How to make more from milk in the informal market in Ethiopia

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Abstract

Most of all the milk produced in Ethiopia comes from smallholders in rural areas. Due to a variety of factors, quality and production are persistently low, and only a small fraction is sold in informal markets. Opportunities to add value to the informal dairy chain should be investigated. Therefore, this report introduces seven new dairy products in the highlands of the Oromia region. These are yogurt with honey and dried fruits, Provolone cheese, *metata ayib* (local cottage cheese), teff butter cookies, *niter kibbeh* (spiced butter), cosmetic butter, and whey *injera.* These products can add value by increasing income and nutrition for smallholders, local and peri-urban consumers.

Socio-economic assessment was carried out based on literature research and interviews with informants with related academic backgrounds. In order to critically analyse the seven product presented here, SWOT analyses have been carried out. Moreover, specific attention is given to a range of supporting interventions, conducive to overcoming constraints inherent to dairy production. Finally, recommendations are provided focusing on the steps that need to be considered for tailoring the above practical interventions to the specific context of the villages in the highlands of Oromia.

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1. Introduction

1.1. Purpose

The main purpose of this research is to provide DairyBISS with ideas for interventions that can result in added value in the informal dairy sector in the highlands of Oromia region, Ethiopia. DairyBISS is a project carried out by WUR livestock Research to stimulate private dairy sector development in Ethiopia. Ethiopian dairy production remains a challenge for the economic development of the country. Currently, local demand for dairy products is increasing. This is both because of population growth and urbanization (Francesconi et al. 2010) as well as growing awareness on nutrition (Francesconi & Ruben 2012).

However, due to a variety of social, economic and technological constraints, most of the potential remains untapped. This report describes these issues and focuses on introducing practical interventions, aimed at creating added-value for the informal dairy chain in the Oromia region. These practical interventions are presented in the form of products such as yogurt with honey or dried fruits, Provolone cheese from Italy, *metata ayib*, butter cookies, spiced butter (*niter kibbeh*), cosmetic butter, and whey *injera*.

1.2. Methodology

This research is based on a literature review and interviews with informants with an academic background in the issues relevant for this report. Through literature review the problem analysis, context and intervention area are described. In order to critically analyse the different developed ideas presented here, SWOT analyses have been carried out. Interviews were conducted with Alemayehu Bekele, PhD-student at the Centre for International Development Issues Nijmegen (CIDIN), Hein van Valenberg, engineer and professor in dairy at the University of Wageningen, and Nicola Francesconi, an agricultural economist working at the International Food Policy Research Institute (IFPRI) in Senegal. These interviews provided background information and input for introducing diverse supporting interventions and recommendations presented below.

1.3. Set-up of report

A background of the research area is provided in the second chapter. This gives an overview of the current characteristics of the informal dairy market in Ethiopia. The third chapter provides an overview of existing as well as proposed dairy products. Following on this, the fourth chapter describes and analyses these practical interventions.

The seven dairy products are introduced and problematized per category (ergo, cheese, butter, and whey) through a SWOT analysis. The practical interventions are yogurt with honey or dried fruits, Provolone cheese, *metata ayib*, butter cookies, spiced butter (*niter kibbeh*), cosmetic butter, and whey *injera*. The strengths and weaknesses described in the SWOT analyses are discussed in the

fifth chapter by critically assessing scientific articles. The seven new dairy products cannot be stand-alone interventions, since the context has to be taken into account as well. By analyzing articles about the specific situation in Oromia, a number of supporting interventions are provided in chapter 6. The practical interventions can only work if there is awareness of the importance of dairy products and hygienic practices.

Furthermore, certification can work as a system to build trust among smallholders. To overcome credit constraints, microfinance could be introduced into the informal sector. Various technical interventions as low-tech refrigerators and thermometers are discussed in this chapter as well. Finally, recommendations and a conclusion are provided in the last part of this report.

2. Background

This chapter provides some characteristics of the Ethiopian dairy sector for a basic understanding of the context. Section 2.1 provides an understanding of the main issues and constraints in the informal dairy sector. In section 2.2 the most important political, economic, social, technical, legal and environmental features are described. Finally, section 2.3 provides a description of the intervention area as well as the main concepts used in this report.

2.1. Problem analysis

Both the liquid milk as well as the milk product markets are dominated by the informal marketing systems (Redda 2001). The rural areas produce 97% of all milk in Ethiopia (Staal and Shapiro 1996 cited in Redda 2001) and in some of these remote areas a formal market for dairy products is absent (ILRI 2008: 48). Due to poor dairy development practices the added value and the quality of dairy products are low. This is shown in poor hygienic practices during milking and processing, and the general low level of food safety, quality and shelf-life.

Local demand is influenced by festivals and holidays (ILRI 2008: 37). Religious fasting days, up to 200 days in a year, make demand for dairy products volatile. This is because on those days no animal products can be consumed (Neijenhuis 2014: 8). On the supply side, seasonal changes influence the available forage for animals leading to uneven production across seasons (ILRI 2008: 37).

In spite of the above constraints, the informal market represents an untapped opportunity for sustainable innovations to improve food security and economic gains across the whole informal chain. In this respect, seven intervention possibilities are investigated and analysed. Chapter four in this report provides a detailed overview of each proposed intervention.

2.2. Context

2.2.1. Political

The Ethiopian government is an influential stakeholder in the dairy sector, especially in the formal market and in cooperatives. In general, power centralization in Ethiopia was accompanied by the policy and practice of using local authorities for purposes of control (Ayele 2011: 1). Although processes of decentralization emerged at the end of the twentieth century, the tradition of using local authorities and government as means of control in the dairy sector remains intact. Due to poor management practices such as a lack of quality control, adulteration of dairy products is likely and contributes to the lack of trust of Ethiopian smallholders in cooperatives (Francesconi & Ruben 2012).

2.2.2. Economical

Although Ethiopia has seen a lot of progress in the last decade, still 30% of its population was still below the poverty line of USD 1.25 PPP a day in 2011. The population living in the rural areas is consistently poorer than those living close to markets and roads (World Bank 2014). This number is particularly revealing considering that 87.7% of the Ethiopian population lives in rural areas (Oromia BOFED 2012). Similarly, although investments in roads and transport have increased (ibid), infrastructure remains poor in both quality and quantity, even with respect to other African neighbouring countries (Wodajo 2014).

Next to these economic constraints, there is a lot of variance in prices of dairy products. This price variance is both seasonal and regional. For example, the prices for *ayib* in 2015 varied between 11.57 ETB (0.56 USD) in Robe and 58.28 ETB (2.82 USD) in Nazareth (CSA 2015). This price volatility makes it difficult to make general remarks about dairy product prices.

With respect to livestock production, Ethiopia has the highest population of livestock in Africa (SNV 2008) with a great share concentrated in the Oromia region (Oromia BOFED 2012). Yet, despite these endowments, domestic supply of dairy products remains low, leading to an increasing dependency on imported products (SNV 2008).

2.2.3. Social

Dairy consumption is an important aspect of Ethiopian culture. In the rural areas milk is given to guests as a way to show appreciation. Selling milk is not common in these areas as it is considered a gift. There is a proportion of smallholders who belief that a curse will be given by ancient gods if milk is not provided to guests, and this is part and parcel of the cultural customs (A. Dekeba, personal communication, June 1st 2015).

