Smallholder Risk Management Solutions (SRMS) in Malawi and Ethiopia

Value Chain Study and Design of a Replicable Business Model in South Wollo Zone, Amhara Region of Ethiopia

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The Sustainable Intensification of Agricultural Research and Learning in Africa (SAIRLA) Programme is a UK Department for International Development-funded initiative that seeks to generate evidence and design tools to enable governments, investors and other key actors to deliver more effective policies and investments in sustainable agricultural intensification that strengthen the capacity of poorer farmers', especially women and youth, to access and benefit from SAI in Burkina Faso, Ethiopia, Ghana, Malawi, Tanzania and Zambia.

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List of abbreviations

ACSI	Amhara Credit and Saving Institute
AISCO	Agricultural Input Supply Organisation
ARARI	Amhara Agricultural Research Institute
CSA	Central Statistical Agency
DAP	Di-ammonium phosphate fertiliser
ETB	Ethiopian birr
FAO	Food and Agriculture Organization of the United Nations
FGD	Focus group discussion
NGO	Non-government organisation
NPSB	Fertiliser containing nitrogen, phosphate, sulfate and boron
Quintal	Ethiopian measurement for 100 kg
SRMS	Smallholder Risk Management Solutions
Tassa	Ethiopian measurement for 1.39 kg
ValueLinks	Value chain methodology designed by GIZ, Deutsche Gesellschaft fuer internationale Zusammenarbeit

Introduction

Sustainable Agricultural Intensification Research and Learning in Africa (SAIRLA) is a five-year programme (2016 to 2020) funded by the UK Department for International Development (DFID). SAIRLA finances eight research projects in six countries (Burkina Faso, Ethiopia, Ghana, Malawi, Tanzania and Zambia), as well as a Learning Alliance that operates at international, regional and national levels. The SAIRLA research projects aim to generate new evidence and decision-support tools for decision-makers, to help create an enabling environment for poorer African smallholder farmers, especially youth and women, to benefit from sustainable intensification.

The Smallholder Risk Management Solutions (SRMS) project is part of the SAIRLA programme and is implemented in Malawi and Ethiopia by a consortium led by Oxford Policy Management (OPM). The SRMS project aims to investigate the key risk factors that smallholders face in sustainable agricultural intensification and to explore risk management strategies that can be put in place to manage them. The research activities of the SRMS project are being implemented in two workstreams, which aim to (1) develop and test innovative risk management strategies and (2) design a 'replicable business model' in both countries.

This study builds on the findings of the SRMS Scoping Study, which was the first research output of the SRMS project, was completed in February 2017 (OPM *et al*., 2017). Based on a thorough investigation of the agricultural and marketing systems in the research countries, the Scoping Study selected teff and pigeon pea as two entry points through which to investigate risk management strategies in Ethiopia and Malawi, respectively. The purpose of this report is to develop a 'replicable business model' for teff in Ethiopia that reduces the risks that smallholders are exposed to in producing and marketing teff.

This report is divided into four chapters. The first chapter discusses the key concepts, the methodology and the data collection methods which were used to select the research area and to design a replicable business model for the selected farmers' cooperative. The second chapter introduces the research area, in particular the three selected Kebele in Tehuledere Woreda (South Wollo Zone, Amhara Region), with whom the SRMS project will work in the future. The third chapter provides a detailed description of the main stakeholders in the teff value chain in Tehuledere Woreda. The replicable business model is presented in the final chapter of this study, along with the proposed modality for implementing the model.

1 Key concepts and research methods

This chapter discusses the conceptual and methodological aspects of the study. The chapter begins by conceptualising smallholder risk and risk management strategies. This is followed by a description of the concept of a 'replicable business model', as outlined in the project technical proposal and made specific to teff trade in Ethiopia. The chapter then describes the 'value chain' approach which is used to explore and understand the characteristics of the teff marketing and production system in Ethiopia. The third section describes the methods which were used to collect and collate information for this study – focusing on the (type of) literature reviewed, interviews conducted and data analysed.

1.1 Conceptualising smallholder risk and risk management strategies

The analytical framework to investigate risk management strategies for smallholders was developed in the SRMS Scoping Study (OPM *et al.*, 2017). Based on a literature review and on interviews with stakeholders, the Scoping Study identified four systemic risks along smallholder value chains: natural shocks; prices; economic coordination; and opportunism. The study further identified potential risk management strategies for each systemic risk along the teff value chain in Ethiopia. The table below shows the systemic risks and their associated risk management strategies as identified by the SRMS Scoping Study.

Table 1: Systemic risks and proposed risk management strategies

Systemic risk	Proposed risk management strategy
Natural shocks	Planting varieties with different maturity dates
	Planting improved varieties
	Improve profitability
	Improve flow of information about new technology
Price risks	
Economic coordination risks	Improve seed supply of improved varieties
	Collective marketing
	Crop storage
Risk of opportunism	

Source: OPM *et al* 2017.

This study provides a contextualised description of the risk environment in the selected study areas. Chapter 2.1 discusses the relevance of each systemic risk in the selected villages and Chapter 4.5 discusses the ways through which the proposed replicable business model is expected to reinforce the existing risk management strategies that are employed by smallholders in the selected study areas.

1.2 The concept of a replicable business model

The underlying objective of the SRMS project is to provide strategies to manage risks faced by smallholders – including price risks, coordination risks and risks of opportunism. A 'business model' that aims to serve this purpose and that at the same time aspires to be replicable needs to fulfil several criteria (OPM *et al*., 2016): it needs to be inclusive, to address systemic risks that hinder commercialisation, and to connect the value chain actors effectively through collective marketing and (if possible) forward contracting. The different value chain actors that participate in

any business model include input suppliers (agro-dealers, public-sector seed suppliers), farmers (marketing groups/cooperatives), buyers (local traders or a private company) and processors (millers, export traders).

A well-designed replicable business model must be demand-driven and must provide an economic incentive to all actors in the value chain to cooperate and make the model work. The design will be based on a diagnostic value chain analysis which investigates the key opportunities and constraints on current performance, explores ways to improve coordination between the value chain actors, and describes the characteristics of input markets and the various incentives of technology adoption. The ultimate purpose of a replicable business model is to provide an action plan that coordinates input supply, smallholder marketing, and buyers' needs, as well as quantities and price incentives for the key value chain actors. The business plan needs to assign clear roles to each of the relevant value chain actors. The SRMS project will then act as a broker (but not as a guarantor) to bring stakeholders together, ensure that the different actors perform their agreed roles and meet their responsibilities, and will ultimately test the model over two crop seasons by documenting the performance of the model and evaluating its effectiveness in managing systemic risks. This will generate key lessons that the project will communicate to policy-makers.

As free markets are often unpredictable and it is not possible during the design of the model to foresee how markets will perform in the future, there is, clearly, no guarantee that the model will indeed continue to be relevant and to work in several years' time. It is likely that the model will require some adjustment over its course of implementation, which will be the subject of the action-research phase of the SRMS project. If, at the end, the model is proved to be successful, it can be replicated and scaled up at country level and to other value chains.

The SRMS project will not itself try to replicate or scale up the replicable business model. The purpose of the project is to generate research evidence on replicable business models and to provide lessons for policy-makers that can be used to design development projects.

1.3 The value chain approach

According to a widely-quoted description, value chains are 'socioeconomic systems that include all enterprises cooperating to serve a particular market' (Springer-Heinze, 2017). These enterprises interact and cooperate constantly to pursue shared interests (including buying and selling products and services, as well as exchanging information) and they belong to a wider value chain community that consists of private associations, specialised service providers and industry-specific public organisations that provide support.

One way to improve, develop and make value chains pro-poor is to 'strengthen mutually beneficial linkages among firms so that they work together to take advantage of market opportunities, that is, to create and build trust among value chain participants' (World Bank, 2010). It is commonly accepted that the inclusion of smallholder farmers and other vulnerable populations in value chain development (VCD) leads to inclusive and pro-poor value chains – which is our ultimate goal in this case study.

Over the past decade, several methodologies have been developed by different organisations to investigate and develop value chains. They include the United Nations Food and Agriculture Organization's (FAO's) 'Guidelines for rapid appraisal of agrifood chain performance in developing countries', the 'Making Markets work for the Poor' (M4P) approach, as well as the ValueLinks method developed by Die Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), among others (FAO, 2007; DFID, 2008; GIZ, 2008). This study uses the ValueLinks method, which has

several favourable characteristics that make it an appropriate methodological tool for designing a replicable business model.

The ValueLinks method 'stands out for the depth in which it covers a range of important issues affecting VCD, including value chain mapping, value chain implementation, assessment of the business environment and facilitating services and monitoring and evaluation of VCD-related interventions' (Donovan, J. 2013). This method looks simultaneously at interventions, investments and policy support networks, which are coordinated (and where necessary discussed) with the relevant stakeholders. This approach investigates the overall characteristics of the entire value chain, explores the links among the different actors and service providers, and identifies common challenges by looking at the value chain in a holistic manner. The ValueLinks method therefore provides useful insight when designing development interventions.

In order to design a viable business model and to improve and develop value chains in a sustainable manner, it is necessary to develop a clear understanding of the characteristics of the existing value chain – this is discussed in Chapter 3 of this study.

1.4 Data and information collection for this study

This study builds on the Scoping Study, which was completed for the SRMS project in February 2017 (OPM *et al*., 2017). A substantial amount of research was conducted for the Scoping Study, which selected teff as the entry point for the value chain study and the design of the replicable business model in Ethiopia (as well as for the SRMS project). The Scoping Study interviewed 10 key stakeholders in Ethiopia, who were selected from a range of government organisations and business actors, including traders and input suppliers (for a detailed list of the interviews conducted see OPM *et al*., 2017: 51). The specific objective of the Scoping Study, however, was not to explore in detail the characteristics of the teff value chain in Ethiopia, but rather to select and narrow down the subject of the research on SRMS in both Malawi and in Ethiopia. This study, while building on the findings of the Scoping Study, focuses specifically on the teff value chain in Ethiopia.

The value chain study started off with a detailed review of the most recent and relevant literature on the characteristics of the teff value chain in Ethiopia. The specific aspects of the literature that were reviewed in detail included the characteristics of the local teff markets, the relative importance of teff in consumption and marketing in the project area, and the characteristics and economic incentives of the main stakeholders in the teff value chain in Ethiopia. Since many of these aspects are well understood and documented in the literature, the purpose of this study was not to conduct further research on the specific aspects of the national-level value chain, nor to challenge the findings of other national-level studies: rather, the literature review provided a useful entry point through which to analyse the local teff value chain within the selected project area, and to explore the functioning of the teff value chain from the point of view of the individual farmers.

Following the literature review, two fieldwork practicums were completed, in March and in June 2017, by Joachim Weber (workstream leader) and Zoltan Tiba (project leader).[1] During the two visits to the project area the research team collected information from a variety of sources:

- a total of 25 key stakeholders were interviewed from different organisations, government departments and farmers;
- two focus group discussions (FGDs) were held with service cooperatives in South Wollo Zone;

[1] The first trip was conducted between 6 and 11 March 2017 by Joachim Weber alone, and the second trip was conducted between 29 May and 3 June 2017 by both Joachim Weber and Zoltan Tiba.

