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Improving Smallholder Livelihoods Through Local Value Chain Development: A Case Study of Goat Milk Yogurt in Tanzania

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Abstract

Smallholder farmers have difficulties entering established value chains with value-added products. In this paper, we look at smallholders' capability to establish and sustainably manage a competitive and economically viable local dairy value chain through the case of Twawose, a small dairy goat co-operative in Tanzania. The analysis uses a value chain approach as a framework to identify the possibilities for upgrading and the determinants of competitiveness in value chains in which smallholder farmers can participate. Results highlight the benefits Twawose participants receive, but caution that a multitude of constraints could impede scaling-up in the future.

Keywords: goat, yogurt, value chain, smallholder farmers, Tanzania.

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Introduction

Establishing a new value chain or entering an existing value chain are both challenging endeavors for smallholder farmers in developing countries. If a market opportunity is recognized, smallholders still require entrepreneurship, business skills, education, and a range of other assets to start an enterprise. Business and entrepreneurship skills are usually not provided by schools in the rural sector, if school has been attended at all. There is often a high degree of illiteracy that increases the difficulties faced by smallholders in starting up a value-adding enterprise (Vermeulen and Cotula 2010; Vorley, Lundy, and MacGregor 2009; World Bank 2007).

For years, the focus among donor organizations has been to increase the participation of smallholder farmers in high-value global value chains. A particular emphasis has been on the promotion of exports, often of organic and fair trade products, with support from either the private sector or public sector, and facilitated through NGO's and other international development agencies. However, in such high-value agrifood value chains, smallholders have limited control. Power is often concentrated among one or a few chain participants that coordinate market activity. As the modern agrifood sector is based on consumer assurance, high standards for food quality and safety, low prices, and reliability of supply, lead actors in retail or export often coordinate the value chain. The ability of smallholder farmers to take the lead is limited, as is their ability to maximize economies of scale. The market is also constantly changing, requiring rural farms and firms to respond and innovate by, for example, switching market channels, changing how they are organized, or investing in equipment. Such value chains may thus be less appropriate for many smallholder actors, who may lack the ability to handle dynamic markets and comply with their increasing amount of regulations and standards.

By contrast, local value chains that meet growing local demand might be more within the reach of smallholders. Local markets may also be characterized by new consumer demands due to changing lifestyles and increased knowledge of the benefits of a more diversified diet (World Bank 2007). In Europe and the United States, local value chain development has been advocated by environmentally conscious consumers demanding local farm products that they perceive as being of higher quality, leading to a rise in the number of specialty and local markets. Many producers have taken advantage of this trend by selling their produce at the growing number of local farmers' markets and/or directly to customers, thus creating local food value chains (see Gilg and Battershill 1998; Verhaegen and Van Huylenbroeck 2002). While Herr (2007) has further identified the potential of local value chain development in the developing world, an in-depth analysis of successful smallholder initiatives in local value chains could give valuable insights on how to develop value chains based on local resources and context.

In Tanzania, local goat production represents an opportunity for local value chain development. Goats already play a significant role in supporting smallholder farmers in improving their livelihoods. Goats are tolerant to limited food and water access, their herds can recover quickly due to fast reproduction cycles, and, because of their small size, are easy to transport (Peacock 2007). In addition, the presence of goats assures farming families of a continuous flow of income, which is difficult to attain from seasonal vegetable sales. Owning goats also represents an investment in capital and can increase the likelihood of obtaining a micro-loan to augment livestock-related or other farm activities (Omore et al. 2004).

Dairy goats are a particularly attractive investment, as the additional milk they generate is sizable compared to indigenous goats that provide much less milk. Small-scale dairy production is an important source of cash income for subsistence farmers, especially in the East African highlands (Omore et al. 2004). It is estimated that 70% (1.6 million tons) of the total national milk production in Tanzania is produced by smallholder dairy farmers. Goats are the most commonly owned type of small ruminant in Tanzania, with dairy goats gaining increased popularity as a source of milk, particularly for the poor (Njombe and Msanga 2009). While Tanzanians consume less milk compared to their East African neighbors, partly due to views that it is a drink for children, the formal market has nonetheless expanded rapidly during the last decade after the dairy processing industry was privatized. In urban areas, the supply of milk and milk products has consistently not met demand. For example, the local processing capacity in Tanzania only met about 33% of the demand during the 1990s (RLDC 2010). The remainder of the milk is imported. The demand for milk and dairy products is also growing in rural areas, creating an opportunity to develop new products and new value chains that connect local supply with local demand.

In this paper, we give an in-depth analysis of Twawose, a dairy goat co-operative in Tanzania, which has attempted to improve smallholder livelihoods through the commercialization of goat milk yogurt. Our research questions explore (i) whether local dairy value chains are beneficial for smallholder farmers, and (ii) whether smallholder farmers are capable of developing and maintaining a newly established dairy value chain. The analysis makes use of a value chain approach that provides a framework to analyze the nature and determinants of competitiveness in value chains in which smallholder farmers can participate. A particular contribution of this study is to highlight the role of farm-specific assets within a value chain analysis as an important means to contextualize the governance relationships within the chain and the ability of smallholders to successfully upgrade production. Our approach further allows us to assess the strategies open to Twawose, both to overcome the barriers currently faced and to sustain and improve market participation.

Overview of the Case

Mgeta division is located on the western slopes of the Uluguru Mountains between 1100 and 1750 meters above sea level. It is about 40 km from the nearest city of Morogoro (see Figure 1). The climate in Mgeta is fairly temperate, with temperatures ranging between 11 and 23°C. The dry seasons in Mgeta lasts for approximately four months, usually from June to September. The population consists primarily of smallholder farmers, with about 84% of residents engaged in agriculture and animal husbandry. Arable land is intensively used in Mgeta and there is little or no opportunity for expansion, which is a considerable constraint to improving livelihoods in the area. Vegetable production is the most important farming system and focused on cabbage, tomatoes, green peas, beans, cauliflower, and carrots (UMADEP 2001).

lies in Mgeta cannot afford to send their children to school. There are also a number of infra-structural challenges in the area. For instance, access to electricity is limited or unavailable, while roads are often in poor repair and impassible during the rainy season (UMADEP 2001).

In 1988, Norwegian dairy goats were introduced in three villages: Nyandira, Tchenzema, and Mwarazi in Mgeta Divison, Morogoro. Their introduction was led by the Department of Animal Science and Production (DASP) of Sokoine University of Agriculture (SUA) (UMADEP 2001). It was implemented in collaboration with the Norwegian University of Life Sciences (UMB). The aim of the project was to improve the livelihoods of smallholder farmers and more specifically to improve household nutrition, especially among children. Previously, there was no access to milk in the area because of the difficulty of keeping cows in a mountainous area (Krogh 2007).

SUA was in charge of distributing the dairy goats to the chosen farmers in Mgeta and providing the accompanying training in goat management. In parallel, a local dairy goat association was established in 1993 by these dairy goat owners. The name of the group is Twawose, which means, “let us come together” in the local Luguri language. The association’s role was to create a network of farmers owning Norwegian dairy goats. They organized training and advisory services, facilitated the sales of goats, and implemented other actions agreed upon by the association. The introduction of dairy goats was followed up through various research projects and collaboration with local NGO’s and extension officers.

A natural scaling out of dairy goats in Mgeta started in 1990 and increased rapidly from 2000, leading to a rise in the number of farmers keeping Norwegian goats in the area. By 1999, the initial number of 10 goat keepers had grown to 50, and by 2009, there were approximately 380 farmers in the three villages maintaining 1538 dairy goats (Krogh 2007).