Women play a key role in milking, processing and selling dairy products (Yisehak 2008). They are also key in decision-making regarding processing and marketing of milk.

As stated above, religion is a social factor that has to be taken into account, since religious fasting days cause high variability in demand of dairy practices (Neijenhuis 2014: 8).

2.2.4. Technical

Ethiopian smallholders often lack technical opportunities. Dairy production is characterized by low-tech mechanisms, and short shelf-life of many dairy products. Moreover, processing is a time consuming activity (O'Mahony 1985).

Cattle numbers differ depending on the specific area: the number of local animals in the Oromia region ranges from 1 to 12 per household. Over 93 % of households use bulls as natural sources of service for breeding, whereas less than 7% is used for artificial insemination (A.I.). The lack of either A.I. service or selected animals in the area leads to the inadvertent use of bulls with unknown pedigree. This, in turn, poses threats of inbreeding (Galmessa et al. 2013), which directly affects the amount of daily milk production. Current production yield of the local breed ranges from 1.2 to 3.3 liter.

Fodder and grass based feed are either not available in sufficient quantities, or their nutritional quality is low in remote rural areas in Ethiopia. These constraints result in low milk and meat yields, high mortality of young stocks, longer inter-calving time and low animal weights (McIntire et al. 1992).

Due to the lack of traditional veterinary services, households also resort to the use of alternative practices. Some of these include using spices, such as ginger, garlic, hot pepper, tobacco leaves and butter, salt and feces of hyena for treatment of internal parasites and mastitis (Galmessa et al. 2013).

2.2.5. Legal

In the informal dairy market there are no standards, quality control mechanisms or dairy policies to protect consumers (Redda 2001: 3). Moreover, there is a lack of institutional arrangements that coordinate dairy investment services (Makoni et al. 2013).

2.2.6. Environmental

The Oromia region faces multiple environmental constraints. Rain variability is high, making milk production low and highly seasonally dependent (Ketema & Tsehay 2015). Overstocking and overgrazing also impact negatively on dairy development. Next to that, poor infrastructure acts as a constraint in the integration of producers and other actors in the market.

2.3. Intervention area

The intervention area is located in the central highlands of Oromia in Ethiopia. This region is approximately 300.000 km^2 and hosts a population of more than 30 million people. About 88% of the population lives in the rural areas, while 12% is settled in urban areas. Oromia has a great physiographic diversity with both high mountains and deep valleys. Average temperatures range between 7 and 22°C in the highlands, and between 22 and 30°C in the lowlands. The main economic activity is agriculture (Oromia BOFED 2012).

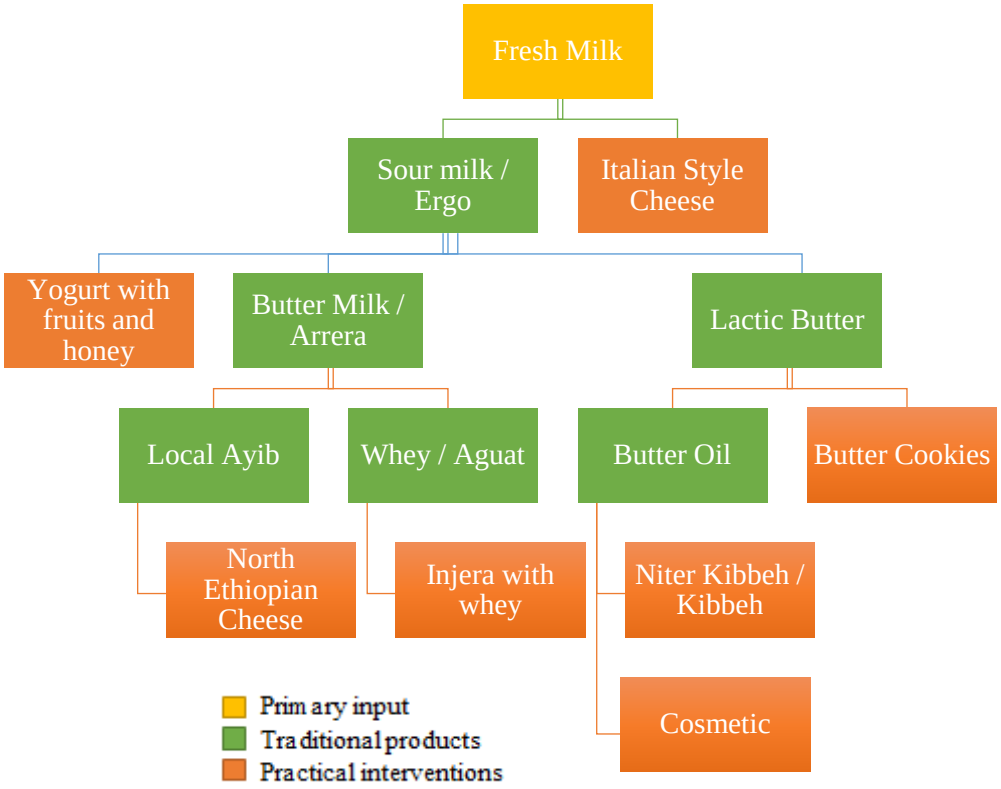
Total regional cow population is high, with approximately 4.7 million cows (Knoema 2013). In spite of this, local milk production performance remains low. On average, indigenous cows provide 1.85 litres a day, and this number is even lower in rural areas (Tegegne et al. 2013). Due to population pressure and urbanization, land size per household and communal grazing land has been decreasing (ibid), making feeding more difficult. Furthermore, the proportion of crossbred cattle is very low in rural dairy production systems.

The practical interventions presented in this report are targeted both to smallholder households and households living in (peri-)urban areas. The definition of smallholders adopted in this report is as follows: smallholders are those farmers possessing between one and five cows, using family labour as main input of production (Makoni et al. 2013). They practise hand milking, and they feed their animals with the available fodder, such as grass with wheat bran supplementation or crop residues (Almaw, Zerihun & Asfaw 2008: 428).

A central concept used in this report is the informal market which markets about 95% of the milk. This is the non-regulated system in which the surplus of milk from local cows is partly channeled to consumers directly or through one or more actors in the chain (such as traders). Farmers and producers deliver the fresh milk to their neighbors, sell it in the local markets, or sell it to itinerant traders. Liquid milk is sold directly or processed into other products such as butter or *ayib* (O'Connor 1992) and only 5% of the milk is marketed as liquid milk (SNV 2008).

Most of the milk produced by smallholders is used for own consumption, meaning that marketable supply per household is relatively small. Informal markets are further characterized by lack of hygiene standards, which poses a direct threat to food safety. In contrast, the formal market is channelled through cooperatives, cooperative unions and private MCCs (Milk Collection Centres), however there is no functional dairy sector policy (Makoni et al. 2013). The milk sold in this market is standardized and pasteurized, and dairy products are supplied to the urban (super)markets. There is a significant grey zone between these two markets, as it is not clear where the formal market starts and where the informal market ends

3. Overview of existing and proposed new dairy products



Adapted from: Developing the butter value chain in Ethiopia, Gebremedhin et al. 2014

4. Practical interventions

The overview in chapter three shows possible untapped opportunities in the informal dairy sector. To add value to the informal market seven product ideas are presented under four categories: ergo, cheese, butter and whey.