- several individuals in local markets, agro-dealerships, trading outlets, traders and a bakery were interviewed, and prices were collected; and
- a two-day value chain stakeholder workshop was held in Haik (Tehuledere woreda) with farmers, market actors, government officials and other relevant stakeholders.

The key stakeholders who were interviewed for this study were selected carefully. While the Smallholder Risk Management Solutions Project (SRMS) Scoping Study interviewed a broad set of stakeholders based both in Addis Ababa and in the project area (Dessie town and Tehuledere woreda), the majority of the stakeholders interviewed for the value chain study were based in the project area in the South Wollo Zone, which was selected by the Scoping Study for further investigation. The ultimate purpose of this study was to select a farmer organisation with whom the business model would be tested, which required the collection of local-specific information in the project area.

Most stakeholders were identified and interviewed during the first fieldwork practicum in April 2017. The research team worked closely with Dr. Arega Gashaw Yimam (Director of the Amhara Regional Agricultural Research Institute – ARARI), who organised the meetings and identified the relevant stakeholders to be interviewed by the research team. The first set of interviews was conducted at the zonal level in Dessie town, where the majority of government stakeholders are based. This was followed by interviews with stakeholders at the woreda level. The selected stakeholders included **business actors** (teff traders in Haik town, enyera bakers, local agro-dealers and farmers) and **government organisations** (the Seed Quarantine Office in Dessie, the Input Supply and Coordination Department in Dessie, senior staff at Tehuledere woreda Agricultural Office including their Crop Production Expert and Value Chain Officer, as well as the Amhara Credit and Saving Institute – ACSI). Annex A contains the list of interviews which were conducted with the relevant stakeholders.

Further information was collected at the local level in Focus Group Discussions (FGD) with two **farmer organisations.** They included the *Hara Huluko* Service Cooperative and the *Fana* Service Cooperative, which are located in Hara and Fana villages in in Tehuledere woreda (one additional key informant interview was held with the Chairman of *Jari* Service Cooperative). The purpose of the FGDs was to find out about the determinants and characteristics of teff production (available seed varieties and other agricultural inputs, impact of climate change on production), trade (market prices, trade networks and main trading agents in the area), as well as extension services and government support networks in the area. To supplement this information collected at the local level, the research team visited several markets and market outlets (agro-dealers) in Haik town and in the project area. A total of seven teff traders were interviewed in order to understand trade relations and to collect the prices of agricultural inputs and produce.

The purpose of the second fieldwork in the project area (May 2017) was to design a replicable business model based on the previous consultations held with the stakeholders. During the second visit, the project team arrived with several options for implementing a business model with the selected farmers' organisations based in the project area. The fieldwork started with a visit to some of the key stakeholders who had been interviewed during the first fieldwork, to discuss the various options for implementing a business model. It was necessary to obtain their views on the proposed options prior to the workshop in order to confirm and assess the feasibility of the different business models.

The replicable business model was presented and discussed in a two-day stakeholder workshop in Haik town which brought together the different teff value chain actors and support service providers. The workshop was facilitated by Joachim Weber and was implemented in a participatory way following the requirements of the ValueLinks methodology (see Section 1.2). A total of 15

people participated at the workshop, including teff farmers from three kebele (08, 12 and 13, located in Tehuledere woreda), representatives of various local government institutions, value chain actors and support service providers. All stakeholders participating in the workshop shared their experiences and the potential business model options were discussed openly with the stakeholders. At the end of the workshop the possible business models were narrowed down to two options, of which the first was finally selected and agreed by all participants. These options are discussed in detail in Chapter 4.

All interviews for this study were conducted by using a semi-structured questionnaire (see Annex C). Each interview started with a detailed explanation of the purposes of the research project, after which the respondents were encouraged to express their views and opinions freely about the status of teff production and trade in South Wollo Zone. As opposed to approaching stakeholders with a predefined and set questionnaire, the ValueLinks method allowed a significant amount of flexibility for the interviewees to express their views in a participatory manner. Through this method it became possible to explore the areas and aspects of the teff value chain which would not have been brought to light if a predefined (and rigid) questionnaire had been used. On average, each interview lasted for at least an hour and in all cases a good relationship was developed with the interviewees. Some of the stakeholders interviewed were selected as the key identified stakeholders (KISs) of the SRMS project.

The different sources of information collected from the literature review and during the fieldwork practicums were triangulated by the research team to select an area and to identify a farmers' cooperative which had the willingness and the capability to participate in a business model and to become a reliable actor in the teff value chain.

2 Area selection and characteristics

The SRMS Scoping Study selected South Wollo Zone in Amhara region for the case study research. The selection of the area was justified based on several criteria.

Amhara region was selected because (1) it plays an important role in national teff production, as 38% of teff in Ethiopia is produced in Amhara; (2) significantly less research has been conducted in Amhara than in Oromia, which is an important entry point for the SRMS project where significant contribution can be made; (3) several research institutions in the region provide additional capacity which the project can utilise and engage with; and (4) the SRMS project may establish possible synergies with the Harnessing Opportunities for Productivity Enhancement (HOPE) project funded by the Bill and Melinda Gates Foundation and managed by the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) (Oxford Policy Management (OPM) *et al.* 2017: 28).

South Wollo Zone is one of the 11 zones of Amhara region.[2] It has been selected by the SRMS Scoping Study because all the agricultural areas in this zone are suitable for teff production. Due to its agro-ecological conditions South Wollo Zone offers limited opportunities for farmers to grow cash crops, including maize, wheat and sorghum, which makes farmers dependent on crops which require risk management strategies.

Figure 1: Map of Amhara region

The SRMS Scoping Study left it open for the value chain study to select a woreda within the zone where the SRMS research would be conducted. In consultation with stakeholders, the value chain

[2] The zones in Amhara region include Agew Awi, East Gojjam, North Gondar, North Shewa, North Wollo, Oromo, South Gondar, South Wollo, Wag Hemra, West Gojjam and Bahir Dar (special zone) (https://en.wikipedia.org/wiki/Amhara_Region).

research team selected **Tehuledere woreda** in South Wollo Zone for the case study research and to develop and test a replicable business model.

Tehuledere woreda covers an area of 405 square kilometres and it is bordered on the south by Dessie Zuria, on the southwest by Kutaber, on the northwest and the north by the Mille River, on the northeast by Were Babu, and on the southeast by Kalu.[3] Tehuledere woreda has unique agro-ecological conditions. The altitude ranges from 500 metres above sea level to 2,700 metres along its southwest border. This woreda has two lakes: Hayq (which lies entirely within it) and Ardibbo (which lies to the south of Hayq).

The demographic characteristics of Tehuledere woreda appear to be static. According to the national census of 2007, the total population of the woreda was 118, 000 people living in close to 29, 000 households (4.1 person per household). The population of the area had declined by 1% since the previous national census in 1994 (*ibid*).

Tehuledere woreda is further divided into **kebeles**, which are the lowest level of administrative unit in Ethiopia. A list of kebeles in Tehuledere woreda is given in the table below. The SRMS project, during the value chain workshop, selected three of the kebeles in Tehuledere woreda to test the replicable business model and conduct further research. They include Hitacha (08), Gobeya (12) and Jari (13) Kebele. They are highlighted in **red** in the table below.

[3] https://en.wikipedia.org/wiki/Tehuledere

Table 2: List of kebeles in Tehuledere woreda, South Wollo Zone, Amhara region

Kebele Name	Kebele code
Haik town	01, 02, 03 04 and 05
Paso Mille (Baso Mille) Town	01
Sulula town	02
Korke	02
Kosoro (Kosero)	03
Welide Lulu (Woldelul)	04
Kete	05
Mesal	07
Hitacha (Hitecha)	**08**
Amumo (Amemo)	09
Hara	10
Haridibo (Ardibo)	11
Gobeya	**12**
Jari	**13**
Wahelo	14
Godiguadit (Godguadit)	15
Tebisa	16
Seglen (Segelet)	17
Nibo (Nibo Kotu)	26
Muti Berg	27
Bededo	01
Mitero (Gedera)	18

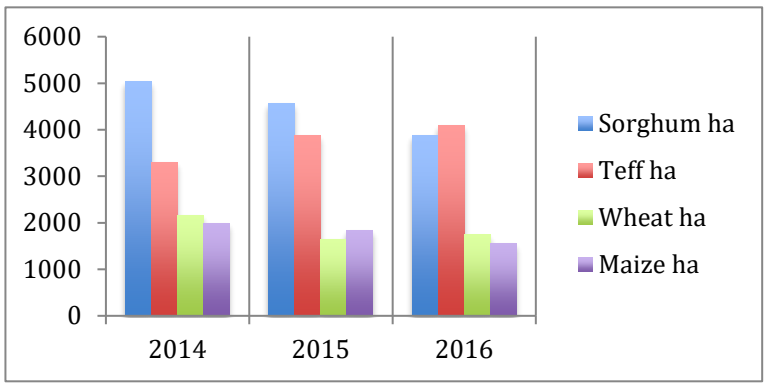
Source: Compiled from information received from the Amhara Regional Agricultural Research Institute, Sirinka Research Station; Profile of South Wollo Zone (2017) and Map obtained from South Wollo Zone Agricultural Office (Annex F).

The selection of Tehuledere woreda was based on a number of criteria. First, the woreda is characterised by very low soil fertility and by erratic rainfall patterns. This means that farmers typically employ a variety of risk management strategies to survive. The agro-ecological conditions in the woreda are suitable for growing teff, but the production of other cash crops is limited due to low soil fertility. All farmers interviewed during the fieldwork confirmed that intensive agricultural production (including hybrid maize production with external inputs) cannot be profitable in the woreda because on average three out of four seasons are 'bad', when production is negatively affected. The second favourable characteristic of this woreda that makes it suitable for the SRMS project is that very limited quantities of certified teff seeds were allocated to the woreda in 2016. The Agricultural Department for Input Supply and Distribution confirmed that in this woreda 4,500 hectares (ha) of teff are planted on an annual basis, which would require approximately 13,000 kg of certified seed. Despite this high demand for seeds, only 600 kg of certified teff seed was allocated to the woreda in 2017. This indicates the high demand for teff seeds in the zone, but it also shows that farmers rarely use certified seeds to produce teff in Tehuledere woreda. In the recent past, farmers with better access to tarmac roads have planted Khat (Catha edulis) as the main cash crop to support household income.

The chart below shows the four major crops grown in Tehuledere woreda. The figures indicate that in the past three years the production of all crops has declined in the zone, except for teff. This

confirms the potential for teff to become an appropriate risk management strategy for smallholders as it withstands erratic weather conditions which negatively affect the production of other cereals.

Figure 2: Production of main crops in Tehuledere woreda



Source: Tehuledere District Agricultural Office

2.1 Risks faced by smallholders in Tehuledere woreda

Farmers based in Tehuledere woreda face several of the systemic risks identified in Section 1.1: natural shocks, price risks, economic coordination risks and risk of opportunism.

2.1.1 Natural shocks

In the study area natural shocks represent a major source of risk for smallholders. **Drought and erratic rainfall** are among the most significant natural hazards and cause risks for smallholders based in Tehuledere woreda. For example, during the drought of 1997/98 cereal production dropped by 25%. Ethiopia experienced a major drought in 2015, triggered by El Niño, when delayed rainfall prevented the planting of sorghum while farmers were still able to plant and harvest some teff. The fields visited by the research team in late July 2017 in Tehuledere woreda had still not been planted, which means that the opportunity to plant sorghum had passed and farmers would have to depend on teff production.