In the 1990s, a number of studies concluded that the dairy goat project was a success, as the introduction of dairy goats met the project goals of improved nutrition, food security, and increased income for smallholder farmers in Mgeta. Dairy goats were recognized as a path to alleviate poverty among dairy goat keepers, as they enabled farmers to realize more consistent sources of income. This was important, as the sale of vegetables is subject to seasonal variation. Also, household nutritional standards increased, especially among children, through the availability of goat milk (Eik et al. 2008; Safari et al. 2005; UMADEP 2001).

The initial success of introducing dairy goats in Mgeta led to further interest from the dairy goat keepers to expand the project. The idea of starting a milk collection and production center (MCPC), and adding value to the goat milk by producing goat milk yogurt, materialized in 2007 by the farmers themselves with support UMB and SUA (Krogh 2007). The idea was triggered by a perception that there was surplus milk available, but that it required collective effort to market. A feasibility study conducted by professors from SUA during a PANTIL (Programme for Agricultural and Natural Resources Transformation for Improved Livelihoods) baseline survey suggested that both goat milk producers and consumers were in favor of establishing such a center. It was believed that a MCPC would boost milk production and assist in the marketing of milk (Kifaro et al. 2007).

There are several reasons for choosing yogurt over other dairy products as a means to add value to surplus milk. In tropical environments characterized by high temperatures, milk deteriorates rapidly, and requires processing to prolong its shelf-life and reach more distant markets. Once processed into fermented milk products like yogurt or cultured sour milk, its shelf life may be extended up to one week (or more) depending on quality, packaging, and storage temperature. Fermented milk is also considered easier to digest and healthier than fresh milk (Bille et al. 2000). Cheese was not considered as an option because there is no tradition of consuming cheese in Tanzania, especially not in poor rural areas like Mgeta. A small market research study on the potential of yogurt production was implemented in Nyandira and met with positive feedback, motivating Twawose to start production (Krogh 2010).

On request from the dairy goat keepers, two selected members of Twawose were trained in ensuring the quality of goat milk and producing yogurt by SUA. By November 2008, pilot production commenced. When this pilot confirmed the potential of selling goat milk yogurt locally, the registration of a co-operative as a business unit began in 2009 and was finalized in January 2010. The production started in January 2010, and by May approximately 20 liters of yogurt was produced twice a week and sold successfully on local market days (Mondays and Thursdays). During these days, farmers from neighboring villages and the nearest town, Morogoro, come to Nyandira, where the processing is located.

Twawose now functions both as a dairy goat farmers association, with 68 members, and a yogurt producing co-operative. While Twawose has successfully taken advantage of one of the many value-adding opportunities in the Tanzanian dairy sector, a multitude of challenges remain to sustain and scale-out such opportunities. In the next sections, we take a value chain perspective to couch the context arising from the opportunities and challenges faced by Twawose as it expands into new markets.

Methodology

A value chain is the full range of activities that are required to create and add value to a finished product or service (Kaplinsky and Morris 2001). This refers to the different phases of production from raw material, processing, distribution, and marketing until the product or service reaches the consumer and is disposed of after use. A value chain analysis (VCA) examines all the actors involved in the chain, the linkages between them, and the activities within each link. It also takes into account market demand, buyer requirements, quality standards, and local, regional, national and global influences on the chain (Kaplinsky and Morris 2001, ; 14). In doing so, the value chain approach goes beyond firm- or activity-specific analysis as it looks at all the actors and institutions that play a part of a product or service's life cycle, rather than single enterprises (Gereffi, Humphrey, and Sturgeon 2005; Kaplinsky and Morris 2001; M4P 2008).

Significant literature exists on how global value chains interface with smallholder farmers' participation (Dolan and Humphrey 2000; Ponte 2008). However, *local* value chains have received little attention in the context of developing countries. Development agencies also tend to focus on supporting farmers in developing countries by identifying profitable markets overseas rather than domestically (Shepherd 2007). According to Altenburg (2006), much less work has focused on local value chains that might provide viable market opportunities, especially for smallholder

farmers. This is supported by Shepherd (2007) who notes: “[The] development of export markets is expensive and complex, particularly where small farmers are involved” (Shepherd 2007, 14).

In this study, the VCA framework of Kaplinsky and Morris’ (2001) was applied in the context of local value chains. Their methodology has four main components. First, it maps the activities in the chain and characterizes the actors participating in it. The purpose of mapping the value chain is to give a visual presentation of the actors in the chains and connections between them. Second, VCA assesses governance structures in the value chain to understand the relationships and coordination mechanisms that exist between actors in the chain and how these may need to be re-structured to improve the chain. Governance includes, among other factors, power asymmetry, rule-making, sanctions, and degree of trust and dependence between the different parties (Kaplinsky and Morris 2001). In some cases, governance is simply referred to as coordination between actors in the same position or different positions in the chain, where the aim is to make different actors within the same value chain act in a way that leads towards a common goal, including efforts that prevent actions based on a different agenda (Riisgaard et al. 2008).

The governance context in this case is a co-operative. Farmer-led co-operatives are democratic associations of voluntary members that work collectively to meet a common goal of mutual benefits. In African countries, co-operatives have a relatively long and sordid history which contrasts with the more successful co-operative experience for farmers in the US or Europe that focuses on local markets (Birchall 2003; Holloway et al. 2000). There are several reasons for the mixed experience of co-operatives in African countries, including poor management, inappropriate cooperative structures, lack of democracy, corruption, lack of working capital, and weak supporting institutions.

Third, VCA highlights upgrading strategies based on constraints and opportunities in the chain. There are numerous ways of upgrading a value chain, with four types being referred to in the value chain literature: process, product, functional, and chain upgrading. Process upgrading focuses on increasing the efficiency of the production both within links and/or between links in the value chain. Product upgrading refers to enhancing the quality and specification of the product, whether by creating entirely new products or by improving old products. Changing the scope of activities carried out within the firm as a means of adding value is referred to as functional upgrading. Finally, upgrading can involve a move into a new value chain altogether by using the skills gained from participating in an existing value chain (chain upgrading). In value chain literature, case studies indicate that product and process upgrading are most common, while functional upgrading is difficult to achieve (Kaplinsky and Morris 2001; Mitchell, Keane, and Coles 2009). Lastly, VCA evaluates who benefits from participation in the chain, and assesses how the distribution of benefits will be influenced by restructuring the chain through different upgrading strategies (Kaplinsky and Morris 2001; Rich et al. 2011).

For the purpose of this study, we modify Kaplinsky and Morris’s framework to include a new area of analysis - review of assets. This is to take account of the fact that rural smallholders are poor, and that assets and resources are crucial in entrepreneurial efforts to build new ventures (Boughton et al. 2007; Shepherd and Wiklund 2005). The asset approach is well-known in the community-based development literature (Green and Haines 2008). How and whether an actor can capture value depends on how assets are generated and maintained, and whether the value

chain achieves a competitive advantage (Barney and Clark 2007; Shepherd and Wiklund 2005). Assets or resources are key elements when creating and implementing strategies for developing the value chain. In this sense, we view assets as closely related to the resource-based perspective in which firms internal strengths are assumed as a source of competitiveness (Barney and Clark 2007). Access to resources, or the asset base, is important when trying to understand why some smallholders perform better than others and how they can create and sustain a competitive value chain. This thus gives a necessary, contextual background to suggest more specific upgrading strategies and to assess the case's capability to implement the strategies.