4.1. Ergo

4.1.1. General introduction

Ethiopia has a longstanding tradition of yogurt consumption, with multiple kinds of yogurt. The type of yogurt this intervention aims at is the cultured yogurt, also called *ergo*. *Ergo* is known by many names: in Borena, the Southern region of Oromia, it is called *ititu* for example (Gonfa et al. 2001). There is a growing market for cultured yogurt (SNV 2008). Ethiopia also imports yogurt (ibid), this shows that there is an untapped market opportunity for the local Ethiopian yogurt industry. As the major fermented dairy product, *ergo* is very common in the country and used by many households. This in contrast to other dairy products, which are only given to children and sick people (Gonfa et al. 2001).

In smoked vessels the milk is naturally fermented with help of bacteria. With a temperature between the 16-18°C the milk ferments into *ergo* within 2-4 days, if the temperature is too hot the risk of over souring is there. When the temperature is lower, more time is needed to get the *ergo* to the right pH (Gonfa et al. 2001).

Yogurt has a relatively long shelf-life because of its high acidity (pH-value between 4.3 and 4.5). *Ergo* that is prepared in the traditional way by fermentation in smoked clay pots has a shelf-life of 15-20 days (Gonfa et al. 2001). Next to the relatively long shelf-life, yogurt is also easy to produce. Moreover, it can be made in small proportions, and only small amounts of milk are required to make yogurt (H. van Valenberg, personal communication, June 9th 2015).

4.1.2. Yogurt with honey and dried fruits

Description

This practical intervention is about selling yogurt with honey and dried fruits in individual clay containers. Next to the characteristics and the advantages of yogurt already described in the section above, the working paper of SNV (2008) claims that the margins on fluid milk are substantially lower than the margins on cheese and yogurt. Whereas the margin for liquid milk ranges from 10 to 15%, cheese and yogurt can provide a margin between 25 and 35% (ibid)..

Ethiopia has an ancient tradition of beekeeping and there are more than 10 million bee colonies in the country (Kinati et al. 2013). In spite of this, 90% of the honey is still sold on the informal market (USAID 2014) and produced with traditional hives. A part of this production is used to produce the traditional Ethiopian honey wine called *tej* (USAID 2014).

Next to yogurt and honey, Ethiopia has a variety of fruit crops that are either sold or used for home-consumption. Smallholders with low production levels serve the informal market, while large-scale producers sell their output on the formal one (CSA 2009). Oromia is a region with many areas appropriate for producing subtropical or tropical fruits. Despite this potential, the total area of land that is used to cultivate fruits is very small and it is mostly smallholder based (CSA 2009). Mango and avocado are the most common cultivated fruits. As with most fruits, prices for these products are strongly seasonal. Short shelf-life also contributes to uneven supply. Furthermore, throughout the market chain 25% of the total production is spoiled (Bezabih & Hadera 2007). Part of this unsold fruit can be dried and sold together with the yogurt and honey.

Promotion

There are opportunities to bring this yogurt to the local and urban markets, where smallholders could sell it in combination with other dairy products. Potential consumers for this product are mainly the Ethiopian urban middle and higher class.

In terms of packaging, producers can choose to keep costs low by distributing the product in small, low quality disposable clay pots, as it is currently done in India, called *kulhar* (Dhamija 2005). For higher-tier markets, multi-purpose clay pots can be used. These containers can be

reused for other purposes, such as cooking utensils or flower pots. An example of the latter type of packaging can be found in the marketing of the typical Spanish dairy-based dessert called *cuajada*.

The price of this product varies a lot per region and season. The price of raw milk in Robe in December 2014 was 20.00 ETB (0.97 USD) and in that same month the price of raw milk was 11.00 ETB (0.53 USD) in Asella (CSA 2014). The ratio between the milk prices and the cheese or yogurt prices are everywhere different. This is not only the case for dairy products, but also for fruits. For example, the price of bananas fluctuate between 20 ETB (0.97 USD) and 12 ETB (0.58 USD) in Oromia (CSA 2015). The average market price of honey in Oromia is 32.10 ETB per kg (1.55 USD) (CSA 2012).

SWOT Analysis

STRENGTHS	WEAKNESSES
– The product does not require labour intensive practices – Yogurt is naturally fermented, no need for other bacterial cultures – Use of seasonal fruits can keep costs low – Honey, dried fruits and yogurt have a long shelf-life.	– Pottering may be a labour intensive activity – Supply of fruit is not stable
OPPORTUNITIES	**THREATS**
– Fruits can be dried to enhance shelf-life – Flavoured yogurt is becoming increasingly popular. – Honey, fruits and yogurt are easily available and also part of the Ethiopian diet – There are seasonal fruits within the area	– Market demand may be low – Local population may not like new flavours – Fruit and honey could lead to an overpriced product

4.2. Cheeses

4.2.1. General introduction

Cheese production remains the primary production activity of a small number of private producers in Ethiopia. In the urban areas retail stores such as Bambis and Fantu provide a range of both imported and locally produced cheeses, yet it is clear that these products are specifically marketed to local higher class and expatriates (van der Valk 2009). Local informal smallholders can also contribute to this specific cheese market by specializing in the production of hard-type cheeses already produced in other countries. Given the logistical constraints caused by poor infrastructure and shelf-life, the most suitable choice of production for smallholders in the highlands would be semi-hard and hard types of cheeses, as these have a longer shelf-life than soft cheeses.

The most consumed cheese in Oromia is *ayib*. *Ayib* is a traditional fermented cottage cheese processed from defatted sour milk (*arrera*). *Arrera* is also known as buttermilk and depending on the churning, it contains 1 to 3 % fat. It is a nutritious dairy product due to its high amount of proteins, lactose, minerals and vitamins. *Ayib* is a soft cheese that is very acid but not stable (Gonfa et al. 2001) and it has a shelf-life of 2-3 days. Due to the short shelf-life this cheese is only sold locally (Makoni et al 2013).

4.2.2. Provolone cheese

Description

This intervention is about introducing an Italian cheese called Provolone in the informal market, as an opportunity for smallholders to produce and increase their income. Provolone is an artisan semi-hard cheese, initially produced in the Basilicata region (Favati et al. 2005). This Southern Italian region is geographically similar to the highlands of the Oromia regions, with a yearly average temperature range between 7 and 25°C. Moreover, this predominantly rural region has also poor levels of infrastructure (European Network for Development 2010), creating challenges for supply chains that can be compared in some scale to those of Oromia.

Fig1. Provolone cheese. Source: http://www.cheesemerchants.com/provolone-products-9.php

In deciding on a possible product, it is important to keep in mind whether the production process can be easily replicated by smallholders. In the specific example of Provolone cheese, the main inputs needed can be found in the region or can be substituted with what is currently present in the area. Firstly, for 1 kg of provolone 12 litre of raw milk are needed. Due to current low yield per cow, smallholders may need to pool milk until yield is increased for each smallholder to be self-sufficient. Secondly, mesophilic cultures and thermophilic cultures are needed to increase the acidity of the cheese. In order to make this intervention sustainable, the culture can be initially provided in a package, and later created by stock culture by using the initial batch for the successive ones.