Among the risks pertaining to natural shocks, pests and diseases are not relevant to teff. Teff is a crop that is hardly damaged by pests or diseases, making it particularly appropriate for managing smallholder risk.

2.1.2 Price risks

Teff prices in Tehuledere woreda are stable and farmers are paid on average more than 80% of the final retail price (they receive between 78% and 86% of the final retail price, depending on quality (OPM *et al*., 2017)). This means that price fluctuations are not a major risk for smallholders in the area.

2.1.3 Economic coordination risks and risk of opportunism

Farmers in Tehuledere woreda have very limited access to **agricultural inputs**, including high-quality seeds, fertiliser, or agrochemicals. The nearest commercial outlets where these products are available for sale are in Dessie Town, which is approximately 30 km from the area. A single farmer can rarely afford to travel to Dessie to buy the necessary inputs for their farm and this makes sourcing of inputs for a single farm economically unviable. Farmers are normally supplied

with seed and fertiliser through their cooperative. There were no major risks of opportunism identified in the area as prices are stable and there are few if any commercial opportunities to exploit by agents.

3 Stakeholder Analysis of the teff value chain in South Wollo Zone

This chapter provides an analysis of the characteristics of the teff value chain in Ethiopia. Before moving on to the analysis, it is important to clarify at least two aspects of this study.

First, the purpose of the value chain analysis is to provide a basis for the design of the replicable business model in the project area which will be implemented and tested with the selected farmers' cooperatives. This chapter therefore does not aim to provide a national-level analysis of the characteristics of the teff value chain in Ethiopia (see Fufa *et al*., 2011; and Tura *et al.*, 2016 for information on this). The purpose is to investigate those aspects of the teff value chain which are important for the design of the replicable business model in the project area.

Second, it should be noted that the description of the teff value chain and the findings of this chapter are relevant as at June 2017. Value chains are dynamic systems, driven by the market and by changes in demand and prices, which impact the value chain upgrading interventions and the business model. At the time of writing it is not known how the business environment is going to develop in the coming months (and years), although the replicable business model is, by definition, based on several assumptions related to the future functioning of the market. These assumptions will need to be revisited and possibly revised as the research project proceeds.

Value chain analyses normally investigate both the determinants and the functioning of **markets**, as well as the motives and characteristics of the key **stakeholders** in the value chain. This chapter puts less emphasis on the market, because cooperative marketing of teff in Amhara region plays a very minor role as farmers can easily sell all their product due to constant high demand in the market (OPM *et al.*, 2017). Tehuledere woreda is a net importer of teff grain every year and trade to other towns (including Addis Ababa) is very limited, and thus insignificant. The emphasis in this chapter is therefore on the main **stakeholders** in the teff value chain in the project area, including farmers, farmers' organisations, processors and support service providers.

Teff is the most important cereal in Ethiopia and it accounts for 15% of calories consumed in Ethiopia (Fufa *et al*., 2011; Central Statistical Agency (CSA) 2016). Despite the low yield of this crop, of around 1 MT/ha, it is the dominant cereal by area planted (OPM *et al*., 2017). The high demand in the local markets ensure that teff fetches a relatively high wholesale price (24 Ethiopian Birr (ETB)/kg, compared with ETB 12/kg for sorghum and maize). Farmers in Ethiopia realise up to 78%–87% of the retail price for teff, which is considered very high (OPM *et al*., 2017).

The teff value chain in Tehuledere woreda includes a number of different stakeholders, who were identified during the first fieldwork in March 2017. The value chain map, which was developed during the stakeholder workshop (Figure 4), reflects the list of these actors. They are described in detail below.

3.1 Ethiopian Agricultural Input Supply Organisation

In Ethiopia the government organises the import and distribution of fertiliser centrally.[4] Fertiliser demand is estimated based on historic quantities of use and on actual size of agricultural land and crops produced in the kebele. The government has also identified certain crops and regions that enjoy preferential treatment in the allocation of fertiliser. In 2017 the Ethiopian Agricultural Input

[4] According to the ValueLinks method, fertiliser does not qualify as a specific input as it can be used for all kind of crops and is not a specific input to the teff value chain. Still, because of its importance and the special circumstances in Ethiopia it has been included in the stakeholder analysis.

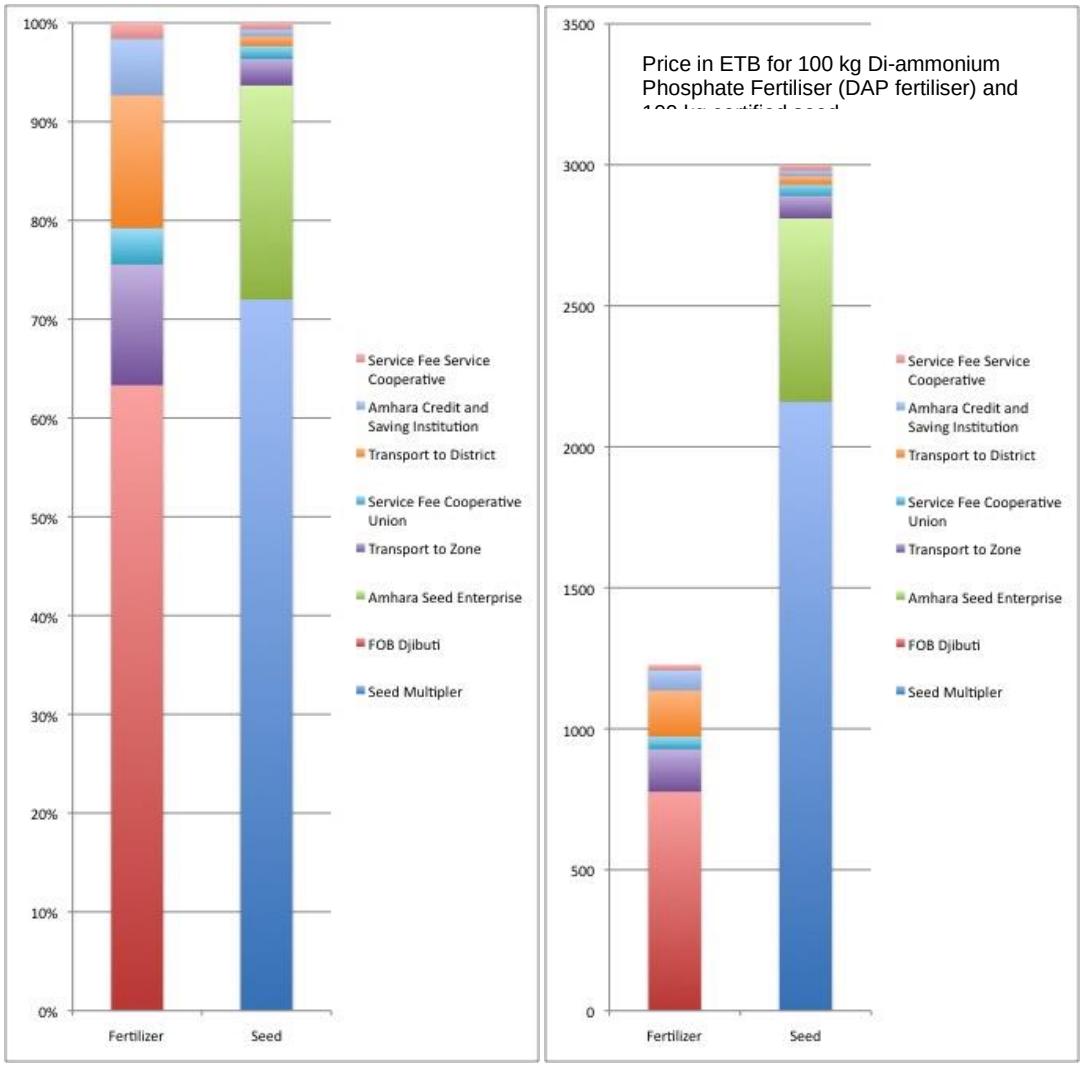
Supply Organisation (AISCO) organised import of fertiliser containing nitrogen, phosphate, sulfate and boron (NPSB) (18/39/7.5/traces) and Urea (46). The fertiliser is imported from Djibuti to all regions in Ethiopia and is stored in AISCO storage facilities. The cooperative unions are responsible for organising the distribution of fertiliser to the different woredas from the storage facilities. In South Wolo Zone 20 woreda are served by three Unions: Tabor Union, Yewole Union and Iricu Union. Iricu Union provides fertiliser to Tehuledere woreda, where Haik is located. The different service cooperatives are responsible for organising transport of fertiliser from Iricu Union storage facility to the village storage facility. From the village storage, farmers collect the fertiliser after they have paid for the fertiliser at ACSI.

Table 3: Import channel for fertiliser to Ethiopian farmers

Location	Prizce in ETB/Quintal (ETB/kg)	Explanation
Djibuti	777 (7,77)	AISCO has to transport the fertiliser from Djibouti and distribute to all zones.
South Wolo Zone	916.91 (9.17)	The unions have to pay this amount to AISCO and transport the fertiliser to the woreda. The actual cost for transport and storage is added to the purchase price when selling to the service cooperatives.
Tehuledere Woreda	974.41 (9.74)	The service cooperatives have to pay this price to Iricu Union in Haik. The cost of transport, storage and a service fee of ETB 20 per Quintal is added by the service cooperative before selling to the farmers.
Service cooperative	1096 - 1495.35 (10.96 – 14.95)	Farmers buy the fertiliser from ACSI. Farmers can buy fertiliser either in cash or on credit. If they buy on credit the interest rate is 7.25% for half a year. ACSI receives a service fee of 7.25% for each kg sold.

The following two charts demonstrate the relative and absolute price build up for fertiliser and seed based on the information collected from Jari Service Cooperative.

Figure 3: Sample price build up for fertiliser and seed



Source: Jari Service Cooperative.

Farmers normally apply on average 50 kg of DAP or NPSB fertiliser per hectare during planting time. When rainfall is favourable and the fields are fertile enough, they apply Urea 35 after planting. At all cooperatives that were visited in April 2017 fertiliser in small quantities was still available from the previous years. As explained by the cooperative members, the reason for this is that farmers did not apply the expected quantities of fertiliser in previous years due to exceptionally dry conditions.

3.2 Amhara Seed Enterprise

A number of teff varieties have been released in the last 50 years (see Annex E for the details). The most important improved varieties in Haik have been quncho (released in 2006) and Zobil (released in 2005), which are grown beside the local land races. Farmers prefer quncho because of it good yields, white colour, and early maturity, which ensures that it avoids moisture stress later in the season. The tendency for lodging does not discourage farmers in Haik from growing quncho because lodging does not play a major role due to low fertility and limited rainfall in the area.

Box 1: Availability, accessibility and willingness to buy certified seeds in Tehuledere woreda

The adaption of certified seed in Tehuledere woreda is very low: less than 5% of the seed used in 2016 was certified.

Availability: Certified teff seed is only distributed through service cooperatives or non-governmental organisations (NGOs). It is not possible to buy certified teff seed in agricultural input supply shops or markets. Service cooperatives are dependent on the distribution of certified teff seed through the Agriculture Input Department.