Assets can be defined in various ways, and may include skills and capacities of individuals, associations, and institutions. In our study, five groups of assets have been chosen to give the necessary overview of Twawose's capabilities to take advantage of opportunities and cope with challenges facing their cooperative when developing their value chain. These asset classes include physical assets, environmental assets, institutional assets, financial assets, and social and human assets. A discussion of each is given in the next section.

Data collection for this study was conducted during two field visits in 2010 and 2011, involving 107 interviews with 120 Twawose members and management, experts, customers, and other dairy goat farmers in the region. In-depth, semi-structured, and group interviews were conducted by the first author, with use of translation, to obtain a clearer picture of the case. Interviews were complemented by secondary data from previous research from the same area, financial reports, and records of milk and herd demographics. During the field work, emphasis was put on cross-cultural differences to ensure that information was understood correctly. More details can be found in Lie (2011).

Results

Overview of Twawose's Value Chain

Before commencing goat milk yogurt production, Twawose's value chain was informal and consisted of farmers selling their surplus goat milk to neighbors and small local restaurants. Twawose supplied its dairy goat farmers with medicines provided through their input supply shop. Other local suppliers provide farmers with complementary feed. In 2007, when dairy goat farmers started complaining about rising milk surpluses and limited market outlets for this surplus, the process of goat milk yogurt production was initiated, as portrayed in the case study introduction.

In January 2010, the MCPC building was renovated to meet milk processing standards, a process guided and sponsored by SUA professors. Fifteen of the 68 Twawose members have been trained in yogurt processing. This ensures constant production even when illness, or when there are other reasons for the absence of workers.

Twawose's upgraded value chain is mapped in Figure 2 (green squares show the development of the chain). Local retailers supply the MCPC with sugar, firewood, used water bottles, and ancillary equipment like cooking pots. The changes to Twawose's value chain have resulted in a tran-

sition from an informal chain to a semi-formal value chain, in which yogurt production is organized through a formally registered cooperative, but still sold informally at the local market.

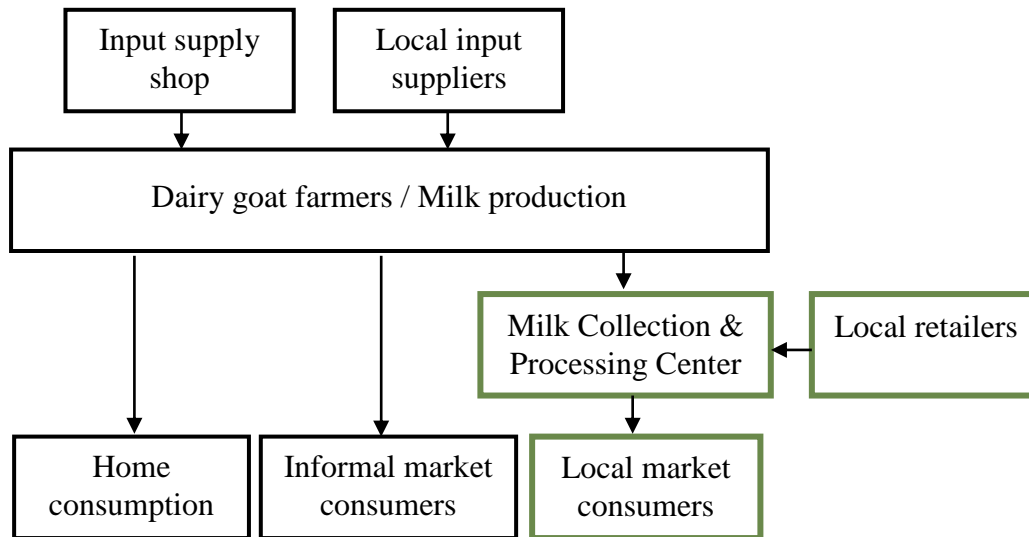


Figure 2. Twawose's semi-formal value chain.

Source. Developed by Authors

Twawose's upgraded value chain has resulted in new actors and activities in the chain. The main actors in Twawose's new value chain are goat owners that supply milk and the farmers working at the MCPC. See Figure 3 for an overview of activities and corresponding costs present in Twawose's value chain. Dairy goat owners that produce goat milk consume milk at home, sell it at the informal market, or sell it to the MCPC; they also sometimes engage in a combination of these activities. Findings from interviews with dairy goat owners reveal that the majority of farmers keep approximately one liter of milk for home consumption. The rest of the milk, about 2-5 liters, is then sold to the MCPC if the farmer is one of those who have been allowed to deliver milk two days a week to the MCPC. Because only a restricted amount of milk is processed, due to the limited local market, supply restrictions have been implemented by the MCPC. The selection of farmers is not controlled very well and mostly based on which farmers are most actively involved in Twawose and produce the largest amount of milk at the time. In theory, farmers delivering milk to the MCPC are supposed to be Twawose members, but in practice there have been occasions when this was not followed. The suppliers that are not members of Twawose have stated their intention to become members, but due to relatively high entrance costs and little pressure from Twawose, this has not yet happened.

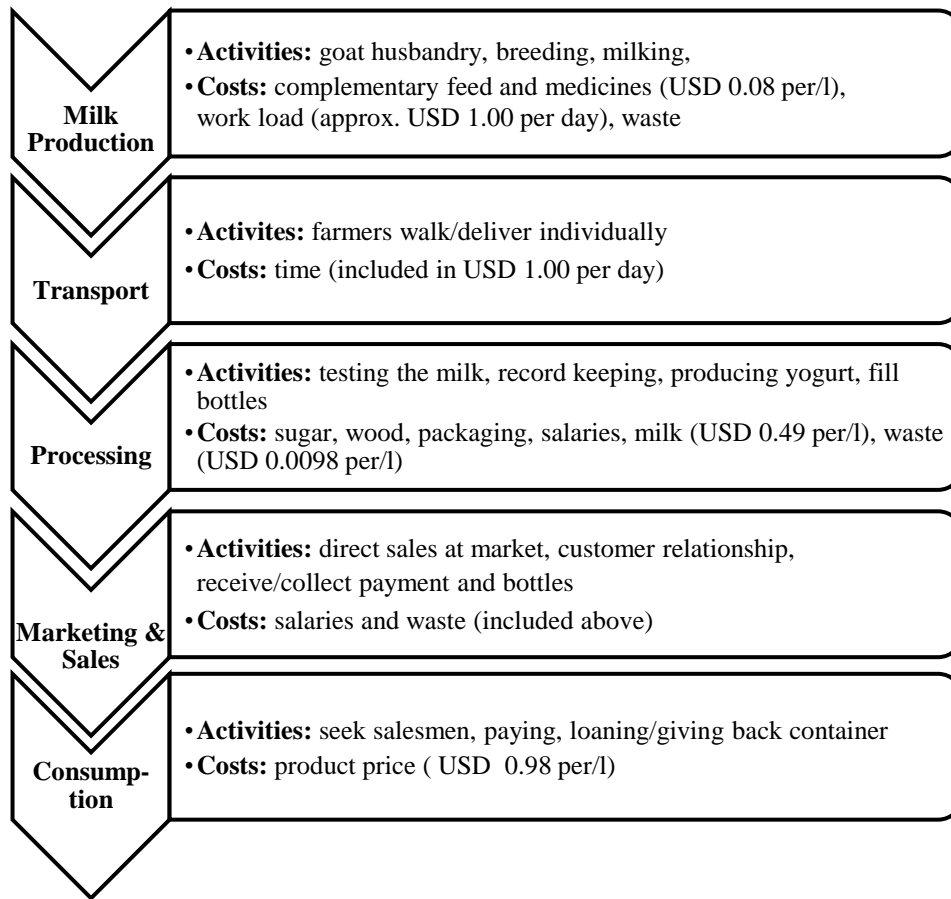


Figure 3. Twawose's value chain including activities and cost in each link.
Source. Developed by Authors