Since this culture needs refrigeration, one possible solution is to appoint a specific smallholder in possession of a cooling facility (section 5.1.1) to be in charge of the culture and to distribute it to the members who participate in the project of cheese making. Next to these cultures, liquid rennet is usually needed to allow the milk to coagulate. Given the limited availability of rennet, other options for coagulating milk are needed. Citrus, an important crop in Ethiopia (Dagnew et al. 2014), can be used instead of rennet. Other substitutes can be plant coagulants, which have been used since antiquity (Adetunji & Salawy 2008). Calotropis procera extracts have been used for traditional cheese making in West African countries, such as Nigeria and the Republic of Benin (ibid). This leaf contains an organic acid called calotropin, which has the ability to solidify/coagulate milk (Chikpah 2014). Although this leaf is not sold, it is native to Ethiopia and it is common in overgrazed pastures. Finally, smallholders need spoons, knives, colanders and butter muslins. In the case of butter muslins, these can be replaced by thinly woven cloths.

Promotion

Provolone could be promoted as an Italian high quality cheese with local flavours according to the spices used. Given that Italian-style cheese would be considered a luxury product, the most logical market to tap into are small restaurants and small supermarkets in the cities around Addis Ababa. The advantage of tapping into this higher-tier market coupled with the unavailability of locally produced Italian-style cheese provides the possibility of marketing the product at a premium over normal *ayib* cheese.

As an alternative to selling the whole cheese, small, round waxed mini cheese sacks can be sold through small supermarkets as snack food. The price of Provolone is higher than the Ethiopian cheese, and costs normally between 124-475 ETB per kg (6-23 USD).

SWOT Analysis

STRENGTHS	WEAKNESSES
– Production process is not complex and can be done in the household – The non-local cheese can be adapted to local taste by adding spices – Easily transported due to long shelf-life and hard texture	– Possibly too expensive to be sold in local markets due to the need of microbial cultures – Aging time means time gap between investment and revenue – The need for cultures requires cooling facility – The need for aging requires a cool place with stable humidity – Production needs to be taught initially and can take time and resources
OPPORTUNITIES	**THREATS**
– Available demand for quality cheeses in peri-urban and urban centres – Most inputs readily available – Climate is conducive to type of cheese production – Higher income to smallholders – Microbial cultures can be replicated via the stock culture and can be stored in Mitticool system or similar refrigerating facilities	– No form of cooling available if alternatives to fridges are not possible – Alternatives to rennet are not directly available or may not be socially acceptable. – Sharing systems for microbial production and aging may lead to theft or adulteration

4.2.3. Metata ayib

Description

Metata ayib is a variation of the normal *ayib* and it is originally produced in the North-eastern area of Ethiopia (Seifu & Tassew 2014). The shelf-life of this product is between 14 and 34 months (ibid). This product can be scaled out of the area of North-eastern Ethiopia to the Oromia highland region in order to solve the issue of the short shelf-life of *ayib*. It is a way to add value to the current dairy products, because it is a new product for the region of Oromia.

The process consists of heating the *arrera* in a clay or gourd pot on an open fire where the temperature reaches 40-50°C. A curd mass is formed and after 30 minutes the vessel is removed from the fire and cooled at room temperature. This procedure is repeated 3 or 4 times until a sufficient amount of curd mass (*ayib*) is obtained. The vessel that contains the curd mixture is covered with fresh succulent grass or leaves of Cordia africana (*Wanza*), Ocimum hardiense

(*Kessie*) or leaves of false banana (*Koba* in Amharic) (ibid). The vessel is tilted down for continuous drainage of whey for up to 3 days. During this time the vessel cover is changed every day. After 3 days of whey drainage, fine powders of the spices Brasica nigra (Senafitch) and Cordiandrum sativum (Dimbillael) are added into the container and mixed with the curd. Once these spices are added, the same procedure of drainage is done again for 3 more days. Afterwards, 10 more spices are added to the mixture (garlic, ginger, korarima, rue, basil, cumin, fenugreek, bishop's weed, shallot, mustard, coriander and thyme) and form a spiced curd that needs to be smoked in a clay pot for 15 days where natural fermentation takes place.

Promotion

The target market of *metata ayib* is both the local as well as the (peri-)urban market. *Metata ayib* can be promoted as a cheese similar to *ayib* with high nutritional value, prepared with traditional spices and a long shelf-life.

The *metata ayib* can be sold in clay or gourd containers in the local markets as well as in the cities. The prices of this product in the North-western of Ethiopia are 7.6 ETB (0.84 USD) and 9.3 ETB (1.03 USD) for the wet and dry season respectively (ibid).

SWOT Analysis

STRENGTHS	WEAKNESSES
– *Metata ayib* can be produced in the household – The ingredients and spices used are typical from the area – The shelf-life of *ayib* increases up to 3 years by processing it into *metata ayib* – Easily transported due to long shelf-life	– *Metata ayib* has a different flavour from local *ayib* – Processing from *ayib* to *metata* cheese takes time
OPPORTUNITIES	**THREATS**
– Oromia smallholders already produce *ayib* – *Metata ayib* can be marketed with a higher price compared to *ayib* – Increases the nutritional value of the local diet	– Teaching production can take time – *Metata ayib* is unknown in the Oromia region – Not all smallholders have access to all spices needed for this product

4.3. Butter

4.3.1. General introduction

The butter mostly used in Ethiopia is lactic butter, called kibe or ghee which is made from sour milk. In general, women are in charge of processing milk into butter (Gebremedhin et al. 2014: 16). The production of butter at the household level is done in a traditional way, in which fat is extracted from sour milk which results in butter grains when rocked in a churn (Gebremedhin et al. 2014: 3). The processing time of traditional butter-making varies between 2 to 5 hours depending on the technical devices used. About 16.5 litre of milk is needed to produce 1 kg of butter. Per churn, about 5-10 litre is used for 200 - 600 gram of butter (Gebremedhin et al. 2014: 4). The by-product of making butter is buttermilk. Kibe is the most stable fermented dairy product and has the longest shelf-life (Gonfa et al. 2001). By adding local spices to the butter, niter kibbeh is produced (see section 4.3.4 for further information about this). The butter is used for consumption, cooking oil and for cosmetic purposes.

There are no formal standards for the traditional butter. To check quality, attention is given to the smell, colour, origin, and degree of adulteration. For example, people are suspicious of buying white color butter, because they perceive it as being adulterated. People rather prefer yellow-red colored butter, which resembles high vitamin A content (Gebremedhin et al. 2014: 18). At the household level, butter is kept in small pots, wooden containers or plastic jugs. Usually, it is sold a few days after production at the local market, wrapped with leaves of castor bean and (false) banana. In some areas butterballs are made, wrapped in plastic containers (Gebremedhin et al. 2014: 18).The selling of butter is done mostly by women on local markets. Sometimes, women sell the butter to local traders who sell it to collection points near provincial towns. This is done by donkeys which can carry about 30 kg of butter (Coppock in Gonfa et al. 2001: 181). From these collection points, the butter is transported to wholesale markets in the larger cities.

Demand for butter increases with the level of household cash income which can vary per season. Therefore, when households generate cash from the sale of cash crops, the demand for butter increases (Gebremedhin et al. 2014: 16).

4.3.2. Teff Butter cookies

Description

Teff butter cookies are a new product which can be introduced in the Ethiopian market. Butter cookies are marketed over the whole world, and Ethiopia has an untapped opportunity for this product. Butter cookies are made of teff flour, butter, honey and different spices such as cinnamon, clove and ginger. Once the mixture is ready, the individual portions are made and baked in the oven. The processing of the butter cookies can be done in the households and consists of ingredients already present in the area. Most probably, the women are the ones who will make these butter cookies.