Accessibility: Certified teff seed is only accessible for farmers if a service cooperative within their reach has been supplied with certified teff seeds through the Agriculture Input Department. All farmers can access a service cooperative, independent of membership. Most service cooperatives 'sell' certified seeds even in smaller quantities than the bags they receive the seeds in, which is normally 15 kg.

Willingness to buy: Farmers have reported that certified seeds are neither available (no service cooperative within their reach has received certified seeds) nor accessible for them. They need 5 kg for 0.5 ha but the seed is sold in 15 kg bags and they cannot afford to pay the high price for the certified seed. Even though ASCI offers farmers affordable credit to purchase certified seeds through the service cooperatives, farmers are reluctant to buy certified seeds (and fertiliser) on credit because of the interest rate and because of religious reasons.

Certified seeds are distributed through similar channels to those used for fertiliser. From Amhara Seed Enterprise seeds are delivered to the cooperative unions based in the zones and from there they are distributed to the service cooperatives. The development agents assess the need for certified seeds in their respective kebele and communicate the quantities to the Department of Agriculture in the woreda. All woreda in South Wollo Zone report the required quantities to the Department of Input Supply and Distribution in Dessie, which then orders the seeds from the Amhara Seed Enterprise.

In 2017, 20.7 MT (207 quintal) of certified teff seed was requested for South Wolo Zone from the Amhara Seed Enterprise.[5] Of this amount, Tehuledere woreda will receive 600 kg (6 quintal) of certified teff seed, to plant a total land area of 4,500 ha.

Farmers normally plant part of their field with improved seed varieties and part of it with local varieties. It is a common practice among farmers to continue to use the improved seed varieties for several years. The demand for certified seed can be estimated based on the area planted with teff. It is estimated that in Tehuledere woreda 4,500 ha of land will be planted with teff in 2017. This would result for the year 2017 in a total demand of 45 MT (450 quintal) of seed, of which 15 MT should be certified seeds and 30 MT should be C1 and C2 quality seeds multiplied by farmers from certified seeds.[6] Despite this demand for certified seeds, only 6 quintal (that is 4% of 150 quintal) of the total necessary quantity has been requested from the Amhara Seed Enterprise for Tehuledere woreda for 2017. According to the Department of Input Supply and Distribution in Dessie this low rate is based on the historic demand in Tehuledere woreda. Given that the use of improved seeds can rapidly increase production of teff, the business model developed for Tehuledere woreda focuses on ensuring that farmers utilise improved seed.

3.3 ASCI

ASCI plays several roles for farmers and their service cooperatives. Any transaction of fertiliser and certified seeds distributed through the Ethiopian Agricultural Input Supply Organisation and Amhara Seed Enterprise has to go through ASCI. A farmer pays ASCI for seeds and fertiliser and with the provided receipt can collect the products from the cooperative. For each kg of fertiliser and

[5] Information obtained from the Agriculture Input Department officer.
[6] 4,500 ha x 10 kg/ha / 3 years = 15,000 kg/year. Assuming farmers utilise C1 and C2 seed in the next two years.

seed ASCI receives a commission of 7.25% of the product value. If the farmer buys on credit the interest rate is an additional 7.25% for the six months for which the credit is given.

ASCI has a number of credit packages to support households. For normal loans, an interest rate of 18% is charged. For households under the safety net programme and for investments in household solar equipment an interest rate of 15% is charged. Youth without a job can get loans at a rate of 8%. These loans are typically in the range of ETB 10,000–15,000.

ASCI was only introduced to Tehuledere woreda in 2016 after the model was successfully tested in other woredas in Ethiopia. According to the interview with ASCI at Hara Huluko Service Cooperative in April 2017 farmers pay for all transactions of fertiliser and certified seeds in cash. No farmer takes a loan for agricultural inputs. Farmers only use these inputs if they have the cash available or can access these inputs without cash investment.

3.4 Farmers

Farmers in Tehuledere woreda produce a number of different crops. Teff, sorghum and wheat are the most important crops, followed by maize and a variety of pulses. The woreda is prone to drought and productivity is often very low. The table below shows the area and yield of the five most important crops in the woreda.

Table 4: Size of production area and yield in Tehuledere woreda (2014–2016)

Crop	Ethiopian calendar	Gregorian calendar		Ethiopian calendar	Gregorian calendar		Ethiopian calendar	Gregorian calendar	
	2006/2007	2014		2007/2008	2015		2008/2009	2016	
	Ha.	yield kg	kg/ha	ha	yield kg	kg/ha	ha	yield kg	kg/ha
Sorghum	5,042	2,039,9100	4,045	4563	1,433,8500	3,142	3868	1,476,0500	3,816
Teff	3,298	5,113,400	1,550	3867	4,899,700	1,267	4086	2,856,500	699
Wheat	2,159	6,068,300	2,810	1643	3,467,400	2,110	1740	2,423,000	1,392
Maize	1,992	8,841,000	4,438	1839	5,648,600	3,071	1549	1,034,700	667
Haricot Bean	422	7,040,00	1,668	390	292,500	7,50	1084	145,800	134

Source: Tehuledere District Agricultural Office

Over the last three years teff has become the most important crop based on the area planted. The area planted to teff increased from 3,298 ha in 2014 to 4,086 ha in 2016. The District Agricultural Office estimates that 4,500 ha will be planted with teff in 2017. The area planted with sorghum, wheat and maize has declined over the same period. Sorghum has decreased from 5,042 ha in 2014 to 3,868 ha in 2016, and wheat from 2,159 ha in 2014 to 1,740 ha in 2016. According to information collected from the Tehuledere District Agricultural Office this is mainly due to the increased frequency of extreme weather conditions and because of the poor soils in the district. Farmers confirmed that they are growing less maize and less wheat due to more erratic dry spells within the growing period. The decision to grow more teff than sorghum is based on higher prices of teff. Additionally, soil fertility requirements for high yielding sorghum varieties exceed the potential of many soils in the area. For farmers, the only reliably producing crop over the last three years has been teff.

Box 2: Description of farming practices in Tehuledere woreda

Land preparation for teff production starts with the first ploughing in March / April. Ploughing is usually done by ox and by traditional plough. Individual farmers work with the support of their families and often work in groups. It is not uncommon to see several pairs of oxen ploughing in the same field. These groups prepare the field of one group member at a time and then move to the next field. Ploughing is repeated at least twice, sometimes even more often by several farmers (while some studies report ploughing up to eight times, in Haik farmers do not plough more than four times a year) (Zewdie *et al*). Following the last ploughing, teff is planted, making sure that the seed has good contact with the soil. While the official recommendation for seed rate is 10 kg/ha, with seeds planted in rows, the farmers interviewed reported that they broadcast seed at a rate of about 30 kg/ha.1 Some farmers also apply fertiliser (DAP or NPSB). While the recommended rate is 100 kg/ha, many farmers only apply around 50 kg/ha, and a few of them add Urea at a rate of 40 kg/ha. Only on good soils and if rainfall is adequate do farmers add 40 kg/ha Urea, which they apply 35 days after planting. If the rains are not good or the field has poor soil condition no further fertiliser is added.

Farmers from Fana Cooperative Society in Kebele 01 and 02 explained that they prefer to use manure and compost because the soils are very sandy and sloppy.

Farmers weed two or three times, depending on weed development. Weeding is done by hand and is considered a very tedious job. Few farmers utilise herbicides which include 2-4-D and Roundup. Some farmers have their own spraying equipment (Kebele 08), while others utilise the equipment provided by the cooperative or the department of agriculture.

Other relevant pests include teff shoot fly and grasshoppers. The family removes grasshoppers physically. Against shoot fly, Diazinon or Karate can be used but no farmer interviewed in Tehuledere woreda has used any agrochemicals for teff production.

Harvesting is done either by family or by groups, depending on the area. Teff is cut by hand and arranged into piles.

Production costs of teff are shown in the table. While yields can vary between 600 kg/ha to 1,200 kg/ha, the farmers interviewed harvest 800 kg/ha on average. This yield was also confirmed by the development agents of the area. Based on this quantity, the average income from a single hectare for a farmer would be ETB 13,600, compared to a cost of ETB 5,800/ha, making teff a very profitable crop. With less than a 350 kg harvest per ha the production costs would not be covered.

3.5 Local traders

Teff in Tehuledere woreda is traded within the woreda. While during peak of the harvest and during periods of low supply teff is traded beyond the borders of the woreda, in normal situations teff produced in Tehuledere woreda is also consumed within the woreda.

Farmers sell part of their production directly to consumers, either from their farm or by using market places within their reach. Depending on household needs, either a small quantity of teff is sold to cover household expenditure, or bigger volumes are sold to pay for outstanding debt or for investments.

The difference between the farm gate and the market price is about 10%, as observed during the analysis in April 2017. At Haik market, the price for white teff was ETB 26/tassa (ETB 18.6/kg), whether sold by farmers or traders. Traders and farmers reported that price at the farm gate was ETB 24/tassa (ETB 17.1/kg). Traders reported the maximum margin they can realise at Haik market is ETB 2.5/tassa (ETB 1.8/kg). The high farm gate price, as compared with the final consumer price, does not make trading in teff attractive for traders and this is the main reason why teff is mainly traded within the woreda.

3.6 Teff mills

The main processing activities in the teff value chain are commercial milling and packing of flour and processing into enjera. No commercial milling was observed in Tehuledere woreda. All milling operations provide services for customers, either for home consumption or for processing into enjera. The milling is charged at ETB 40/Quintal, including cleaning of teff seed prior to grinding.

3.7 Service cooperatives

Service cooperatives are found in every kebele. Most cooperatives serve one kebele, few serve two or three kebele. In some cases, two cooperatives can be found in one kebele. Farmers are free to become members of a service cooperative and non-members can also access services offered by the cooperative, e.g. buying certified seed or fertiliser. None of the cooperatives visited in Tehuledere woreda markets teff for member farmers. Marketing through cooperatives can mainly be observed for export products, e.g. Jairi Cooperative markets sesame for its members, and products traded at the Ethiopia Stock Exchange.

Cooperatives in Tehuledere woreda are not very active in the teff value chain. When provided with certified seed or fertiliser they facilitate the distribution to farmers, but they are not proactive in sourcing and providing services to farmers.

3.8 Iricu Cooperative Union

Iricu Cooperative Union is one of three cooperative unions operating in South Wollo Zone and the only union providing services to Tehuledere woreda. Within the current teff value chain Iricu Cooperative Union is the only channel to distribute certified seeds and fertiliser to the service cooperatives. For other products, the cooperative unions also provide marketing services within the region and the country, but because of the low productivity of South Wollo Zone these services are not very prominent.

3.9 Development agents

In each kebele the Ministry of Agriculture employs a development agent by to provide extension services to the farmers and to collect data and information required by the Ministry of Agriculture. The development agent is responsible for collecting seed and establishing fertiliser demand in the kebele, and for keeping data about agricultural production, area under cultivation by crop, and yields. Several development agents provided the value chain analysis with detailed information and three development agents participated in the stakeholder workshop. Any agricultural project implemented with smallholder farmers in Ethiopia depends on the support from development agents and they have been integrated into the business model developed during the stakeholder workshop.

3.10 Department for Input Supply and Distribution, Dessie

The Department for Input Supply and Distribution is responsible for compiling the actual demand in a zone for fertiliser and certified seeds, and for communicating demand for certified seeds to the Amhara Seed Enterprise and demand for fertiliser to AISCO.