The farmers usually milk the goats twice a day, once in the morning and in the afternoon, and walk up to one hour and a half to reach the MCPC. At the MCPC, the milk is quality controlled and recorded for payment (0.49 USD¹ per/liter) through the local branch of the Savings and Credit Cooperative Societies' (SACCOS). Based on calculations for optimal supplementary feeding and medicine use², we estimate that producing one liter of milk costs farmers approximately 0.08 USD. If we assume that the opportunity cost of own (family) labor is approximately USD 1.00 per day and that a full day of labor is required for trekking milk to the MCPC, milking, and grazing, a household selling 2.5 liters of milk would cover both variable and implicit costs of production.³ Increasing the scale of production would be more profitable for participating households, as household costs for trekking and farming are fixed costs and independent of herd size (i.e., the household cost of trekking one goat or twenty would be the same), while the marginal cost of extra milking (less than one hour per liter) is much less than the added milk rev-

¹ Currency converted per USD: TZS exchange rate prevailing on 8 November 2011.

² The calculation is based on one kg supplementary feed per goat per day consisting of 83.22 % maize, 16.65 % sunflower and 0.12 % minerals. In addition comes deworming approx. three times a year, external insecticide approx. every 14 days and penicillin approx. once a year.

³ Later in the text, we note that the urban minimum wage is USD 50/month, and that rural wages are lower than those prevailing in urban areas. We assume one person would be tasked with this activity.

enue. At the same time, households on average generate less surplus milk than the breakeven quantity computed here (1.48 liters/day, see Table 3 later in the text). While this suggests that current benefits go primarily to larger farmers, with greater certainty in market conditions and more local demand, there would be higher incentives for smaller farmers to produce more milk for the market and improve their own profitability.

The two processors are responsible for producing the yogurt using traditional methods, which leads to a milk-yogurt conversion ratio of 98 %. On average only 2% of the milk evaporates or is spilled during processing into yogurt. Based on Twawose’s financial records from 2010 (Table 1), annual profits were 180 USD, of which the suppliers were supposed to receive 50%, an agreement that was made when the cooperative was founded. Twawose’s financial records indicate that it has a profit margin of 0.08 USD per liter of yogurt when producing an average of 21 liters of yogurt. This is based on purchasing milk for 0.49 USD per liter and includes fixed costs such as allowances and firewood, and the variable costs of procuring sugar, packaging materials, and marketing services. The processors are also in charge of selling the 20-25 liters of yogurt that is produced, using direct marketing and sales strategies. First, they make one round selling the milk. During the second round, they collect bottles (if bottles are not returned the consumer has to pay an extra 0.06 USD) and money. At the end of their work day, the bottles are cleaned to be reused, and the cycle starts over again two days later.

Table 1. Twawose 2010 Financial Accounts

	Costs USD	% of Costs
Income	1993.5	
Raw material	1204.7	66.46 %
Gross profit	788.8	
Allowances	523.9	28.91 %
Equipment	28.5	1.58 %
Marketing	0.94	0.05 %
Other	54.3	3.00 %
Total costs	1811.7	100 %
Net profit	180.7	

Source. Developed by Authors

Twawose’s Assets

In this section, we describe the assets in Twawose’s value chain, focusing on strengths and weaknesses in the chain and related to Twawose as the chain leader. The assets we consider are environmental, physical, institutional, financial, and social and human assets, respectively. Of particular interest here is how these assets both influence the governance of the chain and the upgrading strategies available to Twawose.

The strongest and most critical asset of Twawose, is their collective organization. Strong ties and mutual trust among many of the members has been built through a relatively long history and active membership. Its external network is also a critical asset. This network has provided knowledge and support without taking control of the development or management of the organization. Lack of assets such as proper roads, electricity, and access to information and finance are

threats for future expansion. Twawose's assets are summarized in Figure 4 and briefly discussed below. In the figure, the available resources to Twawose are shown above the line and the missing assets below the line.

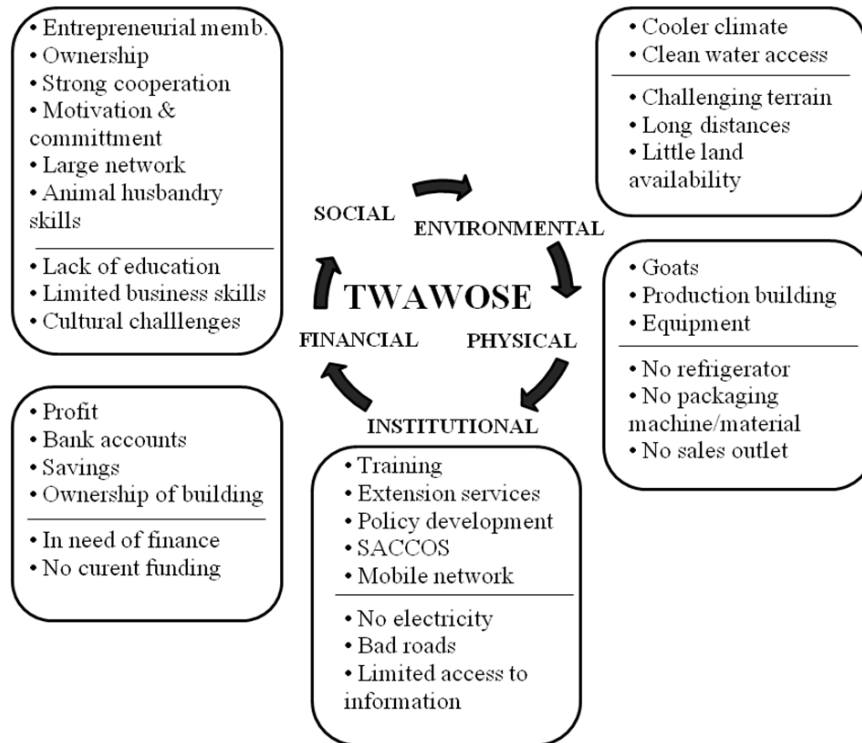


Figure 4. Overview of Twawose's assets.

Source. Developed by Authors

Environmental Assets

Environmental assets such as land and water are determined by the location of the place and its characteristics and climate (Green and Haines 2008). The location of the three villages in the Uluguru Mountains, provides a cooler climate than the average in Tanzania. Norwegian goats thrive better here than in other warmer locations. Moreover, the relatively cooler climate also allows Twawose to temporarily store its yogurt overnight using only cold water, partially mitigating the constraint of limited access to electricity. There is good access to water most of the year.

At the same time, the area is characterized by a difficult terrain and long distances between vil-lages, which negatively impacts both the delivery of milk to the collection center and the distri-bution of the yogurt. There is pressure on the land available for farming and adequate pasture for grazing. This influences herd sizes, potentially restricting the ability of farmers to increase ani-mal stocks. A no-grazing production system can be implemented by Twawose and its network in cooperation with the farmers, but would result higher feeding costs. Milk production may still be an attractive option, since the lack of available land is a bigger challenge if solely pursuing crop farming. Overall, the environment in Mgeta provides relatively favorable conditions for pro-cessing goat milk, in light of the opportunity costs present on other resources.

