricultural sector in line with the central bank's policy (meeting #18, 19, 32; BoT, 2021) However, private banks have charged interest rates of 10-20% per month, which is not sustainable for the agricultural sector, especially smallholder farmers (meeting #9, 24). Smallholder farmers from Magunguli define the terms of a loan they would consider reasonable and feasible as a minimum of 6 months and an interest rate of 1% per month (meeting #17). In Kiyowela, the loan term were 6 months after harvest. The farmers agreed to sell their produce collectively to repay the loan at an interest rate of 5-9% per annum (meeting #25). In Isaula, the proposed collateral was the planting of trees worth the amount needed, with an interest rate of 8%

GTAC model

after 8 months, a term of 8 months and a maximum term of 3 years. The interest rate can be increased to up to 12% p.a. if the agreed credit term has to be extended prematurely (meeting #26). Formal banks such as the NMB offer a loan-to-value ratio of 80% of the invoice amount (meeting #32) or, through the WRS, 65% of the value of the crop installed in the warehouse and serving as collateral (meeting #19), with a loan term of 6 to 36 months (meeting #19, 32). To calculate an appropriate LTV ratio, the risks of the tree as collateral such as fire or theft must be included in the calculation. In the case of Thailand (Starfinger, 2021), a risk and reward discount of 20-50% is applied, i.e. the LTV is 50-80%, which also applies to the results of Starfinger et al. (2023). The LTV ratio used for the prototype in chapter 8 is based on assumptions - the value of the collateral must be 1.3 times the loan amount provided, i.e. the LTV ratio is 72.5% ([appendix E](#)). It is therefore recommended that the loan conditions be set in the following ratios: Interest rate of 9-10% p.a., considering the policies initiated by the government, with the respective inflation expectations already considered, loan term 6-36 months and loan-to-value ratio 50-80% of the loan value. This should be calculated on a case-by-case basis. As highlighted by Starfinger et al. (2023), international mechanisms calculate additional costs for smallholder farmers, including fees for appraisals, insurance or guarantee schemes and other commissions, as well as administrative costs, ranging from 0.3% to 17% of the repayment amount. Insurance costs are not properly assessed in this case study as there is almost no viable option in the market and there is no additional cost for the guarantee scheme offered by PASS or TADB for both the smallholder and the FI. As far as field staff costs are concerned, in the case of the group association that takes care of monitoring and capacity building, the funding is as follows. SACCOs finance themselves through a savings and credit system where members pool their funds to lend to each other. Loan officers are paid based on the percentage of loans repaid, which gives them an incentive to ensure that loans are repaid. To access the funds of these organizations, smallholders have to become members (meeting #18). To become a member of an AMCOs, one must pay an admission fee and buy shares. In the case of the Iringa AMCOs, smallholder farmers must buy 6 shares of 10k TZS each and pay a joining fee of 15k TZS (Meeting #30). A village member who acts as an informant to the loan officer located in the nearest town must be compensated by the loan officer. The fee must be less than the loan officer's transport costs and invested time to travel to the remote village for the various interactions and economically viable enough to be calculated through interest income and still be profitable for the bank. Another critical question is who in the GTAC Model pays the service of the growing asset manager such as GRACOMA. Therefore, a revenue model that determines how the GRACOMA fee will be paid is necessary. Two possible models have been proposed, and the decision on which model to use will depend on farmer's needs and preferences, as well as the financial feasibility of each approach. The first proposed model involves the financial institution granting a loan to the farmer, which includes the fee for the growing asset manager. At the end of the loan period, the farmer repays the loan directly to the financial institution together with the interest rate and the fee for the growing asset manager. This model ensures that the fee is paid directly to the growing asset manager. The second model involves the forest steward marking a pre-determined

number of trees per hectare, which would then belong to the growing asset collateral manager until harvest time. Under this approach, payment of the fee for the growing asset collateral manager can be deferred until the trees are harvested. In this scenario, the FI would provide the growing asset collateral manager with a long-term loan, governed by a separate contract, providing the necessary funds to pay for the forest steward service ([appendix F](#))

7.2.3 Loan issuing

Farmers often prefer to receive loans in cash rather than virtual money, especially in remote villages where it can be difficult to convert virtual money into cash ([appendix E](#)). Official banks, however, do not usually give cash loans to smallholder farmers. Instead, they may issue vouchers for inputs that can be used to purchase products from companies that work with the banks (meeting #18). To obtain loans of any kind, farmers must have a bank account through which they can disburse and repay the loans (meeting #19). To minimize transaction costs and reach previously unreached customers, banks can introduce distribution models that include mobile banking, branchless banking, and mobile payment systems (IFC, 2012). As mentioned in chapter 5.1.1, banks in Iringa have introduced SIM banking and mobile apps that allow customers to deposit and transfer money, expanding the range of financial products. With 65% of adults in Iringa owning a mobile phone (FinScope, 2017), transferring money via a mobile app could be a safer way for lending in the GTAC model by public or private financial institutions, further reducing transaction costs such as travelling to remote areas for lending. Thus, private financial institutions can also transfer large amounts privately from one mobile phone to another, although it is advisable to install an appropriate distribution model as the institution grows. To open a branch, a business license, a tax identification number and a registration certificate from the competent authority are required (meeting #24). How credit is allocated through the GTAC process must be decided on a case-by-case basis.

7.2.4 Monitoring and coaching

Training and coaching are crucial factors for the success of farming and tree-growing enterprises, as shown in the interviews with smallholder farmers and bankers. According to the focus group with smallholder farmers from Isaula, it is important that farmers receive proper training on how to use credit and invest their loans wisely (meeting #26). In this regard, it is crucial to train and coach farmers about the credit process and provide them with financial knowledge to avoid defaulting. In addition, it is important to train farmers in formal entrepreneurship and how to grow their businesses most efficiently so that they use formal credit for the right purposes. One possible solution is to train farmers on how to manage their loans and assets and how to organize themselves into a group of farmers to optimize their resources (meeting #18). However, coaching can be difficult and time-consuming, as it requires time and resources to mobilize farmers and train them effectively, as Godfrey (meeting #18) pointed out. It may therefore be necessary to enlist the help of village agents (meeting #25), who can play an important role in advising and informing smallholders about interest rates and other terms and conditions, which

can help farmers make informed decisions and avoid financial pitfalls. Even if the business is deemed non-viable, NMB can offer support through its NMB foundation, which provides coaching and workshops on business management (meeting #19). To further support farmers, various actors can provide coaching and training for smallholder farmers. Acre Tanzania, for example, provides extension services in financial literacy, insurance and policy changes needed to promote financial inclusion. These services are delivered through direct face-to-face training at cooperatives and farmer groups (Acre Tanzania, 2023). In addition, it is important to coach smallholders on how to assess the value of their trees and forest management in general and specifically for the GTAC model. The Tanzania Forest Service and the District Council are also involved in forest management but have limited resources (meeting #34). The Forest Development Trust (FDT) is an independent Tanzanian institution that provides technical services, including research and development, training and support to farmers and tree grower associations, and market development to increase indigenous productivity in commercial forestry (meeting #34). In summary, coaching and training are critical to the long-term success of smallholder farms. By investing in education and training, farmers can acquire the knowledge and skills they need to grow their farms, increase their resources, and ultimately improve their livelihoods. Loan monitoring and collateral monitoring are two important tasks during the credit process. There are different options as to who can take on this task. In loan monitoring, photos are taken to show that the farmer is using the loan for the right purpose, i.e. for his agricultural production. In collateral monitoring, i.e. growing trees, it is important that the manager of the growing collateral also sends photos to the financial institution showing the progress of the trees.

7.2.5 Marketing

Building a value chain for the crops harvested by farmers in the Iringa region is crucial for smallholder farmer's income, but smallholder farmers still get very little income due to the very opaque marketing process that prevails locally. There are many middlemen involved in the value chain, which makes the supply chain inefficient and expensive, and the end buyer eventually pushes the purchase price down further and further, so that the farmer does not get much. Using the example of a farmer in Magunguli, Scheuermeier explain the supply chain as follows: sporadically trucks drive past the farmer's house and buy the agricultural goods from him at the spot price; this is the business of people called "mlangusi". The Mlangusi resell the collected goods to stationary bulkers in town called "dalali", who then sell to long-distance traders showing up to fill their large trucks and who then truck the goods i.e. to Kenya or to a big market and resell them to bigger stationary wholesalers there, from where the goods then percolate down again into the small retail shops in the large cities. One strategy to avoid losses would be for farmers to pool their produce and sell together to a mlangusi where they can negotiate better prices (meeting #17; [appendix E](#)). Another strategy would be to market their products through a local AMCOs or through a local WRS operator. Alternatively, smallholder farmers can participate in TBM's TSS business, where they register with TSS and receive "cash on the bag" (COB) for their produce. Depending on how they market them, they can then earn a reasonable additional profit. Bahat Tweve's

GTAC model

TSS model works as follows: The farm produce is collected from the farmer by TBM, and the farmer already receives a COB (cash on the bag) advance from TBM, which is the same amount received on the spot market. The advance has an interest of 1% per month. The farmer's produce is then transported to Makambako, where it is cleaned and prepared for sale in Dar es Salaam. TBM organizes and monitors all transactions up to the final buyer and is paid by the buyer. After deducting all costs relevant to the transaction, the remaining net profit is shared 90% with the farmers from whom the advance is recovered and 10% with TBM for its TSS services. A final transparent calculation allows to show each single farmer how the deal went for him or her ([appendix E](#)). A calculation example for the TSS business for the smallholders who participated in the prototype test run is presented and evaluated in chapter 8.

7.3 Impact

One of the main reasons for focusing the case study on a credit model using trees as collateral for smallholder farmers in the Iringa region is the challenge, the unsustainable practice of premature tree felling for a quick profit by smallholders, which harms the environment and local communities. In addition to GTAC, other strategies are being developed to address this issue, such as finding alternative sources of income for the collateral used by farmers in the GTAC model, such as introducing carbon credits. Carbon credits have become a potential source of revenue for individuals and companies that promote sustainable forest management. The credits are earned by planting trees and reducing carbon emissions and can be sold on the international market (meeting #21). Green Resources Ltd. is one such company that has successfully implemented a carbon credit system in the Iringa Region of Tanzania and uses Voluntary Carbon Standards (VCS) to track and validate forests to an international standard. 10% of the profits go to the village fund to be used for education, water supply, health, and infrastructure (meeting #22). But it is difficult for smallholders to meet the standards developed for larger companies. It was mentioned by Kimey (meeting #22) that a standard is missing for carbon credits on the smallholder level. In Usokami, a new business opportunity has arisen for those who can plant trees, as the One Acre Fund offers 450 shillings per tree per year for those who participate. The tree seedlings were acquired for free from an acreage fund to be used specifically for carbon production. Participants are responsible for planting and maintaining the trees and receive a higher payment per tree after three years (meeting #29). This offers the people of Usokami the opportunity to make a profit while contributing to a more sustainable future. Smallholders in Usokami were advised by One Acre Fund not to harvest their trees prematurely, as they would then no longer receive carbon credits (meeting # 29). However, this business opportunity highlighted by the One Acre Fund is difficult to reconcile with the GTAC model, where trees must be of a certain age to be used as collateral, and for carbon credits they must be freshly planted. Both models could be used consecutively in the long run. Carbon credits are a promising way for individuals and companies to promote sustainable forest management and contribute to offsetting carbon emissions. Biodiversity credits are another potential source of revenue for sustainable forestry practices. In an interview with Dr Nyamoga of SUA (meeting #33), the potential for a biodiversity credit system and certification was discussed. The idea is that people and institutions

GTAC model

will be willing to pay more for biodiversity standards. GRACOMA, the local growing asset manager, could also measure and manage biodiversity criteria in buffer zones and the validation of native trees and receive biodiversity credits in return. This service could also be offered to smallholders who own land in the buffer zone and at the same time could use their trees as collateral (meeting #23). However, the link between biodiversity and economic income needs further research. Currently, research is being done on biodiversity in protected areas and the value of biodiversity, as Tanzania is a biodiversity hotspot (i.e. Udzungwa National Park). Tanzanian national parks could also be interested lenders who would pay for such a model (meeting #33). In addition to carbon and biodiversity credits, the value of trees can also be enhanced through non-timber forest products such as honey, fruits, and mushrooms, which can be marketed to generate additional income for communities. Promoting alternative strategies to maximize land use can have unintended consequences, as in the case of the clearing of indigenous Mikusu trees to make room for commercial pine or eucalypts, which runs counter to the principles of sustainability (meeting #21). In a brainstorming session during a visit to the local forests of Magunguli, Bahat Tweve (meeting #14) suggested the "Plenter Forest" strategy, where trees are harvested and cut according to size, rather than clear-felling entire plots, thereby achieving more frequent and regular payouts. Indigenous trees take longer to grow and have a higher value, but the government of Tanzania prohibits the harvesting of indigenous trees. The concept of planting a forest with natural trees and high biodiversity without harvesting them has also been discussed as a means of promoting sustainable land use.

In summary, to assess the potential sustainability impacts of the GTAC model an SDG analysis was conducted ([appendix I](#)). This analysis aims to show the extent to which the GTAC model can contribute to the achievement of the SDG targets if implemented effectively. Through GTAC, smallholder farmers can obtain loans to invest in projects that further contribute to the United Nations Sustainable Development Goals (SDGs) (United Nations, 2023). The success of the GTAC would promote economic growth in the villages by enabling more smallholder farmers to access credit and make larger investments. This would increase villager's confidence and political will to address local challenges and create appropriate facilities, such as schools, clean water systems and affordable and clean energy. Furthermore, the GTAC model would not only provide credit to smallholder farmers, but also create new jobs in pre- and post-harvest value addition. Growing trees in individual plantations or community forests could also be used to establish a health insurance scheme for villagers, where growing trees are accepted as payments for insurance-policies. The GTAC model aims to promote sustainable forestry practices that do not involve clear-cutting but continuous selective harvesting and reforestation of mixed forests, preferably with native species. This approach can lead to more regular income streams for smallholders and contribute to biodiversity conservation and forest resilience. In addition, the GTAC model implementation would encourage smallholders to plant trees and increase biodiversity buffer zones around national parks.

8 Prototype test-run in Magunguli

As part of the case study, the need to test a GTAC prototype with smallholder farmers from the Iringa region was identified. It emerged from the discussions with bank stakeholders that it is difficult to find a local bank that is willing to invest in such a model, as there are no empirical values yet (meeting #18, 19, 32). Therefore, the Swiss foundation farip took on the task and played the role of the financial institution in testing the prototype. The smallholder farmers from Magunguli, Kiyowela and Isaula were all interested and motivated to participate in the test run (meeting #17, 25, 26). It was decided to conduct the test run in Magunguli, as GRACOMA is based there. The success of the GTAC prototype test run is assessed based on certain assumptions, including agreement on loan terms and use, proper documentation of the forest plot, disbursement of the loan via mobile payment or in cash, and repayment of the loan including interest. Data collection on registration forms, loan agreements, photos of forest monitoring and loan utilization, and feedback from farmers and village authorities has also been identified as critical to assess the success of the prototype ([appendix F](#)). Further testing will need to be done to establish a track record. A possible role for the financial institution that is more on the ground could be a private bank like the one from Mville, which has expressed interest in testing this model (meeting #24). The GTAC prototype test run in Magunguli started in January 2023 and is still ongoing. The following sub-chapters document how the GTAC model from chapter 7 was applied to the prototype.

8.1 GTAC prototype roles and responsibilities

The GTAC prototype test in Magunguli involves several crucial roles and responsibilities. Specifically, ten smallholder farmers from Magunguli are participating in the prototype test-run, half of whom grow potatoes and the other half beans. These farmers want to use the loan they receive to grow their crops and repay the loan with interest at the end of the term. For this they agree to participate in the registration of their forest plots and provide feedback on the loan process. The FI, in this case farip, is responsible for granting loans to the smallholders and checking their eligibility. Under the prototype, farip also takes on the role of GRACOMA, which acts as the local growing asset collateral manager. Its tasks include the registration of forest plots, the proper valuation of trees serving as collateral and the monitoring of forest plots during the loan process. Two field agents are also involved in the prototype test: Elibariki Tweve, who is farip's local loan officer responsible for disbursing loans and monitoring repayment, and Ragpar Tweve, who is the forest steward and local field agent of the loan officer. Ragpar Tweve, in the role of field agent, is responsible for monitoring the proper use of the credit by the smallholders and, in the role of forest steward, for monitoring the registration and supervision of the forest during the process. The village executive officer of Magunguli, Davies, is involved in the prototype test as the village authority. He is responsible for attending the test run, providing CCRO land ownership documents, and assisting with any issues that arise. Bahat Tweve, through his company TBM, has agreed to market the farm produce of all smallholder farmers participating in the GTAC test run. This ensures that farmers

Prototype test-run in Magunguli

can market their produce in a fair and transparent manner and repay their loan contracts when there are no external influences to prevent this. Overall, the success of the prototype depends on the effective coordination and cooperation of all these key roles and their respective responsibilities.

8.2 GTAC Steps

The GTAC prototype tested did not meet certain requirements. The test involves smallholder farmers who are members of the Magunguli farmer and tree grower association. The roles of the loan officer and field agent are played by Elibariki Tweve and Ragpar Tweve respectively, as mentioned in chapter 8.1. However, no suitable insurance option for crops or trees has been found. Furthermore, the financial institution farip operating under the GTAC model has not applied to PASS or TADB for a guarantee scheme, nor is there any Buri company that would repay the smallholder's debts. This lack of guarantee increases the risk of loan misuse when farmers have unforeseen expenses. Therefore, in such cases, it is important to talk to each farmer and advise them on a case-by-case basis ([appendix E](#)).

Step 1: Request of loan

In this case, the smallholders did not apply for the loan. The loan was proposed to the smallholders at a meeting with them in Magunguli (meeting #17).

Step 2: Risk Assessment

The risk assessment process for the prototype involves several steps. The first step is to verify the land ownership and tree ownership, which is done by Ragpar Tweve, Elibariki Tweve, Davies and the respective farmer on site. This involves collecting information such as the name of the village, the name of the owner, a sketch with the names of the owners of the surrounding land, the size of the land, the type of trees and the age of the trees. In addition, the land ownership is officially recognized by the village executive officer, Davies, as a CCRO. In the second step, the farmer's entrepreneurial skills are assessed, but no verification is done for the test run as the smallholders were selected by farip. The third step is tree registration, which records the tree species pine, eucalyptus or wild, the age, size, and the market price. The age is expected to be over 9 years old for this prototype and the size is about 5 cubic feet for a 10-year-old tree. Table 2 shows how to calculate the value of the tree, i.e. which and how many trees are needed to cover the loan amount for a collateral. To determine the value of each tree according to its age, a target value of TZS 50,000 was set for a 20-year-old tree standing in the forest. This value is based on the local spot market price for wood on the day of registration, considering that the price of wood also increases rapidly due to inflation, but is not included in the calculation due to the complexity and knowledge gap at the local level. However, younger trees add less value each year, while older trees add more value each year. Therefore, a column called "difference from previous year" was added to capture the additional value each year. For example, a 10-year-old tree is only TZS 2,000 more valuable than a 9-year-old tree, but an 18-year-old tree is TZS 5,000 more valuable than a 17-year-old tree. The same figures were used for Paina and Eucalyptus and are based on assumptions. To cover the

Prototype test-run in Magunguli

loan amount and the risks for the financial institution, an LVT of 75.5% has been used, i.e. if the loan is TZS 850,000, then the amount to be covered by trees is TZS 1,171,300. The LVT used is also based on assumptions and can be discussed on a case-by-case basis. With the tree calculation table in table 2, the number of trees of a certain age that must be present on the registered and reserved forest plot to secure the loan can be checked. For example, if a farmer has 9-year-old trees, there must be at least 117 nine-year-old trees on the plot to secure a loan of TZS 850,000 ([appendix E](#)).

Bean farmer contract agreement							
Purpose of the loan	Bean production						
Loan issuing date	01.02.2023						
Repayment term	6 month						
Loan amount*	850'000 TZS per acre						
Interest rate	1% per month						
Total interest	51'000 TZS						
Repayment amount	901'000 TZS						
Loan-to-value ratio	72.5% (1.3x)						
Amount to be secured with trees**	1'171'300 TZS						
Bean production costs per acre*	Calculation	Value (TZS)	Pine / Eucalyptus **	Value standing tree (TZS)	Diff. to previous year	# trees to secure the loan	# trees for GRACOMA fee
Seeds	2 buckets x 50'000	100'000	5 years	5'000		234	9
Round up (weeds chemical)	5 liters x 14'000	70'000	6 years	6'000	1'000	195	8
Fertilizer	2 bags x 140'000	280'000	7 years	7'000	1'000	167	6
Water fertilizer for leaves	3 liters x 10'000	30'000	8 years	8'500	1'500	138	5
Sowing chemical	2 liters x 20'000	40'000	9 years	10'000	1'500	117	5
Pesticides chemical	2 liters x 25'000	50'000	10 years	12'000	2'000	98	4
Weeding	2 liters x 30'000	60'000	11 years	14'500	2'500	81	3
Planting labor costs	1 acre x 70'000	70'000	12 years	17'000	2'500	69	3
Cultivation labor costs	1 acre x 70,000	70'000	13 years	20'000	3'000	59	2
Transportation	40'000	40'000	14 years	23'000	3'000	51	2
Contingency	40'000	40'000	15 years	26'500	3'500	44	2
Total	=	850'000	16 years	30'000	3'500	39	2
			17 years	34'000	4'000	34	1
			18 years	39'000	5'000	30	1
			19 years	44'500	5'500	26	1
			20 years	50'000	5'500	23	1

Table 2: Contract agreement and GRACOMA fee calculation based on own data ([appendix E](#))

Step 3: Contract agreement

The criteria such as interest rate, loan volume, repayment period and collateral value have been defined in the focus group meeting with farmers from the farmer and tree grower association in Magunguli (meeting #17). The smallholder contract included in the prototype for bean and potato farmers has three building blocks for the contractual arrangement. First, there is a loan agreement between the financial institution (FI) and the farmer, which sets out the terms of the loan. Second, there is a tree registration agreement, which documents the risk assessment carried out in the risk assessment process. There is also a contract between the farmer and GRACOMA that specifies the fees for GRACOMA and the rules that the farmer must follow. In addition, there is a third building block in this prototype, a contract between TBM and the smallholder farmers for the marketing of the farm produce, which is not required for the GTAC model but may be optional. The contract was authenticated with a stamp and the signature of the village executive officer ([appendix E](#)). The calculations and terms of the contract are shown in table 5 in the example of a bean farmer. The input costs for the smallholders were calculated by the smallholders themselves in the focus group meeting in Magunguli, specifying the amount of credit they would need for one harvest season, and specifying the purpose of the credit. The interest rate was set together with farip and the smallholders at 1% per month and a repayment period of 6 months was defined (meeting #17).

In the GTAC system, it may seem simpler for the financial institution to provide a loan of TZS 850,000 million to the bean farmer and pre-finance the GRACOMA fee of TZS 60,000, which is then added to the repayment amount that the farmer has to pay at the end of the loan period. However, this approach is not accepted by smallholder farmers as it seems too risky for them to pay cash for another service, as this way they cannot fully exploit the potential of post-harvest value addition capacity. Therefore, an alternative mechanism is needed to facilitate the effective use of resources. In the prototype model, it was decided that smallholders would pay an additional fee for the services provided by GRACOMA, the fee is paid in form of trees being marked by the forest steward in the smallholder's respective forest plot. As table 3 shows in value, a fee of 7% was set and the required number of trees to cover this fee was calculated and presented in the column "Number of trees to pay the annual GRACOMA fee for this loan per year" in table 2. For example, for a loan of TZS 850'000, a farmer with 9-year-old trees has to deliver 5 trees to GRACOMA each year and another 4 trees the following year if the loan is for two years. This method has not yet caught on, as it requires GRACOMA to be able to pre-finance itself, i.e. obtain a long-term loan, as the trees only bring financial value when they are to be harvested. In this prototype, it is working so far, as farip is playing GRACOMA. A separate agreement with farip has been made for Ragpar Tweve, who is both a forest manager employed by GRACOMA, and a field agent employed by farip in this prototype. This agreement includes a payment contract with farip in which Ragpar Tweve receives TZS 400,000 per month for his duties as forest steward and for his role in preventing locals from interfering with lending. Table 3 shows a potential positive profit calculation of

Prototype test-run in Magunguli

GRACOMA with the income and labor costs for the forest manager per acre and year, whereby the figures are based on assumptions made by local entrepreneurs and are feasible on the ground.

GRACOMA profit statement		
Income	GRACOMA fee per acre p.a.	7% (i.e. 1x mature tree)
	Income per acre p.a.	59'500 TZS
Labor costs forest steward	Time to survey and register a plot	approx. 1 day
	Time to supervise 1 acre p.a.	approx. 2 days
	Annual fee for 100 acres (full capacity)	5'000'000 TZS
	Annual fee per acre	50'000 TZS
Costs	Total costs	50'000 TZS
Profit	Total profit	9'500 TZS

Table 3: GRACOMA revenue model based on own data ([appendix E](#))

In future, the role of the field agent of the loan officer should be remunerated by the loan officers through a commission based on the interest earned on the loans. To ensure the success of the GTAC model, it is crucial that clear and comprehensive contracts are drafted, setting out the loan terms and fees for all parties involved, such as the forest steward and the field agent, and that they are authenticated with a stamp and signature of the village authority. In addition, it is recommended that the GRACOMA fee be negotiated directly with the financial institution and the smallholders as part of the contractual arrangements, considering that GRACOMA requires an advance payment to cover costs ([appendix E](#)).

Step 4: Loan issuing

On 16 January the loan for the bean farmers was disbursed, and on 22 March the loan for the potato farmers. The disbursement process was monitored by group members and the village executive officer Davies, who acted as a witness. The loan was disbursed in cash by ELISEMA, the company of the local loan officer for farip Elibariki Tweve ([appendix E](#)).

Step 5: Monitoring & Coaching

Ragpar Tweve, the local forest steward, plays an important role in overseeing the lending process. He acts as the eyes and ears of Elibariki Tweve as the loan officer in Tanzania. Ragpar Tweve also keeps a ledger recording a farmer's monthly expenditure until harvest and sale. Elibariki Tweve sends a report to farip (the FI in this prototype) every month. In addition, Ragpar Tweve is responsible for checking whether the loan is used to grow beans or potatoes and for monitoring the cultivation costs for each farmer to ensure that the funds are used for the intended purpose. During the meeting in Magunguli where the contract was signed, Elibariki Tweve carefully explained the whole loan procedure to the smallholder farmers. This was an important step to ensure that the farmers understood the terms of the contract and the procedure for obtaining and repaying loans. The forest steward also acts as a coach for

Prototype test-run in Magunguli

the smallholders on the principles of forest management. He conducted a tree assessment with the farmers and explained how it works. This was an important part of the process as it helped the farmers to understand the value of the trees they planted and how they can benefit from them in the long run ([appendix E](#)).

Step 6: Marketing

TSS calculation for bean farmer		
	What	In TZS
COB	Units of agricultural produce per acre	30 x
	TSH per unit (spot market price)	45'000
	COB amount	1'350'000
Middle costs	Middle costs (i.e. transport, taxes, bags, rope, loading, unloading) per unit	2'733
	Total middle costs	82'000
	% of waste from cleaning, processing	Open
Calculate Net income	Income from sales per unit delivered	55'000
	Total amount	1'650'000
	(-) total middle costs	82'000
	minus 1% interest on COB	13'500
	Total net income	1'554'500
	% commission for TBM	10
	Total commission for TBM	155'450
	Earnings for agricultural produce	1'399'050
	(-) COB (paid in advance)	1'350'000
Bonus for farmer	Expected total earnings for bean farmer	49'050
Revenue TBM	Total Commission for TBM	155'450

Table 4: TSS calculation for bean farmer based on own data ([appendix E](#))

It is agreed that the farmers in this prototype would market their bean and potato produce through TBM. In a TSS deal the smallholder receives an advance payment (COB) based on the quantity brought in. After collecting the produce from the smallholder's farm by truck, TBM takes care of everything needed to get the beans and potatoes to market, such as packing, cleaning, loading, transport, unloading and more. TBM finds a buyer in Dar es Salaam who pays a good price, and TBM deducts all the "middle costs" incurred. The remaining amount is split between the farmer and TBM according to the TSS contract, with 90% going to the farmer and 10% to TBM. TBM deducts its commission from the farmer's share, recovers the COB advance and pays the remainder as bonus to the farmer. Table 4 shows an example of an expected TSS deal that could be offered to one smallholder farmer, participating in the test-run, and producing beans. The bean farmer receives an advance "Cash on the Bag" of TZS 45,000 per unit, i.e. for the delivery of 30 buckets of beans, i.e. a total of TZS 1,350,000. The interest on this

Prototype test-run in Magunguli

advance is TZS 13,500 and the total middle costs are TZS 82,000. The beans are expected to be sold in Dar es Salaam at 55,000 TZS per unit, a total of 1,650,000 TZS. After deducting middle costs and 1% interest on the COB advance, the farmer is left with a net income of TZS 1,554,500. From this, TBM deducts 10% as commission, leaving the farmer with TZS 1,399,050, from which TBM recovers the TZS 1'350'000 advances. This results in the remaining 49'050 becoming a bonus that TBM pays to the farmer. Assuming that all material costs are covered by the loan of TZS 850,000 at 1% for 6 months, the farmer is thus left with a net profit of TZS 498'050 from the one-acre beans field ([appendix E](#)).

Step 7: Repayment

It was discussed that when marketing the agricultural produce, TBM will pay the COB to farmers. After sales of the beans, a joint event for finalizing the deal and repaying the loan will be organized. Bahat Tweve together with Elibariki Tweve will be present, whereby Bahat Tweve explains the details of the deal to farmers and pays them out their bonus, and at the same time farmers can repay the loan with interest. After repayment the trees defined as collateral will then again be freed to stand in as future collateral ([appendix E](#)). The success of the prototype test-run will be evaluated based on the successful repayment of the loan plus interest. If successful it may be decided to explore the option to do another test-run and give the farmers a second loan with the FI role played by a local FI such as the private MFI from Mville.

8.3 Mid-evaluation May 2023

In April 2023, all loan agreements with the bean and potato farmers in Magunguli village have been signed. However, the farmers are currently facing a challenge due to heavy rains, which will make it difficult for them to dry their beans properly. The loan agreement with the bean farmers was signed on 16 Jan and with the potato farmer on 22 March with the village executive officer as a witness. Elibariki Tweve, who conveyed the feedback from the farmers, mentioned that they were very happy with the loan and promised to use it wisely so that they would be eligible for future loans. Ragpar Tweve sent photos to show the farmers progress and preparations for planting. However, due to the heavy rains, the farmers for potatoes had to start weeding earlier than usual, which took more time. In February, bean farmers were busy with weeding, while in March they started planting and sowing. Overall, both bean and potato farmers seem to be making good progress in preparing for planting despite the heavy rains. However, more attention needs to be paid to drying the beans, as this could affect the quality of the crop ([appendix E](#)).