3.11 Agrochemical dealers

In Haik town, one agrochemical dealer was identified. Several of the agrochemicals available at his shop are also used in teff production. During the interview, the shop owner stated that agrochemicals are not used for teff. He stated that for teff and other staple food crops agrochemicals are either distributed through the service cooperatives or farmers do not use agrochemicals. Agrochemicals sourced from the service cooperatives are subsidised by the government. If they not available at the cooperative, farmers do not use agrochemicals for teff production. This was also confirmed during the FGDs and other interviews. The agro dealer mainly provides services to horticultural producers, who can also find certified seeds for a variety of vegetables and fruits at the agro dealer shop.

3.12 Quarantine office

The quarantine office is responsible for ensuring the quality of agricultural inputs distributed and produced within a zone.[7] All certified seed production within South Wollo Zone has to be monitored by the department, from field selection up to packing. This includes several visits to the field until harvest to ensure that only healthy and uniform crops are used to produce certified seeds. Final testing of germination and purity and monitoring of storage and packing of certified seeds are also done. For the time being, South Wollo Zone does not produce any certified seeds commercially, although several development initiatives have tried to produce certified seeds in South Wollo Zone in the recent past. All of these initiatives failed to obtain a certificate because not all of the conditions for certified seed production were fulfilled. The department has limited capacity, no vehicle and only small laboratory space, with limited equipment. Any certified seed production initiative would have to facilitate necessary visits to the field.

3.13 A case study of an Enjera baker in Tehuledere woreda

Enjera bakers in Tehuledere woreda produce between 100 and 1,000 pieces of enjera per day. They supply most of the enjera to restaurants and hotels as fixed orders and part of their production is sold on the street and in markets. The below description shows a typical enjera bakery in Haik.

The enjera bakery in Haik produces 3,500 pieces of enjera per week. The bakery is situated about 1 km from the city centre, close to the market and to the bus stand. The miller prefers to buy teff grain directly from the farmers. He purchases on average 3 quintal every market day (Friday and Sunday). The price varies from ETB 1,800 (between November 2016 and January 2017) and ETB 2017 (at the time of the interview in April 2017), and he is expecting that the price will climb up to ETB 2,300 by September 2017. After purchasing, the grain is immediately taken to the miller, where it is sorted, cleaned and milled. The miller charges ETB 40 per quintal for the service – then it is transported to the bakery and stored. Transport costs are ETB 15 per quintal.

[7] The South Wollo Zone Quarantine Office in Dessie was very supportive of the study during the value chain analysis and the stakeholder workshop.

The bakery employs four bakers, each of whom are paid ETB 500 per month. They are responsible for preparing the dough, and for fermenting and drying the enjera. The activity is supervised by the wife of the bakery owner.

For the drying (enjera is not 'baked' but 'dried') they are use four traditional ovens (Metat). These last for about four months before they have to be replaced, at a cost of ETB 150. The drying process consumes wood fuel and sawdust (the cost of which is ETB 300 per week = ETB 250 for the wood fuel plus ETB 50 for the sawdust). The surface of the dryer is greased with ground mustard seed to ensure that the enjera does not stick to it; the mustard seed costs ETB 60 per week.

Each day the bakery produces 500 pieces of enjera and sells each piece at ETB 5. The weekly income from enjera sales is ETB 17,500.

The bakery has never experienced problems selling all products and has plans to improve and expand their production. The plan is to invest in an electric enjera dryer instead of the wood-fired dryer and to increase the number of dryers.

Table 5: Economic analysis of enjera bakery

Item	Unit	Cost/unit	Units/week	Cost/week
Teff	Quintal	2017	6	12,102
Cleaning/milling	Quintal	40	6	240
Transport to bakery	Quintal	15	6	90
Fuelwood	Camelpack	50	5	250
Sawdust	Bag	50	1	50
Mustard seed	Bag	60	1	60
Metat	Piece	150	0.2	30
Wage for four bakers	Person	500	1	500
			Total cost/week	**13,322**

The income from enjera sales covers all costs involved, regardless of the price of teff. At a low teff price the profit is about 25% or ETB 5,000 per week (12% or ETB 2,500 when teff is expensive). This provides a steady income for the family.

4 Design of a replicable business model in Tehuledere woreda

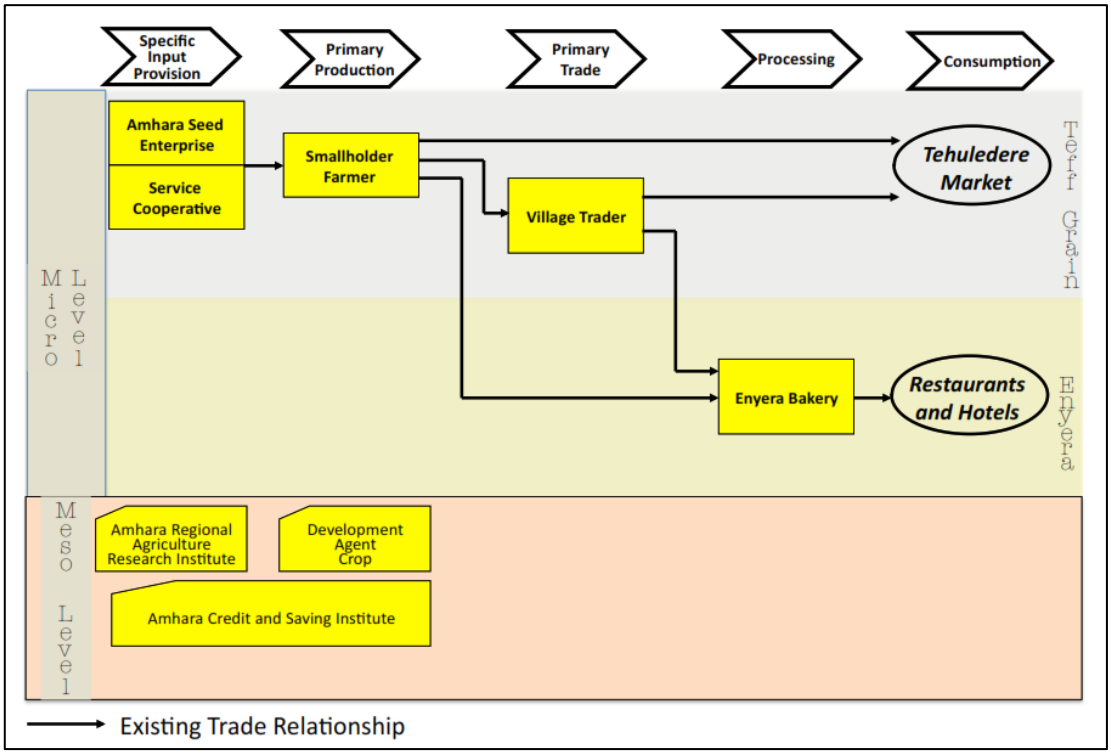
The replicable business model for Tehuledere woreda was developed during the value chain stakeholder workshop in Haik between 1 and 2 June 2017. All relevant actors in the value chain were represented at the workshop, including farmers, traders and government officers (see Annex A for the list of participants). The replicable business model was designed in three steps: (1) discussing and verifying the characteristics of the teff value chain in Tehuledere woreda; (2) identifying where the performance of the value chain could be improved; and (3) designing a replicable business model which would address these challenges. These three steps in the development of the business model are described in detail below.

4.1 Description of the teff value chain in Tehuledere woreda

The participants identified five value chain functions that are relevant in Tehuledere woreda. They include the input supply, primary production, primary trade, processing and consumption. Starting from the teff farmer (whose risk the SRMS project aims to reduce) the participants identified those functions which are necessary to provide teff, from the farmers to the final consumer. In order to produce the required quality of teff, farmers need the right seeds and other agricultural inputs, which are provided by the specific input suppliers. After harvest, farmers sell their teff production to local traders either at the farm gate or at the local markets; alternatively, they may also sell directly to the final consumers. The workshop confirmed that none of the service cooperatives is involved in trading teff.

A separate channel of the teff value chain is enjera baking, which the participants identified as an additional function. Figure 4 below shows the value chain map as it was developed during the workshop.

Figure 4: Value chain map developed during the value chain workshop

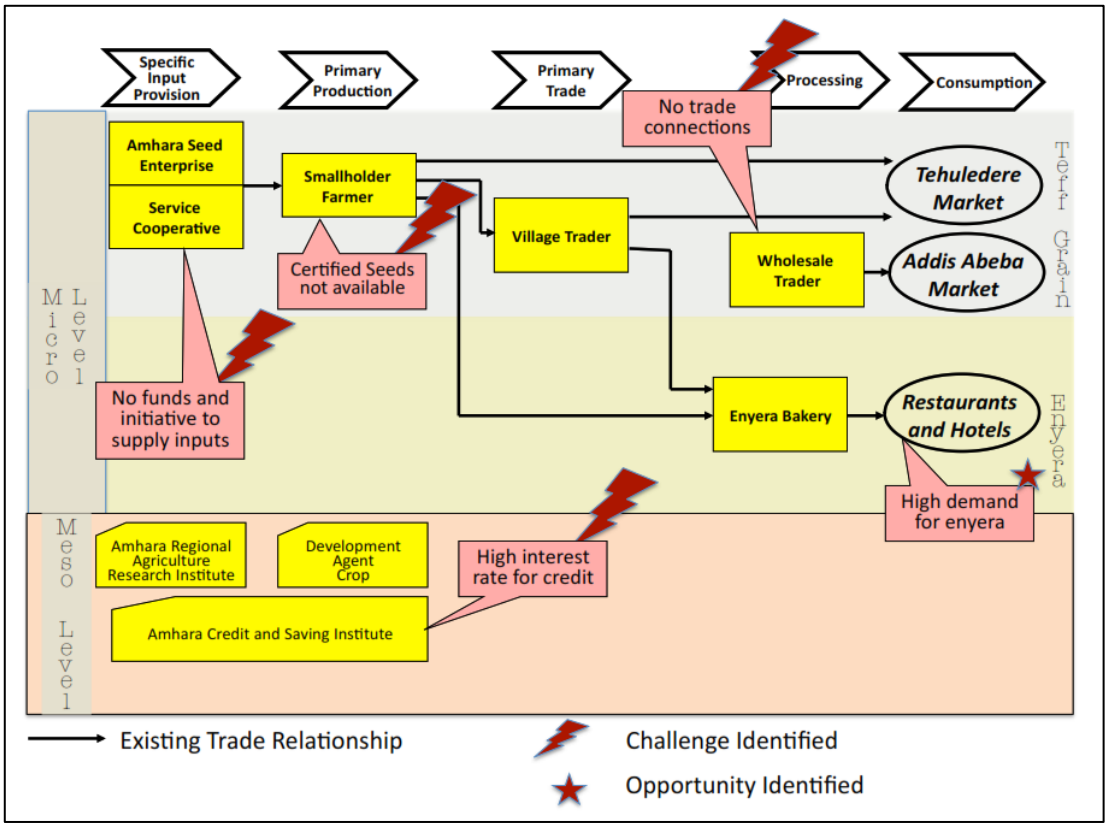


4.2 Challenges identified in the teff value chain in Tehuledere woreda

The workshop participants identified several existing challenges that hinder the effective functioning of the value chain in Tehuledere woreda. The first challenge is at the primary production level: **certified seeds** and other inputs are currently not available in sufficient quantity in Tehuledere woreda. (During the value chain analysis the research team visited Haik market and several other traders and agro-dealers in the woreda. During these visits, it was confirmed that teff seeds are never sold by any commercial agents in this woreda.) The participants explained that they expect to access fertiliser and seeds through their service cooperatives. As noted earlier, the quantity of certified seed ordered for Tehuledere woreda is only 4% of the total quantity of certified seeds needed by the woreda in 2017.[8]

The participants highlighted that the performance of the teff value chain in Tehuledere woreda is hindered by the lack of trade relations with Addis Ababa – although it proved difficult to identify the impact of this on smallholder livelihoods. Demand for teff in the woreda is higher than the available supply from production, which means that farmers can sell teff any time at a profitable price. Therefore, no business opportunities were identified in the areas for marketing and processing teff by the workshop participants. The business models discussed during the stakeholder workshop therefore focus on provision of improved certified seed.