Physical Assets

Physical assets include roads, buildings, and other goods such as animals and equipment that require an investment and where a return on investment is expected (Green and Haines 2008). Twawose's members all own goats, as this is a prerequisite for joining the group. The introduction of dairy goats has been promoted and subsidized through a network effort by SUA, UMB, and Uluguru Mountains Agricultural Development Project (UMADEP). The MCPC has access to rising volumes of milk from Twawose members, as well as non-members that are at times allowed to sell to the MCPC. The large number of dairy goats in the area before the MCPC was established is an important success factor for the cooperative. Other assets available to Twawose include a building that was first used to store input supplies, and has since been renovated for processing activities, a crucial physical asset to establish the MCPC. Currently, Twawose owns enough equipment to process a maximum of 60 liters of milk a day, which means that if they want to process more they will need additional equipment. In the building, there is no sales outlet or shop from which to sell the yogurt.

While Twawose maintains a basic level of physical assets to sustain current levels of production, there is lack of physical assets to further develop and scale-up the chain. A packaging machine, including proper packaging material, will be necessary if larger production volumes are to be sold in new and possibly more distant markets. The yogurt is currently sold in old water bottles, which is not an adequate way of packaging if selling to markets outside the local market. Indeed, even local market customers raise concerns from the use of old cleaned water bottles in interviews. A better cooling system than today's use of cold water would require electricity

The infrastructure in the area is rather poor, and infrastructure is an essential element of forming and developing value chains. There is no electricity available in the village, except from a few generators. This is typical in Tanzania, as only 40% of communities in the country are electrified (Kinda and Loening 2008). That is a major drawback for expanded dairy production because it is important to store the products in a cool place before distribution. The problem is further aggravated by poor roads that are sometimes impassible during the rainy season. This impacts the cooperative's ability to deliver yogurt on time and cost-effectively to customers.

Institutional Assets

Institutional assets include the norms, laws, regulations, policies, trade agreements, services, and public infrastructure that facilitate the transactions or movement of a product or a service along a value chain. The institutional environment comprises of the state, non-governmental agencies, or other supporting instances (Green and Haines 2008).

Institutionally, Twawose is negatively impacted by the lack of an appropriate enabling environment for dairy production in Tanzania in general. One of the smallholder milk producers associations, the Tanzania Milk Producers Association (TAMPRODA), was not in operation as of 2011, while the government seems unwilling to invest sufficiently in infrastructure and farmer empowerment. On the other hand, there are other institutions, like the Tanzania Dairy Board (TDB), Tanzania Milk Processors Association (TAMPA), and the Smallholder Dairy Development Program (SDDP) (Mpagalile, Ishengoma, and Gillah 2008) that can be tasked with providing neces-

sary assistance to Twawose. However, for small cooperatives, like Twawose, institutions like these are located far from Mgeta and can be challenging to connect with because of limited knowledge about the institution.

An important institutional constraint faced by Twawose is its limited access to information on issues that can benefit their business development. This includes everything from clean milk production; to processing equipment, transportation and storage of milk; to potential markets, product price, business strategies and advisory services; and other possibilities and solutions. This is despite relatively good mobile phone coverage and the presence of extension officers in the village. However, extension officers' knowledge on value-added products is relatively limited. SUA and the farmer association attempt to fill in the information gaps, with both acting as important sources for Twawose to overcome these informational challenges.

Financial Assets

Financial assets are economic resources. These are tangible or intangible assets that can be used to create value and include access to financial capital from external sources (Green and Haines 2008). Twawose's MCPC is already generating a profit, which was nearly a total of 180 USD at the end of 2010. Fifty percent of the profit is obliged to be reinvested into development of the value chain, with the remainder distributed to its milk suppliers. Early profitability of the enterprise is important both as a positive feedback on their operating routines and a means to increase the motivation for members to develop the business further.

Twawose has access to savings accounts through the local SACCOS (also an institutional asset), where the money is safely stored until the members collectively decide on the use of the cooperative's funds. In theory, the cooperative has the opportunity to borrow from SACCOS to invest in needed physical assets, using as collateral its production building and equipment. Normally, however, the loans provided from SACCOS are meant for farmers to buy seeds and other necessary farm inputs and not for 'larger-scale' business development like the MCPC. Moreover, the needed amount in loans to scale up production is greater than what can be provided by SACCOS.

External investment is currently not available. However, Twawose's network could in theory provide the necessary capital through research projects, directly from the university, or through individual or NGO support. In any case, accessing finance is not considered the biggest barrier to operations for Twawose.

Social and Human Assets

Social and human assets include human capital, which takes the form of skills and experiences such as leadership abilities, experience, education, labour skills, agricultural knowledge, and mindset. It also comprises of networks, capability, and norms that facilitate collective action and the ability to mobilize resources. Social and human capital can be considered assets that contribute to the development of other forms of capital (Green and Haines 2008).

Twawose is comprised of a group of 68 entrepreneurial minded members. The board mainly focuses on opportunities and solutions, and not barriers and problems. These, and the motivation

the organization has to succeed, are important reasons as to why yogurt production was realized in the first place. These characteristics are also important to overcome constraints and barriers in developing Twawose's value chain. This high motivation to succeed stems from the ownership the Twawose members have of the MCPC, and would probably not be the same if it was introduced and/or run by an external source. The fact that the foundation for the cooperative is the dairy goat farmers' association that was founded in 1988 has built a strong sense of community and cooperation. It has given them experience, both organizational and developmental, that has resulted in an ability to solve disputes and to move forward collectively. This reflects a strong base of social capital.

Twawose members do not have higher education. The highest education of any of the members is secondary school, but several members have received training on various relevant practices. Training has been given on goat husbandry, yogurt production, and an introductory seminar on cooperative structures, providing the organization with members who are knowledgeable in these subjects. At the same time, observations during market research and several interviews with the Twawose leadership revealed a lack of business skills such as marketing, cost and price setting, and other business development skills. Training in these subjects is needed, particularly in making strategic decisions concerning future investments.

Twawose has, as previously mentioned, a large network and collaboration with actors such as SUA, MVIWATA, extension officers, local NGOs like SACCOs, and UMADEP. According to an expert working closely with Twawose and other farmers groups, the large network outside the village is somewhat unusual and differentiates this cooperative from others in the region. A large network is highly valuable in making up for and/or enabling access to missing critical assets or resources (Casson and Wadson 2007). Nevertheless, being dependent on others that have limited time and resources can be discouraging. This is apparent in Twawose's case. Currently, they are in need of information about new markets and new equipment, but their network has not provided them with such information. If Twawose is going to develop and expand the dairy value chain further, they must use their network more deliberately and actively if desired changes are to be realized, rather than use it in a more passive manner as at present.

Culture and norms can also be considered social assets but can also complicate the development of new products. Interestingly, this value chain has overcome the cultural inertia against drinking goat milk. The villagers in Mgeta have developed a taste for goat milk despite the stronger and more characteristic smell compared to cow milk. However, other areas of Tanzania do not have a tradition of drinking goat milk, and this is especially true for towns that have limited access to goat milk. The lack of familiarity with and traditions for consuming goat milk may be a major drawback when introducing goat yogurt to new markets. Moreover, goat yogurt will compete with yogurt from cow milk that is now widely available in urban areas. This aspect will consequently be important to keep in mind when choosing new markets and corresponding marketing strategies.