9 Discussion

The discussion follows the same structure as the GTAC process, discussing the defined factors assessed through the risk importance assessment and the defined risk mitigation strategies in chapter 6. The case study findings are largely consistent with existing literature on the difficulties faced by smallholder farmers in the Iringa region in accessing agricultural finance. Although the Tanzanian government, IFAD and TADB, as well as several private sector financial institutions, have developed innovative agricultural finance solutions over the years (IFAD, 2022; GoT, 2021; Hon. Dr. Magufuli, 2020), all smallholder farmers interviewed during the case study indicated that they were unaware of or did not have access to financial products that meet their needs. Why is this? Given the longer repayment periods during the harvest season, the payment of interest only after the harvest, and the externalities that increase the likelihood of crop failure and thus increase the investment risk for financial institutions, there is clearly a need for a more tailored approach to agricultural credit. This shows a lack of interest on the part of existing financial institutions. As confirmed by the case study data, this is due to several factors, including the risk that financial institutions take when lending to farmers with fluctuating incomes and the so-called misallocation of funds by smallholder farmers. Surprisingly, some of the stakeholders interviewed (meeting #15, 18, 24) mentioned that they had no experience with clients who could not repay or that the default rate was very low. It could be assumed that financial institutions have a very low rate of clients in the agricultural sector or that they are only reluctant to lend to farmers because they must bear more risks due to seasonality and different contract variables. The results of the case study conducted by Weber & Musshoff (2012) in Tanzania confirm that agricultural enterprises are 3% less likely to obtain credit. The study shows that agricultural borrowers have a 14% lower default rate on loan repayment compared to non-agricultural borrowers. This suggests that the credit risk of agricultural clients is overestimated. It is therefore worrying that agricultural businesses are still more likely to be denied access to credit compared to non-agricultural businesses, even though they have a lower default risk. This raises the question of why loan officers see smallholder farmers as their clients primarily as a risk and are afraid of a bad portfolio, which discourages them from taking on smallholder farmers as clients. Currently, there is no innovation in the market that offers financial institutions enough incentives and collateral to offer pre-harvest credit to smallholder farmers and has a track record worth investing in. Both sides must always be considered when devising a well-functioning financial model. For example, Macha et al. (2018) found in their study that the low uptake of microfinance services by smallholder farmers in rural areas was due to factors such as high interest rates, lack of understanding and fear of losing personal assets as collateral required by banks in Tanzania (Bank of Tanzania, 2014; Macha, Chong, & Chen, 2018). However, only two stakeholders respectively Kisanga (meeting #32), a loan officer from NMB, and Dr. Shirima (meeting #35), a professor from Sokoine University of Agriculture, mentioned the lack of title deeds as a problem hindering financial access for smallholder farmers; none of the smallholder farmers saw the lack of title deeds as a problem, nor did the local authorities, as they are mainly allowed to issue CCROs. The problem is rather the fear of losing valuable

Discussion

personal assets such as land or houses. This fear is not adequately addressed in the offers made by the NMB and other national banks to lend to smallholder farmers to invest in their pre-harvest resources such as fertilizer. The loan products offered and examined in the study emphasize the need for high collateral to obtain a loan. Given the risky nature of agricultural credit, it is obvious that financial institutions require some form of collateral when considering the collateral provided by farmers. Furthermore, in addition to collateral, NMB requires a contract for delivery of the crop to a processor or buyer, as offered under the Outgrower's scheme, another product on the market that provides credit to smallholder farmers for the purchase of their inputs, but which poses other challenges, such as the reliance on a single buyer highlighted by IFC (2012), and this model continues to require high collateral, which does not solve the problem. Scheuermeier also highlights that the term "outgrower", which originates from the plantation economy, has little to do with smallholder systems and often even hinders their resilience. The result is a system that is very dependent on a single-product plantation and its dependence on the world market, to the fluctuations of which the plantations are notoriously unable to react with much resilience ([appendix G](#)). Some researchers such as Kadigi & Falanta (2018) have suggested using agricultural commodities as collateral, along with a WRS. This approach has been funded by the national government for several years. However, the findings of this case study have shown that the most pressing need of smallholder farmers in the Iringa region is access to microcredit for the purchase of inputs so that they can effectively plan their harvest season. This need is not met by the WRS, which focuses primarily on "pledging existing stocks" (Kadigi & Kalanta, 2018, p. 5). Furthermore, the use of produce as collateral requires that farmers have already harvested a crop, which is not always the case. Many smallholder farmers do not have access to the inputs needed for harvesting and are therefore forced to sell their produce on the spot market at a low price that may not cover their basic needs. Considering that 61.5% of Tanzania's labor force is employed in agriculture but only generates about 26% of the country's GDP (Mwonge & Naho, 2021; IFAD, 2022), it is questionable why there is so much focus on long-term solutions that does not meet the immediate needs of smallholder farmers in the Iringa region. However, it can be argued that post-harvest marketing plays a crucial role in the smallholder's ability to repay the loan. Therefore, the GTAC model has included marketing as a step in its model and recommends that the produce is either collected and jointly marketed by the farmer and the tree grower association or partnered with another system such as a local WRS operator, AMCOs or TBM. As Respikius (2021) points out in his study, trust is crucial in the timber value chain, especially in the spot market and in relational governance. In the spot market, there is a lack of trust, which hinders cooperation, while building trust facilitates the exchange of market information, reduces opportunistic behavior, and improves coordination between actors. Capital, technology, and market information empower value chain actors. Government should facilitate access to these resources to ensure balanced power dynamics and equitable benefits. Improved access to market information increases transparency and strengthens trust between actors. This can be applied primarily to the agricultural value chain as well, and future research should explore strategies for building trust in

Discussion

the agricultural value chain. Another much-publicized model is SACCOs, of which its failure has recently been discussed more than the actual functioning of the model, both in the interviews conducted as part of this case study and in the literature. FinScope (2017) found that local financial institutions have lost trust in SACCOs due to mismanagement, leading to shortcomings in accountability, while Magali & Qiong (2014) argue a lack of proper credit risk management techniques. The reasons for its failure are debatable. One view expressed by Amani (meeting #2) is that the formalization of SACCOs has led to higher costs for hiring managers and other expenses, which in turn has led to shortcomings in accountability. Another view expressed by Kenneth & Hebel (meeting #19) and Kisanga (meeting #32) is that managers of SACCOs lack entrepreneurial skills, leading to mismanagement and failure. The case study findings showed that the newly introduced AMCOs are currently the most popular cooperative to lend money deposited by the group as collateral with local financial institutions. However, even this approach does not cover pre-harvest financing needs, as their business model is more focused on marketing agricultural products by also providing storage and sometimes selling inputs at fair prices. And it must be mentioned that they are exposed to similar risks as SACCOs. Scheuermeier believes that cooperatives devour far too much social capital. He made the example of observing what happens in the group when a farmer's family fails because of an emergency, they feel ashamed, and some farmers feel disadvantaged because they are more successful and pay more for those who fail. He also pointed out that public actors often try to form such groups, but that smallholders should not be organized from outside, that smallholders are happy to organize themselves if they see the need, as they do with the farmer and tree grower associations, for example ([appendix G](#)).

Thus, there is no tailor-made product, either in the literature or in practice, that meets the needs of smallholders, i.e. gives them access to finance without losing their most valuable and important assets. Therefore, this paper proposed the objective of the GTAC model with the use of another collateral, such as growing trees, which have value but are not lethal to farmers. Although it is a young system offered in some countries, there is almost no research on trees as collateral for agricultural production loans, but only for forestry itself, as also examined in the study by Starfinger (2023). Regarding the development of the GTAC model in this case study, it is useful to compare it with the Thai case study on tree collateral by Starfinger (2021). Although in comparing the Thai model, Scheuermeier argues that the Thai model follows a strictly hierarchical top-down organization where smallholders are forced into prefabricated and standardized institutional conditions. He highlights that an agile approach is emphasized for the GTAC model, which requires continuous adaptation to local organizational or institutional conditions. In addition, it must be said that the Thai model of Starfinger (2021) is an already functioning model, while the GTAC model in Tanzania is still under development and has emerged through the business innovation GRACOMA, which provides collateral management for forest land. There is criticism that in the Thai case, tree collateral is mainly an add-on to traditional land-based collateral to increase loan volume. Field research has shown that local banks in the Iringa region also offer other assets such as

Discussion

trees as an add-on to increase loan volume, and they have confirmed that the use of trees as pure collateral has not yet been discussed but could be an option if the situation is secured in case of farmer default (meeting # 18,19,32). Starfinger (2021, p. 7) also points out that "many smallholders only have access to two-tier credit because they do not own land, which raises the question of the extent to which the actual target group is being addressed". In Thailand, as mentioned earlier, the issue of land ownership has been addressed through the offer of CCROs issued by the local authority as an intermediary. As for the use of trees as collateral only as an additional product, there is a consensus that this would not meet the needs of farmers and would not solve the problem of lack of access to finance for smallholders.

Several authors such as IFAD (2022) have also pointed out that the high transport costs incurred by borrowers living far from credit bureaus in remote areas, influenced by lower population density and poorer infrastructure, make agricultural credit expensive and unattractive to financial institutions. Infrastructure is clearly an issue that the government needs to invest in. Although the interface function of a field agent providing information and monitoring to the loan officer in the nearest town to reduce transaction costs as proposed in the GTAC model, it is questionable whether this would be financially feasible as the field agent would have to be paid by the loan officer at a percentage covered by the interest rate charged to lenders, which cannot be more than 10% for agricultural purposes. The GoT (2021) recommended that a bank must provide evidence of lending to agriculture at an interest rate not exceeding 10% per annum. As in Starfinger's (2021) model, which uses the establishment of village-level bank branches to reduce transaction costs, it is not attractive for the Tanzanian market to open a banking facility that stores money at the village level for security reasons. Or as Starfinger et al. (2023) summarize, the most proposed strategy to reduce transaction costs is to aggregate smallholders to serve a group rather than at the individual level. While this lowers transaction costs, it also carries other risks, such as the establishment of an accountable financial institution at the village level. Nevertheless, GTAC requires smallholders to be members of a farmers and tree growers association, but not only to reduce transaction costs, but also to create a trustworthy environment for smallholders that the model is officially viable with the confirmation of the village authority as a witness, which is also recommended and defined as a prerequisite for the application of the GTAC model. To create an additional relationship of trust between the financial institution and the smallholder farmer that facilitates the assessment of the client's character and entrepreneurial suitability, the GTAC model proposes a local field agent who, while not having expertise in financial matters, can act as a communicative facilitator and provide the financial institution's loan officer with the necessary monitoring information and relevant documents to prove suitability.

It is clear that the potential credit default prevents FIs from investing in agricultural finance. In this context, IFC (2012) has discussed another risk, namely the lack of true risk diversification. Smallholder farmers tend to focus on one or more activities that are all exposed to similar key risks, such as weather

Discussion

or price risks, and are therefore more likely to default (IFC, 2012). This is at odds with Scheuermeier's observations. He argues that smallholder farmers in the Iringa region are highly diversified both in their production and in their broader livelihood system, which includes off-farm income, i.e. sister as a domestic worker, brother as a truck driver, forming a livelihood network. Resilience comes from diversification, and this is what crucially differentiates smallholders from large-scale plantations, which are much less resilient ([appendix G](#)). To encourage financial institutions to invest in lending for agricultural pre-harvest purposes, farmer's fear of default needs to be properly addressed and mitigated. The role of re-insurance, which is highlighted in the literature and by the banks interviewed as a way to mitigate the risks associated with agricultural credit and thus a viable option for investing in a tree as collateral model, is therefore a prerequisite for the successful implementation of the GTAC model. Government initiatives in this direction include the promotion of agricultural finance through the provision of capital to TADB's under the SCGS scheme (Hon. Dr Magufuli, 2020; IFAD, 2022; Government, 2021). This measure has only recently been promoted and has hardly been studied in the literature. The TADB only acts in the background by providing guarantees to financial institutions, which according to a TADB staff member (meeting #39) should have a wider network and access to smallholder farmers in rural areas. The lack of knowledge about a third party providing a guarantee mechanism that covers at least 50% of the loan amount if a smallholder farmer does not meet his obligations may prevent the so-called "moral hazard" that a farmer without risk does not have to repay investments. It can be discussed that the farmer's fear of losing his collateral, which prevents him from getting a loan, is not considered in this approach. If a farmer knew that the risk of losing his collateral was shared, such as a plot of land or a house in the normal case, this might also provide a greater incentive to take out a loan. Unfortunately, tailored agricultural insurance options such as index-based insurance or crop insurance are also lacking or are only just being piloted, as confirmed by studies by Ntukamazina et al. (2017), Osumba et al. (2020) and agricultural insurance provider Acre Africa. According to the study by Starfinger et al. (2023), collateral mechanisms have been analyzed in different approaches beyond the traditional creditor-debtor relationship. The use of local associations of creditors is most frequently mentioned in the literature, followed by intermediary parties such as NGOs or warehouse managers, or third parties providing certificates with ongoing valuation and verification of ownership are effective methods of collateralization and thus the most common categories of risk management. However, no potential third party was identified to cover the debts of smallholders in case of default and receive the collateral. In contrast, insurance of collateralized assets, especially microinsurance, was less mentioned by the internationally operating models that use trees as collateral.

In Tanzania, there is little or no work on tree valuation methods to calculate the value of trees as collateral. RECOFTC (2015) presents the different valuation methods based on a case study project in Laos and mentions the most common methods such as stumpage value, predicted value and a plantation certificate to determine the current value of the asset. Scheuermeier argues that stumpage value only

Discussion

works for clearcutting. For plenter management in mixed forests, as envisaged by Bahat Tweve and already practised by the people of Magunguli, stumpage value is useless. Plentering is about felling individual trees and letting the rest continue to grow ([appendix G](#)). TAFORI (meeting #37) stresses that the valuation process should also consider the different tree species and their respective harvesting methods. They suggest developing a validation method for the national level, which requires knowledge of the specifics of tree assessment at farm level. A tool could be developed to assess validation, recommend secondary tree species that could fit on their forest land in terms of biodiversity and higher value addition, and provide mechanisms for smallholders at the institutional level to plant trees on the right land and increase profitability. TAFORI is exploring a tree valuation tool that could provide collateral to banks and ensure that they are doing the right business with farmers (meeting #37). As the test run of the prototype showed, a target value was used that defined the market value of a mature (20-year-old) tree based on assumptions about spot market prices prevailing locally at that time, neglecting the inflation rate expected in the future. To implement the GTAC model with an official bank in the role of financial institution, more accurate values for the valuation of the trees need to be provided. Scheuermeier reports here from his experience that the smallholders have a good sense of what their trees are worth, and they can explain the derivation quite simply, i.e. what the loggers are willing to pay them for each individual tree or for cutting down a plot. So far, he has had no problems getting suitable figures from them ([appendix G](#)). A plantation certificate can be chosen that not only provides the financial valuation through a stand-based valuation, but also a stand valuation. In the prototype test run, this is essentially done by the forest manager adding a document to the contract indicating the ownership of the trees with the name of the owner, a sketch with the names of the owners of the surrounding plots, the size of the plot, the tree species, and the age of the trees. The valuation uses a target value for each tree species and age and records the difference between the value and age each year to calculate the trees of each species and age required to cover the loan. BAAC (2018), a Thai bank, accepts plantations that are at least one year old as collateral. The Iringa district authority, on the other hand, sets 18 years as the minimum age at which a standing tree can serve as collateral, which puts some obstacles in the way of the model. Clearly, an age limit can play a corresponding role in enabling smallholders who have land and can plant trees but must wait until the trees reach a certain age to access finance, which hinders the development of the GTAC model. If there is no age restriction on trees that can be used as collateral, the trees planted can be used for carbon credits and as collateral that contributes to higher incomes for smallholders. Starfinger (2021) divides the collateral valuation process into different steps, starting with the inventory by the smallholder, followed by the inspection of the land by the bank and the inspection of the plantations by the BAAC-trained local committee, which verifies the measurements and complements them with geotagging and valuation. It is therefore also proposed that tree assessment be outsourced to an assessment institute, which will either assess or certify the plantations. In comparison, in the GTAC system, it is envisaged that GRACOMA will act as an independent body and manage the cultivated areas, i.e. registering forest plots and tree assessment. It can be discussed whether FSC

Discussion

certification can improve the ability of financial institutions to accept trees as collateral. FSC certification is mainly community or cooperative based (FSC, 2023), so GRACOMA could theoretically provide FSC certification for farmers and tree growers associations if this is beneficial for financial institution's decision to accept trees as collateral. But again, the question is who pays for this service, as this will be difficult to implement at the smallholder level and at the village level. Another issue that needs further discussion is how the GRACOMA system service will be paid for, as in other mechanisms mentioned by Starfinger et al. (2023), where a fee is calculated based on assessed stock value or credit volume, or fees calculated per forest plot or hectare. Under GRACOMA, a fee charged to smallholders in the form of cash is not yet accepted. Therefore, an alternative remuneration model was introduced - marking trees in the smallholder's forest plots as a fee for GRACOMA. This resulted in the requirement for the GRACOMA system to have a long-term credit line to finance its activities. This could also mean that GRACOMA could expand its business in the long term and adopt the BURI concept by taking over trees from short-term defaulters. Although the complexity of the system may seem daunting, simple credit solutions have proven inadequate in the past. Therefore, accepting the complexity of the system is key to unlocking its potential and ensuring its success.

10 Conclusion

The GTAC model developed as part of the case study provides a local agricultural financing model that meets the needs of smallholder farmers and financial institutions in the Iringa region, in Tanzania. It meets farmer's needs for agricultural input loans without requiring collateral that is too critical in case of default but provides sufficient collateral in the form of growing trees and a re-insurance option for financial institutions to have the security of recovering the loans and the corresponding interest at the end of the harvest season. The defined GTAC steps serve as a guide for the successful implementation of GTAC. The model has developed intermediary roles along the value chain, such as the role of the field agent, the role of re-insurance, the role of growing asset collateral manager, the role of the local authority and recommendations for marketing the produce. The test run of the prototype has helped to understand how the different elements of the system work together. The review of the operational details of the prototype has confirmed that, so far, two important levers need to be set in motion to move the scheme forward: the establishment of a reliable re-insurance institution and the development of GRACOMA into a fully functional independent organization. The success of the GTAC model thus depends on the establishment of a reliable re-insurance institution to support farmers in case they are unable to repay their loans, i.e. by adding an SCGS mechanism or by partnering with a crop insurance institution. Due to the lack of tailor-made agricultural insurance or tree insurance products available in the market and the inaccessible location in Dar es Salaam for smallholder farmers in the Iringa region, the BURI model was proposed in this case study. The idea of the BURI institution is to take over the debts of farmers who cannot repay their loans and purchase the secured trees for their business purposes. Another success factor is that GRACOMA is financially sustainable, using more accurate figures from official markets and incorporating inflation calculations. BURI's business model needs to be highly specialized and focused on long-term returns based on the increasing value of growing trees. In the long term, it is conceivable that BURI will also be operated by GRACOMA once it is established, but this needs to be further explored. In addition, the GTAC system recommends the involvement of a field agent equipped with a smartphone to provide local information and photos to the loan officer. Coordination between the loan officer and the field agent, as well as the use of mobile technology to reduce transaction costs, need to be further developed and tested for the system to be successful. As the case study shows, smallholder farmers in Tanzania own land and can plant trees, which gives the GTAC system the opportunity to grow beyond lending to farmers. The model can also be offered to villages that could receive loans for infrastructure, health systems and more, as was originally envisaged when the GRACOMA idea came up. Since three of the eight roles in the GTAC model were developed and proposed in this case study and there are no such institutions already operating in the market, the implementation of the GTAC model only serves as a guideline and encourages further testing and research in this area. In sum, the success of the GTAC system depends on the establishment of a reliable re-insurance facility, a fully functional GRACOMA institution and sustained coordination between loan officers and village field agents. In addition, the successful implementation of the system depends on

Conclusion

the creation of the necessary infrastructure and conditions by the promoters, such as the public sector creating conducive conditions and the agricultural value chain actors providing innovations that help smallholder farmers market their products in a fair and transparent manner. With these components, the system could promote sustainable forestry and agroforestry practices and provide farmers with access to credit. Using growing trees as collateral in a formalized financing model for smallholder farmers is a viable approach for improving agricultural production and marketing, providing smallholders with an option for financial resources much better adapted to their needs. As the model evolves, research questions arise such as managing forest plots to produce tree certificates that are even better accepted as collateral by lenders, reliable valuation of trees, development of forestry non-timber products, and improving timber processing to increase the value of standing timber. Demand for non-timber forest products is high, but there is little research on their management and their valuation. There is also the chance to explore how GRACOMA-managed small forests can access additional markets for carbon and biodiversity credits, and how to organize insurance policies for insolvent farmers against fires and other risks. Addressing these complex challenges posed by the GTAC model could lead to a strategic breakthrough for resourcing rural development in Tanzania.

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12 Appendix

Appendix A: Research Diary

Research Group Participants:

- **Rahel Guggenbühl:** Author of the master thesis
- **Ueli Scheuermeier:** CEO of farip
- **Bahat Tweve:** CEO of TBM, founder of GRACOMA and TECASECO, partner of farip and holder of a venture loan of the farip fund
- **Elibariki Tweve:** CEO of ELISEMA, a partner company of farip, takes care of the administrative work on site, financial issues of start-up support and acts as a coach for the ventures cooperating with farip, gets paid by farip
- **Urs Guggenbühl:** member of the Board of Directors from farip (present until the 06.11.2022)
- **Mauro Lanfranchi:** Master Student (present from the 07.11.2022)

About the research diary:

The meetings from the field trip were documented on a daily basis. It was used to record the opinions and statements of the participants. The interviews and focus groups were used to explore attitudes and opinions, identify common themes and patterns, and examine the potential impact of the financial model on the lives and livelihoods of local smallholder farmers.



The research team at a pre-wedding, called send-off party in Mafinga. Ueli, Elibariki, Rahel, Bahat, Mauro.



Urs repairing the car, while kids from Magunguli village are watching curiously.

🌐 in Dar es Salaam

Day 1 (30.10.2022)

1. Entrepreneur interview with Fatuma



Participants:

Fatuma: smallholder entrepreneur, owner of a restaurant in Dar es Salaam, start-up loan granted by farip

Research Group: Ueli Scheuermeier, Elibariki Tweve, Rahel Guggenbühl, Urs Guggenbühl

About the interview:

At the beginning, all participants introduced themselves, followed by an introduction about the purpose of the research group, not giving too much information about the tree as a security approach in order not to influence the opinion about it. The interview was conducted by the research team, who asked specific questions. The points listed are a summary of the answers given by the interviewee(s), other SH groups are mentioned directly.

Summary of the discussion

Prior knowledge agrifinance:

- When she started and had the dream of owning a restaurant, she did not know any produce
- She and some other villagers developed their own trust finance system between women and men
- Other financial products: she knows SACCOs, Vicoba
- Microfinance: she knows many, i.e. Assa, Black, Mkombozi, Pride Africa

Why didn't she ask them for help to set up the restaurant in the first place?

- Trust issues: they have done some strange things! They give a loan based on what they have. If they fail, they lose everything, and she doesn't want to risk that for the sake of her family. She cannot take that risk

How can they find out about financial products?

- Some institutions: Assa micro finance, there are some officials who are out on the streets explaining the credit system
- Why doesn't she take it? She has no need now (farip acts as a lender) and the interest rate they offer is much higher

What do you need to get a loan?

- They only come to do business, she thinks
- Collateral: what they have/own, i.e. house, car
- Why doesn't she talk to financial institutions about a loan? She can't take out two loans, she thinks. And before she couldn't take a loan because she had no money and no business running, but now she can go to the bank, for example mkombozi
- Min. loan 1 million shillings - 2500 dollars
- Interest rate: 18-25%, that is too high, that is the problem

Big challenges in business:

- Weakness of friends and family and other external factors.
- Fatuma case; her business is doing well but now she had to touch her income because her husband's business is not doing well and her father has to go to hospital

2. Entrepreneur interview with Amani

Participants:

- Amani: smallholder entrepreneur, has a retail shop in a residential area of Dar es Salaam
- Research Group: Ueli Scheuermeier, Elibariki Tweve, Rahel Guggenbühl, Urs Guggenbühl

About the interview:

At the beginning, all participants introduced themselves, followed by an introduction about the purpose of the research group, not giving too much information about the tree as a security approach in order not to influence the opinion about it. The interview was conducted by the research team, who asked specific questions. The points listed are a summary of the answers given by the interviewee(s), other SH groups are mentioned directly.

Summary of the discussion

Collateral:

- Wife's salary, she works for the government

- Group collateral is very big here to avoid the default rate

Loan offers in the market that he is aware of:

SACCOs:

- Challenge: difficult systems as some who invest more do not need the money and others who invest less need more frequent loans
- Run off with money suitcases from members? No, the money is stored in a bank, and to withdraw money they need members' signatures

VICOBA (informal cooperation):

- What: Funding model based on trust between people who know each other. They decide how much start-up capital to put in, and on that basis they split the interest rate
- Challenge: Those who give more and succeed more get angry/envious!!!
- Vicoba is the informal Sacco, why does Vicoba work better? no extra money for workers in the office
- With Vicoba, a loan is taken when there is still money in the pot.
- The person who borrows pays an interest rate of (10-20%). The time is determined by the cooperation

Microfinance:

- Challenges: Many defaults, people take out a loan and bail out, including student loans

Other schemes:

- Upatu: Another very informal system; trust systems

🌐 on the road

Day 2 (31.10.2022)

3. Entrepreneur / farmer interview with Bahat Tweve

Participants:

- Bahat Tweve
- Research Group: Ueli Scheuermeier, Elibariki Tweve, Rahel Guggenbühl, Urs Guggenbühl

About the Interview:

At the beginning, all participants introduced themselves. The interview was conducted by the research team, who asked specific questions. The points listed are a summary of the answers given by the interviewee(s), other SH groups are mentioned directly

Summary of the discussion

- In the last two years, there was no money to be made from TBM because of the weather and Covid. Covid also closed the borders for trade, and it became difficult to trade goods
- What did he do? He picked some trees from his forest and sold the trees as timber

Biggest challenge: Influence of externalities

- Ebola in Congo, closing of borders and farmers can't sell their produce
 - Problem: They have invested in agriculture but are stuck with their products and cannot raise the money or sell them on another market
 - Spot market (more planned)? Doesn't work because of logistics and they can't be there in time, can't plan
- 💡 Trees are also used as a security and self-insurance in difficult times

4. Brainstorming with research group

Participants:

- Research Group: Ueli Scheuermeier, Elibariki Tweve, Rahel Guggenbühl, Urs Guggenbühl, Bahat Tweve

Summary of the discussion

Loan system:

- The NMB has many branches and field staff, but where?
 - Other banks, like the Bank for Agricultural Development, might be interesting.
 - What about government lending?
 - Swiss Embassy: What do they support? Which projects?
 - Problematic development aid - NGOs: come and solve the problem without showing how to solve it
 - Empowering the economy is important for development
- 🗨️ → what is GRACOMA's role in case of a default? What happens in case of a default, who will do the maintenance of the growing trees?

🌐 in Msowero

Day 3 (01.11.2022)

5. Village authority introduction meeting with Nasoro Makajula

Participants:

- Nasoro Mahajula: Community Development Officer (his job in the village is to make sure that everything is registered and that the farmers are not cheated)
- Research Group: Ueli Scheuermeier, Elibariki Tweve, Rahel Guggenbühl, Urs Guggenbühl, Bahat Tweve

About the interview:

At the beginning, all participants introduced themselves, followed by an introduction about the purpose of the research group, not giving too much information about the tree as a security approach in order not to influence the opinion about it. The interview was conducted by the research team, who asked specific questions. The points listed are a summary of the answers given by the interviewee(s), other SH groups are mentioned directly.

Summary of the discussion

- A government project is currently underway in which an international wholesaler pre-finances the money for planting and harvesting avocados in the village. The farmers receive the money for the harvesting beforehand, this is called trade-by-government/agriculturally-planned-economy

What does it take to open a bank branch in a village?

- It needs a licence from the district
- It has to abide by government regulations
- Depending on the amount, one has to go to the district trade officer -> the trade officer sits in the district administration
- Challenge: Save cash reserves

6. Brainstorming with research group

Participants:

- Research Group: Ueli Scheuermeier, Elibariki Tweve, Rahel Guggenbühl, Urs Guggenbühl, Bahat Tweve

Summary of the discussion

Village level:

- Banks in a village? Bahat: No, only in Magugu village because of the coffee industry there.
- There is no formal financial institution at all
- Not attractive with the size of volume they could get

Big potential:

- Smallholders feed the country, partly because the plantations are diversified
- 📍 Tree Bank Branch could be GRACOMA with one agent in each village. GRACOMA provides an agent, as a supervisor of credits (that is provision based)

7. Farmer interview with Daniel



Participants:

Daniel: Farmer from village Karadas and village head, TBM silo owner, collaborates with TBM, indirectly receiving loan from farip fund through TBM

Research Group: Ueli Scheuermeier, Elibariki Tweve, Rahel Guggenbühl, Urs Guggenbühl, Bahat Tweve

About the interview:

At the beginning, all participants introduced themselves, followed by an introduction about the purpose of the research group, not giving too much information about the tree as a security approach in order not to influence the opinion about it. The interview was conducted by the research team, who asked specific questions. The points listed are a summary of the answers given by the interviewee(s), other SH groups are mentioned directly.

Summary of the discussion

- Daniel is the owner of a silo - from the silo project with FARIP and TBM

- Process: TBM provides a silo (lease agreement) and buys the crop with a cash on the back system. TBM wants to find a better buyer so that they can use the silo to store the crop and decide together with the farmer about selling it in the future
- Positive feedback: The silo has made him clean the grain after harvest. You have to do that, otherwise the crop will be destroyed by insects etc.
- Now the clean crop, which is better, has also caught on in the village and the demand is higher than the unclean crop
- With silo storage, he could feed the village and his family in times of poor harvest
- Problem: external influences (corona - closure of border), sold most of it in the village and for the family's own use and did not use it for foreign trade, so he could not pay anything for TBM at present, but he says he will do it in the future
- Who bears the risk? At the moment only TBM
- Idea: he buys another silo, one for village and family use and the other for TBM's POS (selling in the future with better prices)
- This way he can also produce more diversified with different projects that TBM can sell at better prices.



Loan with trees as collateral for obtaining a silo

8. Farmer interview with Johanna Samson



Participants:

Johanna Samson: Farmer from the Sukuma Tribe, Silo owner, collaborates with TBM, indirectly receiving loan from farip fund through TBM

Research Group: Ueli Scheuermeier, Elibariki Tweve, Rahel Guggenbühl, Urs Guggenbühl, Bahat Tweve

About the interview:

At the beginning, all participants introduced themselves, followed by an introduction about the purpose of the research group, not giving too much information about the tree as a security approach in order not to influence the opinion about it. The interview was conducted by the research team, who asked specific

questions. The points listed are a summary of the answers given by the interviewee(s), other SH groups are mentioned directly.

Summary of the discussion

- Johanna is a silo owner - from the silo project with FARIP and TBM
- First year was very successful and made good money
- Second year, flooding etc. no good harvest
- Same problem here, TBM bears all the risk?
- He now has a contract with TBM: TBM gives the farmer COB (cash on the back / minimum market value for the crop) for the crop, but can sell it in better markets with better prices in the future and passes on the difference to the farmer, the farmer pays a commission to TBM. The farmer can earn more in the long run
- Do you pay the rent for the silo from the success of the harvest? Now no money came back from Johanna for the rent
- Are farmers generally willing to change the contract? YES
- Idea from before: TBM should collect and diversify different crops (now it is only maize)
- Farmer's idea: diversify, also invest in sesame, contract with deadline, and pay back from other sources and not only the maize in the silo, with the collection point TBM can collect different products
- Due to the success in the first year with the silo, Johanna bought a cow. This cow was named FARIP and has given birth to many baby cows so far
- He would also like to invest in an irrigation system to grow a garden if he could get a loan; so far they have to fetch the water from the water source (about 30 minutes walk)
- 40x lending in 3 months with a total amount of 4 million shillings
- They receive the money back daily
- Default rate: out of 68 loans, 35 are still active, some have said they are stopping now because of the economic crisis but will come back, so they are returning clients.
- Retention rate: 50%
- one case paid weekly for a week and then left
- Other businesses operating in the village: ngiasambu

9. Private bank interview with Dixon

Participants:

- Dixon: NMB Agent from a private Microfinance Institution in Msowero
- Research Group: Ueli Scheuermeier, Elibariki Tweve, Rahel Guggenbühl, Urs Guggenbühl, Bahat Tweve

About the interview:

At the beginning, all participants introduced themselves, followed by an introduction about the purpose of the research group, not giving too much information about the tree as a security approach in order not to influence the opinion about it. The interview was conducted by the research team, who asked specific questions. The points listed are a summary of the answers given by the interviewee(s), other SH groups are mentioned directly.

Summary of the discussion

- Dixon works for a private investor
- To operate as a MF institution, one needs a licence, which is obtained at the district level
- Agent: not employed. You take the benefit of people's payments to the institution every day
- Case: 460 000 shillings came back today, 60k (taken out) 10k for agents lunch. Other 40k a fee for expenses 360k back into the pot for loans. And 90k (of which 10k every day for agents as salary) and 70k back to the owner

What financial products does he offer?

- Interest rate 10-15% per month
- 50000, every day 2000 back
- Customers (small traders): They take a loan for one month
- Collateral: TV, fridge, motorbike card
- 40x credit granted in 3 months with a total amount of 4 million shillings
- You get the money back daily
- Default rate: out of 68 loans, 35 are still active, some said they stop now because of the economic crisis but come back, so they are returning clients
- Retention rate: 50%
- one case paid weekly for a week and then left
- Other businesses operating in the village: ngiasambu



Microfinance = other system here, collateral is needed

📍 in Iringa

Day 4 (02.11.2022)

10. Entrepreneur interview with Josef and Renatus Kastor



Participants:

Josef Kastor and Renatus Kastor: Manager of an avocado seedling farm cooperative (between neighboring families)

Research Group: Ueli Scheuermeier, Elibariki Tweve, Rahel Guggenbühl, Urs Guggenbühl, Bahat Tweve

About the interview:

At the beginning, all participants introduced themselves, followed by an introduction about the purpose of the research group, not giving too much information about the tree as a security approach in order not to influence the opinion about it. The interview was conducted by the research team, who asked specific questions. The points listed are a summary of the answers given by the interviewee(s), other SH groups are mentioned directly.

Summary of the discussion

- Customers: Individual farmers and companies selling about 1/4 of the seedlings to individual farmers and 3/4 to large farms in the Iringa, Moringa and beyond regions
- Loan: Manispa - government institution. The government gives loans from tax revenues, a certain percentage is used for loans for small entrepreneurs (youth, women or disabled)
- Conditions: maximum 35 years old, registration of the youth group
- Application: you have to present your idea
- Collateral: no, the group is the collateral
- Size: loan is only 10 million
- Loan must be repaid within one year
- Problems: small farmers too poor, cannot buy the seedlings -> they also need a loan.
- Price per seedling: 1 seedling costs 3000 shillings
- The big avocado market comes mainly from foreign companies, investors come here and build up the industry. Customers (i.e. small farmers): produce for sale to processors
- Big challenge: transport, they don't have a car

- They want to sell to smallholder farmers as this is the biggest market, but the big problem is that they don't have enough money to invest in seedlings
- Strategy ideas for them: Diversification



TBM could collaborate and offer the transportation service

🌐 in Makambako

Day 5 (03.11.2022)

11. Entrepreneur interview with Lucy



Participants:

Lucy: Bean trader, start-up loan granted by farip, coached by elisema

Research Group: Ueli Scheuermeier, Elibariki Tweve, Rahel Guggenbühl, Urs Guggenbühl, Bahat Tweve

About the interview:

At the beginning, all participants introduced themselves, followed by an introduction about the purpose of the research group, not giving too much information about the tree as a security approach in order not to influence the opinion about it. The interview was conducted by the research team, who asked specific questions. The points listed are a summary of the answers given by the interviewee(s), other SH groups are mentioned directly.