To produce 12 cookies the following ingredients are needed: 120 grams of teff flour, 80 grams of butter, 20 milliliters of water and 2 tablespoons of honey. Firstly, honey is added to hot water in a pan and it dissolves. Secondly, butter and teff flour are mixed well and the other ingredients are added to the mixture. Finally, the dough is flattened with a rolling pin, individual portions are made and they are baked in the oven. In case there is no oven available, other baking options can be assessed. For example, baking the butter cookies above a wood fire on a stone plate. The shelf-life of these butter cookies is about 5 days.

Fig2. Teff Butter Cookies. Source: compiled by author.

Promotion

Teff butter cookies can be promoted as a new kind of dessert that can be consumed together with coffee or tea. The processing of these cookies is an innovative way to use the butter and add value to the chain. Moreover, the use of local products ensures that the resulting flavor is in line with local taste.

The target market of this product is located in proximate cities where the income of the population is higher. The cookies could be sold and packed in small fabric sachets or inside banana leaves. The price of 12 butter cookies is 13.10 ETB (0.63 USD).

SWOT Analysis

STRENGTHS	WEAKNESSES
– Production process is not complicated and can be done in the households – Packaging material easily accessible	– The shelf life of the product is about 3 days – Cooking facilities such as the oven might be an issue – Easily breakable
OPPORTUNITIES	**THREATS**
– Increases the income for (female) dairy smallholders – The smallholders and the population are familiar with the ingredients and flavours – Diversifies the butter chain in a completely new product	– Difficulties on consumer acceptance – Teff flour used mainly for *injera* bread

4.3.3. Cosmetic products: Honey butter-scrub and conditioner

Description

This intervention is focused on adding crystallized honey to butter as a new kind of butter-scrub and on adding honey to conditioners. In Ethiopia, butter is not only consumed directly or used as cooking-oil, but also as a beauty product (Gonfa et al. 2001: 175). It is used for hair and skin by both women and men. The purpose of using butter for cosmetic purposes is that it makes hair and skin supple and moisturised. It is also used to protect the scalp from the sun. Currently, the ingredients used for cosmetic products are butter and spices.

Fig3. Honeycomb. Source: http://sofilundin.com/sweet-dreams/

By adding crystallized honey to butter, a nutritious scrub for the skin is made. Worldwide, honey is frequently added to cosmetic products such as facial washes, skin moisturizers, hair conditioners and in treatment of pimples (Ediriweera & Premarathna 2012). Due to its antioxidant, antibacterial and moisturizing properties honey can be used as a nutritious additional ingredient for cosmetic butter products (ibid). Crystallized honey can be used in butter-scrubs for the skin and liquid honey for conditioners for the hair. This product adds value to the butter products because butter is used in combination with other vitamin-rich, moisturizing products, which enriches the nutritious value for the skin. We assume that the shelf-life of butter scrub and conditioner is about 6-12 months, because the ingredients are comparable with *niter kibbeh* and adding honey does not decrease this time because of its very long shelf-life. Women are in charge of butter production and marketing, so the focus should be on this group when introducing new products such as a body-scrub.

Promotion

Butter-scrub can be sold as a new product on the local market. Honey is a product that is already accessible for people in the rural highlands in Ethiopia. Next to the local market, resorts and spas could be another market to sell the cosmetic products. These products can be used as a luxury product for the middle- and upper class in Ethiopia which go to resorts and spas. Linking markets to resorts is a way to add value to the products made by smallholders. The most economical option for packaging is to wrap the butter-scrub in banana leaves or put it in cheap clay pots. If resorts and spas prefer a more luxurious way of packaging, more expensive clay pots can be used. The price is estimated at 35 ETB per kg (1.75 USD per kg), as it is comparable to niter kibbeh.

SWOT Analysis

STRENGTHS	WEAKNESSES
– Can be relatively cheap to produce – Long shelf-life	– Packaging liquid cosmetic products can be difficult – Too high temperatures or heating can possibly re-liquefy the honey in the butter-scrub
OPPORTUNITIES	**THREATS**
– Higher income generation for (female) smallholders – Add more nourishing value to cosmetic products – All ingredients are available – Use of butter for cosmetic purposes is known in the are	– People see no use in mixing products like honey with butter for cosmetic purposes – There might not be a market for new products such as body scrub. – People may not want to pay extra for these products. – The added value cannot increase income for smallholders (gains of adding honey could be lower than input costs) – Because of poor infrastructure butter is not easily transported to the big cities

4.3.4. Spiced butter (*Niter kibbeh*)

Description

This practical intervention is focused on finding new market opportunities for niter kibbeh, which is a very important part of the Ethiopian food culture. The process of making clarified butter (kibe) or ghee is mentioned in section 4.3.1. By adding spices to the traditional kibe, it turns into niter kibbeh. This is done at the household level. By heating the kibe in an iron or clay saucepan, water evaporates and fresh leaves or mashed spices are added. In the Oromia region, O. hardiense and O. basilicum are used as added flavours (Gonfa et al. 2001: 184). The liquid butter is used and the solids are discarded. In regions situated in the North-west of Ethiopia the selling of spiced butter to neighbours and in local markets is common (Seifu & Tassew 2014). The shelf-life of this product is about 6 to 12 months.

Currently, niter kibbeh is made in almost every household. Here, an untapped market opportunity is present: the homemade mix of niter kibbeh containing different spices, can be sold to households with more purchasing power. These can be people from the working middle-class or more affluent women who rather buy niter kibbeh instead of

making it themselves. Next to these households, also restaurants can offer a possible market opportunity. This may represent an untapped opportunity in the informal market of Oromia region in Ethiopia.

Spices used for making *niter kibbeh* from other regions, such as from the North-western part of Ethiopia are mostly garlic, ginger, korarima, rue, clove, fenugreek, basil, cumin, pepper, and turmeric (Seifu & Tassew 2014). These spices can be bought from local or distant markets and used for making *niter kibbeh* in the Oromia region, so various kinds of spiced butter can be sold.

Promotion

As explained above, the market for the ready-made niter kibbeh is mainly focused on the middle-class households with more purchasing power as well as restaurants. Spiced butter could be stored in clay pots or gourd containers and sold in banana leaves in the local market near small villages or the bigger villages. The prices collected are from the North-west of Ethiopia and vary from 32.80 to 37.80 ETB per kg (3.63 to 4.19 USD per kg) during the wet and dry season respectively (Seifu & Tassew 2014).

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SWOT Analysis

STRENGTHS	WEAKNESSES
– The processing of niter kibbeh is not complicated – The spices can vary depending on their availability and consumer preferences – It is a product that can be marketed at a premium price – Long shelf-life	– Butter making is a time consuming practise – Wrong processing leads to early spoilage
OPPORTUNITIES	**THREATS**
– Higher income for smallholders – Consumers with a higher income that are willing to pay more for a ready-made product – The consumers and households know the product and are familiar with it	– Traditional customs in the Ethiopian cuisine are inherent in Ethiopian culture and tradition – The preferred spicing of butter is very local, good market research needs to be done on how people prefer their niter kibbeh

4.4. Whey

4.4.1. General introduction

Augat is the traditional whey that is the residue of the *ayib*-making. It is drained daily from the *ayib* with a wooden pipette. *Augat* contains a lot of protein and to some extent is consumed by humans, but mostly given to the animals (Gonfa et al. 2001).