Governance

Twawose is unique in the sense that it comprises a producer-driven chain (Kaplinsky and Morris 2001). Chains where producers drive coordination activities downstream to processors and re-

tailers are relatively uncommon in developing country agriculture. In Twawose's case, a cooperative structure facilitated this form of governance. The reason for choosing a cooperative form of organization was to facilitate participation of all the Twawose members in the value chain. According to Holloway et al. (2000) producer marketing cooperatives can effectively reduce transaction costs and thereby enhance market and value chain participation for farmers. Transaction costs in this context can be defined as "the pecuniary and non-pecuniary costs associated with arranging and carrying out an exchange of goods or services" (Holloway et al. 2000, 280). Examples of such costs can be searching for parties with whom to exchange goods and services, taking into account their trustworthiness and bargaining to reach an agreement, transferring the product (transportation, processing, packaging), and finally monitoring the agreement. Since raw milk is highly perishable, especially in tropical environments, there are increased risks when there are long distances to markets, implying higher transaction costs. The means by which the milk reaches consumers or is processed into less perishable forms influences how high these transaction costs might be (Delgado 1999; Staal, Delgado, and Nicholson 1996).

A dairy cooperative can reduce transaction costs facing individual producers by lowering unit collection costs through the pooling of goods, provision of inputs, and enhancement of bargaining power. Cooperatives are also beneficial from a processor perspective by making milk supplies more reliable. Buyers of dairy products can also experience lower transaction costs because cooperatives reduce the need for information about widely dispersed and small-scale sellers of milk (Staal, Delgado, and Nicholson 1996). To lower transaction costs, it is important to develop strong bonds among the actors of the chain through trust, reputation, and mutual dependence.

Twawose has the advantage of being organized as an association since 1988, which has created strong bonds and a history of working together towards a common goal. This has resulted in the opening of a pharmacy focusing on goat medicines, training and advice on goat husbandry among the members, and milk collection and yogurt production activities. Trust, reputation, and mutual dependence among the members have been built through the annual election of leadership posts. A fairly strong leadership with support from the members has further made it possible to develop the activities of the cooperative and attract new members every year.

While Twawose's cooperative structure has some important advantages in its value chain, a number of limitations mitigate the full potential of this model. In particular, challenges remain on both the supply and demand sides. First, Twawose sometimes accepts milk from producers that are not presently members of the cooperative on occasions when members cannot meet their production quotas or simply when such milk is available from producers outside the cooperative. To date, non-members are allowed to deliver milk if they intend to join Twawose, but demands for formal membership intention have not always been followed up. Second, agreements over revenue-sharing modalities have not been fully addressed. When founding the cooperative, the profit from the MCPC was agreed to be split evenly, with 50 % to the members supplying milk and 50 % to reinvestment in the MCPC. However, this was not implemented at the end of 2010. It is unclear why this was not implemented, but one reason could be that it was imposed by external experts and not fully understood or agreed upon among the cooperative members. By not following up on set cooperative agreements, such as profit sharing, the potential exists to discourage suppliers of milk and weaken the cooperative structure.

Third, despite the cooperative structure, an important finding of this research is that there are important differences in the perspectives of different actors in the cooperative concerning marketing behavior. In particular, farmers tend to have a more short-term focus regarding the sales of their milk whereas the MCPC considers longer-term sustainability issues, including reliability and the quality of milk supply. This dissonance in incentives often leads to higher transactions costs between suppliers and the MCPC and constrains expansion. For instance, some farmers tend to add water to the milk to increase their revenue, in contrast to the high quality standards set by the MCPC. In addition, farmers are sometimes induced to direct supplies to informal markets rather than to Twawose where average prices are 0.13 USD higher per liter than those offered by the MCPC. However, selling to the informal market also has its limitations. A farmer can never be sure whether he can sell all his milk due to lack of purchasing power among the farmers in Mgeta that are potential consumers. Moreover, informal sales are often made on credit, unlike sales made to the MCPC. This highlights how the cooperative structure of Twawose serves to ensure quality and steady marketed supplies.

The analysis suggests that an important need in the Twawose case is to better align incentives among stakeholders in the chain to better create and distribute added value in the milk chain. Given the types of assets present among Twawose participants, we reflect on the types of strategies that could be undertaken in the next section.

Upgrading Strategies

Based on the above findings and discussion about the assets and governance structures in Twawose's value chain, constraints and opportunities have been identified. Three types of improvements in upgrading are considered in this section: production and milk supply, processing, and marketing. We note that these types of strategies are not mutually exclusive, as there is an important dependence on strategies to simultaneously improve both the efficiency and quality of supply with greater stability and growth in demand.

Upgrading in Production and Milk Supply

Table 2 summarizes many of the key constraints and opportunities related to upgrading in production. Important constraints revolve around issues of seasonality, instability in production and demand, and limited incentives for production. In response to this, Twawose members are subject to supply restrictions, limited to produce up to a total of 25 liters combined to the MCPC each collection day. The restriction is imposed due to limited local market demand. Goat milk yogurt is only sold two days a week during market days.

Table 2. Constraints and Opportunities in the Production Node

	Key Constraints	Opportunities
Production (Collection/ Transporting)	Milk production low due to poor complementary feed High demand for dairy goats Natural high seasonality in production Unstable supply of milk Limited motivation to supply MCPC High percentage of milk sales to the informal market	Annual increase in dairy goats and farmers keeping dairy goats Underutilized supply of milk Pooling of collection and transportation of milk Increasing the scale of yogurt production

Source. Developed by Authors

Many Twawose members noted during interviews that the most important change that could be implemented in Twawose's value chain was to increase the number of days that goat milk is accepted at the MCPC. All respondents, from dairy goat owners to Twawose leaders and experts, were certain that the potential supply of milk available is much higher than the 25 liters that is allowed to be sold today. To address this, the total potential volume of goat milk present in the three villages (Nyandira, Tchenzema and Mwarazi) was calculated based on expert consultation with staff at SUA. These results are summarized in Table 3. We estimate that the available goat milk in the three villages is approximately 567 liters per day. If only current Twawose members supply the MCPC, the current available supply is still approximately 93 liters/day. This is a conservative estimate and does not take into account that five farmers alone currently supply the MCPC with 20 liters. This implies, in line with findings from the field interviews, that Twawose members maintain higher goat stocks with better management, resulting in higher milk yields than the average farmer.

Table 3. Estimation of Available Supply of Goat Milk in Mgeta

Assumptions	
Number of goats in the 3 villages	1538 goats
Number of female goats in the 3 villages	1186 goats
Farmers keeping dairy goats	382 farmers
Members of Twawose	63 farmers
Average number of goats per farmer	4.0 goats
Average female goats per farmer	3.10 goats
50 % are mature females	1.55 goats
80 % have milk	1.24 goats
Average of 2 liters milk per goat	2.48 liters/day
1 liter for home consumption	1.48 liters/day
Average daily milk surplus per farmer	1.48 liters/day
Supply of milk from Twawose members	93 liters/day
Total supply of milk in the 3 villages	566.8 Liters/day

Source. Developed by authors

The larger question is developing ways of bridging the gap between potential and realized supply, and then to link this to and exploit greater demand for goat milk. According to Riisgaard (2008), upgrading a value chain controlled by smallholders often requires stronger forms of coordination between all the links in the chain. Based on the examination of the governance structures in Twawose value chain, improved coordination is necessary. To increase the coordination between the suppliers and the MCPC to increase the supply of milk, there are several strategies that can be used:

Increased number of Twawose members: more Twawose members could be recruited to increase the number of farmers that can supply to the MCPC to deal with seasonal variations and to increase milk supplies if new markets are explored. It is preferable that these suppliers are members of the cooperative to ensure the quality of dairy goats and the milk generated from them. It is also an important means of developing trust between new members and the MCPC.