Summary of the discussion

- she has a licence as a trader and pays taxes to the government, she is a successful trader and entrepreneur in different types of beans in Makambako
- Buys the beans from farmers, sells at markets and has a shop

Challenges

- she cannot get microcredit, she has no source of credit
- Problem: Banks wants a big collateral - house, land title -> she has a house but no title

Loan

- What does she need the loan for: she wants a loan for a bigger business, she wants to expand her trade business
- Where did she find out about a loan: she went to NMB, CRDB and Finca Equity -> they all want collateral
- she got a farip loan and was the only one who paid it back and needs more

VICOBAs:

- She is a member of vicoba
- How vicoba works: they meet weekly (100 members), each member puts in 20k and then one member gets it all in one week and then another week gets another
- Interest rate: 50% interest rate
- Not registered, if they registered, they would have to pay taxes
- Challenges: Risk due to trust in people
- What is important to know for my model? Vicoba is not a solution, there is no way out

12. Brainstorming with research team

Participants:

- Research Group: Ueli Scheuermeier, Elibariki Tweve, Rahel Guggenbühl, Urs Guggenbühl, Bahat Tweve

About the interview:

At the beginning, all participants introduced themselves, followed by an introduction about the purpose of the research group, not giving too much information about the tree as a security approach in order not to influence the opinion about it. The interview was conducted by the research team, who asked specific questions. The points listed are a summary of the answers given by the interviewee(s), other SH groups are mentioned directly.

Summary of the discussion

- Potential mechanism for working with the Tree Growers Association as we would then have the group collateral again
- Challenge: The group needs a lot of social capital, which usually fails
- Why not per individual? Government wants groups

 **in Magunguli**

Day 6 (04.11.2022)

13. Village authority introduction meeting with Davies

Participants:

- Davies: Village Executive Officer
- Research Group: Ueli Scheuermeier, Elibariki Tweve, Rahel Guggenbühl, Urs Guggenbühl, Bahat Tweve

About the interview:

At the beginning, all participants introduced themselves, followed by an introduction about the purpose of the research group, not giving too much information about the tree as a security approach in order not to influence the opinion about it. The interview was conducted by the research team, who asked specific questions. The points listed are a summary of the answers given by the interviewee(s), other SH groups are mentioned directly.

Summary of the discussion

Registration of land (local authority):

- Land title: only for house land
- Agricultural land: farmers have different titles for agricultural land, and if they do not have a title yet, the village authority has documents that can prove ownership, they are called CCRO
- Forest land: yes, many of them have one, and the government is in further process of giving these land titles for forests to the owners

Village fund:

- How can the village get money? Taxes, money from the districts - can they have other sources?
Yes, they have land to do business with
- Community funds cannot be used for private purposes, i.e. to give money to the poorest.
- Do they have trees? No, but land to plant trees
- It could also be interesting for them to use loans to invest in infrastructure, education



they could use the village land to plant trees to get money for the village fund

GRACOMA → presented:

- GRACOMA comes at the right point, Monday they have a village council, where they can discuss this
- Other idea: People can plant trees in the community land, for insurance purposes (health insurance)
- Loan life cycle: Each loan you can get a bigger loan because the tree gets bigger
- Default: they can sell the trees to someone else a third party (who?) and pay back the loan
- Other venture idea: irrigation system



open question: who is the third party in case of default? Local authority as a kind of insurance fund, that buys the trees. Other creditors or government fund etc.

14. Brainstorming with Bahat Tweve - forest visit

Participants:

- Research Group: Ueli Scheuermeier, Elibariki Tweve, Rahel Guggenbühl, Urs Guggenbühl, Bahat Tweve

About the interview:

At the beginning, all participants introduced themselves, followed by an introduction about the purpose of the research group, not giving too much information about the tree as a security approach in order not to influence the opinion about it. The interview was conducted by the research team, who asked specific questions. The points listed are a summary of the answers given by the interviewee(s), other SH groups are mentioned directly.

Summary of the discussion

- GRACOMA has to clean all the forests because of the fire risk. And they can use this material for charcoal dust and another sequestration process and get carbon credits for it. This is another project idea by Bahat Tweve, called TECASECO
- More value for trees: The space between harvested trees must be limited so that the branches do not move to the side, but the trees grow upwards towards the sunlight
- "Plentnerwald": harvest trees according to size, collect pruning and do not harvest every 5 years a full farm, that only gives money every 5 years. Better to select mature trees for harvesting and get money every now and then

- Native trees have a higher value, take longer to grow, but the government forbids harvesting
- What if you plant a forest with natural trees and great biodiversity, without harvesting and natural reserves, as WWF will give some kind of loan?
- Farmers have to maintain the forest, but can get the additional value of the products (fruits, etc.)

15. Evening interview with village chairman of Magunguli

Participants:

- Village Chairman of Magunguli (no name)
- Davies: Village Executive Officer
- Research Group: Bahat Tweve, Ueli Scheuermeier, Elibariki Tweve, Rahel Guggenbühl, Urs Guggenbühl

About the interview:

At the beginning, all participants introduced themselves, followed by an introduction about the purpose of the research group, not giving too much information about the tree as a security approach in order not to influence the opinion about it. The interview was conducted by the research team, who asked specific questions. The points listed are a summary of the answers given by the interviewee(s), other SH groups are mentioned directly.

Summary of the discussion

Where do you see the challenges in a loan system with Trees as Collateral:

- in convincing the financial institution of the model
- farmers might think that a credit system is set up in such a way that they will fail and lose their forest

Prototype:

- A pilot project is needed to show farmers that it works so that both parties (financial institution and farmer) can trust it

Pre-knowledge:

- Are villagers already taking loans? No, most people do not have access, and if they do, they are disadvantaged (women, youth, disabled first)
- 25 % of villagers have experience with a credit system
- Are there defaults on payments? No

- Where did they get the loan from? From the district administration (0% interest), mcoba (community bank of the district) or/and SACCO
- What do they use the loan for? Partly for business (trade) and agriculture (productive loans)

Village fund:

- Can the village get a loan? No
- The village council has 5 hectares of trees, the money from this goes to the community, i.e. the development funds
- Can the village council be the third party? No, it has no financial resources
- What about the village development bank? From taxes, 30,000 per household per year is used for development purposes, i.e. education: Example school - community builds the school, government provides the teacher

Village Tax system:

- Tax system: no income tax, but CESS tax (every valuable product leaving the village is taxed per load, the money goes to the district and 15% of it goes back to the village)
- Example: for a board, Cess tax 120 shillings goes to the village, he sends it to the district and 15% comes back / or flat rate
- Control: police on the street, they need a receipt which they get from the municipality
- Government has a big system thinking and little motivation to change anything

Transaction costs:

- Nmb agent is missing; they have been looking here but have not seen the potential in the village
- Why don't they see the potential of the village? Too high transaction costs, for small loans
- What about international funds as lenders? Would they be accepted here? Yes, farmers are free to find a foreign investor

Day 7 (05.11.2022)

16. Brainstorming with research group

Participants:

- Research Group: Ueli Scheuermeier, Elibariki Tweve, Rahel Guggenbühl, Urs Guggenbühl, Bahat Tweve

Summary of the discussion

Meeting with the Farmer and Tree Grower Association, what do we want?

- Would it be possible for the association to enter into some kind of cooperation and buy up the trees in case of default so that the farmers can pay back the loan
- Challenge: difficult as they have no money? What if everyone contributed a part? The problem is that they need money from outside now, and can't be trustee atm
- The people in the association are all farmers and tree planters
- How are the trees currently utilized? They sell them as timber, etc.
- The farmers here don't have big plantations, their strategy is more about diversification. They grow something of everything that has value and also feeds the family

Visit to the collection point of TBM:

- Problems why it is not working yet: Mlangusi stops them on the road, farmers don't have enough capital to carry the money on their backs, or they have to collect it from the farmers (with a small pick-up) -> farmers bring it when they know TBM has money and can come anytime
- Biggest problem: not enough capital to start
- How much capital is needed: 20 million shillings / 10,000 USD
- They have a house as a collection point, an unused property. It gets electricity and water
- The vision is to build big silos, a sawmill, a flower mill and a liquor bar and negotiate with farmers for a known collection point so that farmers have a safe place to sell their produce

Model implications:

- Farmer gets loan for forest as collateral
- Case of default; case 1: he picks the balance of valuable trees in the forest and makes money out of it and repays the loan / case 2: farmer marks trees in the forest to sell to a third party and pays back the loan -> in the future, when the farmer has money again, he can buy back his trees

17. Focus group meeting with Farmer and Tree Grower Association from Magunguli

Participants:



District Council for 3 villages (legislative)

Davies (Village executive officer)

Tree Growers Association, of which 5 members were present. All are farmers and tree growers

Research Group: Ueli Scheuermeier, Elibariki Tweve, Rahel Guggenbühl, Urs Guggenbühl, Bahat Tweve

About the focus group meeting:

At the beginning, all participants introduced themselves, followed by an introduction about the purpose of the research group, not giving them too much information about the tree as a safety approach so as not to influence their opinion about it. The discussion was led by the research team, who had the participants discuss certain questions. In the end, a prototype was worked out with the farmers on what a tree as collateral model could look like for them, so that it would meet their needs and also be attractive to financial institutions. The points listed are a summary of the answers received from the farmers, other participants are mentioned directly.

Summary of the discussion

Current challenges:

- Main problem: lack of control that precocious trees are cut because farmers need money
- Reasons for cutting down immature trees? Financial problems, they need money for farmer's resources, for education purposes and if someone is of their relatives are sick. They have no other ways to get money, all agreed on that problem
- planting without purpose, they have no planning or forest management knowledge

Credit model:

- There are loans from the government, but difficult collateral. No loans available with trees as collateral

What does it need for Trees as Collateral:

- Farmer and lender have to sign a contract stating who will take control of the forest. When they take out a loan, they have an agreement.
- What happens in case of non-performance?
 - Ward replied: group monitors and vouches for each other
 - Farmers responded: The group harvests, controls and saves money by selling these products and synergizing by harvesting and selling at the same time, which reduces transaction costs and could also act as a backup in the future if someone does not pay back the loan. To do this, they first need a loan to grow and invest further
- If each member has a loan, what happens if someone cannot harvest due to external factors (flood, death of a member), who pays back the loan? The group pays back the loan and takes control of the forest. But if the group has to pay back the money, the farmer might feel ashamed, which could lead to social problems
- What about a third party buying up the forests in case of default? They say they will not fail, even with the Vicoba system Noonan failed in 6 years. But the risk is there, what should they do?
- Two types of collateral being combined? Group collateral / tree collateral
- Idea (Ueli): Shareholder agreement, but more for group collateral
- Option of third party involved to buy the collateral and pay back the loan:
 - Answer Farmers: why should someone take over. To pay back the loan, they would just cut down the trees and sell them for the loan
 - the system is explained to the farmers with third party involvement: a third party, i.e. a private institution or another investor, can buy out the collateral in case of default, so that the farmer is able to repay the loan and the trees are kept until harvest maturity. An investment for a higher value in the future
- Prototyping by Farip to further work out the best model? They agreed to try it



Education about tree value for farmers needed

Prototyping / pilot with farip as loan giver:

- Pilot project with 10 farmers (5 for beans, 5 for potatoes)

Loan conditions elaborated with the farmers:

- Collateral: Farmers indicate which trees they provide as collateral; the value must be equal to the amount of the loan
- Loan terms: 5 months

- Interest rate: 1% per month (normal here, even below the limit)
- Loan size Calculations (calculation with costs of planting, weeding, and harvesting and all costs in this value chain):
 - Beans: 780k per acre
 - Potatoes: 2 million per acre
- Expected Revenue:
 - Beans: 40 baskets x 30k (market price) = 1.2 million
 - Potatoes: 120 baskets (20litres) x 25k (market price) = 3 million
- Gross profit:
 - Beans: 420k per acre
 - Potatoes: 1m per acre

Harvesting:

- All produce beans or potatoes at the same time and sell them at the same time to repay the loan
- Special Agreement: Sale on the market, guaranteed by TBM. Gracoma validates the trees and manages the collateral

Stakeholder involvement:

- Elisema is the financial intermediary between the farmers and Farip.
- Village office as meeting point: local councillor (does not have to be present, but can), town governor and community president are there and then the farmers sign that they have received the money

Further discussion:

- Potato or beans, beans are not so profitable, potatoes more but have more risks
- To dos before the test: forest registration by GRACOMA
- When to start prototype: credit in April for potatoes / beans in February
- Final feedback from the local council: make sure we have a safe and secure funding process

🌐 in Makambako

Day 9 (07.11.2022)

18. Bank interview with Godfrey

Participants:

- Godfrey: NBC branch officer in Makambako
- Research Group: Ueli Scheuermeier, Rahel Guggenbühl

About the Interview:

At the beginning, all participants introduced themselves, followed by an introduction about the purpose of the research group, not giving too much information about the tree as a security approach in order not to influence the opinion about it. The interview was conducted by the research team, who asked specific questions. The points listed are a summary of the answers given by the interviewee(s), other SH groups are mentioned directly.

Pre-work:

- What agricultural loans do they offer? How do they work? Collateral required? Other requirements?
- We have heard that no farmer can really access credit because the collateral is usually too high. What do you say about this?
- Do you have local agents who offer credit to farmers?
- Do you question the model of the growing tree as collateral? What other conditions would be needed here for the model to work?
- In case of default: would a third party buy the trees?! -> here it is still being examined
- Where does he see the risks in this model? And idea for a risk mitigation strategy?

Summary of the discussion

Risks:

- The risk of trees is great: fire, from lightning, or neighbours setting fire, etc.
- Farmers have no money for fertilizer and manure
- They only take mature trees as money and potential collateral
- The bank loses interest, because the risk is high, and the mitigation is low. Therefore, banks are generally not interested in doing business with farmers

Why is that?

- Cash flow problem: They want a good cash flow from the client, as a guarantee that the business will work. Farmers' cash flow is very erratic
- A big problem why farmers don't get a loan is their character; the bank thinks they will use the money for something else and has had a lot of experience with this, that they spend the money on relatives or a motorbike etc. and not on the actual business. → The bank's biggest fear is the character of the Tanzanian farmer!
- There are many conditions that need to be fulfilled for a loan (tax clearance, we need to know the buyer, etc.) and farmers cannot show that
- Risk mitigation: lack of a control authority
- They are very afraid of the risk of default by clients. I.e. Case: The loan officer, if his book is full of defaulting clients, will probably get a lower salary

What are they offering so far according to trees as collateral?

- Mature trees as collateral, can only be used for additional collateral, a plot of land or house etc. must serve as the basis. So, trees must be mature and able to be harvested, but only for additional loan amount

Group-based loan scheme:

- They finance other businesses for assets, for example they offer financial loans for amcos (group of farmers, can be up to 300 members), those farmers are doing cash crops
- What do they need to bring as collateral? A large group of farmers owns land together and gives the land title as collateral
- Example: loan amount 100 million. For what: timber production. Term: 1 year
- Long-term operations, do they believe in the amcos group? Yes, good cash flow, 3 billion per year
- This group also buys trees from other people to produce timber
- Group's collateral for government loans less than 5 million

Input financing:

- How does the transaction work (farmer): no cash, input money (seed, fertilizer) or assets (tractor with down payment of 20%, with cash in the bank). The bank works with companies and provides the customer with a voucher for the purchase (the seller receives the money from the bank).

Loan conditions (agricultural loans):

- Usually Max. 3 years, scheme per loan
- Loan amount: 20% of annual turnover they are willing to give
- Interest rate: farmers is 10% is the maximum, 9% is the minimum
- Due Dilligence: character check (truth about client's business) -> loan officer goes to client to check and asks neighbors, who know his business
- Default rate: 0.1%
- Obtain collateral; yes and then we sell it

Education:

- Can the loan officer also be the field officer? Yes, but he must have the resources to travel long distances!
- Coaching: Branch managers are not paid for coaching, there are special people in Dar es Salaam who give proper coaching, but there it costs and the employee is paid
- Problem of lack of coaching for farmers: How can it be done? It takes a lot of time and you also have to mobilize them. It is very difficult to teach farmers. Farmers are working with the optimum they have -> how can we increase resources for farmers? 2 types of educational needs; 1. how to be a businessman, how to take care of your own assets (how to manage your loans) 2. how to organize in a group of farmers, i.e. potatoes on Mondays, trees on Tuesdays

Transaction costs:

- An idea to solve the field agent problem: A trusted person from the village (field agent) controls the market and provides security for the bank
- We need people in the field who understand the farmers. -> this is what the loan agent does (but there are only 11 for more than 30 villages)
- Not a long-term business for the commercial bank
- Transaction costs, a lot of supervision, one man cannot run the mechanism, Saccos are the most likely to come into play here
- How can the problem with transaction costs be solved? The salary would depend on a commission, how many loans he brings in. / or he gets a percentage of the farmer's loan
- What about an agent in Magunguli? That is too expensive
- Transaction costs: who pays the field agent? The bank? Or the credit agent? The credit intermediary doesn't have enough money for that, and the bank doesn't hire field agents

Case of default:

- Third party: PASS - dealing with farmer loans? If the farmer cannot pay enough and also in case of default

- If a third party is involved, would the bank accept trees as collateral? The idea should be submitted to the head office. Good idea, but the long-term risk of the growing forest would play a role here for the third party

Growing Trees as Collateral:

- Growing trees as collateral is too little for the bank
- How is the GRACOMA paid for? Part of the loan? Farmers would support this. Marking of trees for GRACOMA.
- Why growing trees, client must have risk to get the loan. Client is more likely to default if collateral is too low
- What if a farmer defaults due to external factors (covid, floods, etc.)? The bank could extend the loan. The bank must not be too lenient in lending to farmers

Group collateral:

- The bank wants farmers to be in groups, why? If a farmer escapes, they still have the group collateral

Insurance:

- Farm insurance, life insurance, permanent instability insurance
- Around 7% of the value of the trees cost insurance -> too expensive and not safe for farmers because they cannot afford it

Input Ueli:

- NBC is a short-term lender, not an investor. -> what is the best long-term investment here? Trees. The potential is huge. In Magunguli there is around 10 million dollars if the value grows.
- How can you invest there? Godfrey: Invest in land. Ueli: I invest in farmers

Goal Bank:

- Bank wants a low-risk portfolio

SACCO:

- The bank doesn't reach many potential clients, how can you solve that?
 - Saccos example: they have 6-7 loan officers who are paid at district level, these loan officers are analysts who evaluate clients' business. They hold daily meetings with the customers in the morning and evening. -> A mechanism to monitor compliance at the district level. They go to the villages (on motorbikes)

- Where does the money for these analysts come from? 10% of the returned loan, on a commission basis
- The difference: Saccos don't trust people, banks do
- Where do they get the money from Saccos: 5-6 people put money in savings and loan scheme
- Banks no longer fund them, now only depositors
- For the bank, analysts are only in Dar es Salaam

Financing of ventures:

- The NBC does not offer loans for new ventures
- Are there venture capitalists / angel investors? There are with small amounts - 8 million and less

Last feedback from Godfrey on the Trees as Collateral topic:

- Trees are a long-term business for which banks do not lend
- One should investigate the business and generally the people of the village. If you invest, you should be careful, hire SACCO to monitor and involve people who monitor each other, people from different backgrounds
- You have to be prepared for the situation, like a project, because the government changes its mind quickly
- Wood is difficult now: taxes are collected by the government -> things change all the time

19. Bank Interview with Hebel & Kenneth

Participants:

- Ms. Hebel & Mr. Kenneth: NMB Branch Officer in Makambako
- Research Group: Ueli Scheuermeier, Rahel Guggenbühl

About the interview:

At the beginning, all participants introduced themselves, followed by an introduction about the purpose of the research group, not giving too much information about the tree as a security approach in order not to influence the opinion about it. The interview was conducted by the research team, who asked specific questions. The points listed are a summary of the answers given by the interviewee(s), other SH groups are mentioned directly.

Pre-work:

- What agricultural loans do they offer? How do they work? Collateral required? Other requirements?

- We have heard that no farmer can really access credit because the collateral is usually too high. What do you say about this?
- Do you have local agents who offer credit to farmers?
- Do you question the model of the growing tree as collateral? What other conditions would be needed here for the model to work?
- In case of default: would a third party buy the trees?! -> here it is still being examined
- Where does he see the risks in this model? And idea for a risk mitigation strategy?

Summary of the discussion

Agricultural loan offers:

- Warehouse Receipt System: farmer wants to grow something, they finance that
 - Collateral: 10 bags of good quality maize, they get a receipt for that and that is the collateral
 - Loan amount: Max. 65% of the value of the maize
- Equipment financing: (down payment of 20% from the client to the bank account) - > i.e. for sprinklers, irrigation etc.
- Input financing: you need a bigger collateral; house, land title

Bank and smallholder interaction:

- Client comes and assesses what they are doing and on that basis the scope is worked out
- Start in the office (enquiry), viability of the business. After talking to farmers, they go for verification. -> Branch manager and loan officer go there
- Is it viable? No, but they do this for the people, also have a NMB foundation that coach's people, gives them workshops on how to do business, etc.

Trees as collateral:

- Can they get a loan if they plant trees? No, because it takes a long time for it to have value and has many risks
- Risk of taking trees as collateral: fire
- Risk mitigation strategy: gracoma. Can they do it then? Yes, they take the idea and then calculate the risk
- BUT: NMB doesn't fund start-ups, they fund industries that have a long history. They have to have a track record
- They can only consider the trees as collateral if the loan program has a track record
- Currently they only offer additional loans for growing trees as collateral
- District representatives: No, everything comes from the branches

- Why is the model not working? A higher position needs to be taken here for discussion. If we have GRACOMA, maybe they can try to accept it. -> We need to talk to the highest authority (in Dar es Salaam). We should try

Case of default:

- Third party: if the client defaults, a third party has to pay back at least 50%. Some private companies are already doing this

Loan conditions:

- Interest rate: 9% per year
- Term: 6 months - 3 years
- Money transaction: They must have an account with the NMB, for asset loans (20% from the client) they deposit the money into the account and the NMB does the transfer
- The NMB officer has limits for discussing loans, some limits apply at branch level, others go up
- Limit for branch level: 75 million / collateral must be at least 150% of the loan

SACCOs and AMCOs:

- Does NMB do any business with saccoes? No, but business with AMCOs: trade in crops, tobacco
- Why AMCOs: I used to do business with Saccos but had bad experience. They usually don't pay back because they started giving loans to members who defaulted
- AMCOs are better: AMCOs system is strong, the manager has a higher position and does not lend to members. AMCOs has good management and is very strong
- Farmers are afraid to put their house as collateral; the best way is to form an AMCOs
- Collateral: No, AMCOs do not take collateral; the group is the collateral
- What happens in case of default: AMCOs will pay for them
- AMCOs takes control of the farmers, it does the credit monitoring
- Operations: AMCOs gives the loans to the farmers and also does the marketing
- AMCOs is a local cooperation
- AMCOs can bear the risk of default, the head of AMCOs knows the character of a farmer and can feel comfortable lending money. Local trust
- What AMCOs are there here? You can find AMCOs in the district council, they are registered there

🌐 in Mafinga

Day 10 (08.11.2022)

20. Brainstorming with research group

Participants:

- Research Group: Ueli Scheuermeier, Rahel Guggenbühl

Summary of the discussion

- AMCOs fail, because they have no silos and food storage breaks down, farmers lose confidence.
- Another Interview needed with the NMB fund!
- Problem: Farmers use credit for things other than their farm
- There is a lack of supervision!
- Should the insurance aspect of tree farming be looked into? What happens in emergencies when farmers need money for family health, etc.?

21. Round of introduction at Iringa District Authority in Mafinga

Participants:

- District head
- Ubisimbali: district forest officer
- Ramadani: natural resources officer
- Research Group: Bahat Tweve, Ueli Scheuermeier, Elibariki Tweve, Rahel Guggenbühl, Mauro Lanfranchi

About the introduction meeting:

At the beginning, all participants introduced themselves, followed by an introduction about the purpose of the research group. The points listed are a summary of the most important discussion points.

Summary of the discussion

Carbon credits:

- Carbon credit schemes are already in place at government level
- Carbon credits: everyone has to register at the district level
- One can earn carbon credits just by planting trees

a. Interview with Ubisimbali and Ramadani

Participants:

- Ubisimbali: district forest officer
- Ramadani: natural resources officer
- Research Group: Bahat Tweve, Ueli Scheuermeier, Elibariki Tweve, Rahel Guggenbühl, Mauro Lanfranchi

About the meeting:

The interview was conducted by the research team, who asked specific questions. The points listed are a summary of the answers given by the interviewee(s), other SH groups are mentioned directly.

Summary of the discussion

- More trees grow on farmers' land than on government land. Is there any data on this? Not yet. -
> Data will be available. The potential among small farmers is greater than among state farmers
- What are the differences in planting between individual tree growers and state owned tree growers: preparation of planting, rotation of maturation
- Strategy for early pruning of trees? They are trying to develop projects with farmers to find ways to make money in other ways and not by cutting and selling pre-mature trees
- What strategies to make money do you teach them? For example, keeping cows, etc.
- Other strategy: cutting down Mikusu (indigenous tree) to plant other trees (pine, eucalyptus) because Mikusu has no value. → problem this is against sustainability principles
- Farmers suffer, so they cut trees and cannot wait
- Forest: weather conditions, hot weather for natural forest -> problem to clear natural forest for avocado
- Some farmers also come to the district and ask to cut natural forest for agricultural purposes, but then they use it for charcoal
- Can you sell a natural tree for timber? No, that is not allowed
- Can you get certification if you plant mikusu for wood? Yes, you can

Trees as Collateral:

- Government institution: gives loans for land, house -> forest needs registration and a title, can only work with land title
- Risks: Banks are afraid of fire
- Risk mitigation: saw mountain (from government), they didn't get loan because you can be punished and kicked out of certified loggers list

- But now they can: the cutting license is collateral for getting a loan (the cutting license is valid for 3 years). Contractors buy a license to cut from the government, and this is the collateral for the bank
- Regulations (GRACOMA): no regulations

Side idea (Ueli) → Is it possible to grant a loan for natural trees? i.e. next to nature reserve, buffer zone, other institutions (for example WWF) would finance this biological tree planting. GRACOMA could act as a controller.

TECASECO:

- Regulations (TECASECO): According to the Environment Act 2004, it is allowed to produce briquettes (alternative energy) from forest waste or soil dust

Carbon credits:

- Can you make money from growing trees through carbon credits?
- Green Resources Limited, a large international company, makes money from timber and carbon credits (10% of carbon credits for villages)
- Individual: 1 oak fund, pays 600 shillings per year per tree (for plantation trees)
- Why not for indigenous trees? Because they want to produce wood
- State projects: The state is forced by the government to help the villages; also through limited green resources

Cutting indigenous trees:

- To cut indigenous trees, it is now allowed with a permit; for security reasons, you need certification (because some can steal) and taxes

22. Interview with Victor Kimey from Green Ressources LTD.

Participants:

- Victor Kimey: ESG Manager at Green Ressources LTD.
- Research Group: Bahat Tweve, Ueli Scheuermeier, Elibariki Tweve, Rahel Guggenbühl, Mauro Lanfranchi

About the Introduction:

At the beginning, all participants introduced themselves, followed by an introduction about the purpose of the research group, not giving too much information about the tree as a security approach in order not to influence the opinion about it. The interview was conducted by the research team, who asked specific

questions. The points listed are a summary of the answers given by the interviewee(s), other SH groups are mentioned directly.

Summary of the discussion

How does the carbon credit system work?

Carbon credits at company level:

- VCS (Voluntary Carbon Standards), they verify and validate the forests - international standard.
- After measuring the plantation, you have this amount of carbon for one year, then it is sold
- The company has a forest that has been checked and certified according to VCS criteria, and then Green Ressources sells the carbon amount to other companies
- 10% goes to the village, they have a fund: Green Ressources has big land that they got from the government, and 10% goes to the village fund
- Currently only 4 villages benefit because the land was previously communal land
- They acquire the land from the village, they don't buy it, they have a contract with the village
- Money in village accounts; they manage the account from the village, must be used for education, water supply, health, infrastructure
- Other services to the village: education, seedlings (for villagers to give to farmers), land acquisition is linked to other services
- Money from carbon credits is used for reinvestment in own plantations.
- Buyers: big companies

Smallholder Level:

- Individual carbon credits for villagers; the problem is the standard that has to be met for small villagers
- Transaction costs for verifying the different plots were too high
- Vcs standards
- Some villagers earn carbon credits for natural forests by partnering with Tanzanian carbon neutral
- Preserved natural forest: standard here; reduced emissions from deforestation (un-redd.org)
- Why farmers cannot meet the standards: Biodiversity protection, additionality (people who buy carbon credits have to pay in addition to what they already have)
- How do they do it: they plant trees on degraded land
- There are no standards for sequestration yet
- Other standards: cdm (clean development mechanism)

- What measures are being taken by Green Ressources or what strategies are planned so that individual smallholders can also receive carbon credits? The FSE (Forest Stewardship Council) standard has developed a standard for smallholders; we need to find a standard for smallholders to bring in
- Who do we need to talk to? Vcs
- The standards for big companies cannot be used for smallholders

Trees as Collateral:

- Could green resources be an investment fund for credits for farmers who have trees as collateral?
No

Biodiversity forests:

- What measures are taken with regard to biodiversity: A protected area is designated

23. District Authority introduction meeting with Mtambule and Dotsabida



Participants:

Saad Mtambule: District Commissioner

Lukas Dotsabida: Head of Sao Hill Estate

Research Group: Bahat Tweve, Ueli Scheuermeier, Elibariki Tweve, Rahel Guggenbühl, Mauro Lanfranchi

About the introduction meeting:

At the beginning, all participants introduced themselves, followed by an introduction about the purpose of the research group, not giving too much information about the tree as a security approach in order not to influence the opinion about it. The interview was conducted by the research team, who asked specific questions. The points listed are a summary of the answers given by the interviewee(s), other SH groups are mentioned directly.

Summary of the discussion

Southern Highlands:

- Southern Highlands; 17% government, 55% smallholders, 10% pfp (private forestry programme) → Smallholder tree growing is way bigger than government controlled lands.
- Timber Market; 70% from the state-controlled market
- They agree upon the fact, that smallholder forests have way more potential than plantation forests; If we invest into smallholder agricultural and forest businesses, the country has a big chance for development

Trees:

- Regulations: Minimum age of trees to use for a collateral would be 18 to 25 years for the government
- They are thinking about prevention and reconsidering the regulations
- Technical Specification: square, normal 3x3 / 6 years first pruning / Diameter class measurements

Risks Smallholder farmer:

- market is not selective; Timber from local or controlled logging goes to the same buyer and he does not care about quality but wants the cheapest
- market standards for timber, that make it difficult for smallholder farmer to sell their produce
- financial inability
- Problem of loss of money for smallholders, because they don't plant their trees according to the technical specifications
- Interest rate too high

Risks FI:

- Banks don't want to pay because they don't have enough control over smallholder tree growers and/or farmers

Risk Mitigation:

- Risk Assessment: benefits if a third party is involved, it could work if other risks are assessed
- Fire situation has improved, much has been done to prevent fire; fire has become a national issue
- Fire control: natural forest, different species, different diseases, different soils, they absorb fire factor etc.

- People who start fires don't have trees; strategy: every village member needs a tree so they don't want to have a fire

Governmental program:

- Extension services to educate farmers
- 1 million seedlings every year free of charge for smallholders to plant trees and take care of them
- Planting of indigenous trees; the program has started planting indigenous trees; permission is needed for cutting indigenous trees; How? has to be applied for at district level and they will decide
- Buffer zone: discussed in government and there are conservation programs; Buffer zone program for planting biodiverse local forests with GRACOMA as supervisor -> could work but needs to be discussed. Carbon credits -> biodiversity credits?
- Recommendation - do not remove local trees. We need to change our behavior from monocultures to biodiversity

🌐 in Makambako

Day 11 (09.11.2022)

24. Private bank interview with Freddy Mville CEO of a private MFI in Makambako

Participants:

- Freddy Mville: CEO of a private MF in Makambako
- Research Group: Bahat Tweve, Ueli Scheuermeier, Elibariki Tweve, Rahel Guggenbühl, Mauro Lanfranchi

About the interview:

At the beginning, all participants introduced themselves, followed by an introduction about the purpose of the research group, not giving too much information about the tree as a security approach in order not to influence the opinion about it. The interview was conducted by the research team, who asked specific questions. The points listed are a summary of the answers given by the interviewee(s), other SH groups are mentioned directly.