Whey is the by-product obtained from cheese making. It constitutes about 85 to 90% of the volume of milk used to produce the butter and cheese, and it retains up to 55% of the milk nutrients (Becerra 2015). This means that a high percentage of protein, lactose, vitamins and minerals remain in the whey (Kosikowski 1979). In Ethiopia the major part of the whey obtained comes from the traditional cottage cheese called *ayib* and it is mainly used for livestock feed (Gonfa et al. 2001). For this reason, including this product in the diet can help to improve health issues as it can provide some essential nutrients.

4.4.2. Adding whey to traditional bread (*injera*)

Description

One way of including whey to the diet could be by adding it to the traditional Ethiopian bread (*injera*). *Injera* is made with teff (Eragostris tef) a cereal that grows in the highlands of Ethiopia. This cereal is important as it contains high sources of fibre and iron as well as calcium and protein. The traditional injera is made of teff flour (180 grams) and water (500 ml), and it has to ferment up to 3 days. Afterwards, the surface of the traditional griddle is covered with butter and when the temperature is high, the mixture is baked. The result is a rounded, flat bread similar to a pancake but with a sour flavour. The shelf-life of injeras with whey is 3 days.

Promotion

Adding whey to the traditional Ethiopian bread and decreasing the amount of water used in the *injera* could increase the nutritional value of *injeras*. The product has market opportunities in small cities within the Oromia region as a street food product where people can purchase a pack of *injeras* ready to eat. In that way, the short shelf-life is not a big constraint anymore, since the food is directly consumed. The separate ingredients can last longer than when they are mixed. The price of one injera is 4 ETB (0.19 USD) in the Eastern part of Ethiopia (Aljazeera America 2015).

SWOT Analysis

STRENGTHS	WEAKNESSES
– Small modification of the traditional bread – Whey is a good source of proteins, vitamins and minerals – Whey injeras have a relatively low price	– Effect on the flavor when compared with the traditional injera – During fasting days whey injeras would not be consumed, while traditional injeras would still be consumed – injeras with whey have a short shelf-life
OPPORTUNITIES	**THREATS**
– The ingredients are found in the area (teff flour, water and whey) – Adds nutritional value to the traditional diet – Street food market culture within the cities	– Households might not want to buy injeras in the market, because they prefer to make injeras themselves – Competition with other uses of whey

4.5. Product's table

	PRODUCT	PRICE	PLACE	PROMOTION	PACKAGING
Yogurt	Traditional yogurt with honey and dried fruits	The regular price of yogurt with the additional price of honey and dried fruits plus packaging costs	Local, peri-urban and urban markets	It can be promoted as a nutritious product	Two strategies: low cost product with low quality disposable clay pots (India) and premium product with high quality reusable clay pots (Spanish *cuajada*)
Provolone cheese	Semi-hard Italian style cheese sold as whole cheese or as round mini-cheese snack	Marketed at a premium over the cost of normal cheese (between 124-475 ETB/kg (6-23 USD).	Peri-urban and urban restaurants and small supermarkets	Can be promoted as an Italian high quality cheese with local flavours according to the spices used	Beeswax added at the end of the production process can be used to coat the final product
Metata ayib	Traditional fermented cottage cheese from North-western Ethiopia	Local prices: 7.6 ETB (0.84 USD) and 9.3 ETB (1.03 USD) for the wet and dry season respectively	Local, peri-urban and urban markets	Cheese with high nutritional value, traditional spices and long shelf-life	Clay pots and gourd are the usual methods used to storage and sell this product
Teff butter cookies	Butter cookies made from teff flour, butter, honey and local species	Approximate price of 12 teff butter cookies: 13.10 ETB (0.63 USD)	Peri-urban and urban markets, small supermarkets.	Can be promoted as a new dessert that can be consumed together with coffee or tea	Butter cookies can be packaged in fabric sachets or banana leaves
Cosmetic butter	Honey butter-scrub and conditioner	Approximate price is 35 ETB/kg (the regular price of niter kibbeh with the additional price of honey)	Local market, the bigger and commercial towns of Oromia, and spas/resorts	Can be promoted as a cosmetic product with additional nourishing value	Banana leaves or low quality disposable clay pots. Spas and resorts may prefer more luxurious clay pots.
Niter kibbeh	Spiced butter used mainly as cooking oil	Local prices: 32.8 to 37.8 ETB/kg (3.63 to 4.19 USD/kg) during the wet and dry season respectively	Peri-urban markets, restaurants	Spiced butter already made with the most used and typical species within the area	Banana leaves, clay pots and gourd could be the different containers used to sell the product
Whey injera	Traditional ethiopian bread with whey	The price of a traditional injera is 4 ETB (0.19 USD)	Local markets and food street markets	Product with nutritional added value	There is no need to package the injeras as it is a food street product. Banana leaves could be an alternative.

Table 1. Product's table. This table provides an overview of all the above written product ideas taking into account the five P's of marketing: product, price, place, promotion and packaging.

4.6. Critical assessment SWOT Analysis

4.6.1. Cooling systems

In rural Ethiopia, there is a lack of electricity. 83% of the population is not connected to electricity grids (Terefe Tucho et al. 2014). Mainly the urban areas are provided with electricity, while the much larger rural areas do not have access to it. Ethiopian Electric Light and Power Authority (EELPA) is the sole national energy utility currently, and it is argued that decentralization could strengthen the various regional offices so that decision-making and implementation of electricity supply activities are more direct. Smallholders in remote rural areas lack access to cooling systems and this is a major constraint in the dairy sector. To increase the shelf-life of these products and to keep cultures for making cheese, cooling facilities are necessary. Rural communities rely on traditional biomass energy sources, human and animal power. But these energy sources are diminishing because of rapid population growth and the absence of energy substitutes for traditional energy sources (Wolde-Ghiorgis, 2002). Deforestation is one of the results of this reliance on solid biomass energy, which negatively influences biodiversity, ecosystems, and soil quality (Diriba Guta 2014).

To overcome this constraint, different kinds of energy should be investigated. Renewable energy via water, wind or solar power could be explored. However, Terefe Tucho et al. (2014) argue that this can fulfill energy needs at national level, but it is not suitable for rural areas. Local solutions should be taken into account for sustainable development. Commitment from local government and civil society in these investigations is key. For effective development of the energy sector, it is important to include the various stakeholders. Rehfuess et al. (2010) argue that household fuel choice in rural Ethiopia is more 'supply driven' than 'demand driven', and thus policy efforts should consider supply-side limitations. Fuelwood scarcity is the main supply side constraint. Access to other energy sources than the traditional ones can improve household welfare (Diriba Guta 2014).

Next to renewable energy, low-tech refrigerators could be a solution to the dairy preservation issue. An example of such a low-tech refrigerator is Mitticool. As explained in chapter 5.1.1, Mitticool fridges work without electricity and cool the inside of the fridge by evaporation. It is low-cost in comparison to other fridges, but still the low income rate of smallholders should be taken into account. A solution to this investment constraint could be that the Mitticool fridge is shared with a few smallholders, so not all households have to buy one for themselves but are able to share the costs of this investment.

4.6.2. Fasting period

During fasting days, Ethiopian orthodox Christians do not consume dairy products. The amount of fasting days vary, but it can last up to 200 days a year. Milk sales decline by 20 to 25% during the fasting periods (Makoni et al. 2014: 90). The biggest challenge for smallholders in Ethiopia is to prevent the milk from spoilage during this fasting period. Historically, Ethiopian smallholders have dealt with this constraint by producing lactic butter, which has a longer shelf-life compared to milk.