Figure 5: Challenges identified in the value chain during the value chain workshop



[8] Information collected from the Dessie Department for Input Supply and Coordination (the stakeholder interviews).

4.3 Option 1 for a replicable business model in Tehuledere woreda

Based on the discussions during the workshop, two options were finally considered for the replicable business model.

In Option 1, ARARI would provide approved basic quality **seed** to a selected farmers' group to produce certified seeds in Tehuledere woreda. This would address the shortage of certified seeds for teff production in Tehuledere woreda. The farmers are to be selected based on their location, their commitment to implementing the business model and whether they can be clustered into a unit of at least 5 ha of connected land. According to the Ethiopian Community Seed Multiplication Requirements at least 5 ha of connected land have to be used for community seed multiplication, to ensure separation from other varieties.[9] Ideally, the farmers' group would need to identify two areas of 5 ha each to multiply the seed. According to information obtained from the Input Supply Office and from the quarantine officer, to implement this model the area and the farmers would need to be selected in collaboration with both of the two offices to ensure that they comply with all formal requirements for seed multiplication. From site selection up to harvest the group would then be supported, trained and supervised by the team from ARARI. Additionally, the quarantine officer would be required to visit the field as per the visiting schedule. According to this business model, during the first year the project would provide support to the quarantine officer, the agricultural department and to ARARI to work with the farmers. In the subsequent years, however, the model would become 'replicable' without further project inputs as the farmer group would continue with the model using the funds generated from the sale of the produced certified seeds. All other inputs required to grow teff seeds (fertiliser and chemicals), as well as all production activities (weeding, removal of off-type plants, harvesting), would need to be carried out by the farmers' group.

It is expected that the group would harvest 4–7 metric tons of teff from each variety. Assuming that the harvested seeds get a certificate from the quarantine office, the harvest would be transported to ARARI, where it would be cleaned, packed and stored for sale as seed. If no certificate is issued, the farmer group would have to sell teff as food (not as seeds).

According to this business model ARARI would have the task of identifying markets and supporting the farmers' group to sell certified seed. As part of the outreach, at least one member of the farmers' group would be trained in seed marketing and be kept informed about possible markets for teff seed.

ARARI would then sell the seeds as certified seeds on behalf of and together with the farmers' group, preferably to customers who require bigger volumes of certified seed for final distribution (for example, an NGO or other development programmes). Part of the certified seeds should be marketed by the group within Tehuledere woreda, to address the shortage of certified seeds in the area.

The potential income that the model could generate is shown in the table below. The table below compares the potential income from four options: production of (1) local teff variety; (2) improved teff variety with good agronomic practices; (3) certified teff seed for local sale, and (4) certified teff seed for sale to Amhara Seed Enterprise. The assumption is that the farmers will be able to sell 60% of the harvested teff as certified seed, while the rest could be used for home consumption or for sale as food. If they manage to sell 100% as seed, then their income would increase accordingly.

[9] Information obtained from quarantine officer.

Table 6: Economic comparison teff models

	Traditional teff production	Teff production with improved seed	Seed teff production local sale of seed	Seed teff production sold to Amhara Seed Enterprise
Yield kg/ha	700	1200	1200	1200
Price ETB/tassa	24	26	40	30
Income ETB/ha	16800	31200	42400*	34400*

* 800 kg is sold as seed for ETB 40/30/kg and 400 kg is sold as food for ETB 26/kg

Teff seed production for Amhara Seed Enterprise generates a 15% increase in price compared to the food teff market price. The additional income generated can hardly cover the additional costs of certified seed production (removal of off-plants, facilitation of quarantine officers' movement and higher price of basic seeds to be used for certified seed production). In other initiatives in which farmers' groups produce certified seed for Amhara Seed Enterprise, the additional costs to produce certified seeds are normally covered by the NGOs and the development programmes. In order to make this business model profitable for farmers, a detailed assessment of the teff seed value chain has to be conducted, with a special focus on establishing reliable information of certified teff seed demand and realistic sale prices. While the model has very high economic potential, the additional research involved and the limited capacity of the local stakeholders would make it difficult to implement; therefore it is not recommended to be implemented at this time. Additionally, the model would also need sufficient support from several government institutions, including Amhara Seed Enterprise and ASCI.

4.4 Option 2 for a replicable business model in Tehuledere woreda

During the value chain analysis, it became clear that only a very small percentage of farmers are using certified seeds: less than 5% of the seed used in Tehuledere woreda is certified seed. In some woredas, farmers do not collect the available certified seed from the service cooperatives because they find the price too high. For Tehuledere woreda it is estimated that in 2017 about 4,500 ha will be planted with teff. In order to plant 4,500 ha at a seed rate of 10 kg (i.e. the reduced traditional rate), the total seed required would result in 45 MT (450 quintal) of which 15 MT (150 quintal) should be certified seed. According to the Department of Input Supply and Distribution, 6 quintal of certified seed has been requested from Amhara Seed Enterprise for 2017 for Tehuledere woreda. Discussions with development agents, Ministry of Agriculture staff, ACSI and farmers revealed that although the purchase of certified seeds has an economic benefit for farmers, they do not have the cash or the willingness to purchase certified seeds. To overcome the reluctance of farmers to invest money into certified seeds the model explores a cash-free provision of certified seeds and recovery of the cost through the return of food teff.

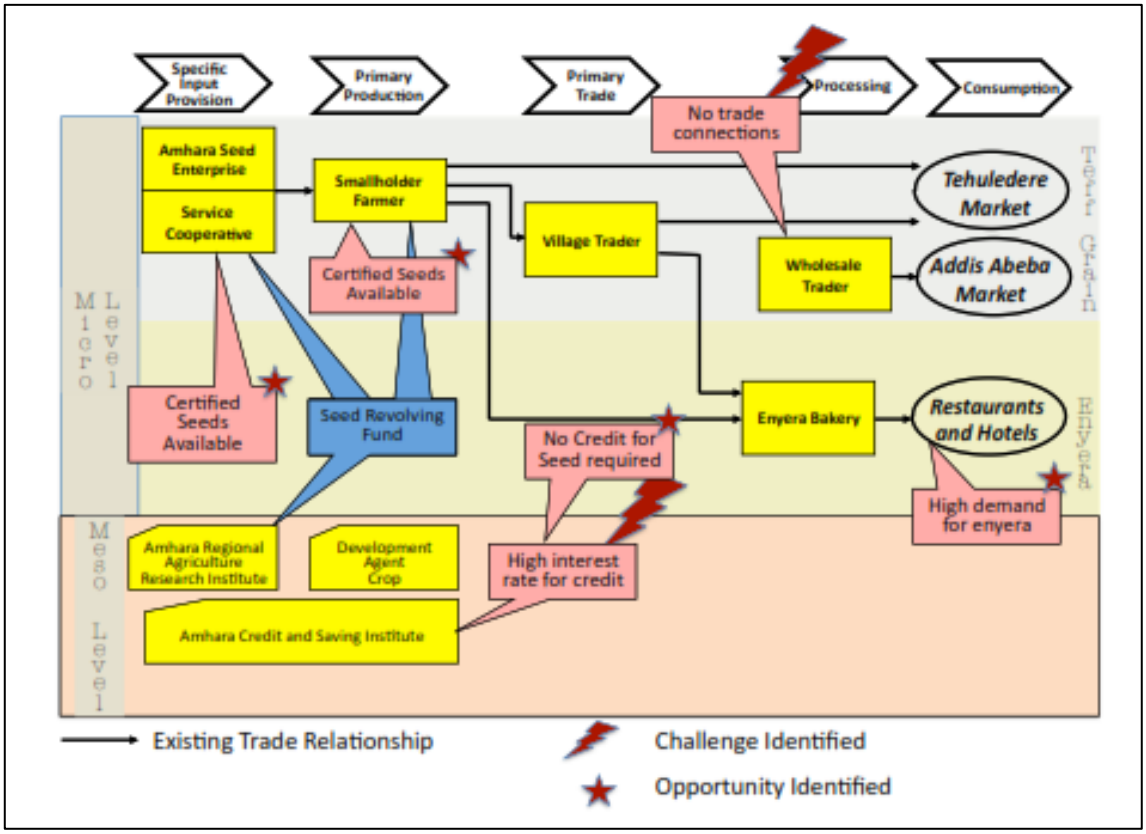
The business model, in order to be replicable and scalable, requires a minimum of 100 farmers per kebele to participate. Each farmer would need to be provided with 4 kg of certified teff seed and each farmer would need to return 8 kg of teff after harvest. See the economic analysis below in the table.

Table 7: Economic analysis of seed revolving fund

Description	Quantity	Quantity needed	Value per unit	Total value in ETB
Purchase of certified teff	100 farmers	4 kg certified seed	ETB 30/kg	100 * 4 * 30 = ETB 12,000
Handling of certified seed by service cooperative	4 quintal		ETB 20/ quintal	4 * 20 = ETB 80
Support from development agent Daily Subsistence Allowance @ ETB 300 per day for distribution of seed	3 days		ETB 300/ day	3 * 300 = ETB/900
Support from District Agric. Office	2 days		ETB 400/day	2 * 400 = ETB/800
Supervision of ARARI	2 days		ETB 700/day	2 * 700 = ETB 1,400
Handling of returned teff by service cooperative	8 quintal		ETB 20/ quintal	8 * 20 = ETB 160
Total cost for each service cooperative to provide 100 farmers with 4 kg certified seed each			**Total**	**ETB 15,640**
Total value of teff returned April 2018	100 farmers	8 kg teff	ETB 20/kg	100 * 8 * 20 = ETB 16,000
Total surplus generated				ETB 360

The development agent, together with village elders and cooperative leaders, would select 100 farming households. These households should be engaged in teff farming and be active farmers. Priority should be given to resource-poor households, as long as it can be reasonably anticipated that they are capable of cultivating 0.4 ha of teff successfully. Each participating kebele would register 100 famers in a registration form provided by the SRMS project, which will be used to document the distribution of certified teff seed and the collection of returned teff (see Annex B). It is anticipated that the District Agricultural Office and the development agents will provide supervision during household selection. The farmers will be required to return double the amount of teff they have received before the end of April to the service cooperative. The teff will subsequently be sold and the proceeds will be used to buy certified seeds again, which will make the model replicable without project support. These can again be distributed under the same system to 100 farmers.