Summary of the discussion

MF business:

- Small loans for small entrepreneurs
- Collateral: Appliances in the house (TV, etc.)
- Interest rate: 20% per month
- Term: monthly loans
- Default rate: 30% run away -> because of Covid, many businesses are shut down
- How can he cover the loss? He loses his profit
- Now after covid: he closed his business because of covid and war
- Will he reopen: yes
- Before Corona, default rate: 0%
- When default: he usually went to get the collateral. → He still has a lot of collateral; some have been sold, some are still there because the contract has not been fulfilled

Loan for his business:

- Requirements for microfinance loan: registered business, bank statement (not less than \$250,000)
- Where did he get the capital? From different companies - his own money to start

- Example: If you have 500m (cash in a bank account) as capital, you can register your business, if you need more money, you can get another loan
- Nmb: before you get a loan, you first need an accountant and a lawyer to register a company. You need 2 more shareholders
- NMB loan conditions; your registered company, capital, bank certificate as security
- In case of default: he loses his business and bears the risk as he has many clients
- Contract: there is a form that the client signs, and then he goes to the local government and signs the contract there with the road administration official as a witness

Agrifinance:

- Farmers as clients: he has no interest to work with farmers, but farmers came as businessmen, and some were mistakenly among his clients
- What did they say they were doing: they have a lot of tricks, they colluded with someone in the business and gave their properties as collateral
- Collateral Checking: His team goes and checks, but not always.
- Farmers don't manage to pay monthly, but after harvest they paid everything, but in the period between he had problems.
- Why can't he offer long-term loans: Small entrepreneurs would stop paying after a longer period.
- Corona is affected by this, but he has a plan to invest in farm inputs (i.e. give out loans for fertiliser directly, etc.)

Growing Trees as Collateral:

- Growing trees as collateral is possible, but you have to have insurance
- What insurance: fire insurance → It exists, but farmers don't know it exists
- Insurance for 1 hectare: you have to have the data (value, size): 1 hectare 1.5 million shillings per year
- Third party insurance: yes would also be possible
- He thinks it can be profitable, why? If the customers come, he makes money
- The big risk for trees as collateral is fire
- Mitigation Strategy: the big task is to educate people on how to prevent fires

🌐 **in Magunguli**

Day 12 (10.11.2022)

25. Focus group meeting with smallholder farmers and tree growers from Kiyowela

Participants:

- 7 farmers and tree growers
- Ward Executive Officer
- Education officer of the district
- Village head
- Research Group: Elibariki Tweve, Rahel Guggenbühl

About the focus group meeting:

At the beginning, all participants introduced themselves, followed by an introduction about the purpose of the research group, not giving them too much information about the tree as a security approach so as not to influence their opinion about it. The discussion was led by the research team, who had the participants discuss specific issues. The points listed are a summary of the responses received from the farmers, other participants are mentioned directly.

Summary of the discussion

Business - What are the challenges you face in your business?

- Cultivation: capital for inputs, using local seeds instead of artificial seeds (result more)
- Strategy: direct money or direct artificial seed
- Government: does not give out this artificial seed
- Modified seeds (hybrid seeds): against diseases -> yes, there is a market
- Many people plant trees and therefore do not have enough space to grow crops - Why: they see more value in trees
- Ward Executive Officer:
 - Lack of receipt of inputs at the right time, no ability to plan the harvest
 - the fact that farmers invest more money in inputs (preparatory work/cultivation, harvest) but subsequently receive less money for the output (sale of the products)

Loan options:

- Do you need a loan: Yes, they need it very bad!
- Even with the conditions (interest rate: 9%, collateral: land, time: 6 months) they are willing to take the loan because:

- they want to be able to plan the harvesting season better with getting input products on time, like that they can be more successful in the agricultural business
- they also mentioned that the higher the collateral, the more motivated they are to pay back the loan, because it would be very bad to lose it → They need a win-win deal
- Worst case they are ready to lose the land, their lives are on the move
- Did you have a loan? No never
- Why? No financial institution came here to explain the loan offer
- What do you need a loan for? Cultivation, buying artificial seeds

Banks:

- They have no financial institution here to go to, they lack a local field worker, Bankers don't see them
- Banks don't offer any agricultural loans
- Interest rate: 9%, they think 20%. → the interest rates are too high, the banks are too strict
- Repayment Term of 3 years. -> Yes, they would be interested!
- **Village chairman:** There are people who came to the field, but had no adequate product offer for small-scale production. Credit for other products and not for beans, more maize. But they would give input credit

Education:

- Village leader: Very important that you also coach and sit with the client and inform them about interest rates and other conditions

Land Title:

- Village head: If you don't have a land title, you don't get the loan
- Land title: no official once, but the government started to give them to the farmers
- How can you solve this? The village chairman must be informed, and he can get a prov. title
- If someone wants to buy, he needs certificates and with the village chairman's confirmation this would be also valid as a land certification - > could also work for a loan in Tanzania

Transaction Costs:

- Bank employee never came to the village to give information about loan options.
- Why don't they go to Makambako to get a loan? They have no financial resources to go there, the transport costs are too high

Insurance

- Insurance would be a solution; but no one comes to inform them

Other loan offers:

VICOBAAs

- yes, they have local VICOBAAs
- Process: every week they need a certain amount of money from each member: after 3 months they can get the shares
- Loan amount: You can take 3x your share
- Conditions: 5-10% interest rate, after 6 months they can take more, after one year
- VICOBA is not very helpful to the villagers as they have no money

AMCOs:

- AMCOs: They heard about that
- AMCOs as a solution? Yes, could be. Village Chairman: They see the solution in a loan for an individual and not in a group, they have had bad experiences in a group

Trees as collateral:

- Would you give your growing trees as collateral for a loan? Yes
- Would you put your land and trees as collateral? Yes
- What is riskier, trees or land: land

Risks for Growing Tree as Collateral:

- big challenges are fire and climate change
- Risk mitigation strategy: firebreaks
- It depends on whether they are selling timber or houses
- Premature Selling: Yes, they are sold prematurely
- And why? Because the economic situation is difficult and they have no other means to pay school fees etc.
- Where do they sell the trees: Most of them sell them between neighbors

Value of Trees:

- The value is not exactly determined, a buyer comes and buys, and it could be that they sell the trees below their value
- Do they sell them when they need money for their children or for personal purposes? Yes, and they don't know the value of the trees exactly, so they sell them below their value
- What kind of forest do they have: Plantation forest mainly

Prototyping:

- What is done there (farming): most grow beans and keep cows and pigs

- How much money: 560k per acre
- Gross profit: 30 baskets x 30k = 90k schilling
- Interest rate: 5-9% per year
- Collateral: Forest
- Time: 6 months → after the harvest.
- Sell together? Yes

26. Focus Group Meeting with smallholder farmers and tree growers from Isaula

Participants:

- 3 farmers and tree growers from Isaula
- Village chairman from Isaula
- Research Group: Elibariki Tweve, Rahel Guggenbühl

About the focus group meeting:

At the beginning, all participants introduced themselves, followed by an introduction about the purpose of the research group, not giving them too much information about the tree as a security approach so as not to influence their opinion about it. The discussion was led by the research team, who had the participants discuss specific issues. The points listed are a summary of the responses received from the farmers, other participants are mentioned directly.

Summary of the discussion

Business:

- What do you do for a living: They have agricultural land, beans, millet (sorghum) and maize.
- Land titles: You can get all the titles, but generally only a few of them have them already.

Agricultural challenges:

- big challenge to get fertilizer and chimpanzees eat the maize.
- What do they do about it: protection - build a small hut, women and men go there to protect their fields
- Other problem: using manure and not fertilizer; big competition for manure, because it's used to grow avocado, they don't get it. (2 farmers use manure atm)
- they don't have enough money and a low income, not enough capital, to buy input products; so they are less productive, would need a lot of manure to boost production.

- Location is less productive than other areas in the southern highlands, i.e. Magunguli is more productive, there is more sand in that region and the proximity of the river is better in Magunguli.
- How can you remedy this without money? They ask the government for help to bring manure to different farmers when they start production.
- Why not getting money from a bank? The conditions are too harsh.
- What conditions: Collateral are fixed assets, house, land title.
- Problem they think, that the bank is no friend, they want them to lose the collateral, they heard that from Magunguli

Failed case, when a local loan option was available for smallholder farmers:

- There was a loan option model available called KIMAIDE 2006 (Community Commercial Bank), they had a small capital from the bank to lend to smallholder farmers
- What went wrong? People failed and lost their collateral (their land)
- One of the farmers was a member and lost because the bank died
- Why did the farmers fail? People went there to apply for a loan but did not use it for farming but for other business, so they got a loan but were beginners and had no experience in business and failed, i.e. poor management of the business
- Other factor that they used the loan for health issues from family and then they failed
- Main reason: no proper training on how to invest the loan

Kimaide model:

- Collateral: Land
- Interest rate: 5%
- Term: 6 months

Other known loan options?

- No knowledge of MF; Usually for those loan options the collateral is too big
- vicoba works at village level

Value of Trees:

- Natural forest or plantation: plantation trees
- Why actually? Natural trees are owned by the government
- What are the challenges in this business? Fire
- Prevention strategy: firebreak
- What value do you create with your trees? Trees are harvested after 7 years, sometimes earlier if needed

- Selling pre-mature trees: some due to disease, others for school fees or for house construction
- Do you know the value of the tree? No, they don't know the value of their trees
- Tree selling process: they can sell trees depending on the tree, sometimes they call someone who knows the value of the trees better (Private people, Chinese people when they buy)
- Village leader: sell them at a loss, if they have problems, they sell them

Trees as Collateral:

- Would you give your growing trees as collateral to get a loan? Yes, they would, depending on the interest rate. -> assuming 9% per year
- Would you give your land and trees as collateral? No
- Where do you see the opportunities in this system? Very good model, people would understand it, they think. Potential is here because the interest rate is doable
- Where do you see the risks? Risk of failure due to external influences such as weather, fire, etc. But they would like to test it!!
- Important note: First of all, anyone who wants to borrow needs to have a strategic plan for how to use the loan for their agricultural business. A risk is if you don't have these capabilities
- What would you do in case of default? If natural habits occur, they want to pre-long the repayment time to max 1 year and they would agree to increase the interest rate until they repaid the loan

Prototyping:

- Purpose of Loan: For food cultivation for commercial purposes
- Amount: 540 k per hectare
- Yield: 1 hectare 7 bags X 150 = 1mio 50k
- Collateral growing trees: worth the amount they need
- Interest rate: should be in 8 months - 8% after 8 months
- Term: 8 months
- Maximum 3 years
- We can also increase the interest rate: Maximum 12% per year

General feedback:

- Question from them: Where do they have to go to get a loan if this works? For them it is important that people come to the village
- They really appreciate that we came up with this idea and they didn't expect something like this, we opened their eyes to what potential there could be and if it works, they would like to be ambassadors and tell other people about it

27. Brainstorming with research group

Participants:

- Research Group: Ueli Scheuermeier, Rahel Guggenbühl, Elibariki Tweve

Summary of the discussion

- What to do in case of default: The trees belong to farip, they can buy them back
- GRACOMA mark the trees used for a collateral
- Mtunsa Misitu takes control, takes over a station?

🌍 in Magunguli

Day 13 (11.11.2022)

28. Interview with Ragpar Tweve (forest steward hired by GRACOMA)



Participants

Ragpar Tweve, farmer and tree grower, mtunsa misitu (forest steward) for GRACOMA and son of Bahat

Research Group: Rahel Guggenbühl, Elibariki Tweve

Summary of the discussion

Opportunities:

- Improvement in living standards through other sources of income due to multiple investments triggering poverty in rural areas, reduction in rural-urban migration of youth and social change through multidisciplinary entrepreneurship

Risks & mitigation strategy:

- A farmer may delay creating firebreaks, increasing the risk of fire outbreaks
- Early education on fire mitigation measures helps reduce fire outbreaks

Roles and responsibilities of forest steward:

- Identifying farmers who owns trees
- Visits of the tree sites and measures how many hectares the farmer owns.
- Validation of the qualified trees to use as a collateral

Validation process (monthly):

- Identification process and marking of 13+ year old trees from the farmers, that could be qualified for a loan
- Check of the angle size of the branches and if they need pruning, if yes they get pruned right away
- Making fotos of the qualified trees

🌍 in Usokami

Day 14 (12.11.2022)

29. Focus group meeting with farmers, tree growers and One Acre Fund carbon credits beneficiaries in Usokami

Participants:

- 7 farmers and tree growers and One Acre Fund carbon credits beneficiaries
- Village executive officer
- One Acre Fund village agent
- Research Group: Elibariki Tweve, Rahel Guggenbühl

About the focus group meeting:

At the beginning, all participants introduced themselves, followed by an introduction about the purpose of the research group, not giving them too much information about the tree as a security approach so as not to influence their opinion about it. The discussion was led by the research team, who had the participants discuss specific issues. The points listed are a summary of the responses received from the farmers, other participants are mentioned directly. It should be noted here that the presence of the One Acre Fund village representative may have influenced the responses of the smallholders in the focus group.

Introduction One Acre Fund Field worker:

A new business opportunity has arisen in Usokami for those who own annual trees. One Acre Fund, a company specialising in sustainable agriculture and forestry, is offering 450 shillings per tree per year for those who are interested. The catch is that the trees cannot be used as timber for construction, only for firewood. The tree seedlings were obtained free of charge from an arable land fund with the intention of using them specifically for carbon. Participating people are responsible for planting and maintaining the trees and receive a higher payment per tree after three years. Before this business opportunity, the people of Usokami used the land for growing food and propagating eucalyptus. However, they were advised by the One Acre Fund that they could make a profit while helping to reduce carbon emissions. Now they can use the land for both trees and food crops. Under the programme, participants plant four different tree species along the boundary of their fields. After three years, they will also count the pine trees towards carbon credits. Forestry experts from the One Acre Fund monitor and control the process, including the height and dimensions of the trees. It is important to know that when the trees are cut down, they no longer have any value. The focus is on sustainability and reducing carbon emissions rather than using the trees for commercial purposes. This new business opportunity offers individuals in Usokami the chance to make a profit while contributing to a more sustainable future.

Summary of the discussion

Business:

- What business do you have? Agriculture, carbon credits, trees
- Which is the best tree for bees and other fruits? Mto (fruit tree), mhuaemi, mvumengi, msaula, mheress
- Why plant these trees and not trees with additional value? Mvengi is possible, others are not for biological reasons. -> they do not know how to expand

Idea Research Group: they could get money from fruits, from wood and from carbon credits and from using trees as a collateral to get another loan.

- how could that work? Now they can still do business and additionally plant trees at the border
- The One Acre Fund allows all trees, but they want to start with the Eucalyptus trees
- Feedback form the One Acre Fund field worker: he is a field worker and can't answer this

Challenges:

- What are the challenges you face? (i.e. agriculture, forest) one challenge is the tree management, maybe there is not enough rain so the trees cannot survive, Mkenge and Mgunga, most have already died, other species are more tolerant
- Another challenge is that the goats eat 9 of the 10 species allowed to plant according to One Acre Fund

Loan model:

- What credit options are available with one hectare? Farming services: education services from field agents (farmers pay them a fee), the one-hectare fund gives other subsidized inputs, but you have to transport these products from the town to the village, all these costs for the middleman are added to the farmer's credit. You do not receive cash. The one-hectare fund provides additional support for input resources (fertilizer, storage bags, seeds)
- Interest rate: 9% per year
- Term: 10 months
- Collateral: no collateral
- Default rate: some could not repay, they are willing to negotiate, no additional interest rate for more time -> but in general very few defaulters
- Loan from one acre: 270 people from the village out of 4770 total members from the village
- Qualified farmers receiving subsidized crops from the government are around 570 village members

Bank loans:

- Loan from outside: nothing from outside
- Why not? There is no financial institution here and they do not know where to go. Fund for one hectare only for inputs, they need money to pay the man to prepare the field
- More loan needed: Yes, for preparation and harvest. They need financial support to grow trees on 3 hectares, from the one hectare fund they get the capital through carbon credits only for one hectare
- Why don't people know the banks? **Village head:** we know the banks, but the terms are not for the farmers. Banks want interest every month, but they cannot pay before harvest. → They are not open to this kind of loan because they would fail
- The fund for one hectare is negotiable; they give them 7 months

Trees:

- What value do you create with your trees? Carbon credits, timber.
- Pre-mature pruning? No, because they would no longer receive carbon credits.

Introduction of GRACOMA: Brainstorming session

- Questions from them: If trees are put as collateral, who owns the trees? the trees belong to the farmers, a field officer will come and coach you and teach the farmers
- What happens when trees are burnt? Mtunsa takes care of fire lines, etc.
- If there is a failure and something happens (fire), it is negotiable from our side
- The farmer has to submit a business plan so that the exact management can be monitored and planned -> to make sure that the farmer needs the credit for his business
- Case of Default: the trees belong to the farmer, if he does not pay back, the trees belong to the financial institution, but the farmer can buy back the trees with the deferred loan. → **farmers:** what kind of trees? Any trees that have value, including indigenous trees

Trees as Collateral:

- Where do you see the opportunities in this system? They see a 100% opportunity. Through gracoma, they can use the extra loan for cultivation that is missing from One Hectare Fund. And with the income from the carbon credits, they are more certain to pay back the credit
- Where do you see the risks? **Village head:** after failure, the trees are no longer under the farmer's control / **one hectare fund agent:** risk of losing the trees, their own property
- Farmers' questions: What would be the interest rate? -> depends on the business, usually 9% per year. Conditions flexible

🌐 in Iringa

Day 16 (14.11.2022)

30. Focus group meeting with AMCOs Iringa

Participants:



Emanueli Skendasi: AMCOs secretary

Elda Kisoma: Leader for women in AMCOs

Henry Mtensi: Chairperson of AMCOs

Research Group: Bahat Tweve, Ueli Scheuermeier, Elibariki Tweve, Rahel Guggenbühl, Mauro Lanfranchi

About the focus group meeting:

At the beginning, all participants introduced themselves, followed by an introduction about the purpose of the research group, not giving them too much information about the tree as a security approach so as not to influence their opinion about it. The discussion was led by the research team, who had the participants discuss specific issues. The points listed are a summary of the responses received from the farmers, other participants are mentioned directly. It should be noted here that the presence of the One Acre Fund village representative may have influenced the responses of the smallholders in the focus group.

Summary of the discussion

About their business:

- Facilities they own: Amcos warehouse is a room, is used from Amcos only and not rented out, office building is for saccos and Amcos, is granted to them by the village, i.e. by the government
- what other businesses do they have? Income from fertilizer commissions, grass bag rent and storage fees
- 2003-2004 - saccos were doing well, why not now? Bank of Tanzania created a standard for SACCOS, whereas those institutions are paid government funds, they now need a security guard, cashier, controller etc. So, this private SACCO tried to copy this model but in the end they could not pay the fees and failed
- Big problem: losing money on operating costs, all civil servants now need a fee

- Future of AMCOs / SACCO: they want to develop but have no capital left. They want to get a loan from Hope Iringa farmers' cooperative again
- How do you say hope that you will not fail again: saccos have changed the model, they no longer give loans to smallholder farmers, they also sell fertilizer. AMCOs and saccos no longer want to give loans to farmers, they allow farmers to get loans from other SACCOs and spend them on fertilizer at their AMCOs
- Other strategy: plan for planting trees. With eucalyptus, they have to wait 7-8 years. They think they have potential for trees. Another idea is to build a machine for maize to rent to farmers

AMCOs model:

- How does it work? Farmers receive a loan from the Saccos and can buy fertilizer and other inputs from the AMCOs at a cheaper price than on the market
- What is the profit for the farmers? Members benefit from different prices for input products (i.e. fertilizer for 120,000 in the market, for 83,000 you receive it at AMCOs). The aim is to help farmers build a certain base to be able to farm on their own afterwards
- Pig bags (Air tide bags to mitigate insect infestation) are provided by AMCOs for harvesting and tar pallets are also rented out. AMCOs has a warehouse and farmers bring the produce to the warehouse and pack it in bags. The farmers clean the produce on the farms, there is an employee at the warehouse who checks it and then packs it into the bags. -> Warehouse system
- Farmers need money when they harvest, how to solve this? Pay 60% of the market price to farmers when they receive the produce. So they need to have a first produce. From the profit they make out of the selling of the produce the farmer receives another percentage
- They gave the farmers training, standards for maize, and then they could sell the crops
- Conditions for membership in AMCOs? You must have shares in AMCOs (6 shares of 10k each), 15k joining fee, and you must be a local person, under 18 or unmarried, you need your parents' signature
- Where did they get the financial resources? From the Iringa Foundation hopes. They currently just stopped giving them money
- Conditions for a Loan from hope: Interest rate 10%, collateral - no collateral / Term: 6-12 months

Failure of AMCOs:

- Why did AMCOs fail: market price dropped drastically, so prices fell and the business model no longer worked, so they couldn't repay the loan for the hope foundation and the hope foundation stopped paying
- How does it work now? It's a big challenge because they have no financial resources. The core business is still fertilizer distribution

- AMCOs does not give loans at the moment, but only sells fertilizer

Conclusion:

- They face a big challenge as the model has not worked so far. -> Solution to find an institution that gives them low-interest loans. They need money for a fertilizer shop now
- Why invest in AMCOs when I can give the money to a private entrepreneur? A private entrepreneur would benefit himself but is more flexible than a corporation. AMCOs are many and all benefit from the same pie. AMCOs has fertilizer available, but once AMCOs has decided how to run the business, one hectare fund has already taken over
- The real business of AMCOs could be to give out real loans!

SACCOs:

- Where do the SACCOs get the money from? They have no source, CRDB had a loan for saccos (interest rate 16-18% per year, too high) -> government regulation of 9% not yet in force, maybe next year
- 9% interest rate would be possible for SACCOs
- Interest rate: if bank has 9%, SACCOs have 12-13% for farmers because they need commission

Conditions SACCOs:

- Collateral? You must have a savings account with saccos.
- Interest rate: 1% per month.
- Saccos member: You can borrow max. twice the amount of your savings
- Term: 6-12 months
- How many defaulters: 100 members, 30 defaulters
- What action do they take on defaulters: A third company ensures that farmers repay their debts (Jamu company, debt collection company)
- Farmer misuses loan of 100k and must pay pack, SACCOs hires third company to collect loans from farmers, SACCOs pays the company, and it gets the money from farmers. The farmer also pays the running costs for the jam company and 10% of the loan

Challenges for farmers, information from Elda (smallholder farmer and AMCOs member):

- Challenges for AMCOs and the farmers: They do not get enough credit from saccos and AMCOs. Saccos only solve small problems, cannot fulfil the business plan with these small loans and because of these small loans, which are not enough, there are defaults
- One idea to solve the problem: have your own women's system. Weekly savings so that they can use these savings when shortages occur, external funding would help them enormously

31. Evening Interview with Jovita about her experience with AMCOs



Participants:

Jovita: working for a foundation that is in close collaboration with amcos, wife of Elibariki

Research Group: Rahel Guggenbühl

About the interview:

Informal discussion at the house of Elibariki and Jovita after dinner.

Summary of the discussion

- Why is she not an AMCO member: She worked for an NGO (Rudi) that provided training for farmers, i.e. on which seeds are best to use, which markets to invest in, etc. They also help to bring farmers together with banks like CRDB

Challenges for farmers and AMCOs:

- Singenta (seed distribution company) distributed seed that could not be harvested due to poor soil quality, but farmers were not reimbursed
- Farmers often do not have enough money to produce, and AMCOs may not have the financial resources to support them
- Loans that are difficult to repay can be problematic because contracts often dictate what farmers must harvest, and this does not necessarily match what is profitable
- She was on the ground this year, farmers were not getting loans, the government was only pushing for loans for wholesalers to give out fertilizer

AMCOs and SACCOs:

- Ukumbi and Malembichi are successful AMCOs
- In Malembichi, there is both an AMCO and a SACCO, with members belonging to both organizations. The SACCO provides loans, while the AMCO was established because the SACCO was not allowed to distribute fertilizer directly by the government
- Successful AMCOs often have shops where they distribute fertilizer to members
- SACCOs are a source of income for members and offer low-interest loans to increase capital. They are not banks, but foundations

- AMCOs can be helpful because members know each other and AMCOs can thus better determine who can repay loans; so it is easier for them to follow and control farmers, thus the transaction costs are lower

How to get a loan as a SACCOs at CRDB:

- Banks must have a registered group, with each institution guaranteeing loans based on its knowledge of the farmer and his farm
- A registered group usually serves as collateral for loans
- The interest rate for loans is 18% per annum
- Lending to AMCOs would be advantageous as the organizations know their members and can mentor and monitor them

Idea for a new model for saving cooperatives:

- Savings are a great incentive for farmers to invest in their farms
- The procedure to become a private savings cooperation involves setting up a free account with the CRDB, signing a bank account for a group leader and individual members, and keeping the money for three years
- Members are encouraged to don't use the money they do not need immediately
- The contracts include provisions for heirs in the event of a member's death
- Proof that savings work is important, as farmers may not trust that their money is safe

Freedom for farmers:

- The bottom line is that farmers know what they want and how to farm. Institutions don't know the farmers' needs, they often come and tell the farmers to grow sunflowers, but the farmers know what works and what doesn't work this year! Farmers should have the freedom to harvest what they think is profitable each year. So a big problem for loan systems is that farmers are being controlled wrongly, they tell them usually what to plant etc.
- Farmers also often have two farms, one for the rainy season and one for irrigation

Use trees as collateral:

- Some farmers have trees, yes
- The idea of using trees as collateral is good, but it also poses challenges such as the risk of fires

Day 17 (15.11.2022)

32. Bank interview with Justine Kisanga

Participants:

- Justine Kisanga: has been a field agent before in Kilombo, Morogoro at NMB
- Research Group: Elibariki Tweve, Rahel Guggenbühl

About the interview:

At the beginning, all participants introduced themselves, followed by an introduction about the purpose of the research group, not giving too much information about the tree as a security approach in order not to influence the opinion about it. The interview was conducted by the research team, who asked specific questions. The points listed are a summary of the answers given by the interviewee(s), other SH groups are mentioned directly.

Summary of the discussion

Agricultural finance risks:

- Farmers sometimes fail to have title deeds (more and more to come and government does a lot here) or a structured business model. The government has not formalized agriculture, which makes it difficult for farmers to get credit
- A credit model is a challenge as farmers need government-approved documents to get a loan from a bank. Banks also require good collateral to reduce risk
- Farmers are not insured, which exposes them to the risk of fires
- Farms must have some development on the land (i.e. buildings, storage facilities) to be used as collateral
- Bank has experience, that farmers do not take agriculture seriously and therefore are more likely to default
- Farmers are not familiar with loan products
- A lot of farmer fail the risk assessment of the banks
- Timber market has a high volatility at the moment, which makes it risky to invest there
- Moral hazard is a major problem due to different cultural practices – banks have experience that farmers take the loan and use it for other purposes than their agricultural business
- Insurance is a major challenge for credit products. To use land as collateral, it must be built on and have some income. Other documents such as inheritance can be used with the endorsement of the village head
- Philosophy: Bank usually goes for less costly projects on shorter terms

- What were the challenges for a field officer? Bank wants formalized activities and for farms these formalities do not exist, farmers are not prepared. Some other challenges; a farmer planted trees even though he does not own the land

Mitigation strategy:

- Banks assess the risks and try to mitigate them by collateralizing inventories, providing working capital loans and using the farm as collateral
- For agricultural products, the objective is to measure and mitigate risks on a case-by-case basis.
- Risk mitigation strategy: padi (rice, term used from Indonesia), maize, they can assess the risks -> how? Some crops are organized, warehouse financing (the warehouse needs a loan); collateral in the warehouse

Education and knowledge spreading:

- Banks educate farmers about financial products at village meetings, but they cannot mobilize all farmers at once, i.e. NMB field staff educate farmers about loan products, but banks prefer formalized activities, such as village meetings
- The bank targets large farms first, hoping that it will then spread to smaller farms

Transaction costs:

- So far, credit products have been offered in high traffic areas
- Now a campaign is being conducted to reach all villages with field staff

Risk assessment:

- The default rate is less than 10%, because the branch officer visit their clients regularly to assess their performance and advise them in how to optimize
- Check for land title: According to the government's law, any land that is used as collateral must be developed, which means there must be some kind of income out of the land. In some cases, other documents are also used, i.e. inheritance, which is approved by the village executives.
- They have never looked for trees, more about title of the land
- 11 Branch staff plan to visit the villages (2-3 times per year after assessment)
- As a field officer, he also checked the farmer's character by finding out what other activities he/she is involved in business-wise, and thus made a personal assessment of whether the smallholder has the experience and knowledge to work efficiently with a loan and be able to repay the loan

Loan product offer

NMB:

- Agricultural loans are offered with bullet instalments depending on the type of crop. An instalment is collected every six months along with the interest rate. Similar options are available for other enterprises with different cash flows

AMCOs:

- The loan products are offered through AMCOs.
- The main problem with AMCOs is that their managers are often corrupt and mismanage the funds. This often leads to fraud and failed AMCOs
- AMCOs bring farmers and lenders together, but they need credible leaders to be successful
- Farmers often face the problem of being cheated or given wrong information
- Creditors lend to AMCOs, and AMCOs give out input products

Origins of the microfinance model:

- Group lending is common in microfinance models, and the group serves as collateral
- NMB does not offer group loans, but TCB does

Trees as Collateral

Opportunities:

- Great opportunities for tree farming, especially in the highlands of Iringa District
- Big potential, a lot of additional benefits with trees: Sustainable approach, you can make business with tree products etc.

Risks:

- At the moment for NMB Bank: Trees can only be used as collateral in addition to other facilities.
- Trees are not stable in value, which makes them unreliable as collateral. The market dynamics for trees are also volatile
- The future of trees as a commodity is uncertain due to the Chinese market and its impact on the market for tree products
- Farmers are shifting to avocado trees due to the decline in timber prices, which is reducing interest in tree cultivation
- Financial institutions are open to opportunities, but the risks are significant
- A big problem is also the lack of tree insurance, as there is huge risk of fire

Trees as Collateral loan product: what is needed from his point of view?

- The bank verifies that the farm has a title or proof of ownership from the local authorities
- The bank requires a document of permission to harvest the trees
- Personal documents are also required
- The bank checks the financial requirements and provides the necessary funds for harvesting the trees

Conditions:

- The bank pays 80% of the invoice amount if all requirements are met.
- The credit period is 12-36 months
- The equipment is used as collateral and the bank keeps the registration card
- The interest rate is 9% per annum for agriculture
- In sum, a prototype loan product requires collateral worth at least 50-70% of the loan amount and the interest rate should be 9% per annum. For a six-month loan, the interest rate would be lower

Case of default:

- GRACOMA and Mtunsa Misitu could help give the banks a security of the collateral management
- A third party could possibly offer insurance and the bank would accept it

🌍 in Morogoro

Day 18 (16.11.2022)

33. Research institution interview with Prof. Greyson Nyamoga from SUA

Participants:

- Prof. Greyson Nyamoga, Head of Forest and Environmental Science at University of Sokoine in Morogoro
- Research Group: Bahat Tweve, Ueli Scheuermeier, Elibariki Tweve, Rahel Guggenbühl, Mauro Lanfranchi

About the interview:

At the beginning, all participants introduced themselves, followed by an introduction about the purpose of the research group, not giving too much information about the tree as a security approach in order not to influence the opinion about it. The interview was conducted by the research team, who asked specific questions. The points listed are a summary of the answers given by the interviewee(s), other SH groups are mentioned directly. Another main topic of this meeting was the evaluation of a possible future research cooperation between the University of St.Gallen and Tanzania.

Summary of the discussion

Research: Trees as collateral

- There is a need for research on the value of trees as collateral for loans.
- TFS discussed insuring trees, which could make it easier for financial institutions to lend.
- There are no such programs, but there was a REDD+ project that focused on planting trees as carbon offsets.

Challenges:

- Insurance is expensive for farmers because of the high risk.
- Trees are a long-term investment, but farmers need money before harvesting, which is a big challenge.

Biodiversity Credits:

- There is potential for a biodiversity credit system and certification.
- Assumption: People and institutions are willing to pay extra for biodiversity standards
- Idea Ueli: GRACOMA could also measure and manage the economic value of buffer zones and the validation of indigenous trees and non-timber forest products such as honey and mushrooms

and get biodiversity credits for it, they could also do it as a service for the smallholder farmers, who own land in the buffer zone.

- But it needs research here? Professor agrees totally, he says there is no research on the link between biodiversity and economic income.
- ATM they have research in biodiversity in nature reserve and biodiversity value, i.e. Tanzania is a biodiversity hotspot (for example misungu national park)
- Tanzanian national parks could also be an interested Credit provider, who would pay for a model like this.

Other value generators with trees:

- Non timber forest products (honey, fruits, mushrooms), saw hill fetching honey from exotic trees (pines), honey is way better from indigenous tree
- Hartz is also marketed (China uses this), also the promotion of beehives, beehives are expensive

TECASECO:

- Produces briquettes from white charcoal, but there are problems in using briquettes for private cooking
- The company is looking for ways to enter the market through universities and private markets
- Bio-waste and leaves from trees felled for charcoal production are used to make the briquettes
- There is a national debate on the use of charcoal for cooking

Collaboration:

- Collaboration with Sokoine University of Agriculture and COSTECH is possible, with a memorandum of understanding required
- Next steps: Building up a Cooperation with the Forestry Department (he agrees), as a host department. In Tanzania doing collaboration with universities, you need a host department

34. Research institution interview with Prof. Mwaseba from Sua

Participants:

- Prof. Dismas L.Mwaseba, Associate Professor in the Department of Agricultural Extension and Community Development at Sokoine University in Morogoro
- Research Group: Bahat, Ueli, Elibariki, Rahel, Mauro

About the interview:

At the beginning, all participants introduced themselves, followed by an introduction about the purpose of the research group, not giving too much information about the tree as a security approach in order not

to influence the opinion about it. The interview was conducted by the research team, who asked specific questions. The points listed are a summary of the answers given by the interviewee(s), other SH groups are mentioned directly. Another main topic of this meeting was the evaluation of a possible future research cooperation between the University of St.Gallen and Tanzania.