This research investigated other alternatives that could increase the shelf-life. For example, yogurt has a much longer shelf-life compared to milk, as well as the *metata ayib*. Another way to deal with the short shelf-life is to look for opportunities in markets that are easier accessible or are closer situated to the smallholders to decrease the time between production and consumption of dairy products.

4.6.3. Distribution

Short shelf-life and distribution issues are a major constraint for the dairy sector. Since most dairy products have a short shelf-life there is not much time for distribution. Next to that, the infrastructure is very poor in Ethiopia, especially in the remote rural areas. In recent years, Ethiopia experienced an improvement in infrastructure. The activities and projects to improve the infrastructure have been mostly centred around in and around the capital Addis Ababa (Africa Research Bulletin 2015). Hydroelectric and road construction projects are financed with loans from international organizations, and international private contractors are implementing them (Mains 2012:4).

In general, most of the roads in Ethiopia are concentrated in the central, Eastern, and Northern highlands (Africa Research Bulletin 2006). Most of the rural areas have poor constructed roads which means that in these areas, traveling and distribution is time-consuming. Villages located near a main highway have some buses as option for transportation, but the main transportation way in rural villages is walking (Bryceson, Bradbury & Bradbury 2008). Transport by animal is also used to a certain extent, especially the use of donkeys is common in Ethiopia.

Short shelf-life products as the teff butter cookies should be distributed the same day of processing and cooking. The distribution can be an issue, because this kind of product should be processed when the trader comes to the village or when the local markets are settled in a precise day. Different ways of distribution can be used, for example by using a donkey as a transportation method which has already been reported as an usual distribution method (Gebreab et al. 2004). Another option is selling the products to the traders within the informal market, who distribute the dairy products to different markets around the area (Redda 2003).

4.6.4. Packaging constraints

Packaging can be a challenge for smallholders given their limited financial abilities. At the same time, a sustainable packaging strategy can also contribute to the creation of the product's added value. In this respect, the development of suitable packaging for increased transportability and use, as well as use of local materials are factors to consider in the context of subsistence markets (Weidner et al. 2010). Especially in the case of dairy products a smart packaging strategy can ease the constraints created by products' perishability, which can be especially problematic due to poor infrastructure and market fragmentation, as explained above. In the context of the above interventions, particular stress has been given to the availability of local materials in packaging decisions. These include locally made clay pots, wax produced from beekeepers for cheese and banana leaves. This packaging can increase the shelf-life of dairy products if the packaging materials are good. The best way of packaging dairy products minimize air and have a moisture entry into the product (Dairy for Global Nutrition 2014). Next to that, packaging also makes selling of dairy products more convenient.

4.6.5. Time gap between investment and revenue

The inclusion of a mechanism to overcome credit constraints, such as the ones described in section 5.2, can overcome the issue of uneven income due to aging times for cheese production. This type of constraint is similar to typical issues smallholders face in making decisions about production inputs before products can be brought to the market at harvest. In this respect, specific loan arrangements which tailor repayment schedules and cash disbursements to the specific seasonality of the market can be beneficial to those smallholders willing to invest in cheese production. Unlike agricultural products, cheeses such as the Provolone offer producers the option of choosing different aging times, which, coupled with proper production planning, can lead to a smoothing of income variability.

5. Supporting interventions

The following section elaborates on broader technical and socio-economic aspects which should be considered together with the implementation of the above practical interventions. These are meant to identify specific aspects such as hygienic practices, credit constraints and simple technical innovations that can help achieve adding more value to the introduced dairy products in this report and already existing ones in the project area.

5.1. Social

5.1.1. Training and brochure on hygienic practices

There should be more awareness among smallholders and traders about the importance of hygiene. It could add value to the market position of the smallholders and traders. If dairy products are produced in an enhanced hygienic way, quality will be improved which guarantees better food safety. Another result of better hygienic practices is expanding market opportunities, since reasons for urban residents for not buying rural products are mostly because of safety reasons (Francesconi et al. 2010).

Awareness about hygiene in the informal dairy sector is key in reaching successful interventions. It is a way of capacity building. A brochure could help to create more awareness among smallholders and traders. Because most smallholders smallholders are illiterate, the use of images is preferable in relation to text. This has to be combined with a short training, which can both target men as women, as they both have a role in the production of dairy products (Yisehak 2008).

A possible example for a training with brochure could be the example described by Vaarst, Byarugaga and Nakayuma (2007). Even though this project was in Uganda, it can still serve as an example for the Ethiopian case. Vaarst et al. (2007) used the Farmer Field School, a method based on identifying livestock production constraints and finding solutions where smallholders learn from each other (ibid:2). In this study, smallholders met every fortnight for two hours during a 12-month period. This all was facilitated by two local extension agents with help of scientists from the local university. Each time they met at a different farm owned by one of the group members, which contributes to mutual trust, openness and respect (ibid: 5).
The training on hygienic practices has to be tailored to the Ethiopian setting, but the main idea could be an inspiration for raising awareness on hygiene among smallholders.

Issues which could be covered in the training and the brochure (Pandey & Voskuil 2011):

- Clean animal shed before and after milking
- Groom the cow on a daily basis to keep the animal clean
- Clean clothes and hands before milking
- Clean and massage udder before and during the milking

- Discard the foremilk
- Use antiseptic solution to clean the udder
- Clean milking equipment before and after milking with hot water and dry them in the sun
- Boil water before use
- Use a lid to store the milk and keep it in a cool and shady place.

It is important to build upon the existing practices in dairy hygiene in order to create effective development. To identify the motives for changed behaviour, local views about hygiene should be assessed. Moreover, hygiene messages need to be positive, which makes the process of learning easier to adapt. To intervene and improve the current situation of the rural areas is necessary to take into account the access to implements for water supply, sanitation and hygiene as well as the functioning of policies and funding (WHO 2005).

5.1.2. Certification

Most people in remote areas buy dairy products from people who are familiar to them. This is mainly because of food safety reasons. People often do not trust others they don't know, since they cannot be sure whether the product is safe and of good quality (A. Dekeba, personal communication, June 1st, 2015). To tackle this issue, a quality guarantee in the form of certification can be introduced. This could add value because people might be more willing to pay a higher price for products with a certification as this indicates the product is safe to consume. Smallholders could cooperate and produce dairy products according to a certain standard and market it in a certified way.

There are some constraints with certification. The first constraint is the issue to decide who should enforce the quality certifications. In the implementation phase, a NGO financed by a donor government could do the quality checks and hand out the certificates. But, to make a certification scheme financially sustainable, smallholders themselves have to organize quality enforcement after a certain period of time. Consequently, certification must be implemented on a big scale to meet the high costs at the implementation phase. The relatively high costs to become a member of a certification scheme leads often to the exclusion of poorer smallholders (N. Franscesconi, personal communication, June 5th, 2015).

Next to that, research about certification showed that the added value of the products often does not benefit the producers. This is because of information asymmetry, poor management in the cooperatives and high transaction costs (N. Franscesconi, personal communication, June 5th, 2015; Beuchelt, Kiemen and Zeller 2010). To enhance the willingness of producers to invest in quality, there should be a reward built in the certification process. If dairy quality is higher, also the revenues of the producers should be increased.