Further training in goat husbandry: This is important so that new members of Twawose, who have not received this training, can learn how to build sturdy goat houses, feed the goats optimal-

ly, treat them appropriately with medicines, and understand the importance of a clean milking environment. Training and coordination of impregnating the goats to deal with the seasonal variety in milk supply would be beneficial.

Formal contracting: Although it is difficult to legally bind farmers in contracts, contracts can be used to improve the communication between milk suppliers and the MCPC. A contract can express more formally the intentions of the MCPC to raise the volumes of the milk it accepts. Transaction costs will be lowered if producers have an assured market for their sales, reducing the incentives for farmers to sell to informal markets. This process can be enhanced further if the profit-sharing scheme between producers and the MCPC can be successfully established.

Increased price of milk: The current price of milk delivered to the MCPC is 0.49 USD, which is less than the local informal market price of 0.62 USD. Several dairy goat owners repeatedly expressed that this was the main reason for not supplying the MCPC. The Twawose leadership stated that the MCPC price was decided upon together with all members of Twawose during the annual meeting at the beginning of 2010. At that time, however, the idea had been to implement the profit-sharing program, which was not realized in 2010 (without cost savings). In order to raise the price of milk to levels closer to those prevailing in the informal market, Twawose would need to attract more milk suppliers and rely on the economies of scale generated by greater numbers of producers.

Increased number of production days for yogurt: This would result in a more secure market for goat milk suppliers and would lower transaction costs.

Establishment of small collection centers: The long distances between farmers and the MCPC still keep transaction costs high. The pooling of milk collection by starting up a mini collection centers and organize transport activities has the potential to mitigate transaction costs for farmers by reducing time spent on sales due to long distances to market and limited access to information regarding demand and prices. During interviews, both suppliers and the Twawose leadership expressed a desire to establish small collection centers in Tchenzema and Mwarazi, something that was supported by experts, such as Kurwijila (2011). This would lower the delivery time for farmers since only one dairy goat owner would deliver the bulked milk. Small collection centers would also lower the chance of farmers selling the milk to informal channels instead of complying with the agreement of supplying the MCPC. To realize the establishment of a small collection center, one would require a place to collect the milk, a quality assurance manager, and a delivery system for the bulked milk. Reactions to this prospect were mixed, however. In Mwarazi, for instance, dairy goat owners do not trust each other when it comes to the quality of the milk. Testing for quality in each village requires that a farmer might have to refuse milk from their neighbors. An independent third-party, possibly from SUA or a trained extension agent, may be required to facilitate this option.

While it is clear that the supply base for larger volumes of goat milk exist, other parts of the value chain need to be considered in parallel. We next focus on ways to improve processing and link the potential supply with activities that will expand consumer demand too.

Upgrading in Processing

Table 4 provides an overview of constraints and opportunities related to upgrading in processing. The main challenges relate to available technology and infrastructure, though opportunities exist to increase both the amount of milk processed and number of days processing takes place. In 2010, the total amount of milk processed by the MCPC was 2128 liters of goat milk. The goal for 2011, according to the Twawose leadership, was to collect and process 3000 liters of goat milk, an increase of 29%. This intended increase is modest given the potential supply in the market, implying a daily increase of 10 liters per day (from an average of 20 liters per day to 30 liters per day). Technically, Twawose would need to increase its processing capacity utilization by 200-300 liters, which would be easily possible given its capacity utilization of just 22% in 2011.

Table 4. Constraints and Opportunities in the Processing Node

	Key Constraints	Opportunities
Processing	Variable yogurt quality Limited access to new yogurt culture Lack of satisfactory packaging No electricity No cooling mechanisms Limited investment	Increase processed milk volumes Increase processing days Utilization of large network to overcome constraints

Source. Developed by Authors

The most cost-effective approach to this would likely be through the bulking of milk, meaning that they should increase the amount processed at any given time, but continue to process only two days a week. Expert consultation and the Twawose management remarked that approximately 30 additional liters of milk can be processed per day before considerable investments in new equipment are needed. This means that farmers could deliver every day to the mini collection center, once in operation, or directly to the MCPC. On the days when the milk is not processed, it would be kept cool for production the next day since production will only take place every other day or even two times a week. This would require expert management to ensure links between suppliers and buyers were adequately established and to ensure that the milk quality is maintained.

Further expansion will require additional investments on the supply side. A strict focus on quality is crucial when entering new competitive markets. One important factor is to secure access to new culture that is needed to produce yogurt from milk. At present, the MCPC uses the previous day's yogurt as the culture, but this is risky, as if one batch is contaminated, culture for the following day would be unavailable. Access to new culture can be secured through their network, for example through the milk processing plant at SUA.

Improved cooling systems are essential to keep a high quality product, particularly if Twawose embarks on strategies to sell to more distant markets or to bulk milk for processing the following day. An established cold chain increases the shelf life of yogurt from two days to 5-7 days, which would make new markets possible. A cold chain would require the acquisition of either a refrigerator or freezer, both of which would be a fairly large investment and depend on access to electricity which is problematic. The two means of accessing electricity are generators or solar power. While a few smallholders and small businesses use generators in Mgeta, the use of gener-

ators is expensive and would increase the price of yogurt considerably. The generator used by the guest house near the MCPC, for example, uses 2 liters of fuel per hour, and one liter of fuel costs approximately 1.25 USD. Running a generator all day long to keep a refrigerator cold would be prohibitively expensive for the MCPC. On the other hand, solar power can be a good option considering it already exists in the village and can potentially be acquired through Twawose's network.

Another major bottleneck in further developing Twawose's value chain is the poor packaging used at present. Today, Twawose uses old water bottles when selling the yogurt and collects them for reuse the same day unless the customer pays for the bottle (0.06 USD). Interviews in May 2010 revealed that Twawose leaders did not know the availability of plastic sachets, their cost, or that a packaging machine needed to seal the sachets requires electricity. While plastic sachets would increase the price per liter of yogurt by approximately 0.06 USD⁴ to 1.05 USD/liter, they represent a better option than other forms of packaging. Their use would require overcoming obstacles concerning electricity and infrastructure, however.

A final challenge concerns transportation. In Tanzania, transportation is expensive and might drive the price of yogurt to uncompetitive levels, especially if we considered the cost of improved packaging as well. One transportation option is to use the public *dala dala* (the local privately-operated bus service). This option would add about 3.69 USD to the costs per time milk is transported and 45 liters would have to be transported at a time to breakeven at today's supply and selling price, which would necessitate a relatively large increase in production relative to current levels. Another option is to organize transport independently. Because of the distance and that the area is mountainous, a bicycle is not feasible, requiring the use of either a motorbike or car. Either option is too costly at present considering the small amount of yogurt produced. The third transportation or distribution option is inspired by the Danone Grameen joint venture in Bangladesh. In this case, yogurt is produced locally and predominantly uses door-to-door distribution by local women that are trained in sales and delivery of a nutritional message. The women buy the yogurt using micro-credit and receive a commission for each packet of yogurt they sell (Yunus, Moingeon, and Lehmann-Ortega 2010). This option would not influence the price substantially because a middle-man, either in form of a retailer, mobile trader, or a salary to a Twawose member, would be used as well if using other modes of transportation and distribution. A 0.06 USD commission per liter is reasonable according to interviewed respondents. The breakeven for this scenario is 17 liters sold, which is less than current production, but would benefit from greater scale of production over time. Whether it is best to use public transportation or Twawose members to sell the yogurt on commission depends on the nature of the additional market that is targeted.