Figure 6: Replicable business model and seed revolving fund for Tehuledere woreda



If a kebele is able to run this system without the support from ARARI they would be able to generate a surplus of more than ETB 1,500 in a year. This surplus could be used to improve the infrastructure of a service cooperative, to increase the number of participating farmers or to cover for any defaulting farmers. For the first year, oversight by ARARI will be important to allow for the initiation of the project, together with some oversight and coordination by the SRMS project.

Initially, the second business model was designed having risk management strategies for smallholder farmers in mind. A combination of three drought-resistant crops, a legume, sorghum and teff, would have been the most ideal package. To include a legume in the package would have increased the value and the volume of the package beyond the capacity of this project, but still would be the most interesting from the point of view of risk management. While prices for legume seeds are similar to those for teff and sorghum, the higher volume needed per area for planting results in a higher return rate for farmers.

The initial package proposed at the stakeholder workshop was a combination of 1.5 kg certified sorghum seed and 2.5 kg certified teff seed, which would have been sufficient to plant 0.2 ha of each crop. Each farmer would then return 8 kg of only teff seed after harvest. Through this package the farmer could produce a big volume of food in a good year when the sorghum produces well, but is sure to harvest at least the teff in a very dry year. The farmers in the stakeholder workshop refused this package and the conditions. The discussion clarified that the two main reasons for farmers refusing the package with sorghum are that the main planting time for sorghum is already over and that improved certified sorghum only produces good results when additional inputs are used.

Based on the situation above the participants of the workshop decided to implement the option 2 business model, with only certified teff seed to be distributed. The business model aims to encourage farmers to buy good-quality improved teff varieties' seeds. Under the characteristics of

the current market and the existing seed distribution system in Ethiopia this is the **only** entry point for a business model that aims to be replicable in subsequent years, as the market conditions are already very favourable for farmers and they can easily sell any additionally produced teff profitably.

Seed revolving fund

During the stakeholder workshop the participants, through the facilitator's assistance, designed a viable business model for the cooperative. The underlying objective of the replicable business model is to provide *continued* access to high-quality seeds to members and other farmers in the area by establishing a *seed revolving fund*. The initial seed purchase for 2017 planting will be financed by the SRMS project, but all other costs and seed purchases in subsequent years will be financed out of the proceeds of the seed business run by the different service cooperatives with the support of local administration.

First season of the seed revolving fund (2017/18)

For the growing season 2017/18, the stakeholder workshop decided that the project should target 300 farmers in three different kebele: Hitachi, Gobeya and Jari. Each farmer will prepare 0.4 Ha of land to produce teff and thus receive 4 kg of certified seeds of the Quncho variety. This allocation assumes a seed rate of 10 kg/Ha, which is based on the recommendation in ATA (2007) and which was also confirmed by the development agents and by farmers in the area. Each farmer will plant and manage the teff as part of their routine farming activities. The agricultural extension staff based in the area will provide support as and when needed.

Based on the information from the stakeholder workshop the yield of certified seeds planted on 0.4 Ha is between 320 kg and 450 kg. Out of this harvest each farmer is expected to deliver 8 kg of teff back to the service cooperative. The value of the 8 kg of teff returned to the service cooperative is expected to be ETB 160 assuming a price of ETB 20/kg in January 2018. This will allow the service cooperative to purchase at least 4 kg of certified seeds for 100 farmers while also being able to pay for the necessary operational costs.

While the business model assumes a similar situation and prices in the subsequent years this cannot be taken for granted and additional facilitation on how to utilise the seed revolving fund should be considered by the project.

4.5 How does the business model address smallholder risks?

The risks faced by teff producers in the study area have been discussed in detail in Chapter 2.1. The replicable business model, which is based on a seed revolving fund, aims to provide farmers with opportunities to reduce risks in various ways.

4.5.1 Managing risks caused by natural shocks

Teff as a crop plays a critical role in managing drought. If rains arrive on time in April, farmers plant long-duration varieties of sorghum, which is harvested in October. If the rains arrive later, in June or July, farmers plant shorter-duration sorghum, which is also harvested in October. Teff is usually planted on pure stand during the months of June and July, and has a maturation period of three to five months depending on altitude and variety. If sorghum fails, income from sale of teff is used to buy sorghum in the market. In practice, then, 'No crop can compete with teff in terms of risk management' (OPM *et al*., 2017: 29).

4.5.2 Managing price risks

As noted in Chapter 2, prices of teff are stable in the area, meaning price fluctuations do not represent a major risk for smallholders.

4.5.3 Managing economic coordination risks

As access to inputs is a major risk factor for smallholders, the business model has been designed in a way that it reduces this risk by tasking the selected three service cooperatives to coordinate supply of inputs and marketing of products. As part of the business model, seed supply is delivered in bulk to the cooperative and farmers collect the seed they need from the cooperative. The harvested product to be returned by the farmers is delivered by the farmers to the cooperative and from here the cooperative can market the product in bulk. This strategy ensures that farmers benefit from collective sourcing of inputs that otherwise would not be available and through collective marketing the cooperative has a higher chance of accessing premium markets, including Addis Ababa.

4.5.4 Managing risk of opportunism

As noted in Chapter 2, there were no major risks of opportunism identified in the area as prices are stable and there are few if any commercial opportunities to exploit by agents.

4.6 Workplan to implement the business model

In order to successfully implement the business model described above, a series of activities need to be implemented. These are summarised in the table below.

Table 8: Activities to be performed

Activity	Date completed	Responsible
Registration of 300 farmers	June 2017	ARARI, Development agents
Purchase 1,200 kg of improved variety certified or basic teff seed	June 2017	ARARI
Package the teff seeds into 300 units of 4kg bags	June 2017	ARARI
Transport 100 bags of the 4 kg teff seed to each of the three selected kebele (Total = 1,200kg transported)	June 2017	ARARI
Ensure that the three development agents distribute the 4 kg bags of teff seed to the 100 farmers in each kebele and document this in the relevant form	July 2017	ARARI, Development agents, District Agricultural Office, Local authority
Harvesting and return of 8kg of teff by each farmer	February 2018	Farmers Service cooperatives
Sale of 800 kg of teff at each service cooperative	April 2018	Service cooperatives, District Agricultural Office
Business model design / adjustment / review workshop	May 2018	SRMS research team Service cooperatives District Agricultural Office
Order 400kg of certified seeds at each service cooperative	June 2018	Service cooperatives District Agricultural Office
Registration of 300 farmers	June 2018	Service cooperatives Development agents
Ensure that the three development agents distribute the 4 kg bags of teff seed to the 100 farmers in each kebele and document this in the relevant form	July 2018	Development agents, District Agricultural Office, Local authority
Harvesting and return of 8kg of teff by each farmer	February 2019	Farmers Service cooperatives
Sale of 800 kg of teff at each service cooperative	April 2019	Service cooperatives, District Agricultural Office
Business model design / adjustment / review workshop	May 2019	SRMS research team Service cooperatives District Agricultural Office
Order 400 kg of certified seeds at each service cooperative	June 2019	Service cooperatives District Agricultural Office
Registration of 300 farmers	June 2019	Service cooperatives Development agents

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Annex A List of interviews conducted in Ethiopia, 2–8 April and 29 May–3 June 2017

The following table provides a list of the interviews that were conducted by the research team between 2 and 8 April and 29 May and 3 June 2017.

No	Date	Person	Title	Institution	Interviewed by	Location	Phone	Email
1	03-April-17	Abraham Tsegaye	Process Coordinator	South Wollo Zone Department of Input Supply and Distribution	Joachim Weber	Dessie	+251 914 716 538	
2	03-April-17	Berhane Gebre	Head of Department	Dessie Seed Quarantine Department	Joachim Weber	Dessie	+251 914 066 057	
3	04-April-17	Zemenai Worku	Value Chain Officer	Tehuledere woreda Agricultural Office	Joachim Weber	Haik	+251 901 828 848	
4	04-April-17	Ahmed Mohammed	Credit Expert	Tehuledere woreda Agricultural Office	Joachim Weber	Haik	+251 985 262 191	
5	04-April-17	Mohammed Lulu	Cooperative Head	Tehuledere woreda Agricultural Office	Joachim Weber	Haik	+251 911 158 188	
6	04-April-17	Hussien Seid	Food Security Expert	Tehuledere woreda Agricultural Office	Joachim Weber	Haik	+251 913 320 713	
7	04-April-17	Wosen Adem	Disaster Warning Expert	Tehuledere woreda Agricultural Office	Joachim Weber	Haik	+251 920 490 017	
8	04-April-17	Meaza Mekonnen	Crop Production Expert	Tehuledere woreda Agricultural Office	Joachim Weber	Haik	+251 927 784 037	

9	04-April-17	Awel Kassa	Cooperative Chairman	Jari Service Cooperative	Joachim Weber	Haik	+251 914 467 379	
10	05-April-17	Kekebus Asefa	Bakery Owner	Enyera Bakery Haik	Joachim Weber	Haik	+251 922 625 006	
11	05-April-17	Zemed Berhanu	Manager	Puyassa Restaurant	Joachim Weber	Haik	+251 915 866 041	
12	05-April-17	Yilmer Ahmed	Crop Development Agent	Tehuledere woreda Agricultural Office Kebele 01	Joachim Weber	Haik		
13	05-April-17	Fantau Yimam	Crop Development Agent	Tehuledere woreda Agricultural Office Kebele 10	Joachim Weber	Haik	+251 925 043 675	
14	05-April-17	Kadir Ali	Public Relations Officer	Amhara Credit and Saving Institution	Joachim Weber	Haik	+251 960 742 103	
15	05-April-17	Mesfin Bahta	Socio-economics Extension Researcher	Sirinka Agricultural Research Centre	Joachim Weber	Sirinka	+251 921 270 374	
16	06-April-17	Mulageta Mammo	Teff Breeder	Amhara Regional Agricultural Research Institute	Joachim Weber	Bahirdar	+251 912 492 965	mamomulugeta328@gmail.com
17	06-April-17	Dessatega Getu	Extension Researcher	Amhara Regional Agricultural Research Institute	Joachim Weber	Bahirdar	+251 938 418 379	tessetelferson@gmail.com
18	06-April-17	Negussie Siyum	Agricultural Extension Researcher	Amhara Regional Agricultural Research Institute	Joachim Weber	Bahirdar	+251 918 135 152	negussiese@gmail.com
19	06-April-17	Tigist Ademgew	Technology Multiplication	Amhara Regional Agricultural	Joachim Weber	Bahirdar	+251 918 311 480	ademgewtigist@gmail.com

			and Seed Researcher	Research Institute				
20	07-April-17	Kedir Mohammed	Crop Development Agent	Tehuledere woreda Agricultural Office Kebele 08	Joachim Weber	Haik	+251 920 489 991	
21	07-April-17	Birhanu Melaku	Crop Development Agent	Tehuledere woreda Agricultural Office Kebele 15	Joachim Weber	Haik	+251 914 054 242	
22	30-May-17	Abraham Tsegaye	Process Coordinator	South Wollo Zone Department of Input Supply and Distribution	Zoltan Tiba and Joachim Weber	Dessie	+251 914 716 538	
23	30-May-17	Berhane Gebre	Head of Department	Dessie Seed Quarantine Department	Zoltan Tiba and Joachim Weber	Dessie	+251 914 066 057	
24	30-May-17	Meaza Mekonnen	Crop Production Expert	Tehuledere woreda Agricultural Office	Zoltan Tiba and Joachim Weber	Haik	+251 927 784 037	
25	30-May-17	Fantau Yimam	Crop Development Agent	Tehuledere woreda Agricultural Office Kebele 10	Zoltan Tiba and Joachim Weber	Haik	+251 925 043 675	
FGDs with farmers' cooperatives								
FGD - 1	05-April-2017		Hara Huluko Service Cooperative			Hara Village, Tehuledere woreda, South Wollo Zone		
		Seid Hassen	Accountant	Hara Huluko Service Cooperative	Joachim Weber	Hara	+251 922 604 218	
		Mohammed Aden	Secretary	Hara Huluko Service Cooperative	Joachim Weber	Hara	+251 949 929 852	