Summary of the discussion

Private forestry and investment

Market:

- More trees grow on private land than on corporate or state land.
- Private forestry is present in the villages and there are investors, including non-resident investors, who buy land and plant trees.
- In the past, there was always a development of different markets: timber rush, avocado rush, so a risk here is that it could be a bubble and after a few years the markets are not there anymore
- But the Tree Market: With trees there is a certain stability, there will always be a market and also with climate change the trend to invest in the Tree Market will now go up again

Risks:

- You can do more money out of trees than with maize, but you need to have more time
- Investment in private forestry is considered profitable, but fire is a major constraint
- Farmers are often unaware of the value chain and the actors in it, which makes it hard to know the value of their trees, so they can be pressured to sell their trees prematurely, leading to fraud and low prices
- Professor Mwaseba has been working on a project looking at governance and access to benefits in the timber value chain, including gender dynamics and access to land, he provided us with the papers here
 - Outcome from gender dynamics, problem here with the ownership, normally men inherit the land, that's why the woman have no title deeds
 - Transport can be a challenge too in some areas, where the infrastructure is bad

Opportunities:

- Professor Mwaseba believes that the future of tree planting lies with smallholders as they have the potential for commercial success, if they have the resources to do so
- GRACOMA could serve with the validation of trees for farmers, there is definitely potential for improvement along the timber value chain to make it more sustainable and economically viable for villagers

Mitigation strategy:

- Smallholder Farmers are usually told: If you want to harvest more successful, you have to use these methods: firebreaks, clearing, use of fertilizers

Programs and associations in the tree market:

- The Private Forest Program (PFP) is a joint government program funded by Finland, targeting smallholders and the Tree Growers Association, one specifically in Iringa
- The Forest Development Trust is primarily an institution targeting larger farms
- The Tanzania Forest Service and the District Council are also involved in forest management, but resources are limited
- Tree growers association, providing input training etc.

Further research:

- There is limited research on non-timber forest products such as honey and mushrooms, but the demand for these products is high
- As part of a Danida program in 2016, professor Mwaseba worked with two PhD students, one of whom studied the timber value chain and the other access to land
- Further potential research areas:
 - Potentials along the timber value chain?
 - Can the local small-scale timber value chain be improved?

35. Research institution interview with Dr. Shirima

Participants:



Deo Shirima - Assisting Director of the Carbon Certification Department at SUA

Paulo Iimo: Forest health Expert in the Ecosystem and Conservation Department at SUA

Research Group: Bahat Tweve, Ueli Scheuermeier, Elibariki Tweve, Rahel Guggenbühl, Mauro Lanfranchi

About the interview:

At the beginning, all participants introduced themselves, followed by an introduction about the purpose of the research group, not giving too much information about the tree as a collateral approach in order not to influence the opinion about it. The interview was conducted by the research team, who asked specific questions. The points listed are a summary of the answers given by the interviewee(s), other SH groups are mentioned directly. Another main topic of this meeting was the evaluation of a possible future research cooperation between the University of St.Gallen and Tanzania.

Summary of the discussion

Tree market:

- Good idea, in general the farmer empowerment initiatives have a lot of potential
- According to an official government report, 73% of afforestation is done by tree growers associations/private tree growers, 10% by afforestation projects and 17% by NGOs
- Smallholders usually have 10-25 hectares of land and a large potential
- Currently: There is an avocado Rush

Trees as Collateral risks:

- Challenge: It is difficult to make this accessible to smallholders. Demand for loans is high, supply low
- Banks: They are reluctant to take risks and for example CRDB bank is not on the field and cannot reach the smallholder farmers in rural areas
- Land ownership issue: CCRO or title deeds are needed
- Community property: it needs to be registered and certified at district level

- Cooperation: GRACOMA needs to look at how it can cooperate with FSC standards

Insurance:

- Insurance: It is difficult to get insurance, since farmers usually have no money to get one
- Potential Solution: Offer of a product such as a bundle of insurances (life insurance, forest insurances and more) with this option the forest insurance can be reimbursed through different package offers
- Acre Africa is an insurance company in Dar es Salaam that is piloting with different affordable for agriculture tailored insurance products
- Certification: Farmers who cannot afford insurance but have trees can have their forest certified by organizations such as the FSC (Forest Stewardship Council) to qualify for insurance

Risk sharing model:

- Additionality issue: it must be demonstrated that the trees will be used for collateral and carbon credits
- Carbon credits are only available for newly planted trees, but for a collateral the trees need to have a certain age

TECASECO:

- Coal dust: Some research has already been carried out in this area
- Sequestration: No research has been done yet
- TECASECO idea: He heard about it for the first time and more research is needed. A feasibility approach or standard needs to be presented
- National carbon guidelines: Existing
- Sustainability: understanding of the process is needed
- Certification process: people need to think through the process, but also the market potential needs to be thought through
- Methane offsets: smart strategies are needed. A pilot project needs to be carried out to determine the appropriate level of compensation
- Regulations: Accessible via website

Research:

- Global carbon neutral strategy: Some project types are lacking in this area. They need a scientific basis and have to work with existing methodology. Mostly there are projects on afforestation and researching the methodology/framework

Standards and projects:

- Carbon Tanzania is the only private company working to VCS standards

- Carbon credit project with tree planting: a company operating in the Mgeta corridor started a project without standards but now needs to catch up

Collaboration:

- MOU required and signed by a legal party, but they are open to collaboration.
- Projects must be registered with them

36. Evening brainstorming with research group (and Pessa)

Participants:

- Pessa: consultant and future partner of Bahat Tweve
- Research Group: Bahat Tweve, Ueli Scheuermeier, Elibariki Tweve, Rahel Guggenbühl, Mauro Lanfranchi

Summary of the discussion

Reflections on GRACOMA from Bahat:

- GRACOMA as a full-service provider for financial institutions
- Revision of land title documents

Reflections on GRACOMA from Pessa:

- Challenges: Title deeds needed, previously banks did not recognize them (CCRO). Now they accept them
- Opportunities: many smallholder farmers in Iringa region, many farmers have title deeds (CCRO)

Next steps:

- Testing the prototype; next steps for prototype:
 - Identification of farmers
 - Mtunsa Misitu has to verify the forests
 - loan agreement
 - granting of loan
 - Mtunsa Misitu has to check/verify the correct use of the loan
 - farmers have to pay back the loan after harvest plus interest
 - the trees are back with the farmers
 - farmers can take another loan
- How long does the prototype last? One harvest time, i.e., 6 Month

🌐 in Morogoro

Day 19 (17.11.2022)

37. Interview with Dr. Bakengesa and Dr. Pilly from TAFORI

Participants:



Dr. Siima Bakengesa – Director of Forest Production Research

Dr. Pilly Joseph Kagosi – Researcher

Research Group: Bahat Tweve, Ueli Scheuermeier, Elibariki Tweve, Rahel Guggenbühl, Mauro Lanfranchi

About the interview:

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Summary of the discussion

Research by TAFORI:

- TAFORI has a versatile team (economists, tree specialists and everything you need)
- There is research into smallholder silviculture, tree assessment and operational credit procedures, as they are aware that a lot of smallholder farmers still lack financial resources
- Scientific research on tree farming is as well ongoing
- There is a separation in research of forestry and agricultural credit
- They also research on, what trees species to grow, also trees with additional value
- Or on operational processes and loan schemes
- From TAFORI's perspective, they support the private sector, the smallholder sector and the government sector
- TAFORI promotes indigenous trees, biodiversity forests and fruit trees; they promote trees for soil improvement, water purification, carbon concentration, etc., as well as fruit trees
- Research to develop tools for propagating and raising trees in a proper manner

- Open Research Question: How can farmers understand the value of what grows in their fields?
- Research on market, regulations, financing and international environment (carbon credits)

Tree as Collateral

Tree market:

- There is a stable market for timber at the international level, but at the individual level the market is very unstable because trees are sold prematurely. Many farmers sell the trees below the market price

Risks:

- It is an ongoing process and they are still at the regional branch level as it is difficult for them to reach the very rural villages
- Major obstacle for smallholder farmers; problems in understanding the processes for validating trees so that they can be used as collateral, but some farmers already use trees as collateral at local level, so they do not know the value of their trees and negotiate with their neighbors, the challenge here is to formalize this already used model
- It is about the commitment of the farmers themselves to manage the trees and use the right harvesting methods (i.e. thinning strategy)
- Pre-mature tree cutting, because of short-time need of loans (sickness in the family, school fees for the kids etc.)
- Missing entrepreneurial skills; i.e. propagating the trees and/or making a tree nursery

Opportunity:

- They find the idea very good, highlighting the business potential
- Trees can be used as collateral, but financial institutions and smallholder farmers need to better understand their value

Tree valuation methods:

- Farmers have difficulty understanding validation processes for trees to be used as collateral, where they also do research on
- Tree Species have different methods to harvest and therefore need to be valued differently
- Methods: cost benefit analysis, market price method
- They are currently researching on: How to develop a validation method for national level. Therefore, they need to understand on Farm level, i.e. understanding the ins and the outs
- Develop a tool for field staff to assess validation; develop an institutional-level mechanism for planting trees on the right land and increasing profitability. The tool would also recommend the

secondary tree species that could fit on their forest land in terms of biodiversity and higher value addition. This tool is meant for smallholder farmers who are in the process of validating the tool

- To use trees as collateral, the banks need to value the farms; they are researching on a tree value tool, this could also give the bank data on collateral and therefore the security that they are doing the right business with the farmers

Forestry management:

- Pick trees, not clear-cut harvesting
- Smallholder farmers know a lot about tree management, but they don't know how to propagate trees and make a nursery out of them
- Planting trees for energy started with a nursery and now they are planting these trees and realizing the value

Banks in Tanzania:

- There are initiatives offered by banks for smallholder farmers to get access to financial resources from banks such as SNB, NMB, Agricultural Development Bank
- Banks offer low-interest loans to smallholder farmers to encourage growth, since 5 years they are developing their models in this area

Education:

- Farmer field school methodology: farmers teach themselves about planting forests
- How can you teach farmers; No official educational meeting, you have to show them and invite them

Regulations:

- Government regulations against clear-cutting of local tree species

Concluding remarks by Dr. Bakengesa:

- The use of trees as collateral for a formalized financing model for smallholder farmers is a good approach to further develop the agricultural market and provide them with an option for financial resources, as the use of trees as collateral for smallholder farmers is a common tool at the local level
- To do's with the prototype: Financial institutions need to be sensitized on the use of trees as collateral
- farip needs to understand, what is the value of trees to further coach smallholder farmers; i.e. here is a need for technology to validate tree management by smallholder farmers, potential collaboration here with TAFORI → Mtunsa Misitu needs a smartphone, a checklist and/or a tool for validation? (mobile software, easy to share)

- Other collaboration with TAFORI to conserve indigenous trees
- Carbon offset market and verification of carbon standards

Carbon Credits:

- Market for carbon from diversified products (i.e. carbon compensation) → more input is needed here.
- Verification of carbon standards

🌐 **in Dar es Salaam**

Day 20 (18.11.2022)

38. Interview with Hamisi Saidi Mmomi an Officer from PASS

Participants:

- Hamisi Saidi Mmomi, Office Manager at Private Agricultural Sector Support (PASS)
- Research Group: Elibariki Tweve, Rahel Guggenbühl

About the interview:

At the beginning, all participants introduced themselves, followed by an introduction about the purpose of the research group, not giving too much information about the tree as a collateral approach in order not to influence the opinion about it. The interview was conducted by the research team, who asked specific questions. The points listed are a summary of the answers given by the interviewee(s), other SH groups are mentioned directly.

About PASS:

PASS is a non-profit company based in Tanzania whose aim is to make smallholder farmers in the country "bankable" and improve their access to financial services. The organization was established in 2004 and works with a number of other institutions, including the Danish and Tanzanian governments, to provide a range of services to farmers, including training, business development and loan guarantees. One of the main challenges PASS aims to address is the lack of collateral and financial documentation among smallholder farmers, which makes it difficult for them to access credit from traditional financial institutions. Through its various programs, PASS seeks to bridge this gap and help farmers improve their productivity and income.

Summary of the discussion

PASS Product Offer

Product 1: How to make smallholder farmers bankable

- Conduct various trainings and work with partners such as SNW, ITS and NAB to build capacity
- Assess clients' knowledge/resource gaps, provide financial literacy support and training in bookkeeping, accounting, and marketing
- Provide business development services and assistance with bankable business plans
- Group formation for registered groups
- Most clients are farmers and cooperatives

Product 2: Loan Guarantee

- PASS provides loan guarantees for clients who have little or no collateral
- Products: Credit guarantee or non-cash guarantees are offered for food and other products
- Cash Cover: up to 60% of the loan is covered by PASS, client must have some risks too (moral hazard)
- Cooperation with 14 banks, different conditions for legal entities such as individuals, groups and companies
- What are the conditions? differs according to legal forms (individuals, groups, companies). Most clients are groups, cooperatives and companies
- Banks need a financial report from Cooperatives and following documents:
 - need a statute and a certificate of maximum liability
 - a bank statement
 - a tax identification number
 - you need to have experience in your business (at least 2-3 years)
 - a business license (may be required if you do more than farming and processing)
 - in some cases a business plan (CV of the leaders of the group who need to have experience and qualification)
 - they also need to know what kind of financial needs
- Individuals: They need the same except for the business license and the T-number (tax number) and the statute and certificate

PASS Operations:

- Procedure: The bank evaluates the collateral and the bank communicates directly with PASS, not with the person, unless the client receives a big loan
- Field staff cover Tanzania through 6 offices and have technical teams on the ground, in Morogoro they have the largest portfolio
- Where does the money come from? The Danish government provides the money
- PASS does not charge interest, only a 0.5% fee per quarter for the guarantee
- The number of defaulters is decreasing
- PASS does not offer start-up financing

Risk Assessment:

- PASS offers a guarantee service for the banks so that they do not have to bear the full risk with the farmers, and in this way aims to promote lending to small farmers. Their model is that they guarantee 50% of the loan amount and the other 50% has to be secured by collateral from the farmer

- In case of default, banks have many options to recover their collateral unless farmers are not cooperative. Selling property is the last option they would use
- PASS does not decide on collateral, the bank does that: Credit is assessed based on bankability and productivity, and collateral is assessed last, the most important is the assessment of the bankability

Risks in agrifinance:

- They have no collateral at all or only weak collateral and missing track records
- Farmers are often skeptical due to lack of knowledge and attitude
- Default often due to knowledge gaps in the banking system
- Agricultural sector gets less credit from banks due to risks and policy interventions
- Productivity will increase with credit, but a change in mentality is needed for success
- Moral Hazard: If client has nothing to lose, there is no incentive to pay back

Risks for Growing Trees as Collateral:

- PASS would face the challenge of insuring trees, which incurs additional costs
- With forest collateral, banks want to know if the trees are insured, when they will be harvested and if they have title deeds
- Environmental Risks, such as fire etc.

Banks:

- CRDB, NMB, Tanzania Agricultural Development Bank are active in agricultural loans
- SACCOs: no cooperation

39. Interview with Chirsker Masaki of TADB

Participants:

- Chirsker Masaki, Office Manager Agricultural Development Bank
- Research Group: Elibariki Tweve, Rahel Guggenbühl

About the interview:

At the beginning, all participants introduced themselves, followed by an introduction about the purpose of the research group, not giving too much information about the tree as collateral approach in order not to influence the opinion about it. The interview was conducted by the research team, who asked specific questions. The points listed are a summary of the answers given by the interviewee(s), other SH groups are mentioned directly.

About TADB:

TADB is a government-owned development finance institution that focuses on providing financial support to the agricultural sector in Tanzania. Its main objective is to contribute to the country's economic growth and poverty reduction by promoting sustainable agriculture through the provision of affordable and accessible credit to smallholder farmers, agribusinesses and other actors in the agricultural value chain. TADB offers various credit products and financial services, including direct loans, value chain financing and guarantee schemes, to address the financing challenges of Tanzania's agricultural sector.

Products offered:

- The problem of smallholder farmers who do not have access to financial resources
- Possible solutions: Direct credit, value chain financing, guarantee system
- Cooperation with NMB, CRDB and 50 more banks

1. Direct lending

- TADB does no direct lending to smallholder-farmer, they do not have a network, and the commercial banks have a larger network to monitor and control
- Eligibility conditions: Need for a business, 2-3 years of experience
- Challenges for borrowers without title deeds
- No direct reach to smallholder farmers, they are doing direct landing mainly for groups such as AMCOs or bigger companies

2. Guarantee system

- NMB gets 50% from TADB if the lender defaults and they cannot get the collateral. If there is no default, TADB gets a fee back
- The aim is to improve financial inclusion and access to finance
- TADB is the interface with the commercial bank; the bank requests a transaction and, if eligible, forwards it to TADB
- The borrower has no contact with TADB

3. Integrated financial models for the value chain

- Need for a business idea and business model
- Possible interest rate differentials for women and young borrowers
- Examples of value chain financing (inputs, machinery)

Mechanism:

- Preference for working with agricultural marketing cooperatives (AMCOS)
- Challenges with AMCOS: leadership, crop problems
- It is expensive to deal with individual farmers as customers (200 acres or more)
- No specific failure rate mentioned

Challenges for TADB:

- Limited reach of the TADB network and branches to smallholder farmers, they want to increase the awareness
- Need to sensitize farmers on certain issues and also educate them, but at the moment they have not enough money to qualify the staff, that is necessary so that they have the knowledge. He is thinking about a coaching program for smallholder farmers
- At the moment for TADB it is too expensive to monitor one individual loan of around 10 Mio Schilling, that's why they usually only do direct lending for bigger loans
- They want to work with one partner; one smallholder unit, one unit within the bank
- General Partners from TADB: He is not allowed to tell

Risks for smallholder farmer in agrifinance:

- The problem for women is that they usually do not have title deeds because the man inherits the land. But usually, it is the women who work the land

Interest Rate:

- Interest rate options: short-term, long-term
- Rate depends on gender and age: i.e. for women and/or youth there is usually a different

Trees as Collateral

- There are advantages of using trees as collateral
- Challenges occur with insurance issue, group formalization and registration
- TADB's potential role in the Tree as Collateral model: providing the guarantee system, no individual lending possible
- Plans to expand partnerships and create a transformation unit for smallholder farmers

Risks:

- Smallholder Farmer need to have the CCRO and be registered, documents need to be submitted to the district officer or development officer, who also should act as a coach
- They would also need to have some sort of forest insurance
- Better chances to get loans, if they are in groups – it is too expensive on individual level for the banks

Appendix B: Pre-field research goal definition per SH group

Goal definition done by Rahel Guggenbühl

1. Smallholder Farmer

Value Generation, why they need financial resources:

- **Value Generation:** What is their main business / value generation?
- **Art of business:** Agricultural innovation? Other forms of innovation/ entrepreneurship?
- **BoP Aid or entrepreneurship:** Do they also need support for resources to survive (food and drinking water)?

Scope of Financial Resources at the village:

- What financial support exist in the village? What possibilities do villagers have so far to get financial support?
- What has been done so far in acquiring financial resources?
- What is the scope of the need of receiving financial support in the village?
- How is the process to get financial support?
- What are pros / what are cons in the interaction with financial institutions?
- Why is it difficult to get financial aid?

Cultural challenges:

- **Communication:** How is the communication between financial institution and them so far? What are challenges here? Do financial institutions understand what your needs are?
- **Knowledge:** Have you heard of a micro credit or another form getting a loan from a financial institution? Do you understand what the contract in a micro credit process says / means?
- **Trust:** Do you trust a financial institution?

GRACOMA:

- Have you heard of the GRACOMA venture? IF yes, what do you think of it?
- Would you use their service as the Collateral Management of your trees?
- What sort of trees do you usually plant?
- What do you use the trees you plant for?

Carbon Credits:

- Do you know what causes global warming?

- Do you know, what needs to be done to work against global warming?
- Have you heard of earning money through carbon credits?
- Have you heard of carbon sequestration or the TECASECO project here in town?

Challenge the model: Growing trees as credit collateral:

- Would you use growing trees as credit collateral?
- **Ownership:** Do you have an owner certificate of the land you work on?

2. GRACOMA

Innovation Process:

- What is the exact value generation?
- How does the Value Chain look like and what are the processes there?
- What are the main challenges so far?
- What solutions were found for challenges so far?

Main Stakeholder Interaction:

- What SH are involved so far?
- What are interfaces with the SH in the value chain of GRACOMA?
- What important SH are missing?

SH: Smallholder Farmer

- What clients do you have on board so far? (Groups, family, single entrepreneurs / farmers)
- How does the agreement, value exchange look like?

SH: Financial Institutions

- Have you had contact with financial institutions about your venture so far?
- What was difficult?
- Why do you think they would agree to a tree as a credit collateral credit system and why not?

Forestations: Tree/ Forest Characteristics

- Planting of Tree Species? What are common?
- Do you want to foster sustainable growth of forests? How do you do that?
- What is the value of a tree? How does it differ between sort?

Evaluation of Tree as Credit Collateral Credit Model

→ Short presentation: Present, what are the findings so far / Present the challenges that have been researched. Compare the already model in use from Thailand.

To discuss:

- What has been done here so far?
- What do you think are the main challenges in setting up such a model?
- Would building up a Tree as Credit Collateral institution makes sense in the village to foster it as they already did in Thailand?
- FURTHER GOAL: Characteristics of the Model in Thailand TBR and to be challenged and to evaluate a fit here/ and find out challenges and solutions to the challenges?

3. Financial institution in Tanzania

Offered Products:

- What products are offered in the market for smallholder farmers / village entrepreneurs?
- How does the loan scheme look like?
- What are challenges?

Trees as Credit Model:

- Challenging the Trees as Credit Model (presentation)
- What is needed that it would work, and financial institution would collaborate here?

Tree as Collateral Bank /Institution:

- Do there exist any Tree Collateral and Tree Banks as in other countries?
- Bank of Agricultural or Agricultural Cooperatives in Thailand / Bank of Agriculture in Nigeria
- What does it need to build up one of these banks?

4. Tanzanian university

Goals:

- Research of Trees as Credit Collateral
- Research of Forestation
- Agricultural Programme setup with HSG?

5. Tanzanian entrepreneur

Value Generation, why they need financial resources:

- **Value Generation:** What is their main business / value generation?
- **Art of business:** Agricultural innovation? Other forms of innovation/ entrepreneurship?
- **BoP Aid or entrepreneurship:** Do they also need support for resources to survive (food and drinking water)?

Scope of Financial Resources at the village:

- What financial support exist in the village? What possibilities do villagers have so far to get financial support?
- What has been done so far in acquiring financial resources?
- What is the scope of the need of receiving financial support in the village?
- How is the process to get financial support?
- What are pros / what are cons in the interaction with financial institutions?
- Why is it difficult to get financial aid?

Cultural challenges:

- **Communication:** How is the communication between financial institution and them so far? What are challenges here? Do financial institutions understand what your needs are?
- **Knowledge:** Have you heard of a micro credit or another form getting a loan from a financial institution? Do you understand what the contract in a micro credit process says / means?
- **Trust:** Do you trust a financial institution?

Appendix C: Topic clustering by interviewees and stakeholder groups

Excel sheet created by Rahel Guggenbühl

		1. Farmer	4. Other relevant SH	7. Research Institutions				
		2. Financial Institution	5. Government					
		3. Field Research Crew	6. Entrepreneur					
		Agri-Finance Landscape						
Meeting #	SH Name	Pre-Knowledge	Risks	Risk Mitigation Strategy	Local FI	Loan needed	For what?	Loan received from FI
1	Fatuma		External effects: sickness of family where she needs the money for / husband as a farmer had not a good harvesting season and Fatuma needs to help him.		yes	yes	Ressources (products etc. / restaurant maintenance / growth of restaurant	no --> has a FARIP grant
2	Amani		Trading for products		yes	yes	Wants to build a house	yes, with the collateral of his wives salary, who is working for a governmental institution
5	Nasoro Makajula		to develop the market for agricultural finance in the village, no offer yet		/	yes	to support village members for projects	yes, through government project
7	Daniel Masuaga		External effects (weather where harvesting fails, Corona when they closed the boarders and couldnt trade)		no	yes	Investing in more silos, to store more food and be able to trade through TBM (Bahats company)	no
8	Johanna Samson		external effects - weather: flooding of the previous year	Product Diversification	no	yes	Also invest in a good irrigation system to build a garden and be able to do better farming	no
9	Dixon		to control in case of default, had one person so far that has escaped (run away), bc he couldnt pay back the loan		private FI	/	/	/
10	Renatus Kastor		want to also diversify into other products, to reduce the risk of default of one product transportation, bad infrastructure, too high transaction costs: Cannot transport seedlings to farmers	Product Diversification	no	yes	to extend, for transport and trading	yes, governmental loan
11	Lucy		cant get micro loan and no source of credit, wants to grow		no	yes	for storage to trade in a bigger extent	no --> has a FARIP grant
13 & 15	Davies and Chariman	around 25% of village farmers/ tree growers have experienced a loan system	no financial resources that come into the village, village fund (community development fund) through tax income only tax system is also a potential risk with higheres the transaction costs		Village authority cannot get credit --> But 25% of the village have experienced a loan scheme, with no defaults --> they got the loan from the district administration (0% interest rate), mcoba (community bank from the district) and sacco	yes many from the village need it --> for production / productive credits		
17	Tree Growers Association (Farmers)/ Village Executive Officer / Ward Cuncelor)	No, only that collateral is too high	lack of control, that pre-mature trees get cutted, bc farmers need money Factors mentioned by farmers: financial issues, need money for farmer ressources, for education they need money and when someone is sick of some relatives. Have no other options to get money	Receiving a loan: Tree as collateral Forest Management Education	Loans from the government, but with difficult collaterals	yes	Planting, field maintenance and harvesting	no, collaterals are too high

Meeting #	SH Name	Pre-Knowledge	Risks	Risk Mitigation Strategy	Local FI	Loan needed	For what?	Loan received from FI
26	3 farmers and tree growers Village chairman	no	Agricultural Risks: they don't have enough money and a low income, not enough capital, to buy input products big challenge to get fertilizer and chimpanzees eat the maize using manure and not fertilizer; big competition for manure, because it's used to grow avocado, they don't get it, but with it you can produce more productive In general location is less productive, far from river and a lot of sand Bank Risks: no trust and too high collateral	What do they do about it: protection - build a small hut, women and men go there to protect their fields Governmental input loans can help	no	yes, urgently		no
28	Ragpar Tweve	no						
29	7 farmers and tree growers and One Acre Fund carbon credits beneficiaries, Village executive officer, One Acre Fund village Agent	no - Why don't people know the banks? Village head: we know the banks, but the terms are not for the farmers. Banks want interest every month, but they cannot pay before harvest. --> They are not open to this kind of loan because they would fail.	Fund for one hectare only for inputs, they need money to pay the man to prepare the field		no	yes	for preparation and harvest. They need financial support to grow trees on 3 hectares, from the one hectare fund they get the capital through carbon credits only for one hectare.	no
30	Emanueli Skendasi (amcos secretary), Elda Kisoma (Leader for women in amcos), Henry Mtensi (Chairperson of amcos)	/	market price drops, and market instability; ; market price dropped drastically, so prices fell and the business model no longer worked, so they couldn't repay the loan for the hope foundation and the hope foundation stopped paying not enough financial baking to operate accordingly competition like one acre fund, who takes over, until they receive proper funding	loans with good conditions (lower interest)		yes	for giving out loans to smallholder farmers	foundation hope
30	Elda Kisoma	yes, about amcos and saccos only	They do not get enough credit from saccos and Amcos. Saccos only solve small problems, cannot fulfil the business plan with these small loans and because of these small loans, which are not enough, there are defaults.	One idea to solve the problem: have your own women's system. Weekly savings so that they can use these savings when shortages occur, external funding would help them enormously.	no	yes more than she gets from amcos or saccos	planning her agricultural business	from amcos
31	Jovita Tweve	yes, good knowledge about the local agri-finance landscape	Farmers often do not have enough money to produce, and AMCOs may not have the financial resources to support them. Loans that are difficult to repay can be problematic because contracts often dictate what farmers must harvest, and this does not necessarily match what is profitable.	Savings are a great incentive for farmers to invest in their farms	yes	yes for smallholder farmers	planning their agricultural business mor efficient	no
32	Justine Kisange	yes a lot	Lack of formalization in agriculture makes it difficult for farmers to get credit Government-approved documents and good collateral are required by banks for credit models Farmers are not insured, and farms must have some development on the land to be used as collateral Banks have experienced that farmers may default or use loan for other purposes High volatility in timber market makes it risky to invest Moral hazard is a major problem due to different cultural practices Insurance is a major challenge for credit products Bank usually goes for less costly projects on shorter terms Challenges for a field officer include lack of formalization and preparedness among farmers.	Banks assess risks and use collateral to mitigate them for agricultural loans. The aim is to measure and mitigate risks for each agricultural commodity on a case-by-case basis. Padi (such as rice) and maize crops can have risks assessed through warehouse receipt financing. Warehouse receipts serve as collateral for loans, and collateral can also be stored crops.	rural areas hard to reach	/	/	/

Meeting #	SH Name	Pre-Knowledge	Risks	Risk Mitigation Strategy	Local FI	Loan needed	For what?	Loan received from FI
33	Prof. Greyson Nyamoga	/	/	/	/	/	/	/
34	Prof. Dismas L.Mwaseba							
35	Deo Shirima Paulo limo							
37	Dr. Siima Bakengesa Dr. Pilly Joseph Kagosi	Research on Agri-Finance, operational credit procedures						
38	Hamisi Saidi Mmomi	NGO for agricultural finance or value chain support	They have no collateral at all or only weak collateral and missing track records Farmers are often sceptical due to lack of knowledge and attitude Default often due to knowledge gaps in the banking system Agricultural sector gets less credit from banks due to risks and policy interventions Productivity will increase with credit, but a change in mentality is needed for success Moral Hazard: If client has nothing to lose, there is no incentive to pay back		difficulty to reach smallholder farmers in very rural areas			
39	Chirsker Masaki	agricultural development bank	TADB has a limited reach to smallholder farmers and wants to increase awareness There is a need to sensitize and educate farmers but TADB currently lacks the funds to train their staff TADB is considering partnering to provide coaching to clients TADB finds it too expensive to monitor individual loans around 10 Mio Schilling, so they only do direct lending for larger loans Women face a challenge in accessing loans because they often do not have title deeds as land is inherited by men, despite them being the ones who work on the land					

Meeting #	SH Name	Why not?	MF	VICOBA	SACCO	AMCOs	Other loan offers	Insurance Options
1	Fatuma	must show a collateral give out loans based on what you have --> cannot risk her children and family	No Loan. Understanding: small loan with collateral --> knows Asa, Black, Mkombozi, Pride, Africa	she was a member, but someone ran away with the money	No, bc regulated and too expensive (need to pay the officers)			
2	Amani		Yes has a loan. Understanding: small loan with collateral	based on trust and is only done between members who now each other. Almost the only model used in this area --> the informal SACCO	No, bc regulated and too expensive (need to pay the officers)			
5	Nasoro Makajula						Governmental loan for a project from an investment from an international wholesaler, farmer get money to plant a certain product --> governmental agricultural planning	
7	Daniel Masuaga	Collaterals are too big --> there exist no loans for	none	no	no			
8	Johanna Samson	Collaterals are too big --> there exist no loans for agricultural purposes	none	no	no			
9	Dixon							
10	Renatus Kastor						Loan from Manispa - local government institution (development for young entrepreneurs) Conditions: Under 35 years old, registration of the youth group	
11	Lucy	Collaterals are too big --> there exist no loans for agricultural purposes	She went to NMB, CRDB and Finca Equity --> all wanted a collateral, that she couldn't provide	yes, she was a member. But she sees the risks there in trust issues. Vicoba is not registered such as Sacco, because than they need to pay taxes and other costs will come such as to pay employees etc.				
13 & 15	Davies and Chariman				yes, some of the village have done that		governmental loan offers, but here they prioritize women, youth and disabled persons. From mcoba (community bank of the district) or/and SACCO	
17	Tree Growers Association (Farmers)/ Village Executive Officer / Ward Councillor		no	yes, they are member of VICOBA also --> in 6 years no defaults, but only very small loans	no			

Meeting #	SH Name	Why not?	MF	VICOBA	SACCO	AMCOs	Other loan offers	Insurance Options
18	Godfrey	/	They offer input financing	no	Did do business with this organization, but banks now don't fund them anymore saccos only do deposits at NBC --> In General the system is good and they take over the controlling part which is very important for NBC	they give loans to amcos organization, who are offering a sort of WRS for smallholder farmers and also taking care of the marketing of the crops They also do business with trees/timber		Farm insurance, life insurance, permanent instability insurance Around 7% of the value of the trees cost insurance -> too expensive and not safe for farmers because they cannot afford it.
19	Olipa Hebel & Kenneth	/	Warehouse Receipt System Equipment Financing Input Financing	no	Not anymore, had to many defaults by the smallholder farmer	They finance Amcos		
21	Ubisimbali & Ramadani							
23	Saad Mtambule & Lukas Dotsabida							
24	Freddy Mville		He offers MF loans for small businesses on a monthly basis want to expand to offer input loans					fire insurance; It exists, but farmers don't know it exists. Insurance for 1 hectare: you have to have the data (value, size): approx. 1 hectare 1.5 million shillings per year
25	7 farmers and tree growers Ward Executive Officer Education officer of the District Village head	they don't know any options around, no bank or financial institution came to explain the loan offers	don't know any option	yes they have a local vicoba; Conditions: 5-10% interest rate, after 6 months they can take more. Vicoba is not very helpful to the villagers as they have no money, they need external money.	no	amcos, they have heard from it		no information about products received