5.1.3. Awareness trough advertisements

Supermarkets and processing industries in Ethiopia are currently not dominant and can be counted as a negligible share of the national dairy sector (Francesconi, Heerink & D'Haese 2010). But, the amount of urban citizens and their incomes is increasing, which means that a growth in supermarkets and industrial processors is expected in the near future. This can bring a risk for local smallholders because it can decrease their market share. Therefore, Francesconi et al. (2010) argue that policy and governance measures have to be taken to minimize this risk. These measures can be in the form of introducing certification schemes for poor people or creating efficient cooperatives. Here, the monitoring, evaluation of the process of institutional building and strengthening is crucial (ibid).

Another possible channel to support local dairy smallholders is to give urban citizens incentives to buy dairy products from the rural areas. If more people are aware of the quality and safety of consuming dairy products from rural areas, this could lead to an increase in the demand and thus benefit the informal market as well. Focusing on products with a long shelf-life, such as butter is necessary to guarantee safety and quality.

It is important to include dairy producers, concerned authorities, cooperatives, and non-governmental organizations in raising awareness (Tegegne et al. 2013). The awareness could be raised via advertisements on billboards, television, radio, magazines, and newspapers.

5.2. Economic

5.2.1. Overcoming credit constraints: Micro-finance and Rotating Saving and Credit Associations

Lack of credit is one of the numerous constraints that smallholders face in the Oromia region. Credit organizations are mainly in urban areas, where medium-scale farmers are located. Missing road infrastructure, coupled with low level of entrepreneurship in the highlands makes reaching smallholders costly and unattractive from the perspective of microfinance institutions (MFI's). In a study conducted in the Oromia region by Ayalew Sida (2014) it is shown that there is a strong negative correlation between livestock ownership and participation in microfinance programs, a probable indication that microfinance institutions are not engaging with smallholders in the dairy sector (ibid).

In order to overcome these constraints, the above interventions can work as a catalyst to foster interest in local credit bank institutions or NGO's. By allowing smallholders to put forward a business proposition for small-scale investments, MFI's could be willing to incur the higher costs of reaching the highlands area. The availability of credit can help smallholders invest in some necessary inputs for the implementation of the interventions proposed in this report. Specifically, materials such as thermometers, initial bacteria cultures, clay, alternative refrigeration facilities,

and basic tools can provide hygiene and pest control. A long-term availability of funds would moreover allow successful interventions to be scaled up and for an improvement in living standards in the intervention area.

Currently, one microfinance institution operating in the Oromia region is the Oromia Credit and Saving Share Company (OCSSCO), with a gross loan portfolio outstanding of USD 91 million as of 2012. OCSSCO works as a standard MFI, providing loans in small sizes and in short cycles with increasing nominal values as credit histories with borrowers are developed. Lending takes place in groups, which facilitates access even in the absence of assets pledged as collateral by using social capital instead. Moreover, cash needs due to seasonality are accommodated (Sida 2014). The possibility of negotiating flexible loans can be an advantage for those smallholders willing to invest in activities where investment costs and profit collection times do not coincide, such as in the case of cheese making.

Next to microfinance, rotating saving and credit associations (ROSCA's) can alleviate the lack of credit. In these arrangements, groups of individuals voluntarily pool their regular savings, with disbursements determined either by random draw or bidding until every member has received their share of the total amount in the common "pot" (Kedir et al. 2011). These informal mechanisms are popular in developing countries, where formal credit markets are not fully developed (ibid).

Further fieldwork research is however needed to assess the current livelihood strategies employed by smallholders in the specific intervention regions and how MFI's can be included in the development of the informal dairy value chain.

5.3. Technical

5.3.1. Mitticool

Most smallholders lack access to electricity. To overcome this constraint, other kinds of refrigeration have to be assessed. Mitticool refrigerator offers a low-cost and low-tech solution for preserving food. It is a refrigerator made out of clay, and originally comes from India. It does not need any electricity, because it works by water evaporation. Ten litres of water circulate through the pores on its walls which eventually evaporates; this process lowers the temperature of the clay. It is

Fig4. Mitticool. Source: http://www.mitticool.in/

used to store drinking water, vegetables, fruits, and dairy products. These products can last three to seven days longer than when they would have been placed outside the Mitticool. The inside of the fridge can be up to eight degrees lower than the outside temperature, and it works best in dry climates (Yadav & Goyal 2015).The Mitticool refrigerator can increase the shelf-life of the products elaborated above. For example, it could serve as a way to keep the mother culture for the Provolone cheese, as explained under section 4.2.2. The yogurt can also be stored in the fridge, so it can be conserved longer.

6. Recommendations

When planning development projects, special consideration should be given to the specific context of the target area and its population. Historical, physical and sociocultural factors such as ethnic diversity, patterns of collective action, and previous experience with development efforts have to be taken into account when introducing new development ideas (Gow & Morss 1989). Also religion, language, gender, kinship networks and resources access and control should be considered. Although this report has focused on the highlands of the Oromia region, it is important to stress that this area is highly heterogeneous in terms of geographical, cultural and social characteristics. The following sections include recommendations about the steps that need to be considered for tailoring the above practical interventions to the specific context of the villages in the highlands of Oromia.

6.1. Assess smallholder's perspectives

Whether people accept new technologies regarding to food, a wide variety of factors should be considered. Because of the specific traditions in Ethiopia, smallholders can be mistrustful towards changing technology or ingredients of traditional products. Knowledge of and trust in the new technology, smallholder's perception on risks and benefits as well as product characteristics such as taste and price play a role in local acceptance (Greehy et al 2013:38). For example, adding whey to *injeras* may not be socially acceptable since this is a staple food in the Ethiopian diet.

6.2. Providing training

Given the above, an in-depth empirical research in 2-3 villages in Oromia about smallholder's perspectives on the new products should be considered. As a next step, smallholders willing to participate in the project are identified and introduced to a pilot-program. This could include workshops in how these products should be produced, and how and where they could be marketed. Introducing dairy products to the informal market requires training on new methods of production.

It is important to build upon the existing practices in dairy production. This would facilitate adaptation and acceptance of the newly introduced methods.

Dairy experts from NGO's or commercial companies can provide initial training and knowledge transfer until farmers are able to internalize the new practices in their daily production activities and share them with other farmers.

6.3. Identify consumer's preferences and social networks

Ethiopian consumer's needs and preferences also have to be taken into account before considering the implementation of new dairy products. This practice, known as consumer orientation, is increasingly done in subsistence markets. It shows that also within the context of subsistence markets consumer orientation leads to benefits for producers and consumers alike. Ingenbleek et al. (2013) found in a field study in Ethiopia that customer orientation should be a primary concern in subsistence markets, much as it is now in high-income markets. In the case of the introduction of the above products, a customer research in the highlands and in the towns surrounding Addis Ababa should be conducted in order to verify how receptive markets can be to these specific products. Where needed, local considerations for preference in taste can then be incorporated within the production process.

In order to foster consumer interest, promotion activities should be considered. The ability of producers and traders alike to tap into existing social groups of the target markets, such as local religious associations, is an important prerequisite to stimulate word of mouth. Whereas promotion in developed countries mainly takes place via traditional mass-media channels, one-to-one interactions within complex networks characterize subsistence markets (Sridharan & Viswanathan 2008 cited in Weidner et al. 2010).

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