		Seid Muhie	Chairman	Hara Huluko Service Cooperative	Joachim Weber	Hara	+251 922 896 174	
		Mohammed Yiner	Chairman Auditing	Hara Huluko Service Cooperative	Joachim Weber	Hara	+251 921 519 492	
		Aminal Adem	Member	Hara Huluko Service Cooperative	Joachim Weber	Hara	+251 977 907 665	
		Mohammed Ali	Member	Hara Huluko Service Cooperative	Joachim Weber	Hara		
FGD -2	05-April-17	*Fana Service Cooperative*						
		Mohammed Hussein	Chairman	Fana Service Cooperative	Joachim Weber	Kebele 01		
		Jamal Seid	Accountant	Fana Service Cooperative	Joachim Weber	Kebele 01		
		Bezabik Ali	Selling and Purchasing Officer	Fana Service Cooperative	Joachim Weber	Kebele 01		
Stakeholder workshop: 01–02 June 2017								
		Kebebe Seid	Crop Development Agent	Tehuledere woreda Agricultural Office Kebele 12				
		Meaza Mekonnen	Crop Production Expert	Tehuledere woreda Agricultural Office				
		Dr.Asmare Dejen	*Vice President for Research and Community Service*	*Wollo University*				
		Birhanu Malaku	Crop Development Agent	Tehuledere woreda Agricultural Office Kebele 13				

		Birhane Gebre	Head of Department	Dessie Seed Quarantine Department				
		Abraham Tsegaye	Process Coordinator	South Wollo Zone Department of Input Supply and Distribution				
		Hailu Megash	Teff Farmer	Tehuledere woreda				
		Adafa Mulugeta	Teff Farmer	Tehuledere woreda				
		Fantay Muhamed	Teff Farmer	Tehuledere woreda				
		Endiris Said	Teff Farmer	Tehuledere woreda				
		Tirunes Tefera	Teff Farmer	Tehuledere woreda				
		Tamir Chekole	Teff Farmer	Tehuledere woreda				
		Mesfin Batha	Translator	Sirinka Agricultural Research Centre				
		Masreshaw Seid	Teff Farmer	Tehuledere woreda				
		Araya Gugsa	Teff Farmer	Tehuledere woreda				
Local markets visited								
1	07-April-17	Market day in Haik	Five selected teff traders in Haik market		Joachim Weber	Haik		
	07-April-17	Agrodealer			Joachim Weber	Haik		
	31-May-17	Agrodealer			Zoltan Tiba and Joachim Weber	Haik		

Annex B Questionnaire for registering farmers

በ_____ቀበሌ ያሉ የአባወራ/የማወራ ስም ዝርዝር

List of Households in _____ Kebele

	የአባወራው / የማወራ ስም Name of HH head	የአባወራው / የማወራ ጾታ Gender of HH head	የቤተሰብ ብዛት Number of HH members	ያለው የመሬት ስፋት (በዬክታር) Size of landholding (Hectare)	4 ኪሎ የተቀበለበት ቀን Date 4kg bag received	የአርሶ አደሩ ፊርማ Farmer's Signature	8 ኪሎ የመለሱበት ቀን Date 8kg tef returned	የአርሶ አደሩ ፊርማ Farmer's signature
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

Annex C Semi-structured interview questions

The **key informant interviews** were conducted in a semi-structured way to allow participants to express their views freely. The following questions were asked during the interviews.

1) Please describe your actual and historic involvement in the teff value chain (e.g. production area, volume and prices; consumed, traded, stored and processed volume; trading partner within the value chain; other partners and services in the value chain; training and extension activities)

2) Where do you see opportunities to improve your involvement in the teff value chain (e.g. additional resources; infrastructure development; policy framework)?

3) Are you aware of other teff promotion projects?

4) Please describe the pests and diseases you have encountered.

5) What are the costs of the activities you perform within the value chain (actors only)?

6) Please describe your experience working with your service cooperative and cooperative union.

Guiding questions used during FGDs:

1. What efforts has your group undertaken to improve your livelihood?

2. Please describe how prepared and ready your community is to act together?

3. What opportunities does your community see for development?

4. What are the main obstacles hindering achievement of the above development opportunities?

5. Which government organisations and institutions provide support to community development?

6. What are the possible sources of funding for communal action?

Annex D Workshop schedule

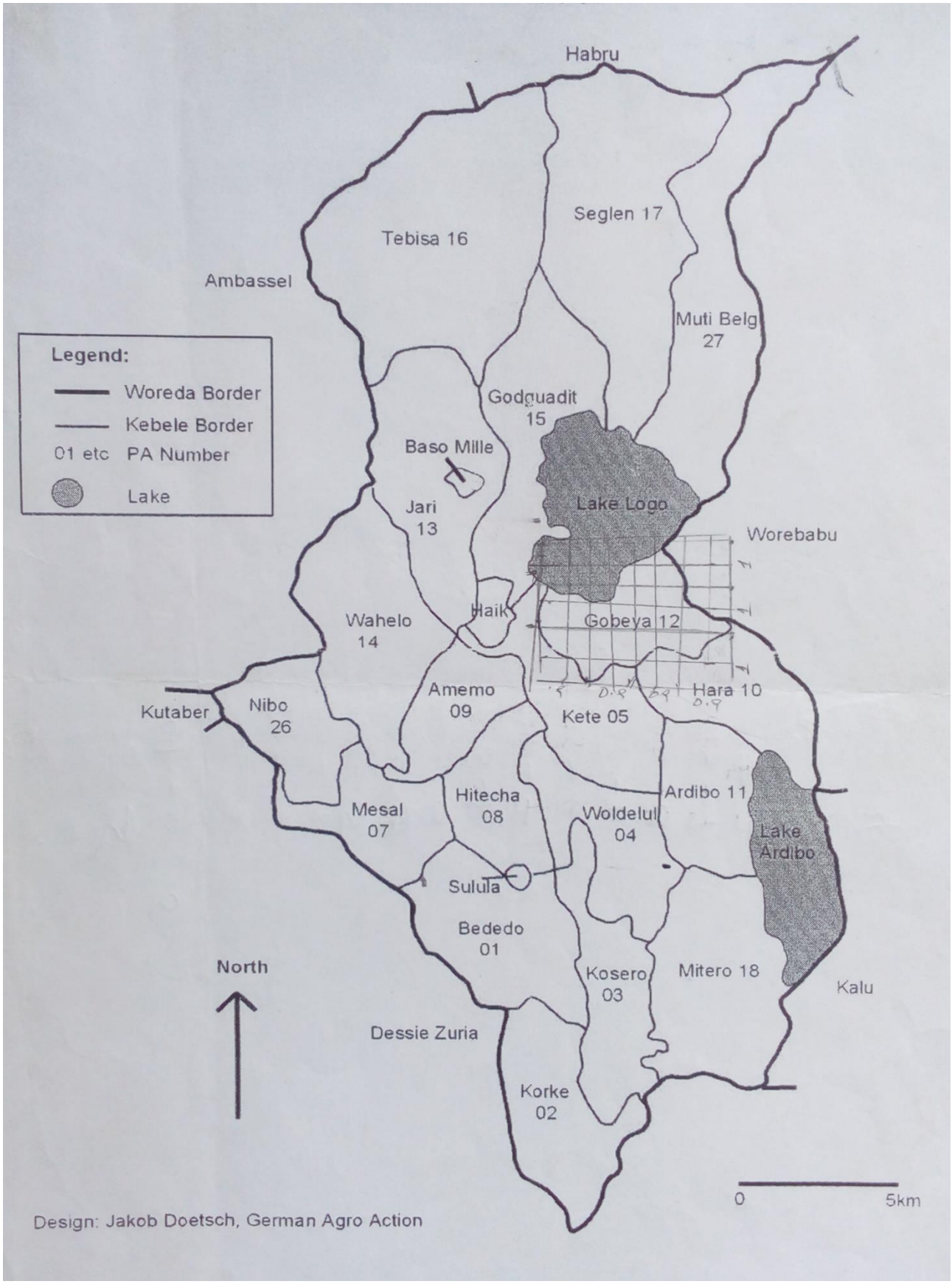
Thursday 1 June 2017	
Time	**Activity**
09:00	Registration
09:30	Official opening
10:00	Introduction workshop objective and participants
10:30	*Tea break*
11:00	Presentation of preliminary teff value chain map
12:00	Discussion about teff value chain map
01:00	*Lunch*
02:00	Group work: where do we see opportunities to improve the productivity of the teff value chain?
03:00	Presentation of group discussion result
04:00	*Coffee break*
04:30	What do we want to pick up from the group results, or presentation of business model teff seed production?
05:00	*Closing*

Friday 2 June 2017	
Time	**Activity**
09:00	*Registration*
09:30	Discussion about teff seed production business model
10:30	*Tea break*
11:00	Develop work plan
12:00	Closing of workshop, evaluation
01:00	*Lunch*
02:00	Individual discussion with stakeholders involved in the business model

Annex E Teff varieties

Variety	Year of release	Breeder	Maintainer
Wora	2015	DZARC	EIAR
Worekyu	2012	SRARC	ARARI
Boset		DZARC	EIAR
DZ-01-99	1970	DZARC	EIAR
Enatit	1970	DZARC	EIAR
Magna	1978	DZARC	EIAR
DZ-Cr-44	1982	DZARC	EIAR
DZ-Cr-82	1982	DZARC	EIAR
Tseday	1984	DZARC	EIAR
Gibe	1993	DZARC	EIAR
Ziquala	1995	DZARC	EIAR
Dukem	1995	DZARC	EIAR
Holetta Key	1999	HARC	EIAR
Ambo Toke	2000	HARC	EIAR
Gerado	2002	DZARC	EIAR
Koye	2002	DZARC	EIAR
Key Tena	2002	DZARC	EIAR
Gola	2003	SRARC	ARARI
Ajora	2004	SRARC	ARARI
Genete	2005	SRARC	ARARI
Zobil	2005	SRARC	ARARI
Gimbichu	2005	DZARC	EIAR
Dega	2005	DZARC	EIAR
Yilmana	2005	ADARC	ARARI
Dima	2005	ADARC	ARARI
Guduru	2006	BARC	OARI
Amarach	2006	DZARC	EIAR
Quncho	2006	DZARC	EIAR
Mechare	2007	SRARC	ARARI
Gemechis	2007	MARC	EIAR
Etsub	2008	ADARC	ARARI
Kena	2008	BARC	OARI
Simada	2009	DZARC	EIAR
Lakech	2009	SRARC	ARARI

Annex F Map of Tehuledere woreda



Source: South Wollo Zone Agricultural Office.

Annex G Pictures from the workshop and the fieldwork