Meeting #	SH Name	Why not?	MF	VICOBA	SACCO	AMCOs	Other loan offers	Insurance Options
26	3 farmers and tree growers Village chairman	don't know about it and don't trust it, as they think they just want to get their collateral, banks are no friends they think	no	yes they have a local vicoaba	no	no		don't know any
28	Raggar Tweve							
29	7 farmers and tree growers and One Acre Fund carbon credits beneficiaries, Village executive officer, One Acre Fund village Agent	no knowledge about any loan options	no	/	/		Carbon Credits from One Acre Fund	/
30	Emanueli Skendasi (amcos secretary), Elda Kisoma (Leader for women in amcos), Henry Mtensi (Chairperson of amcos)		/	/	yes	/		they don't know any / Less Default, if they diversify their product offer, such as being involved in the selling of fertilizer business and as well in giving out loans
30	Elda Kisoma		/	/	yes	yes		she doesn't know any
31	Jovita Tweve		CRDB other banks	/	yes	yes		she proposes to build a saving cooperative
32	Justine Kisange		In agri finance usually group collateral Warehouse receipt System	/	/	Have done business with Amcos	/	For trees much needed, but to expensive for smallholder farmers

Meeting #	SH Name	Why not?	MF	VICOBA	SACCO	AMCOs	Other loan offers	Insurance Options
33	Prof. Greyson Nyamoga	/	/	/	/	/	/	/
34	Prof. Dismas L.Mwaseba							
35	Deo Shirima Paulo lino							Farmers usually cannot afford insurance A potential solution is to offer a bundle of insurances (such as life insurance and forest insurance) to help farmers afford forest insurance Acre Africa is an insurance company in Dar es Salaam that is piloting affordable, agriculture-tailored insurance products Farmers who have trees but cannot afford insurance can have their forests certified by organizations such as the FSC to qualify for insurance.
37	Dr. Siima Bakengesa Dr. Pilly Joseph Kagosi						SNB, NMB and agricultural development bank offer agri-finance loan options	
38	Hamisi Saidi Mmomi							
39	Chirsker Masaki					yes they work with amcos		

		Product Variables (Agri-Finance)					Tree as Collateral	
Meeting #	SH Name	Collateral	Interest Rate	Loan Volume	Repayment Term	Risk Assessment	Pre-Knowledge	Opportunities
1	Fatuma	house, car in general, what they own	MF: 18-25% per annum or per Month depends on the structure	Min Loan Volume: 1 Mio Schilling = 2500 USD				
2	Amani	house, land, other assets Group Collateral, to minize default rate For his bank loan he is using now, his wifes salary (working for the government) is the collateral	MF: 10-30% / VICOBA: 10-20% per annum or per month depends on their structure			Different time frames (1 year usually) Vicoba: time is defined by the cooperation		
5	Nasoro Makaiula	no collateral needed	0% - governmental loan has no interest rate for farmers			Different time frames (1 year usually)		
7	Daniel Masuaga	Land, house					no knowledge	
8	Johanna Samson	Land, house					no knowledge	
9	Dixon	TV, Motorbike License, other assets	MF: 10-15% per Month			small loans paid back in a couple of Month		
10	Renatus Kastor	group collateral	0% --> from governmental development fund	Size: 10 Million	1 year			
11	Lucy	house, land	VICOBA: 50%					
13 & 15	Davies and Chariman	group collateral	0%				no knowledge	can work out, since farmer have land title and some also forest land titles Other Income source to fill the village fund for infrastructure and other purposes needed for the village Could also give the land for the village to plant the trees that they could use for loans
17	Tree Growers Association (Farmers)/ Village Executive Officer / Ward Cuncelor						no knowledge	Would be able to harvest all together and than synergize for the trading, lower costs and can grow more

Meeting #	SH Name	Collateral	Interest Rate	Loan Volume	Repayment Term	Risk Assessment	Pre-Knowledge	Opportunities
18	Godfrey	Land, Bank Account etc.	9-10% per annum		Usually up to 3 years	They also always do a due diligence: Character and Business check	yes	Be able to reach more clients
19	Olipa Hebel & Kenneth	Collateral usually is their bank account, they need to have one Asset Loan: Money on the Bank account WRS: the crops etc. collateral must be at least 150% of the loan.	9% per annum	depends on the request, Limit for branch level: 75 million, if higher they need to get permission from higher up	6 Month - 3 years	Viability of the business Verification at local village by branch manager and loan officer	yes	Be able to reach more clients
21	Ubisimbali & Ramadani							
23	Saad Mtambule & Lukas Dotsabida							
24	Freddy Mville	Own Business: Appliances in the house (TV, etc.)	Own business: 20% per month	depends	Own business: monthly loans	MF Loan Conditions for him: registered company, capital, bank certificate as security Own business: Collateral Checking for his clients: His team goes and checks, but not always.	no knowledge	Big opportunity to reach more clients
25	7 farmers and tree growers Ward Executive Officer Education officer of the District Village head	they would accept trees and land	Banks: assume 20%, they think interest rates are too high Vicoba: 5-10%	depends	after harvesting		no knowledge	to be able to get input products early on also artificial seeds, to be able to better harvest and get a better produce to sell

Meeting #	SH Name	Collateral	Interest Rate	Loan Volume	Repayment Term	Risk Assessment	Pre-Knowledge	Opportunities
26	3 farmers and tree growers Village chairman	Collateral are fixed assets, house, land title. --> too high	Kimaide Model that was not working: 5% Assumption: 9% per annum	depends	Kimaide Model that was not working: 6 Month		no knowledge	Very good model, people would understand it, they think. Potential is here because the interest rate is doable.
28	Raggar Tweve							Improvement in living standards through other sources of income due to multiple investments triggering poverty in rural areas, reduction in rural-urban migration of youth and social change through multidisciplinary entrepreneurship
29	7 farmers and tree growers and One Acre Fund carbon credits beneficiaries, Village executive officer, One Acre Fund village Agent	One Acre Fund: no collateral needed	One Acre Fund: 9% per annum	One Acre Fund: 450 shillings per tree per year, after three years higher amount	10 Month	Controlling of the trees	no knowledge	They see a 100% opportunity. Through gracoma, they can use the extra loan for cultivation that is missing from One Hectare Fund. And with the income from the carbon credits, they are more certain to pay back the credit.
30	Emanueli Skendasi (amcos secretary), Elda Kisoma (Leader for women in amcos), Henry Mtensi (Chairperson of amcos)	amcos as collateral, e.g. group collateral	16-18% from CRDB to SACCOs --> too high From hope foundation: 10% 9% for amcos from a bank would be doable	depends	Hope Foundation: 6-12 Month	members need to have shares at amcos (6 shares of 10k schilling each)	no knowledge	
30	Elda Kisoma	no collateral	SACCOs: 12 - 13%	depends	SACCOs: 6-12 Month	members need to have shares at amcos (6 shares of 10k schilling each)	no knowledge	
31	Jovita Tweve	registered group	AMCOs: around 18% per annum	depends		control of what farmers are harvesting and also telling them what to harvest, critical because farmers know best what is most profitable in each year	no knowledge	
32	Justine Kisange	Land, Input crops	9% per annum for agricultural loans	bank pays 50-80% of the collateral value	12-36 month / 6 month than the interest rate is lower	Default rate is less than 10% due to regular branch officer visits to assess and advise clients. Collateral for loans requires developed land that generates income, or other approved documents such as inheritance. Focus is on land title rather than trees. 11 branch staff plan to visit villages 2-3 times per year after assessment. Field officer checks farmer's character by assessing their business experience and knowledge to determine loan repayment ability. What is needed: title or proof of ownership from local authorities, document of permission to harvest trees, personal document	no knowledge	Tree farming presents great opportunities, particularly in the highlands of Iringa District. There is big potential for additional benefits with tree farming, including a sustainable approach and the ability to make business with tree products.

Meeting #	SH Name	Collateral	Interest Rate	Loan Volume	Repayment Term	Risk Assessment	Pre-Knowledge	Opportunities
33	Prof. Greyson Nyamoga	/					no knowledge and no specific research on that topic	big opportunity also for a research, no research atm at SUA about Trees as Collateral
34	Prof. Dismas L.Mwaseba						no knowledge and no specific research on that topic	Smallholders have the potential for commercial success in tree planting. Validation of trees for farmers by Gracoma can help increase the value of their trees. There is potential for improvement in the timber value chain to make it more sustainable and economically viable for villagers.
35	Deo Shirima Paulo lino						no knowledge and no specific research on that topic	
37	Dr. Siima Bakengesa Dr. Pilly Joseph Kagosi						yes, researchin on tree valuation tools and agri-finance, but not in a combination.	They find the idea very good, highlighting the business potential Trees can be used as collateral, but financial institutions and smallholder farmers need to better understand their value
38	Hamisi Saidi Mmomi		PASS does not charge interest rate, they receive a 0.5% fee, when farmer paid back the loan	depends		PASS provides a guarantee service to banks to promote lending to small farmers PASS guarantees 50% of the loan amount, while farmers have to secure the other 50% with collateral Banks have multiple options to recover their collateral in case of default, with selling property being a last resort The bank decides on collateral based on creditworthiness and productivity, with collateral assessment being the last step in the process	never used tree as collateral	
39	Chirsker Masaki		interest rate can depend on gender and age, lower for youngster and women		short-term and long-term options		never used tree as collateral	

Meeting #	SH Name	Risks	Risk Mitigation Strategy	Tree as Collateral Loan Scheme	Tree / Land Owner (size)	What do in case of Default?
1	Fatuma					
2	Amani					
5	Nasoro Makajula					
7	Daniel Masunga	financial agent is missing in the village		yes	no	
8	Johanna Samson	financial agent is missing in the village		yes	no	
9	Dixon					
10	Renatus Kastor				TBD	
11	Lucy				Land Owner , TBD	
13 & 15	Davies and Chariman	to find financial institutions agreeing to this ATM there is no loan scheme available for farmers Farmer could think, that the bank offers them a loan scheme with the purpose that they fail and loose their forest Financial Agent is missing in the village	A pilot project is needed to show farmers that it works so that both parties (financial institution and farmer) can trust it	yes	Land owner, no planted trees yet	no financial ressource in case a farmer defaults to buy his trees, so the farmer can pay back the loan
17	Tree Growers Association (Farmers)/ Village Executive Officer / Ward Cuncelor)	Loan giver needs to know the farmer In case of default, why should someone take over the forest plot. Be to pay back the loan they would just cut the trees and sell them for the loan. --> longterm thinking here is missing, that they can make more value if they let the trees grow and than sell them.		yes	Land Owner and Tree Owner	Ward answered; Group is monitoring eachother, the group is taking care. Farmers answered; no default, because if they harvest at the same time they can synergize and get more money, be lower transaction costs to sell the products.

Meeting #	SH Name	Risks	Risk Mitigation Strategy	Tree as Collateral Loan Scheme	Tree / Land Owner (size)	What do in case of Default?
18	Godfrey	<p>only mature trees are a value for the bank</p> <p>risk of trees is big: fire, through thunder lightning, or neighbour who puts a fire etc.</p> <p>risk of erratic cashflow</p> <p>farmer have no money to fertilize and nourish the trees, bank loose therefore the interest, because the risk is big and mitigation is low.</p>	group based lending	Mature trees as collateral, can only be used for additional collateral, a plot of land or house etc. must serve as the basis. So, trees must be mature and able to be harvested, but only for additional loan amount.		PASS: Dealing with farmer loans and case of default Group Collateral, where group vouches for each other
19	Olipa Hebel & Kenneth	<p>risk of long harvesting period of trees</p> <p>risk of trees: Fire</p>	additional group collateral as for example Amcos showing them a track record	Currently they only offer additional loans for growing trees as collateral.		Third party: if the client defaults, a third party has to pay back at least 50%. Some private companies are already doing this.
21	Ubisimbali & Ramadani	<p>early pruning of trees</p> <p>risky weather conditions</p>	<p>Strategy for early pruning of trees? They are trying to develop projects with farmers to find ways to make money in other ways and not by cutting and selling pre-mature trees.</p> <p>For example, keeping cows, etc.</p> <p>Other strategy: cutting down Mikusu (indigenous tree) to plant other trees (pine, eucalyptus) because Mikusu has no value. problem this is against sustainability principles.</p>	<p>governmental mechanism</p> <p>receivment of a cutting licence as collaterals: collateral for getting a loan (the cutting licence is valid for 3 years). Contractors buy a licence to cut from the government, and this is the collateral for the bank.</p>		
23	Saad Mtambule & Lukas Dotsabida	<p>market is not selective; Timber from local or controlled logging goes to the same buyer and he does not care about quality but wants the cheapest: market standards for timber, that make it difficult for smallholder farmer to sell their produce</p> <p>financial inability</p> <p>Problem of loss of money for smallholders, because they don't plant their trees according to the technical specifications</p> <p>Interest rate too high</p>	<p>Risk Assessment: benefits if a third party is involved, it could work if other risks are assessed</p> <p>Fire situation has improved, much has been done to prevent fire; fire has become a national issue.</p> <p>Fire control: natural forest, different species, different diseases, different soils, they absorb fire factor etc.</p> <p>People who start fires don't have trees; strategy: every village member needs a tree so they don't want to have a fire</p>			
24	Freddy Mville	<p>The big risk for trees as collateral is fire</p> <p>lack of itree insurance; many smallholder farmer don't know that this exist or it is too expensive for them, no tailored options on the market</p>	Mitigation Strategy: the big task is to educate people on how to prevent fires.	Growing trees as collateral: is possible, but you have to have insurance.		
25	7 farmers and tree growers Ward Executive Officer Education officer of the District Village head	<p>fire and climate change</p> <p>Loosing of money, because they need to sell trees pre-mature for a smaller value</p>	firebreaks		yes tree and land	

Meeting #	SH Name	Risks	Risk Mitigation Strategy	Tree as Collateral Loan Scheme	Tree / Land Owner (size)	What do in case of Default?
26	3 farmers and tree growers Village chairman	Risk of failure due to external influences such as weather, fire, etc. no entrepreneurial skills, e.g. to be able to plan the loan for their agricultural business	education		yes tree and land	If natural habits occur, they want to pre-long the repayment time to max 1 year and they would agree to increase the interest rate until they repaid the loan.
28	Ragpar Tweve	A farmer may delay creating firebreaks, increasing the risk of fire outbreaks	Early education on fire mitigation measures helps reduce fire outbreaks		yes tree and land	
29	7 farmers and tree growers and One Acre Fund carbon credits beneficiaries, Village executive officer, One Acre Fund village Agent	Village head: after failure, the trees are no longer under the farmer's control / one hectare fund agent: risk of losing the trees, their own property.	A strategy to mitigate the challenge of farmers cutting trees prematurely in emergency situations for short-term money could be applied in the case of Usokami village, where farmers work with the One Acre Fund and therefore do not cut trees prematurely because they would then no longer receive carbon credits. The same strategy could work with trees as collateral or other business opportunities where the value of the trees generates a different value for the smallholders.	yes	yes tree and land	
30	Emanueli Skendasi (amcos secretary), Elda Kisoma (Leader for women in amcos), Henry Mtensi (Chairperson of amcos)				yes tree and land	
30	Elda Kisoma				yes tree and land	
31	Jovita Tweve	risk of fire			yes tree and land	
32	Justine Kisanga	Trees can only be used as collateral in addition to other facilities at NMB Bank. Trees are not stable in value, which makes them unreliable as collateral, and the market dynamics for trees are also volatile. The future of trees as a commodity is uncertain due to the impact of the Chinese market on the market for tree products. Farmers are shifting to avocado trees due to the decline in timber prices, which is reducing interest in tree cultivation. Financial institutions are open to opportunities, but the risks are significant. A big problem is also the lack of tree insurance, as there is a huge risk of fire.		from the bank's point of view: Verification of ownership or title of the farm from local authorities. A document showing permission to harvest trees. Personal documents of the borrower. Checking of financial requirements and providing necessary funds for tree harvesting. Loan Product Conditions: The bank pays 80% of the invoice amount if all requirements are met. Credit period of 12-36 months. Equipment used as collateral, with the bank keeping the registration card. Interest rate of 9% per		Gracoma and mtunsa misitu could help give the banks a security of the collateral management A third party could possibly offer insurance and the bank would accept it

Meeting #	SH Name	Risks	Risk Mitigation Strategy	Tree as Collateral Loan Scheme	Tree / Land Owner (size)	What do in case of Default?
33	Prof. Greyson Nyamoga	Insurance is expensive for farmers because of the high risk. Trees are a long-term investment, but farmers need money before harvesting, which is a big challenge.	TFS discussed insuring trees, which could make it easier for financial institutions to lend.	There are no such programmes, but there was a REDD+ project that focused on planting trees as carbon offsets.		
34	Prof. Dismas L.Mwaseba	Time constraints for forestry investment, you can do more money with trees than with maize, but it takes more time Fire hazards Lack of awareness of the value chain among farmers leading to premature selling, fraud, and low prices Gender dynamics and unequal access to land ownership leading to unequal benefits in the timber value chain Poor infrastructure making transportation a challenge in some areas.	Smallholder Farmers are usually told: If you want to harvest more successful, you have to use these methods: firebreaks, clearing, use of fertilizers			
35	Deo Shirima Paulo Iimo	Difficulty in making the project accessible to smallholder farmers due to high demand for loans and low supply. Banks are reluctant to take risks, and CRDB bank is not on the field and cannot reach smallholder farmers in rural areas. The issue of land ownership where CCRO or title deeds are needed. Community property needs to be registered and certified at the district level. The need for cooperation between GRACOMA and FSC standards.				
37	Dr. Siima Bakengesa Dr. Pilly Joseph Kagosi	For banks it's difficult to reach very rural villages. Smallholder farmers face obstacles in understanding the processes for validating trees so that they can be used as collateral. Some farmers already use trees as collateral at the local level, the challenge is to formalize this already used model. The commitment of the farmers themselves to manage the trees and use the right harvesting methods is critical. There is a risk of premature tree cutting due to short-term needs for loans, such as sickness or school fees. Some farmers lack entrepreneurial skills, such as propagating the trees and/or making a tree nursery.	Education on tree value assessment, management and propagation of their assets.	yes exists already on an informal local level		
38	Hamisi Saidi Mmomi	PASS would face the challenge of insuring trees, which incurs additional costs With forest collateral, banks want to know if the trees are insured, when they will be harvested and if they have title deeds Environmental Risks, such as fire etc.				
39	Chirsker Masaki	Smallholder Farmer need to have the CCRO and be registered, documents need to be submitted to the district officer or development officer, who also should act as a coach They would also need to have some sort of forest insurance Better chances to get loans, if they are in groups – it is too expensive on individual level for the banks		Could support with the guarantee scheme, but at the moment no direct lender for smallholder farmers, could have potential in the future and when the system has a track record		

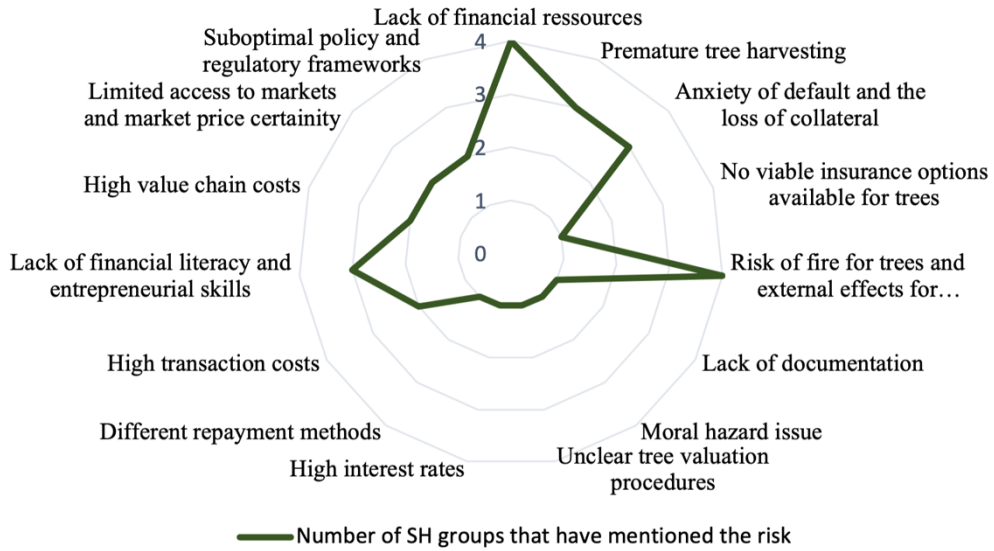
Meeting #	SH Name	Pre-Knowledge	Risks	Risk Mitigation Strategy	Local FI	Loan needed	For what?	Loan received from FI
18	Godfrey		Due Diligence for a wide range of clients Experience with too low collateral loan schemes, that clients usually used the money for something else than their business (eg. for sick relative, a motorbike etc.)		they are based in Makambako and have other branches on city level all over Tanzania, no branch at village level	/	/	/
19	Olipa Hebel & Kenneth	yes	NMB needs a track record, that farmers can get a loan, what usually farmers don't have	group collateral; only working with amcos as they handle the farmers	they are based in Makambako and have other branches on city level all over Tanzania, no branch at village level	/	/	/
21	Ubisimbali & Ramadani	yes						
23	Saad Mtambule & Lukas Dotsabida	yes	Banks don't want to give out loans because they don't have enough control over smallholder tree growers and/or farmers					
24	Freddy Mville	yes	Farmers don't manage to pay monthly, but after harvest they paid everything, but in the period between he had problems. Experience, that small entrepreneurs stop paying after a longer period		yes	yes on business level	extend business	MF Institution
25	7 farmers and tree growers Ward Executive Officer Education officer of the District Village head	no	Farmers: capital for inputs using local seeds instead of artificial seeds, don't receive those seeds are too expensive (artificial seeds are taking care of diseases, so less risks) Ward executive officer: Lack of receipt of inputs at the right time, no ability to plan the harvest the fact that farmers invest more money in inputs (preparatory work/cultivation, harvest) but subsequently receive less money for the output (sale of the products) Banks: - They have no financial institution here to go to, they lack a local field worker, Banks don't see them - Banks don't offer any agricultural loans	receiving of artificial seeds, so they can farm more productive	no	yes Even with the conditions (interest rate: 9%, collateral: land, time: 6 months) they are willing to take the loan because: 1. they want to be able to plan the harvesting season better with getting input products on time, like that they can be more successful in the agricultural business / 2. they also mentioned that the higher the collateral, the more motivated they are to pay back the loan, because it would be very bad to lose it	Cultivation, buying artificial seeds	no

Appendix D: Risk analysis

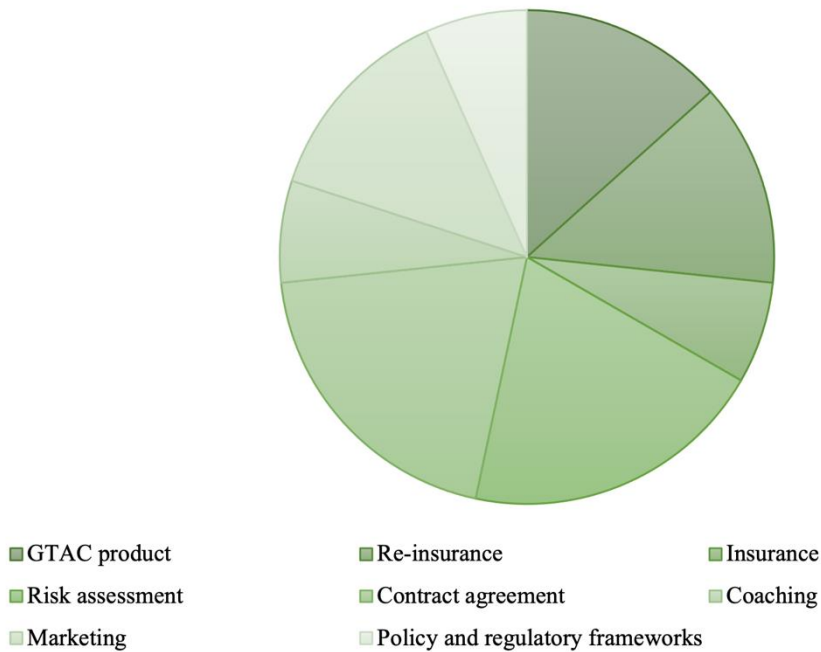
Excel sheet created by Rahel Guggenbühl

Factor	Risks (radar chart)	Smallholder Farmers	Financial institutions	Value Chain Players	Government Player	# of SH groups	Research institutions
GTAC product	Lack of financial resources	1	1	1	1	4	1
GTAC product	Premature tree harvesting	1	1	0	1	3	1
Re-insurance	Anxiety of default and the loss of collateral	1	1	1	0	3	0
Re-insurance	No viable insurance options available for trees	0	1	0	0	1	1
Insurance	Risk of fire for trees and external effects for agricultural production	1	1	1	1	4	1
Risk assessment	Lack of documentation	0	1	0	0	1	1
Risk assessment	Moral hazard issue	0	1	0	0	1	0
Risk assessment	Unclear tree valuation procedures	0	1	0	1	1	1
Contract agreement	High interest rates	1	0	0	0	1	0
Contract agreement	Different repayment methods	0	1	0	0	1	0
Contract agreement	High transaction costs	1	1	0	0	2	1
Coaching	Lack of financial literacy and entrepreneurial skills	1	1	1	0	3	1
Marketing	High value chain costs	1	0	0	1	2	1
Marketing	Limited access to markets and market price certainty	1	1	0	0	2	0
Policy and regulatory frameworks	Suboptimal policy and regulatory frameworks	0	1	0	1	2	1
Factor (pie diagram)	# of risks defining the factor						
GTAC product	2						
Re-insurance	2						
Insurance	1						
Risk assessment	3						
Contract agreement	3						
Coaching	1						
Marketing	2						
Policy and regulatory frameworks	1						

Number of SH groups that have mentioned the risk



Factor pie chart



Appendix E: GTAC Prototype evaluation with field research team (Nov. 22 - April 23)

During the prototype test-run on site, several brainstorming sessions and email conversations took place between Rahel Guggenbühl, Ueli Scheuermeier, Elibariki Tweve and Bahat Tweve. In November 2022, the team evaluated the prototype and in January 2023, the test run began. This summary contains all the information gathered by Elibariki Tweve, who acted as farip's local representative, Bahat Tweve, TBM's managing director, and Ragpar Tweve, the forest steward, about what happened during the prototype testing.

Prototype

Track record:

- First prototype with Magunguli and then further process to get track record, banks to participate in GTAC model need to find a private bank like the one from Mville as a partner and then continue to test the prototype until track record

Roles and Responsibilities

- 1. Smallholder Farmer: 10 Smallholders from Magunguli, 5 growing potatoes and 5 growing beans in the Prototype testing**
- 2. Financial Institution: Farip**
- 3. Local Asset Manager: GRACOMA, played by Farip as at the moment they have no-one local that can operate that, it is still an idea.**
- 4. Field Agent:**
 - Elibariki Tweve as local loan officer from Farip
 - Ragpar Tweve as forest steward and local sub-contractor from loan officer aka eyes and ears at site
- 5. Village Authority: Village Executive Officer from Magunguli (Davies)**

Pre-conditions:

- 10 smallholder farmers are members of the farmers and tree growers' association in Magunguli
- Local field agent role is done by local loan officer from farip in collaboration with the forest steward
- No insurance and no guarantor, farip is the insurance in this prototype

Step 1: Risk assessment

- a. Prove of land ownership:** Ragpa does this on the spot, with the name of the place, the name of the owner, a sketch with the names of the owners of the surrounding plots, the size of the plot, the type of trees, the age of the trees. Land ownership is also officially recognized by village executive officer as CCRO.

b. Prove of entrepreneurial skills of farmer: no check done here, as farip chose smallholders for the test-run.

c. Tree registration:

- **Tree Type: Pine, Eucalyptus and wild trees**
- **Tree Age: 9 +years**
- **Tree Size: around 5 cubic feet for a 10-year-old tree**
- **Market price (stand 03.05.2023): 1 standing 10-year-old tree on one acre (=0.4ha) calculates 80'000TSH**
- **Prototype calculations were made with 50'000. The price of wood is rising faster than inflation. This is for ONE standing tree. On one acre (=0.4ha) there are still 300-400 trees after 20 years**

d. Tree valuation (table created by Ueli Scheuermeier)

Estimated value of trees and required number of trees to cover loan and pay GRACOMA fee			
850'000 TSH	Loan amount	Month	6
51'000 TSH	Total interest	Nr. of acres of plot	1
901'000 TSH	Total amount to be repaid		
1.3x	Times how much to cover risks		
1'171'300 TSH	Amount to be secured with trees		
7%	Fee for GRACOMA		
45'050 TSH	GRACOMA fee per year for this loan		
1	Nr. of years for this loan (only full years)		

Paina (Pine)	Value in TSH standing in forest	Diff to previous year	No. Of trees to secure the loan	No. of trees to pay the annual GRACOMA fee for this loan
5 years	5'000		234	9
6 years	6'000	1'000	195	8
7 years	7'000	1'000	167	6
8 years	8'500	1'500	138	5
9 years	10'000	1'500	117	5
10 years	12'000	2'000	98	4
11 years	14'500	2'500	81	3
12 years	17'000	2'500	69	3
13 years	20'000	3'000	59	2
14 years	23'000	3'000	51	2
15 years	26'500	3'500	44	2
16 years	30'000	3'500	39	2
17 years	34'000	4'000	34	1
18 years	39'000	5'000	30	1
19 years	44'500	5'500	26	1
20 years	50'000	5'500	23	1

Mlingoti (Eucalyptus)				
5 years	5'000		234	9
6 years	6'000	1'000	195	8
7 years	7'000	1'000	167	6
8 years	8'500	1'500	138	5
9 years	10'000	1'500	117	5
10 years	12'000	2'000	98	4
11 years	14'500	2'500	81	3
12 years	17'000	2'500	69	3
13 years	20'000	3'000	59	2
14 years	23'000	3'000	51	2
15 years	26'500	3'500	44	2
16 years	30'000	3'500	39	2
17 years	34'000	4'000	34	1
18 years	39'000	5'000	30	1
19 years	44'500	5'500	26	1
20 years	50'000	5'500	23	1

Notes by Ueli Scheuermeier 03.05.2023 (translated into English with deepl)

- a. I tried to put a value for each tree depending on age. The target value was 50'000 (12.2022) for a 20-year-old tree standing in the forest. Now we must be careful that the younger trees only add small value each year, but the older trees add much more value each year. So, I added a column "Diff to previous year". There we can see how each year the additional value increases. For instance, a 10-year-old tree is only 2'000 TSH more valuable than a 9-year-old tree. But an 18-year-old tree is 5'000 TSH more valuable than a 17-year-old tree.
- b. I just took the same figures for Mlingoti like for Paina. But of course, this may be different. It can be adjusted.
- c. So, how many trees are required to cover the total amount to be repaid? We must take care of the risks for GRACOMA. There can be fire, there can be cheating, there can be problems with the loan-taker, there can be all sorts of issues that cannot be foreseen. So, we must increase the amount to be covered by the trees. Times how much? So, we must increase the amount to be covered by the trees. Times how much? I just put 1.3 in B6. So, if the loan is 850'000, then the amount to cover with trees is 1'171'300. We can change that figure 1.3 (loan amount 72.5% of collateral value) because it is red.
- d. In column "No. of trees to secure the loan" the Excel calculates how many trees of this age must be there to secure the loan. As an example, we take the loan of 850'000 with 51'000 interest. So, for instance if the farmer has 9-year-old trees, there must be at least 117 nine-year-old trees on the forest plot that is registered and reserved for this loan. If there are more trees on this plot, then those additional trees can be used for getting more loan. But for a farmer who only has 6-year-old trees, there must be 195 such six-year-old trees on the registered forest plot. However,

if a farmer has 18-year-old trees, then only 30 such 18-year-old trees must be reserved for this loan.

- e. We must work out how farmers can pay for the service of GRACOMA. Let us assume GRACOMA charges a fee for its services which is 7% of the value of the loan per year. In another mail we can discuss the various options to pay that fee. But in case farmers want to pay the fee with their growing trees, then how many trees must the farmer provide to GRACOMA each year for covering this loan? We can see that the farmer with a loan of 850'000 plus 51'000 interest must pay GRACOMA a fee of 45'050 for each year that the loan is running. How many trees is that for a farmer with 9-year-old trees? See column "No. of trees to pay the annual GRACOMA fee for this loan per year". It is 5 trees. If the loan is for two years, then next year he will have to give GRACOMA an additional 4 trees. And if the loan is for three years, then on the third year he will have to add another 3 trees, because by then the trees will be 11 years old.

Step 3: Contract agreement

1. Contract for smallholder farmer

- a. Loan agreement between FI and the farmer, loan condition agreement
- b. Registration of trees agreement, documentation of the risk assessment
- c. Contract agreement between farmer and GRACOMA with the fee for GRACOMA and rules

→ All this authenticated with stamp and signature by the Village Executive Officer.

2. Contract for forest steward

a. GRACOMA Payment

Ragpa has a fixed service contract with GRACOMA for 400'000 per month. This is none of the farmers' business. What GRACOMA has to do is to collect enough through the fees to pay Ragpa and everything else. And so we have not calculated that exactly. But: one mtunza can control up to 100 acres at a time. In the end, it boils down to the equivalent of one mature tree per acre per year as a fee to GRACOMA. Nothing was paid by the farmers.

b. FI Payment

FARIP, as a financial institution, pays Ragpa to take care of FARIP so that local people don't mess around with the loans. In the prototype, we leave it at that for now, because: Ragpa already gets 400,000 a month for his work as a mtunza, but so far he has been underemployed. Now we want him to add to it. We can make up the difference in our minds and construct two streams of money to Ragpa from it: From GRACOMA (played by FARIP) to Ragpa and from Credit Institute (played by FARIP) and Ragpa. In the future, the Watunza will be compensated by the credit officers, presumably with a commission funded by the interest earned on the loans they service.

Zu 1a. Loan agreement between FI and the farmer (table created by Rahel Guggenbühl)

Contract agreement	# Bean Farmer	# Potato Farmer
Membership at farmers and tree growers' association	Yes	Yes
Purpose of the loan	Commercial bean cultivation	Commercial potato cultivation
Collateral	The collateral for this loan is trees owned by the smallholder farmer and registered and managed by GRACOMA. GRACOMA's documents form part of this agreement are accompanied by genuine images of GRACOMA's tree registration documents. <ol style="list-style-type: none">1. Tree Registration & CCRO of Land2. Tree Value: 1.3 x loan amount	
Loan issuing date	01.02.2023	01.04.2023
Loan amount*	850'000 TSH per acre	2 Mio TSH per acre
Interest Rate	1% per Month	1% per Month

Side notes to table contract agreement:

- Repayment: about 6 months, but if it takes longer, they can talk to Eli aka farip as marketing will also be done through TBM aka Bahat Tweve.
- Cost: the figures are an informed estimate, prices vary.

Zu 1a. Side calculation: input costs for smallholder farmer (table created by Farmer and Tree Growers Association from Magunguli and controlled by Elibariki Tweve)

Input Costs	# Bean farmer	Value	# Potato farmer	Value
Seed	2 buckets x 50'000	100'000	2 bags x 80'000	480'000
Round Up	5 liters x 14'000	70'000	6 liters x 15'000	90'000
Fertilizer	2 bags x 140'000	280'000	5 bags x 140'000	700'000
Water Fertilizer for leaves	3 liters x 10'000	30'000	6 liters x 10'000	60'000
Snow Chemical	2 liters x 20'000	40'000	12 liters x 20'000	240'000
Pesticides Chemical	2 liters x 25'000	50'000	3 liters x 25'000	75'000
Weeding	2 liters x 30'000	60'000	3 liters x 30'000	90'000
Labor charge during plantation	1 acre x 70'000	70'000	1 acre x 70'000	70'000
Labor for charge for cultivation	1 acre x 70,000	70'000	1 acre x 70,000	70'000
Transportation	40'000	40'000	120'000	120'000
Contingency	40'000	40'000	25'000	25'000
Total		850'000		2'000'000

Zu 1c. GRACOMA Fee paid by smallholder farmer

GRACOMA Fee: GRACOMA will receive 2 trees marked by the forest steward on each smallholder's field, this is stated in the contract (see tree valuation section for exact calculations).

Zu 2b. Forest steward fee paid by GRACOMA (table created by Ueli Scheuermeier)

	Market value for normal standard Paina / Mlingoti	
1 acre has	500	trees
1 standing tree in the forest at 20 years can get	50'000	TSH
Days Mtunza Misitu needs to survey and register a plot	1	day
Days Mtunza Misitu needs each year to supervise one acre	2	days
Daily wage Mtunza Misitu	30'000	TSH
GRACOMA pays Mtunza Misitu for each acre per year	60'000	TSH
Days Mtunza Misitu works per month if fulltime	25	days
Monthly earnings of Mtunza if working full time for GRACOMA	750'000	TSH

Step 4: Loan issuing

The loan to the farmers was issued in cash as it was stated that the government officials will help to collect it from the smallholder farmer, if there are any problems.

Step 5: Controlling & Coaching

a. Controlling:

- Will be carried out by the local forest manager "mtunza misitu"
- Mtunza Misitu acts as the eyes and ears of the financial institution, in this case Farip, and Eli as the loan officer in Tanzania (Eli showed him how to take the photos, etc.)

b. Coaching:

- Eli re-defined the contract variables with the smallholder farmers and explained them the procedure
- Mtunza Misitu as coach according to forest management principles together with the smallholders he did the tree value assessment and explained them how it works

Step 6: Marketing

- Spot markets; smallholders have to store and weatherproof their produce, then wait for some trucks to come and buy their produce at a very low spot market price.
- Role: mlangusi like Lucy is in Makambako, the nearest town, and gets calls from smallholder farmers that they have produce to sell. Then she sends a truck to pick up beans, she pays for the transport costs and the produce (also at the spot market price), then she stores the produce in her warehouse in Makambako and then big transporters (called dalali) come to fill her trucks (about 30 tonnes) to go to Kenya to sell to bigger buyers.

Bean and potato farmers have agreed to market their produce through TBM. Here is a calculation example from an expected TSS deal for bean farmers conducted by Bahat Tweve. The prices are based on current spot market prices and market prices of produce sold in Dar es Salaam. Bahat Tweve calculates the TSS transactions for 5 bean and potato farmers.

Bean farmer potential future revenue of bean production (table created by Bahat Tweve)

TSS calculation for bean farmers, numbers based on assumption and local experience by Bahat Tweve						
	Farmer Name	STEVEN MUHUMBA	MARIO SUTTA	ZACHARIA SUGAULI	ZAWARD FUNGO	FROLA VAGINGA
COB paid to farmer	UNITS given by this farmer to TBM for marketing	30	30	30	30	30
	TSH per unit	45'000	45'000	45'000	45'000	45'000
	Calculated full COB amount	1'350'000	1'350'000	1'350'000	1'350'000	1'350'000
	Real amount paid to farmer TSH	1'350'000	1'350'000	1'350'000	1'350'000	1'350'000

Middle costs	Total costs specific for only this farmer	0	0	0	0	0
	toll processing costs for all farmers: per unit	0	0	0	0	0
	general mid costs for all farmers: per unit	2'733	2'733	2'733	2'733	2'733
	combined total general mid costs per unit	2'733	2'733	2'733	2'733	2'733
	Total general mid costs for this farmer	82'000	82'000	82'000	82'000	82'000
	Total mid costs for this farmer	82'000	82'000	82'000	82'000	82'000
	% of waste from cleaning, processing					
Calculate Net Income	Income from buyers per unit delivered by farmers	55'000	55'000	55'000	55'000	55'000
	Units delivered by this farmer	30	30	30	30	30
	Total TSH for this farmer	1'650'000	1'650'000	1'650'000	1'650'000	1'650'000
	Minus total Middle costs this farmer	82'000	82'000	82'000	82'000	82'000
	minus 1% interest on COB of this farmer	13'500	13'500	13'500	13'500	13'500
	Total net income for this farmer	1'554'500	1'554'500	1'554'500	1'554'500	1'554'500
	%	10	10	10	10	10
	Calculated commission from this farmer to TBM	155'450	155'450	155'450	155'450	155'450
	Minus commission for TBM = remaining for this farmer	1'399'050	1'399'050	1'399'050	1'399'050	1'399'050
	This farmer returns COB advance	1'350'000	1'350'000	1'350'000	1'350'000	1'350'000
BONUS	Remaining for this farmer after clearing COB adv	49'050	49'050	49'050	49'050	49'050
Final pay	Finalized total remaining to pay to this farmer	49'050	49'050	49'050	49'050	49'050
Income / Loss TBM	Real commission from this farmer	155'450	155'450	155'450	155'450	155'450
	Loss for TBM from this farmer	0	0	0	0	0

General Mid-Cost Calculation (Unit = debe / bucket = 1x 20 litres; table created by Bahat Tweve)

TRANSPORT WITH SCS					
total units transported		150			
Transport fee pay to SCS		300'000			
Transport costs per unit		2'000			
Description	Type of unit	No of units	TSH/unit		TSH
Transport	bag	30	10'000		300'000
bags	bags	30	500		15'000
Taxes	bags	30	2'000		60'000
rope	bundle	1	5'000		5'000
loading	bags	30	500		15'000
unloading	bags	30	500		15'000
				Total general middle costs for units with TSS	410'000
				Number of units with TSS	150
				Total general middle costs for each unit with TSS	2'733

Prototype test-run status april 2023 by Elibariki Tweve:

- All contracts signed.
- Lots of rain in Magunguli, difficult drying of beans afterwards, which could be a challenge for farmers.

Bean farmer's:

- 16.01: Loan agreement at Magunguli Village with Village Executive Officer as witness
- Feedback from Farmers: Eli: "They were VERY HAPPY for this and promise to do on right thing so that they can be loanable again".
- February: Killing Weeds
- March: Cultivating and Planting

Potato farmer's:

- 22. 03: Loan Agreement at Magunguli Village with Village Executive Officer as witness / 2 Mio each
- Feedback from Farmers: Eli: "They appreciate it and will work as agreed."
- Photos were sent
- March: Start killing weeds with herbicide, needed to start earlier because of the rainy season and it takes a long time to kill the weeds
- End of March: Start of the preparation with buying seeds

Bean prototype test-run participants are:

- Steve Muhumba
- Mario Sutta
- Zacharia Sugauli
- Zaward Fungo
- Frola Vaginga

Potato prototype test-run participants are:

- Eva Mlelwa
- Bahati Myinga
- Chesco Ngonzi
- Regino Sutta
- Norbert Sutta

Photo monitoring during loan process of bean and potato farmers:

Photo monitoring done by Ragpar Tweve or Elibariki Tweve and sent to the GTAC test-run documentation whatsapp group with Ueli Scheuermeier, Bahat Tweve, Elibariki Tweve and Rahel Guggenbühl. As Elibariki Tweve's phone was stolen, the first photos of the bean farmer loan agreement were lost and cannot be shown here.



Wednesday 22nd of March

Potato prototype test-run participants:

- Steve Muhumba
- Mario Sutta
- Zacharia Sugauli
- Zaward Fungo
- Frola Vaginga

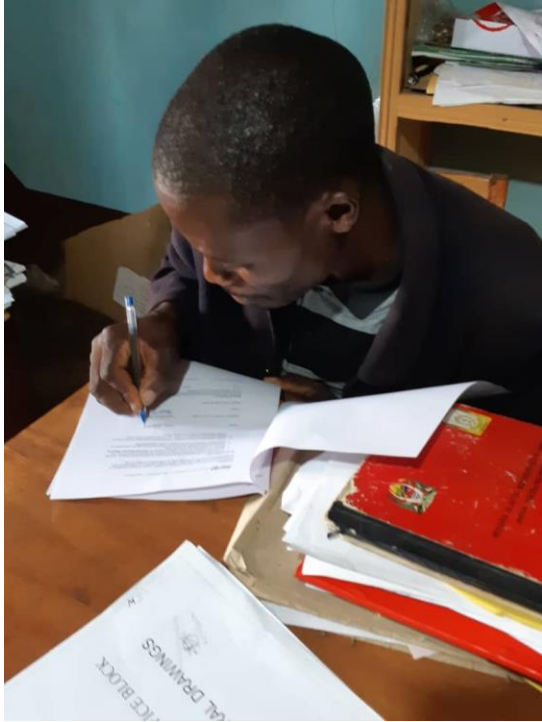
Also present:

- Elibariki Tweve
- Ragpar Tweve: Mtunza Misisu



Wednesday 22nd of March

Potato farmers are reading the farip contract.



Wednesday 22nd of March

Potato farmer are signing the farip contract.



Wednesday 22nd of March

Davies the village executive officer of Magunguli acts as a witness and gives a stamp when all parties have signed the farip contract.



Wednesday 22nd of March

Mario Suta's bean farm.



Friday 14th of April

Potato seedlings.



Thursday 04th of May

Progress of a bean farm in Magunguli.



Tuesday 16th of May:

Frola Vaginga with her child working in her beans farm.

Appendix F: Prototype documents

1. Loan agreement, an example for bean cultivation (translated from Swahili into English by Elibariki Tweve)

Between

Zawadi Fungo of Magunguli village, Kiyowela district, Mufindi district

and

Fund for African Rural Innovation Promotion (FARIP), Alexandraweg 34, 3006 Bern, Switzerland, Swiss company registration number CHE-326.707.775.

Purpose of this Agreement:

Zawadi Fungo is a member of the Tree Growers Association in Magunguli village. He is a farmer who grows various food and crops. GRACOMA will train him in bookkeeping and monitoring forest conditions during the loan period. The forest supervisor will oversee and manage the production of different types of seedlings and their sale to farmers, show farmers how to make money from different improved tree varieties, and do other forestry work such as beekeeping. This way, future lenders can see how a farmer can work efficiently and how the necessary information can be collected and monitored. Zawadi Fungo wants to grow beans to receive money to long-term meet his daily needs such as school fees, health care, social and economic needs. At the FARIP meeting on 11 May 2022, the FARIP Board agreed in principle to provide him with a loan to achieve his goal.

For now, FARIP will work with Zawadi, just as GRACOMA will work with him later in the concept.

The contract will specify how Zawadi Fungo will receive and repay the loan, e.g:

- Loan for bean production.
- A contract with a form stating how his forest and bean farm will be managed.
- Zawadi Fungo's loan that will help ELISEMA and the forest supervisor to manage the accounts and bookkeeping of his business, such as finances, expenses, valuation, etc.

Loan for Zawadi Fungo:

The money from this loan will be used exclusively for commercial bean cultivation as submitted to FARIP: TZS 850,000 to rent a farm until one hectare is harvested.

Loan amount: TZS 850,000

Start date: 1 February 2023

Interest rate: 1% per month

Loan repayment schedule:

- The loan is repaid in one lump sum to Tanzania Biashara Mapema (TBM) immediately after the sale of the crop through the TSS system.
- The interest rate is TSH 8,500 (51,000 for 6 months), so the total amount to be repaid, including principal, is TSH 901,000.
- The deadline for repayment is 31 July 2023.

Collateral:

The collateral for this loan is trees owned by Zawadi Fungo and registered and managed by GRACOMA. GRACOMA's documents form part of this agreement are accompanied by genuine images of GRACOMA's tree registration documents.

Special conditions:

- Zawadi Fungo will submit a contract between him and the forest guardian (Ragpa) for monitoring and control to obtain accurate financial information on bean cultivation.
- A contract with Tanzania Biashara Mapema to sell the crop to ensure a market for the produce.
- Responsibility for maintaining the forest and bean farm lies with Zawadi Fungo in the event of a human or ecological disaster.
- FARIP has authorised ELISEMA INVESTMENT to manage all financial transactions in Tanzania on behalf of FARIP for Zawadi Fungo in loan disbursement, interest collection and loan repayment.
- ELISEMA will send FARIP monthly progress reports on Zawadi Fungo's harvests, which will be sent by the forest guardian (Ragpar Tweve) via Whatsapp.

Signatures and dates:

ELIBARIKI TWEVE, Managing Director ELISEMA:

Zawadi Fungo, farmer:

Ragpar Tweve, forest steward:

Village Council:

Ueli Scheurmeier, CEO-FARIP:

2. Signed contract for bean farmer, an example:

Mkataba wa mkopo Kilimo cha Maharage

Kati ya
Zawadi Fungo wa Kijiji cha Magunguli, Kata ya Kiyowela, Wilayani
Mufindi
na
Fund for African Rural Innovation Promotion FARIP (Taasisi),
Alexandraweg 34, 3006 Bern, Switzerland,
Usajili wa kampuni SwissSwiss CHE-326.707.775

Dhamira ya makataba huu
Zawadi Fungo ni mmojawapo ya wanakundi cha wapanda mbi kiji cha Magunguli. Yeye pia ni mkulima wa mazao mbalimbali ya chakula na biashara GRACOMA Lengo kuu lake ni kumfanya mkulima wa mbi akune mbi yake kwa na umri salishi au unadaiwa kwa mbi kuwa tayari kwa kuvunwa imeingia sasa baada yakuona watu wanavuna mbi michanga kwa sasa inawafundisha kutunza nyaraka na kujaa hali ya mbi iliyoy wakati wa mkopo.

Mtunza Miotu atakuwa akifanya kazi ya kusimamia na pia atakuwa akendesha biashara ya kuzalisha miche ya aina mbalimbali za mbi, na kuzaa miche hiyo kwa wakulima kuwaonyesha wakulima jinsi ya kutengeneza fedha kwa kutuma mbi iliyoboreshya ya aina tofauti tofauti, na kufanya kazi zingine zhusianazo na mesu, mifano uzakishaji wa ng'ani k.

Hatua ya hii itawezesha kuwaonyesha watoa mkopo wa baadaye kwa kiviwi Mkulima anawezesha kazi kwa umadhubuti, na kuonyesha biashara zinazohitajika zinoweza kukusanywa na kusimamia. Zawadi Fungo atataka kulima maharage ili kukidhi mahitaji yake ya kila siku kama vile ada za shule, ugonjwa michango mbalimbali na ya kijamii na maendeleo. Katika kikao cha mwezi wa 5/11/2022 kweye kikao cha FARIP, bodi ya FARIP ikubali kikanuni kumpa mkopo ili kufika lengo.

Kwa wakati huu FARIP watafanya kazi na Zawadi Fungo kama vile GRACOMA watafanyotanyi naye baadaye katika dhana.

Mkataba huu utatonyesha jinsi Zawadi Fungo atakavyopokea mkopo na kuilipa - mf

1. Mkopo wa kulima maharage
2. Mkataba wenye fomu ambayo itaonyesha jinsi shamba lake maharage na misitu itakavyosimamiwa.
3. Mkopo wa Zawadi Fungo utakavyoweza ELISEMA na Mtunza Miotu kumsimamia Zawadi kazi ya kutunza kumbukumbu za biashara mf fedha, matumizi na tatimani.

1. Mkopo kwa Zawadi Fungo
Fedha kutoka katika mkopo huu zitatumika ili katika kufanya kilimo cha kibashara cha maharage kama andiko lililowasilishwa kwa FARIP 850'000 kwa ajili kilimo cha maharage kwa kukodi shamba mpaka kuvunwa kwa ekari moja

Kiasi cha mkopo: 850'000 TSH
Tarehe utakopozana: 1. Februari 2023.
Kiasi cha riba: 1% kwa mwezi.

Urudishaji wa mkopo utakavyokuwa:

- Utarudiwa kwa mkopo mara baada ya kuzaa mazao kupitia mfumo wa TSS- kwa kampuni ya Tanzania Biashara Mapema (TBM).
- Riba itakuwa 8'500TSH (51'000 kwa mwezi 6) kwa mwezi kwa hiyo Jumla ya mtaji na kiasi kilichorudiwa ni Tsh 90'000.
- Muda wa mwisho wa kuilipa ni tarehe 31 Julai 2023.

Zawadi Fungo

Part 1

Loan condition agreement between FI and the farmer

{4}

FOMU YA GRACOMA KWA USAJILI WA MITI INAYOENDELEA KUKUA .

Hii fomu inahititisha kuwa miti inayoendelea kukua katika eneo kama iliyoinishwa na nyaraka hii. Miti hii inawez tumika kama dhama. GRACOMA watakuwa wakimtumia Mtunza Miotu kukagua mara kwa mara kama miti hiyo ipo na inayoendelea kukua.

JINA LA ENEO... *MAKUNZI*

MMILIKI HALALI WA ARDH... *ZAWADI FUNGO*

MMILIKI HALALI WA ENEO... *ZAWADI FUNGO*

JIRANI NO 1. *DAMANI NGENZI*

JIRANI NO 2. *EVELINI MSAKWA*

JIRANI NO 3. *TWEVE*

JIRANI NO 4. *ZAWADI FUNGO*

ENEO limethibitishwa lingi Elgaji ya miti.
Miti yenyi emakazi.
Nukta za GPS:

1. ZF1
2. ZF2
3. ZF3
4. ZF4

Miti yenye miaka Zaidi ya 7 ni... Eka moja

MASHAHIDI WA MITI ILIYOPO NI. *AFISA MTENDAJI*
KIJILIWA MSAKWA
KATA YAKITOWELA
26/1/2023

1. AFISA MTENDAJI WA KIJILI...
2. JIRANI NO 1... *DAMANI NGENZI*
3. JIRANI NO 2... *EVELINI MSAKWA*
4. JIRANI NO 3... *Tweve*
5. JIRANI NO 4... *Zawadi Fungo*
6. MTUNZA MISTU... *Afanane.*

Part 2

Registration of trees, documentation of trees used as collateral

Dhamana:
Dhamana ya huu mkopo ni mti inayomilikiwa na Zawadi Fungo ambayo imesajiliwa na kusimamiwa na GRACOMA. Nyaraka za GRACOMA ni sehemu ya makubaliano haya. zitaambatanishwa na picha za nyaraka halisi za GRACOMA za usaji wa mti.

Masharti Maalumu:

1. Zawadi Fungo atonyesha mkataba katika yake na Mtuza Misitu (Ragpa) kwa ajili ya usimami wa mkataba utafitaji sahihi wa kifedha wa biashara ya kilimo cha maharage.
2. Mkataba wa mauziano ya mazao baada ya kuvuna na Tanzania Biashara Mapema ili kuwa na uhakika wa soko la mazao yake.
3. Dhamana ya utunzaji Misitu na shamba la Maharage ni la Mtuza Misitu mwehewe na janga lolote la kibinadamu au kimazingira ni yeye atakayewajibika
4. FARIP wamewapa mamlaka ELISEMA INVESTMENT kusimamia miamala yote ya kifedha Tanzania kwa niaba ya FARIP, kwa Zawadi Fungo, katika kutoa mkopo, ukusanyaji wa riba na urudishaji mkopo.

Tarehe 16/1/2023

Tarehe 16-1-2023

ELIBARIKI TWEVE, CEO ELISEMA

Zawadi Fungo, Mkulima wa Maharage

Tarehe 16/1/2023

Ragpa Tweve, Mtuza Misitu.

Masharti Maalumu:

ELISEMA atawasilisha taarifa za maendeleo ya mazao kwa FARIP kila mwezi kutoka kwa Zawadi Fungo kupitia taarifa atakazopata kutoka kwa Mtuza Misitu (Ragpa Tweve) ambazo atakuwa akituma kupitia Whatsapp.

Tarehe 16/1/2023

Tarehe..

Afisa Mtendaji wa Kijiji Ueli Scheumeier CEO-FARIP.

AFISA MTENDAJI
UELI SCHEUMEIER
AFISA MTENDAJI
UELI SCHEUMEIER
AFISA MTENDAJI
UELI SCHEUMEIER

Part 3

Contract agreement between farmer and GRACOMA with the fee for GRACOMA and rules

Signatures

- Smallholder farmer
- farip (representative Elibariki Tweve)
- Witness stamp by village executive director

3. GRACOMA registration form – Growing Trees (translated from Swahili into English by Elibariki Tweve)

This document witnesses that trees are growing on the land which is described in the document. The trees can be given as a security. GRACOMA will use the Mtunza Misitu to check regularly that these trees are still there and are growing.

NAME OF THE PLACE:

OWNER OF THE LAND:

OWNER OF THE TREES:

NEIGHBOR 1 JIRANI NO 1.:

NEIGHBOR 2. JIRANI NO 2.:

NEIGHBOR NO 3:

NEIGHBOR NO 4:

Area that is considered acres

GPS Coordinates:

1.

2

3

4.

Number of trees older than 15 years:

Number of trees older than 10 years:

Number of trees below 10 years:

Fee for control 0 or one-tree of this value per year per acre and fee for registration is one-tree

WITNESSES

1. VILLAGE EXECUTIVE OFFICER.
2. NEIGHBOR 1.
3. NEIGHBOR 2 .
4. NEIGHBOR 3.
5. NEIGHBOR 4 .

6. MTUNZA MISITU.
7. REGISTRAR OF GRACOMA

Rules and regulations for mtunza misitu on how he will operate work with forest's owners:

What will be the contribution of the farmer for supervision services?

1. A farmer shows his/her trees as a security for fee.
2. To take trees that is equal with value of money for fee to sell to pay fee if he/her has no cash or a farmer can buy for himself/herself after his/her loans completed.

Responsibilities for Mtunza Misitu:

1. Mtunza Misitu must know all 4 points and coordinates of the farm trees where can help him to know number of trees that owned by a farmer on that land.
2. He must know all neighbours in all 4 locations for confirmation for land title or ownership
3. He must enter inside the land to check value of trees and of which type e.g pines, Eucalyptus or miombo etc.
4. He must have photo point that show every year tree's progress.

He is doing all these to help GRACOMA to get actual information about trees to loan giver that growing trees is there and trees can used as a security for the loan.

NOTE; Firebreaks and cleaning are task for the smallholder farmer.

Business Model Concept

What:

The idea “Trees as Collateral” was brought to FARIP by farmers from Magunguli, Mgololo area: They want to provide their growing trees as security for loans. This would allow them to cover their monetary requirements while at the same time leaving the trees to grow further (the older a tree is, the more its timber-value increases each year). Discussions and probing by FARIP with farmers soon established that there is a requirement for collateral management on behalf of the loan-providers, who would mostly be absent. This resulted in the concept of GRACOMA (growing assets collateral management), ie. a company that would specialize on managing/supervising and registering these growing assets as collateral for loans.

Who:

- Farmers, who can use GRACOMA service to validate their trees and register them
- Financial institution, who can use the data collected (e.g forest fotomonitoring, forest security measurement, forest validation)

How:

It needs a reliable person to keep an eye on the forests: Such a person is now called a “Mtunza Misitu”. He or she is the person on the spot, based in the village, who will do all the required work in the forest (i.e. validation, monitoring, registering), trained and contracted by GRACOMA. Such a person will also operate his/her own nursery as a commercial enterprise, including services to villagers owning GRACOMA-registered plots, eg. for pruning or fire-breaks, replanting, help in harvesting, any advice on management, etc. See also prototype model in step 4.

Value (Revenue Model eg. income streams for GRACOMA):

The question of who pays for the service will be further analyzed in the testing of the prototype. Loan provider, farmers and the public are all possible candidates that could be involved in the revenue model for GRACOMA. The different cases are presented here.

1. Farmers pay GRACOMA fees?

Farmers will not be able to pay cash for GRACOMA services. However, we had discussed that farmers could allow the Mtunza Misitu to mark a number of trees per year per acre, which would then belong to GRACOMA until they are harvested, and thereby later pay for the fee. This implies, that in the meantime GRACOMA can access some cash-resources that would be covered by those trees then owned by GRACOMA (eg. a loan by loan-providers direct to GRACOMA?). Another model would be that the

loan provider includes the GRACOMA fee, a percentage amount in the loan model and pays back the loan with interest rate and Gracoma fee included in the end of the loan term eg. harvesting period.

2. Loan providers pay GRACOMA fees?

They would pay GRACOMA for the services of managing the collateral they accept as security for providing loans. Probably they would include such expenses into the loan agreement, ie. have the return of those expenses also covered with growing trees to be harvested later - or with the return of the loan that includes such fees. Another idea may be where the loan providers themselves invest in forest plots in each village they operate in, to cover their expenses in GRACOMA. That is the logic, but to implement it, the loan-provider would probably more easily provide the resources for GRACOMA itself to own trees, from which it would then earn the fees for the services to farmers. However, such logics will be challenging to make transparent to farmers.

3. Public interest pays for GRACOMA fees?

The public interest may come to bear by eg. paying for the fee of GRACOMA, or subsidizing such a fee, etc. Again, as with the loan-providers, the public may itself invest in tree-plantations to later recover the expenses when harvesting those trees.

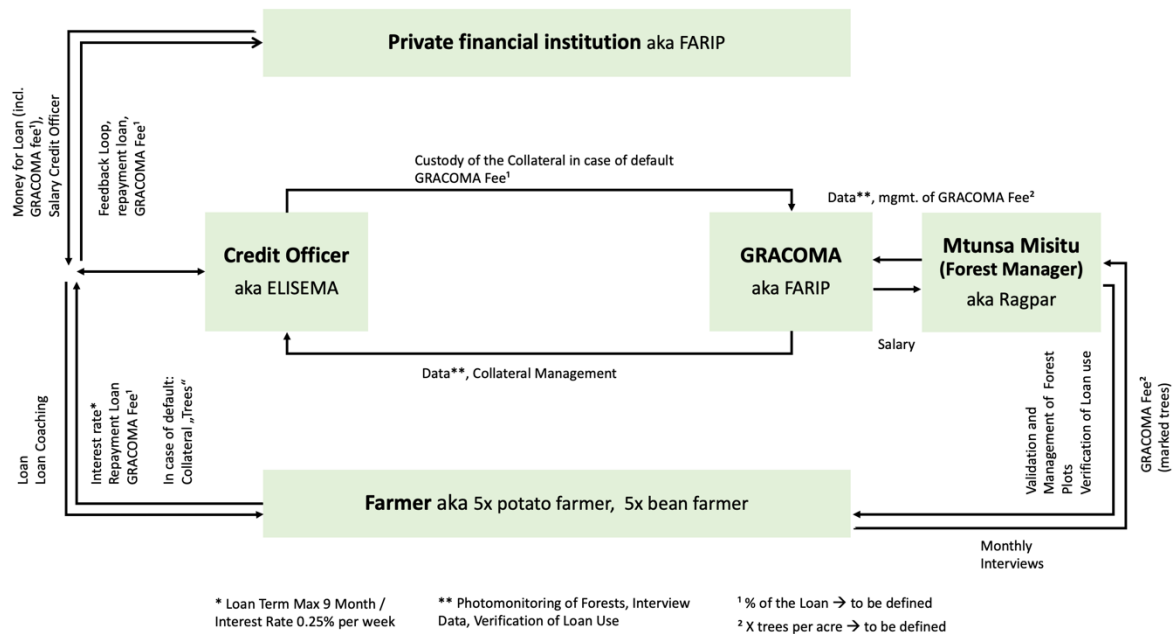
Prototype

In the prototype, we test the revenue model with the farmer as a customer from GRACOMA and who also pays the GRACOMA fee; We will discuss two potential models with the farmers in the contract agreement and decide upon one.

1. The financial institution grants a loan to the farmer, which includes the GRACOMA fee (amount to be determined). At the end of the loan period, the farmer repays the loan, which includes the interest rate and the GRACOMA fee.
2. Mtunza Misitu can mark a certain number of trees per acre (number to be determined), which then belong to GRACOMA until they are harvested, so that the fee is paid later. The financial institution, i.e. FARIP, gives GRACOMA a long-term loan, which is regulated in a separate contract, so that GRACOMA has the money ready to pay Mtunza Misitu for his service.

Test Format – Prototype

Loan contract with growing trees as collateral, will be signed from farmer, Elisema (in the name of FARIP) and village executive officer as witness in Magunguli village office.



Underlying assumptions and falsifiable Hypotheses

The test-run is based on the following assumptions:

- Agreement of loan terms with the farmers can be made
- Loan disbursement is doable through mobile payment
- No misuse of the loan is being made
- Repayment of the loan in the end of the term time from all farmers inclusive the interest rate

Based on these assumptions, the following hypotheses are tested in the prototype tests:

1. **The farmer does not misuse the loan for other purposes, than for the agricultural business**
2. **the farmer repays the loan after a maximum term of 9 months, including the interest rate of ¼% per week, if there are no external influences such as floods, etc.**

Test set-up and Feedback Loop

Roles

- Farmers are already in their final role
- Ragpa Tweve is already in his final role as mtunza misitu, contracted by GRACOMA (ie. FARIP at present)
- FARIP plays the role of GRACOMA
- FARIP plays the role of loan provider

Process and Feedback Loop

The responsibilities and tasks with the corresponding deadlines have been defined in the table. The feedback loop on the tasks is done via a Whatsapp chat. The group will be led by Ueli and Rahel, who will review the completed tasks and remind the actors of the deadlines and responsibilities.

Deadline	Status	Who	What
Nov.22		Bahat, Ragpar	Check on suitability of registration forms for forests we used before. Are they still suitable? Make adaptations or simplifications and send it for revision to FARIP/Rahel.
		Eli	Formulate loan contract between loan provider (ie. FARIP) and farmer with GRACOMA-registered plot and send it for revision to FARIP/Rahel.
		Ragpar	Identify 5 farmers with forest plots with at least 10-year-old trees who want to take a loan for preparing field for beans and 5 farmers who want to take a loan for preparing field for potatoes.
Dec.22		Ragpar	Mtunza Misitu inspects and registers the 10 plots and forwards information to GRACOMA.
		Ueli, Rahel	GRACOMA assesses the information and decides to provide loan to each farmer with a registered plot. Maximum 9 months at 1/4% per week (excluding the week in which the loan was received, and the loan is paid back. This means only count the full weeks Monday-Sunday that the loan was running).
		Bahati, Eli, Ragpar	Meeting with Farmers at village office: 1. decide with farmers, what model, they agree on how to pay GRACOMA fee. /2. Sign contract with village executive officer as witness.
Jan. 23		Eli	Money is channelled through ELISEMA to each bean farmer in cash in the village office with Village Executive Officer as witness.
Feb. 23		Ragpar	Mtunza Misitu monitors the use of the beans loans by sending photos of each freshly planted beans field.
		Ragpar	Mtunza Misitu does an interview with farmer about how the farming is running.
Mar.23		Ragpar	Mtunza Misitu provides first photomonitoring of forests and Interview data to GRACOMA.

Apr. 23		Eli	Money is channelled through ELISEMA to each potato farmer in cash in the village office with Village Executive Officer as witness.
		Ragpar	Mtunza misitu monitors the use of the potato loans by sending photos of each freshly planted potato field.
Jun. 23		Ragpar	Mtunza misitu provides second photomonitoring of forests to GRACOMA.
		Bahat	Beans harvest: If they want, beans farmers can market their beans via TBM-TSS. TBM pays farmers with COB and acc. to TSS finalization. The money movements of TSS are completely outside this testing of GRACOMA.
		Ragpar	Mtunza misitu sends photos of harvesting of beans to GRACOMA.
		Eli	Each bean farmers pay back loan in cash in the village office with village executive officer as witness to Elisema.
		Ueli	FARIP confirms the repayment to each bean farmer in writing and returns the collateral to the farmers on a contractual basis.
		Eli	Interviews beans farmers to get their feedback how it went, plus also get feedback from village authorities.
		Ueli, Rahel	In case of serious bottlenecks, FARIP will adapt and make changes to the further procedure.
July – Aug. 23		Bahat	Potato harvest: Those potato farmers who want can market their potatoes via TBM-TSS.
		Ragpar	Mtunza sends photos of harvesting of potatoes to GRACOMA.
		Eli	Each potato farmers pay back loan in cash in the village office with village executive officer as witness to Elisema.
		Ueli	FARIP confirms the repayment of each potato farmer in writing and returns the collateral to the farmers on a contractual basis.
		Eli	ELISEMA interviews potato farmers to get their feedback how it went, plus also get feedback from village authorities.
Sept. 23		Ueli, Rahel	FARIP assesses the returns and makes a report to evaluate this test.

Analyzing the test results and updating the business model concept

Evaluation Criteria

The test is successful if and when:

- Farmers agree with the process and the results of registering their forest plots
- All farmers agree with the terms of the loan to them.
- All farmers use the loan for what they promised to use it (no misuse)
- GRACOMA has useful registration documents and monitoring documents of each forest plot and the use of each loan (photos, etc).
- Loan disbursement to farmers was smooth through mobiles, or cash via mobile of Mtunza misitu.
- All farmers could fairly market their produce (with TSS-deals, if they want, but not forced)
- All farmers repaid their loan with interest. In case of a default, Mtunza misitu can take custody of the collateral trees through a signed confirmation from village authorities.

Data Collection

Information to be collected for analysis:

- Registration forms of each plot
- Loan agreements with each farmer
- Photos of forest monitoring
- Photos of loan usage
- All money transaction data for each single loan/farmer
- Feedbacks from interview with farmers and with village authorities
- Descriptions of any mistakes or unforeseen things that didn't work as expected, and an explanation of the possible reasons.
- (the results of the TSS marketing is outside this test, but should also become available)

Appendix G: Scheuermeier's GTAC model implications and comments on the thesis 2023

Model implications april 2023:

1. **Tree-financed agricultural production:**

- Tanzanian farmers have zero chance of getting a loan for their agricultural production, despite many ultimately failed attempts to establish the development project-financed approach on a sustainable basis, and despite frequent assurances to the contrary from the financial sector. What we experienced on the ground shocked even me!
- The reason is that the farmers cannot offer collateral for loans, or the collateral required is unacceptable to the farmers because it is far too dangerous. The reasons seem to be very diverse and complex.
- The idea now is that farmers could offer their growing trees as collateral, but this would require that this collateral be valued and controlled. Hence GRACOMA.
- So, the whole idea is that, **growing trees are the collateral for short-term loans for agricultural production**. And therefore, repayment is not by selling trees many years from now, but in the short term with the proceeds of agricultural production financed with GRACOMA collateral.
- I don't have the overview, nor have I researched this, but it could be that we are breaking new ground with this tree-collateralized financing of agricultural production. Be that as it may! Crucially, we probably have all the elements in place to set up the scheme - except for the guarantor, which specializes in smallholder trees. But at least we have clear ideas of what their business model can look like. I also have a feeling that these short-term agricultural production loans could be of a larger volume than the infrastructure loans we had first thought of (for irrigation systems, roads, warehouses, tractors, etc.).
- This also means that agricultural production financed by GRACOMA needs to be closely monitored to see if and how farmers will be able to market their increased production profitably and fairly, which - as we have learned - is far from trivial. And this is where TBM has a solution with its TSS offer.
- (And how a possible village health insurance scheme could accept growing trees as an insurance benefit.... - but that would be a whole other story, but one that could have resounded implications).

2. **Specialized guarantee company**

I think it would be worthwhile to think this through in more detail and implement it in a pilot project. After all, such a specialized guarantee company that knows this tree business inside out could be the breakthrough to enable local banks to get in.

3. Eyes and ears of the FI agent

Local banks will not be able to join despite the guarantees (see B) because of their transaction costs for small, widely dispersed loans. Hence a second role for the Mtunza Misitu: he would also be the village representative (in Magunguli) of the Financial Credit Officer at the head office (in Makambako). The village representative does not decide on the credit assessment or allocation, that is done by the credit officer. But the credit officer can rely on his village representatives to pass on the information to him for assessing the credit applications, and that his village representatives also check on the spot after the credit has been granted to see if everything is above board. And since there is already a GRACOMA-funded Mtunza Misitu on the ground, it is obvious to train the same person as a village agent. All that is needed is to strictly separate the two roles, which is best ensured through separate compensation channels for the Mtunza/Village Agent: GRACOMA to Mtunza, FI to Village Agent, both the same person. I am afraid that the problem of transaction costs is always systematically underestimated in such small loans to smallholders, which probably explains the current credit constraint in rural Tanzania. A financial institution working with GRACOMA collateral must have formulated a deliberate and targeted strategy for capacity building to keep transaction costs low. This is even more so as Tanzania is a vast and sparsely populated country. What we are proposing here could be such a strategy.

Comments on the thesis may 2023:

Literature review agricultural finance:

Ueli Scheuermeier: A basic story is this one: Production is one thing, and that is always looked at. Processing and marketing along the whole chain is the other, and much less attention is paid to that. The reason why a guy like Bahat, who operates deep inside the system, came up with TSS has this story behind it: when Clive Lightfoot and I were trying to improve communication among East Africans for IFAD 20 years ago, we deliberately didn't set any thematic targets. At that time, it was NGOs, government people, farmers and traders who joined in. Initially, production stories were exchanged, mainly driven by the NGO types, presumably based on the ever-present idea of poverty reduction and protection against famine. But the minority of farmers and traders like Bahat, in the learning exchange, saw to it within 2 months that almost only marketing was discussed, because "we are not starving, we can feed ourselves, but we are not making any money". After a few years, the NGO and government types dropped out because their programmes came to an end. What remained were the entrepreneurial farmers and traders, like Bahat in Tanzania, Moses Gichuru and Beatrice Obara in Kenya, and Paul Nyende or Jacinta Namubiru in Uganda. And it was in the exchange among them that the TSS concept emerged and was also supported by IFAD in the first pilot implementations. When IFAD left, these people continued, in Tanzania only Bahat. Bahat, however, was the driving force behind the TSS concept, and was able to demonstrate many things to the others because of his unrivalled market skills. These people are all still sporadically in contact with each other today. etc. Conclusion: A lot is written about smallholder production by the official development guild (which of course also publishes). And

if you let the smallholders (who never publish) decide for themselves where the shoe pinches them, then they always talk about marketing sooner or later, and much less about production. EXCEPT: Yes, in the financing of their production. But just, it then also needs financing of the TSS.....

Nevertheless, it is more than right to invest in the financing of smallholder production. But we must also think about stabilising the marketing of their products. If this does not work, the loans are wasted..... Let's see if this is mentioned later....

Diversification of production:

Literature: "Moreover, a major risk is the lack of true risk diversification. Smallholders tend to focus on one or more activities, all of which are exposed to similar main risks, such as weather or price risks. In addition to the loss of income at the individual farm level, financial institutions are exposed to the risk of default or frequent debt restructuring (IFC, 2012)."

Ueli Scheuermeier: I disagree with IFC here because it contradicts my observations and those of anthropologists and farming systems research people. I can't give you any scientific references off the top of my head, unfortunately. But the consensus among people involved in smallholder extension tends to be this: smallholders are highly diversified in their production, as well as in their larger livelihood system, where non-farm income is also built in (sister is a domestic helper, brother a truck driver, etc, and they are a livelihood alliance). If smallholders were not highly diversified in their sources of income, they would have died out long ago in the face of so many uncertainties. Resilience comes from diversification, which distinguishes smallholders quite decisively from large-scale plantations, which have much less resilience. Diversification in smallholder production is not understood by the credit institutions because it is too complex and individually different. They only ever see one crop and not the whole system. That would simply be too much to ask of a microcredit officer in a rural bank in the farthest reaches of Makambako!

Outgrower's scheme:

Ueli Scheuermeier: Hm..... Beware of outgrower's loans. The term outgrower comes from the plantation economy, which often has its own processing on the plantation itself (very pronounced with tea and sugar, but also coffee and palm oil). An outgrower is someone who produces outside the plantation for the plantation. With outgrowers, a plantation can better utilise its processing machinery and shift the climatic as well as general production risk to the surrounding smallholders. This has little to do with smallholder systems, and often even hinders their resilience - although: I have not yet met any small sugar or tea outgrowers who had not also invested intensively in bananas and tomatoes. Because these large factories (sugar!) need many workers, a market for fresh food is also emerging. But that's just it: A system is emerging that is becoming very dependent on a one-product plantation, and on its dependence on the world market, to whose fluctuations the plantations are notoriously unable to react with much resilience.

WRS:

Ueli Scheuermeier: All fine. But why do we hardly find any really functioning WRS in Tanzania any more? Let's see what else comes in this report. The main reason for the failure of the WRS is that the banks stopped participating as soon as IFAD relinquished its role as guarantor. By the way: When SDC wanted to introduce metal silos in Tanzania through Helvetas, it was Bahat's innovation to interpret these metal silos as "warehouses" and to pay COB on stored maize in the metal silos (to the consternation of the Tanzanians who were employed by Helvetas to implement the project, because they thus lost control. Bahat had a cinematic fight with these NGO types in Msowero over this, and he won it because the farmers wanted to work with him and not with the Helvetas NGO people). Bahat's innovation vis-à-vis the official WRS was: the silos remained at the farmers' homes, and thus under their control (which was crucial for them in crop-failure the next year), and that TBM had a key and took over the marketing with TSS. And thus bypassed the bottlenecks of the official WRS. But just..... When everything else cooperates, it works brilliantly. And if the weather doesn't cooperate, or the government's screwed-up export policy undermines the market and so throws a spanner in the works - all factors outside the metal silo sphere of influence, then..... NEWAPINA! It just takes an incredible amount of patience and systemic intuition to stay tuned.....

Agricultural Credit Cooperatives:

Ueli Scheuermeier: A beautiful construct, but in reality it devours far too much social capital. You only have to observe what happens in the group when a farmer family has to default because of an emergency. Farmers themselves never set up such things, they are always introduced and enforced from outside, by projects (and often ignored again by the government after a few years because it has neither the staff nor the finances to continue it). Farmers very often organise themselves informally and successfully, but we development cracks have not yet managed to link their informal organising talents cleverly with the money sloshing around internationally.

Education of smallholders in forestry:

Literature: Another factor contributing to the exclusion of trees as collateral is the lack of knowledge of smallholders in economics and plantation management (Pokorny et al., 2010; Starfinger, 2021; Yonika & Ngaga, 2011).

Ueli Scheuermeier: Sorry, but this is bullshit! These people assume that they know what smallholder forests should look like, small versions of their forest plantations. Bahat was totally innovative there too when he helped Thomas Müller to cut the trees on Schwarzenegg in Heimisbach: It is multi-species mixed forests in plenter management that bring resilience to the forests, that smallholders can put on the scale, and such large plantations as even Green Resources cannot. To think that the established forestry

and plantation science knows how to teach smallholders "economics and plantation management" is doomed to failure. Established knowledge and experts need to retrain. They can best learn from farmers like Bahat and his Tree Growers Association (hence Bahat's idea of the Pesanane Farm Forestry Field School).

Thai Tree Bank Model:

Ueli Scheuermeier: Very interesting. And I suspect that GRACOMA deals with some key aspects in a fundamentally different way. Spontaneously, two come to mind:

1. the Thai assume that farmers have no experience and no skills, and that consequently they have to be guided down to the smallest management detail. De facto, the small farmer becomes a stooge of the bank's forester. GRACOMA, on the other hand, accepts a priori the skills and experience and ideas of smallholders to find out for themselves what they can do in their forests to make money. This attitude is based on real experiences with people like Bahat and Ragpa. Sorry, guys like Bahat or Ragoa are really coming out of it, and would be so happy to explore further. Supporting THAT is the strategy to ensure long-term value creation in these smallholder forests in a sustainable way.
2. a strictly hierarchical top-down organisation, where smallholders are forced into prefabricated and standardised institutional conditions that may not even have been tested for their suitability for the farmers (suitability for the bank, of course, has!). And this as a standard, when every village functions differently? Hm..... - can't work in the long run either, because it's too rigid? In GRACOMA, we have much more agile ideas that require local organisational or institutional adjustments. The strategic core mechanism there is also peer exchange, i.e. learning exchange. Jeez, the things I had already discussed with Bahat when he came up with his Pesanane Farm Forestry School (modelled on the Farmer Field School approach he had experienced from the World Bank).

Stumpage Value:

Ueli Scheuermeier: Stumpage value works only in clear-cutting. Stumpage value is useless for plentering in mixed forests, as Bahat envisages and the people in Magunguli are already practising (plentering: clear-cutting individual trees and letting the rest continue to grow). Again, an expression of the same mindset: We foresters know how to manage forests properly and have to teach this to the farmers so that they can manage profitable small-scale versions of plantation forests. Counter claim: The trained foresters have no idea how highly diverse smallholder forests can be managed much more profitably by them -> Hence the Pesanane Forestry School.

Value Assessment:

Literature: "The financial assessment considers the harvesting costs depending on the distance to the road and the relationship between volume and number of pieces. The certificates consist of several components, i.e. a description of the land user/owner and a land register number, a site sketch with cadastral or GPS coordinates, a list of standing trees according to diameter classes, the financial valuation of the trees and a short descriptive part (RECOFTC, 2015)."

Ueli Scheuermeier: Läck doch mir! I hardly believe that valuation has to be so complicated. In any case, the farmers in Magunguli have a good sense of what their trees are worth, and can explain their derivation quite simply: What are the cutters willing to pay them for each individual tree, or for clear-cutting a plot. So far, I have had no problems getting suitable figures from them. Developing this local understanding and further internalising the value creation (local wood processing? beekeeping? wild fruits?), THAT is the challenge.

Appendix H: Farip document “ventures & research opportunities”

Research opportunities

Sketch-Notes as input for further exchange on assessing the viability of research cooperation, based on the experiences of FARIP with local entrepreneurs in Tanzania

US version 22. Nov 2022

A. Briquettes from waste biomass

State-of-the-art at present:

The Tanzanian company TBM has worked out with villagers in the Mgololo area how to process waste biomass (eg. crop residues, leaves, offcuts, prunings, detritus after clear-cutting forest plots, gras, etc) into what they call “mvumbi ya mkaa” (chardust). They do this through careful pyrolysis in open pits, and have achieved a level of competency that can produce decentralized production of large tonnages. Around 80 tons of chardust are presently stocked in a warehouse in Isaula (Mgololo).

They have also, through cooperation with a mechanical engineer from Switzerland, worked out a machine, with which they can process this chardust into briquettes. These briquettes burn well.

A short study by researchers from the geographical institute of the university of Berne has assessed the biomass available for such operations. There was a fear that there might be biomass extraction at levels that may become detrimental to the environment at large. This, however, the study showed to be not the case. Biomass extraction can proceed far beyond anything that is presently envisaged, particularly in the southern highlands, without any detrimental effects on the environment.

Present challenge:

The briquettes burn very differently than the charcoal that most people know. The aim had been to be able to replace the charcoal made from cut indigenous trees. It now turns out that apparently the briquettes do not lend themselves easily to simply replace charcoal as fuel in the stoves that everybody uses. What would be required is more understanding on the burning qualities of the briquettes, how to configure them so that they burn more like charcoal, and/or how to make simple but effective adaptations to the local stoves, so that we can penetrate the mass-market and thereby make a substantial nation-wide impact on the reduction of charcoal from trees.

Research opportunities:

- Engineering will be required to work on the configuration of the briquettes and/or on possible simple but effective adaptations to the ubiquitous stoves.
- In case the technical issues can be solved, the main anticipated challenge will be the operational and regulatory mechanisms for scaling this up to levels that achieve a nation-wide impact. TBM

has identified the many mama ntilie as the conduits for introducing the technology to the urban population at large. So these wamama ntilie will probably be the most useful test-market and partners in working out the solutions.

- The economics of brikettes versus charcoal versus gas bottles for covering at least 50% of all stoves in an urban location may uncover the leverage points for making brikettes commercially viable - resulting in income generation both in rural areas as in urban locations, while at the same time reducing the pressure on indigenous forests.

B. Trees as collateral

State-of-the-art at present:

This idea was brought to FARIP by farmers from Magunguli, Mgololo area: They want to provide their growing trees as security for loans. This would allow them to cover their monetary requirements while at the same time leaving the trees to grow further. Note that the older a tree is, the more its timber-value increases each year.

Discussions and probing by FARIP with farmers soon established that there is a requirement for collateral management on behalf of the loan-providers, who would mostly be absent. This resulted in the concept of GRACOMA (growing assets collateral management), ie. a company that would specialize on managing/supervising these growing assets as collateral for loans. Initial efforts by FARIP in cooperation with villagers at working out the procedures at the village level so far identified the below items, all of which have been implemented on a test-basis so far for remote plots in Magunguli:

- A reliable person to keep an eye on the forests: Such a person is now called a “Mtunza Misititu”. He or she is the person on the spot, based in the village, who will do all the required work, trained and contracted by GRACOMA. Such a person will also operate his/her own nursery as a commercial enterprise, including services to villagers owning GRACOMA-registered plots, eg. for pruning or fire-breaks, replanting, help in harvesting, any advice on management, etc. Interestingly, in the case of the first mtunza misititu in Magunguli, he is at the same time the chief of the fire-brigade of the village!
- A process for registering forests that will be the collateral. This includes establishing exact location, proof of ownership, valuation of the trees, and forwarding this information to GRACOMA.
- A regular monitoring of the growth of the forest plot, through photomonitoring. The photos are taken with smartphones and sent to GRACOMA via Whatsapp, for analysis and verification in far away places, eg. even in Europe.
- In order to explore and test the procedures, FARIP has provided a loan to TBM (for buying a truck), secured with trees belonging to the owner of TBM.

We have gone through the motions of the above items and have some experience on their implementation, giving us some better idea on the challenges we face:

Present challenges:

The most serious challenge turns out to be the almost total lack of interest so far by any existing Tanzanian financial institutions in this model. This is not surprising, given...:

- The very conservative attitude of financiers towards any loans to farmers who have - by nature or their profession - very erratic incomes, and that are even often rather low.
- A history of misuse of funds by villagers due to them being chronically cash-strapped to deal with emergencies and other more important immediate cash-requirements for their survival. This phenomenon we must assume has deep systemic reasons.
- The many failed attempts in the past to establish sustained and wide-spread loan access for smallholder farmers in rural areas, the reasons of which are apparently still poorly understood.
- The very high transaction costs for servicing and supervising many small loans that are thinly dispersed in vast areas.
- The lack of enough skilled credit officers who understand the economic challenges of smallholder farmers sufficiently well to assess their loan requests.
- The insistence on securities that are too dangerous for most villagers (lose the land title because of a draught or flood that destroyed the crop?).
- What happens when a tree-secured loan defaults? It would be a pity to cut immature trees to cover the default. What other mechanisms may come to bear? We have been thinking of long-term third party involvement, but not yet clear how that would work out.
- Insurances? Loan providers would want to see insurances, eg. against fire. How would cash-strapped smallholder farmers pay for insurances?
- Indigenous trees: So far valuation of trees has almost exclusively been done on exotic timber species (mostly pine and eucalypt species). A market for products of indigenous species has not been developed (or is even prohibited by regulation). This has led - in our observation - to the clearcutting of self-propagating indigenous woodlands and planting of just a few exotic species. This raises serious concerns not only for biodiversity but also for resilience of forests against fire and diseases. This dynamic must by all means be avoided with GRACOMA, or even reversed.

Research opportunities

We keep discovering how complex the ramifications of this innovation are, how many diverse aspects therefore come to bear, providing a wide range of questions to be explored, the answers of which may

lead to strategic breakthroughs in rural development, given the huge values that growing trees create over time! Just to pinpoint those that presently come to mind:

- How can the procedures with forest plots be managed, so that finally GRACOMA can provide tree-certifications that financiers are willing to accept as collaterals for providing credit?: (Identification and registration of trees, monitoring, how is the Mtunza paid)
- How can trees be reliably assessed for their value, depending on age, species, type of management, etc. (Probing so far seems to indicate that TAFORI has considerable experience in this).
- How will smallholder forestry look like, that never clear-cuts a plot but does continuous selective harvesting (=> more regular income stream for the smallholder) and replanting of mixed forests, preferably with indigenous species where applicable?
- How can such GRACOMA-supervised smallholder forests access the carbon market?
- How can GRACOMA-supervised forests with indigenous species access the emerging international market for Biodiversity-credits? Are the national parks (eg. Udizungwa) amenable to explore this for their buffer zones?
- How can the value of non-timber products be assessed and even developed?: Honey, wild fruits, nuts (and their processing to new marketable products), herbs, mushrooms, fodder, chardust, etc? What are the nutritional, medicinal, cosmetic, mechanical properties of such products and how can they be developed into high-quality marketable products that increase the value of the growing trees (examples: Mikusu-juice? Misaula-seeds as nuts)?
- Would the trees in agroforestry also become relevant for GRACOMA (agroforestry here understood to be the growing of eg. fruit trees in plots that also hold cultivated crops).
- How can transaction costs for supervising widely distributed small local credits be brought down to manageable levels? Is there a role to be played by locally based staff contracted by GRACOMA?
- How can farmers pay for insurance policies against fire? Is there a way they can pay with growing trees? Could even health insurance for rural families be organized via the growing trees they own?
- We appear to require a back-up system, that has a long-term strategic interest and thereby could pay for defaulted loans and take ownership of their tree-collateral, and yet allow those trees to grow to maturity. A re-insurance system?
- How can the quality of timber processing be locally enhanced, so that the value of standing timber in the forests can increase?
- What are the reasons for most efforts in rural credits to smallholder farmers having failed so far to achieve acceptable scales of geographic coverage, and what may be the remedies? In which way may the GRACOMA-concept provide a new perspective and leverage into the problematique?

C. Carbon credits with TECASESO

State-of-the-art at present:

Terminal Carbon Sequestration in Soils TECASESO, emerged as a combination of various elements into a complex innovation. The trigger was the fact, that villagers in Magunguli had figured out how to produce large amounts of chardust without cutting trees, but the briquettes still had technical issues and marketing issues. Add to that the intensive small gardens that SAT in Morogoro had explored. The idea then clicked while discussing with Sukhuma farmers and Maasai herders in Msowero, when considering how to earn money with all the presently wasted cowdung in their bomas (fenced holding area of cattle for the night).

The idea works like this:

- Farmers make chardust from waste-biomass
- They mix this chardust with cowdung from bomas. This “loads” the char-particles with nutrients and with water.
- The mix is taken to high-intensive horticulture plots nearby
- This horticulture requires off-season water, so water is organized for these highly localized gardens through whatever pumping may be possible, along with distribution through affordable simple micro-irrigation technologies.
- The horticulture produce is marketed via TSS with TBM (see below)
- Carbon credits are earned because carbon is now terminally sequestered in soil. Additionally, the chardust in the soil also increases the fertility plus also resilience to draught, allowing organic production.
- Initial research with carbon certifiers has surfaced the problem of methane emitted into the atmosphere during the pyrolysis in open pits (methane is an even more serious climate gas than CO₂). This methane we now know can be compensated with planting trees (along GRACOMA lines). However: Probably the mixing of chardust with cowdung on bomas also hinders methane emissions which would naturally happen from the cowdung. The charring of biomass otherwise rotting in the landscape also avoids the methane emitted by the rotting process. So this may also be factored into compensating the methane output from pyrolysis.
- FARIP agreed to allow farmers to test an idea of how to provide unrefutable proof that chardust has in fact entered the soil: Bags of chardust with numbers are filmed with smartphones as they are poured onto the cowdung and chardust spread over the cowdung. Such films must be without interruption and include showing the registered bag-numbers. They are then sent via Whatsapp to a checking agency that will then calculate how much carbon has now entered the soil because of the emptying of that one bag onto the cowdung. This test has been successful, which was the reason why farmers in Magunguli and FARIP decided to go ahead with TECASESO.

Present challenges

The process has yet to be organized, and then verified and certified by a suitable body, that will allow to certify such carbon sequestration for the carbon trade, including the compensation of any emitted methane during pyrolysis. This is a major effort, and we have started to be coached by Ithaka Institute in Switzerland <https://www.ithaka-institut.org/en/home> in order to find a way to achieve this.

The innovation is complex, ie. in fact 5 innovations must presumably synergetically interact to achieve commercial viability

1. Managing cattle for maximizing dung- and urine-harvesting,
2. Pit-pyrolysis and putting chardust into the soil,
3. small intensive garden plots,
4. microirrigation for such plots,
5. marketing of the produce along TSS-lines.

Whether any of these innovations could achieve commercial viability on their own is doubtful, yet together it looks like they could achieve a great income generating impact for villagers. How to approach this complex in close collaboration with villagers?

This approach will only have a recognizable impact on the climate and on income generation on a national scale, if and when tens of thousands of smallholders, distributed over a vast area, can put chardust into their soil to improve it. Such scaling up will be operationally challenging, particularly in the management of data from many remote locations, to be efficiently assessed and certified by certification agencies, for then trading on the international carbon markets.

Research opportunities

- The whole certification process itself will be new for many certifiers. It may even be, that a new standard will emerge for VCS
- Intensive organic gardening with such substrates and microirrigation, among people who are so far more cattle-oriented, opens many aspects to look into. This includes an intriguing aspect of gender: Initial talks with a few families suggest that the more stationary women will be the ones who want to engage in intensive gardens that depend on their livestock for their fertility and production.
- Suitable and reliable - and yet affordable - micro-irrigation for such people becomes a further avenue of research: Design, operations and economics for highly decentralized servicing over vast areas?
- The feed and fodder aspect gets an additional scope for earning money: While improving the cattle output, feed/fodder efforts will additionally earn money through the increased production

of dung and therefore more vegetables for sale. Here again, the synergetic operational interactions become apparent. How can the economic effects of such interactions along all the innovative interfaces in this emerging system be assessed? How resilient/vulnerable are they? Who will earn those benefits, and how are they fairly distributed in a way that stabilizes the system?

- What are the regulatory requirements by public agencies to ensure the safeguarding and furthering of the public interest in carbon sequestration along these very decentralized lines in many rural and remote areas, along with the many economic ramifications emerging out of it?

D. Transaction Security Services TSS

State-of-the-art at present:

TSS is the business model of Tanzania Biashara Mapema, the company in southern highlands with which FARIP has many years of experience in cooperation. TSS is a service to all actors along a value chain from producers (mostly farmers) to end-consumers (mostly in cities) in that it organizes and supervises all the transactions along the chain on behalf of the producers, and finally retains a commission calculated as a percentage of the proceeds of a deal. The transactions are controlled and documented such, that TBM can show and prove to all actors along the chain who was paid how much for doing what. This achieves a level of transparency that generates trust, that then allows to plan transactions (“biashara mapema”), allows to identify and remedy mistakes where they happened, allows to assess and negotiate fair payments for services, and finally achieves - when successful - increased income to farmers while stabilizing the value chain.

The procedures of TSS have evolved gradually over at least 15 years, but have not yet managed to achieve a breakthrough, mainly due to factors outside the immediate business model. This has led TBM to also engage in transport (the unreliability of which is the main reason for many deals to fail), in post-harvest storage technology for farmers (for reasons of surviving market crashes due to erratic regulations, eg. export bans and such), in advance payments (for taking care of immediate cash-needs of farmers at harvest), etc. etc. This has led to an emerging “eco-system” of diverse ventures that are thought as synergetically interacting and supporting each other - all with the aim to improve the reliability and profitability of TSS deals managed by TBM on behalf of the farmers.

TSS has turned out to be a generic business model, ie. applicable to any commodity that is traded. Obviously it started with commodities such as maize and potatoes and beans, but is also applicable to timber, or - as becomes apparent now - even virtual commodities such as carbon credits or biodiversity credits.

In FARIPs view, this makes TSS an interesting and innovative mechanism to achieve commercial viability of just about any ventures emerging in rural areas in which the vast majority of smallholder farmers are involved. However, TSS has - even after these many years, and even though the basic concept is sound - yet to achieve commercial viability for itself (it has achieved it for farmers!). The challenge has been problems outside its original scope of business, which has forced it to also look into ways to resolve those with further additional ventures (in transport, stocking, advance payments, etc). This in turn makes it an interesting venture for understanding the real bottlenecks in agricultural markets in Tanzania.

Present challenges

- The agricultural markets for Tanzanian smallholder farmers are almost exclusively spot-markets. This even applies along the whole value chain: Each transaction is opportunistic on-the-spot and virtually not plannable in advance (just think of a truck full of potatoes broken down in Mikumi park in the scorching sun). TSS is an attempt at working out a remedy for this. The challenges are complex, yet fascinating and interesting. And yet, TSS has become a major instrument to understand the insecurities of agricultural markets for smallholder farmers, and for understanding where leverage may be applied to achieve a remedy. However, this requires long term financial and operational stamina, something TBM cannot have with the resources at its disposal.
- TSS is data-intensive, ie. time-sensitive information must be collected, relayed and documented, and timely money-transactions must happen. TBM still does not have the tools to do this efficiently.
- The managerial capacity and competency of TBM is not sufficient to a) develop TSS further except only very slowly, b) scale the effort and c) become bankable. FARIP is presently attempting to see how the obvious existing traditional competencies of running a traditional company in a traditional way through communication in traditional networks can be formalized to standards that can access formal financial procedures.

Research opportunities:

- How can the TSS mechanisms be enhanced in terms of documentation, communication, data-management, and finances?
- How well do the various other ventures (transport, stocks in metal silos, mills, advance payments) synergetically interact with the core TSS, and how can this be improved?
- How can TBM be financed sustainably over a long enough period of time in order to create the start-up stamina required to achieve competency and impact?

- How best to document the emerging bottlenecks with TSS, and learn from them for understanding the general constraints in the market mechanisms from rural villages to the many low-income end-consumers in the cities?
- How can TSS improve the access to nutritional and healthy food by the vast majority of low-income consumers in the cities, at conditions affordable to them?

Appendix I: SDG contribution

This SDG analysis was created on power point by Rahel Guggenbühl (September 22) and is based on own data and brainstorming discussions with the field research team and was conducted before the field research.

SDG Contribution



	<p>Village economic growth: If the system works, more entrepreneurs can obtain credits and large investments would be possible. The people would know, that they have raised the money from their own resources and through their own efforts, and that they will be able to continue to do so. The resulting self-confidence will have local political consequences in the sense of villagers' will and capacity to deal with their village-level challenges, and then to create the village institutions for taking care of them, e.g. for local infrastructures, schools, clean water, affordable and clean energy and more.</p>
	<p>Insurance: It is conceivable that with growing trees at least a health insurance system could be established for the people in the village, whether through individual plantations of the families, or through community forests owned by the village.</p>
	<p>Biodiversity buffer zones and an increase in growing trees: With GRACOMA, the authorities would be able to issue cutting permits for growing local tree species because their provenance is documented. But more importantly, with GRACOMA it would also be possible to provide much higher credits for growing local tree species, especially in the buffer zones around the national parks, which would reduce the pressure on the national park, also for fruits and other natural products, as well as give wildlife more of a chance to stay in the buffer zones, plus the system would increase peoples interest in growing trees, that would help against the climate crisis and carbon pollution.</p>
	<p>Institutional linkages: It is foreseeable that various Tanzanian institutes and programs could be involved, which in turn, in partnership with e.g. Swiss institutes, could accompany the challenges on the ground in order to work out and document village-suitable solutions, and to work out further projects based on these. Action research, participatory technology development, peer-exchange learning, etc. would be examples of likely useful methods.</p>
	<p>Creating jobs: Not only would the system help smallholders to obtain loans, but it would also create new jobs through investments in small village-level businesses pre-crop (seeds, implements) and post-harvest value-addition in the village, including warehousing.</p>

13 Auxiliary material list

Supporting technologies	Usage	Affected places
DeepL	Consistency in writing style	Whole paper
Chat GPT	Recommendations for text paragraph shortening	Chapter 2,3,5
Adobe InDesign	Visualization, layout	Figure 1
	Visualization, layout	Figure 2
	Visualization, layout	Figure 3
	Visualization, layout	Table 1
	Visualization, layout	Table 2
	Visualization, layout	Table 3
	Visualization, layout	Table 4
Excel	Radar chart	Figure 1, appendix E
	Pie chart	Figure 1, appendix E
	Interview clustering	Appendix C
Power Point	Visualization of SDG analysis	Appendix I

14 Declaration of authorship

"I hereby declare,

- that I have written this thesis independently,
- that I have written this thesis using only the aids listed in the index;
- that all parts of the work produced with the help of aids have been precisely declared;
- that I have mentioned all sources used and cited them correctly in accordance with standard scientific citation rules;
- that I have acquired all intangible rights to any materials I may have used, such as pictures or graphics, or that these materials were created by me;
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By submitting the written work, I agree by implicit action to submit the declaration of independence, to have read and understood it and that it corresponds to the truth.

Rahel Guggenbühl