Upgrading in Marketing

Table 5 summarizes Twawose's various market options and many of the constraints and opportunities related to each market. We distinguish between local and urban markets, where numerous new venues exist, but limited market information constrains expansion at present.

⁴ Electricity is not included in the calculation.

Table 5. Constraints and Opportunities in the Market Node

Markets	Opportunities	Key Constraints
<i>Local market (Mgeta)</i>		
Current local market	Sales outlet at MCPC Two “bigger” restaurants Increase marketing	Limited local purchasing power Limited marketing skills Increase in price due to added profit margin
Neighboring villages	Sales by members of cooperative Sales on commission Local restaurants	Lack of adequate packaging Lack of cold chain Increase in price due to added profit margin Limited local purchasing power Limiting marketing skills Unknown market demand
Institutions	School milk program Orphanage Make use of network to acquire financial support	Lack of existing school milk program Need for external financial support Challenging to meet constant and larger supply demand
<i>Urban market (Morogoro)</i>		
Restaurants	University cafeterias Local restaurants Demand for local dairy products	Long distance to market Lack of cold chain Little experience in producing specific and larger amount at constant high quality Competition from other dairy products
Mobile traders	Town market and surrounding areas Differentiation strategy Premium price	Long distance to market Lack of adequate packaging Limited marketing skills Limited ability to meet large demands Competition from other dairy products Unknown market demand
Institutions	School milk programs Orphanages High demand Networking to acquire financial support	Long distance to market Lack of cold chain In need of external financial support Little experience in producing specific and larger amount at constant high quality
Supermarket	Two supermarkets Differentiation strategy Premium price	Long distance to market Lack of cold chain No adequate packaging Little experience in producing specific and larger amount at constant high quality Competition from other dairy products Unknown market demand
Milk bar	Morogoro town Differentiation strategy Premium price	Long distance to market Lack of cold chain Financial investment needed High rent Limited ability to produce and meet large demands Limited marketing skills Competition from other dairy products Unknown market demand

Source. Developed by Authors

The market research revealed that there is potential to sell more goat milk yogurt (approximately 10 liters) if the yogurt is marketed more intensively during the market days. Some yogurt can also be sold on other days during the week directly from the processing building to people living

in Nyandira. Several current customers expressed that they would buy goat milk yogurt every day if it was available at the current price. Increasing the price in the local market is not an option due to limited purchasing power. The local restaurant market has not been exploited yet, and introducing yogurt as a new product in these locations may be an option because of the limited choices of food and drinks locally. Brief interviews were conducted with the owners of the larger restaurants in Nyandira village, and there was positive feedback about this prospect. A second option is to serve milk or yogurt to school children, but that would depend on external funding since Tanzania has no official school milk program. Serving children in Grade 1-3 at the nearby primary school would require 80 liters of yogurt per day, or about 25 liters over three days, which is achievable. Seasonal supply of milk and unsteady supply of yogurt remains a challenge if entering this market. But local markets might be more understandable if orders are not met compared to more formal urban markets.

A small amount of yogurt can be transported back to Tchenzema and sold to, among others, the dairy goat owners that supply the milk. Another possibility is to introduce the yogurt (approximately 35 liters) in nearby local villages that are not part of the cooperative, such as Langali and Mlali (recall Figure 1). Selling directly to consumers at these markets requires packaging and preferably plastic sachets. Selling to local restaurants would save both packaging and the time spent selling in local markets. By using cool boxes, it would be possible to transport the yogurt to nearby villages, but it would have to be sold on the same or the following day to avoid poor quality. In Nyandira, and neighboring villages, the main source of income is agriculture, resulting in a highly seasonal purchasing power. An interesting finding during the field visits is that people preferred to drink milk and yogurt when the weather is hot as refreshment. To avoid the high level of seasonality of consumption in Mgeta, one solution would be to introduce the yogurt in the nearest town, Morogoro. This would also bring economic value from outside Nyandira and will allow money to be circulated beyond the local market.

In Morogoro, goat milk yogurt could be sold to cafeterias at the two local universities, SUA and Mzumbe, at smaller local restaurants, and/or to the two supermarkets. Selling to the supermarkets would require improved packaging, but when selling to cafeterias, packaging is not necessarily required because they can sell by the glass. Several restaurants visited during the informal market research followed this practice. Twawose can sell yogurt in larger 3-5 liter plastic cans if selling to such markets. However, cooling the yogurt before transporting it to Morogoro is necessary to ensure quality. Also, the seasonal supply of milk and unsteady supply of yoghurt will make entering this market a challenge. On the other hand, Twawose could use the seasonality of production to its advantage by marketing its product as a seasonal or “limited time” product, generating a buzz about specific times when “best” to consume yogurt.

Other market possibilities are schools and orphanages, and to open a milk bar in Morogoro (a shop that sells ‘home-made’ dairy products). In the latter case, it should be noted that there has been an upsurge in the number of milk bars in urban areas in Tanzania (Ashimogo and Greenhalgh 2007). The market research in this study only revealed two milk bars in Morogoro and none of them sold goat milk. A milk bar usually only sells home-made dairy products, but could also supplement their sales with other products that a customer would find convenient to buy at the same time. A milk bar would make the distribution channels easier because the supplier (Twawose) would not have to deal with different buyers that are dependent on getting the milk

and yogurt at specific times. Additionally, targeting milk bars would minimize new packaging costs because it is common for milk bars to sell yogurt by the glass. Still, offering packaged yogurt in addition to selling by the glass would be a good diversification strategy for sales to consumers purchasing for home consumption. Twawose intended to run a milk bar in Morogoro and started the process in 2010, but stopped such plans when they realized the expense and difficulties in obtaining packaging materials. However, as throughput increases, this could be an option to examine in the future if a consistent supply of milk and yoghurt can be achieved.

A major challenge in the urban market is competition that the cooperative does not face locally. Urban consumers are not used to drinking goat milk, and cow milk is widely available at cheaper prices. Cow yogurt is not widely available and prices are higher. At the same time, some consumers might choose goat milk products over cow's milk products. Many people believe that goat milk is easier on digestion than cow's milk, and some of those in urban areas have a fondness for goat milk from their childhood in rural areas. Some studies indicate that goat milk can be tolerated by those that are lactose intolerant, especially children, but no comprehensive studies have been conducted yet (Haenlein 2004). This can create a competitive advantage for goat milk products, especially if additional research focusing on African countries is conducted. Due to this advantage and limited supplies, a higher price of goat milk products could be justified in the urban market. Many challenges would need to be overcome to enter the urban Morogoro market, such as coordinating milk and yogurt supply, creating a cold chain, and improved packaging. A good marketing strategy is also necessary.

Scaling Up: Upgrading and/or Replication of Value Chain

The analysis has revealed that there is potential for significantly increasing the supply of goat milk and identified possible strategies for utilizing this potential. If farmers can supply the MCPC nearly every day, the amount of milk processed would increase, allowing more farmers to supply milk and other actors (such as vendors) to profitably enter the value chain. These strategies are incumbent upon new markets for yogurt. Due to a lack of electricity and limited experience with meeting non-local demand, it is advisable to focus on the local market initially. When a more stable yogurt production chain is established, and obstacles concerning electricity and packaging are better managed, the urban market can be targeted. This should be preceded by more thorough market research and marketing strategies that educate consumers on the nutritional advantages of goat milk.

As noted earlier, the different upgrading strategies suggested here are not mutually exclusive, and necessitate some degree of integration. The expansion of supply from Twawose necessitates an integrated package of interventions that raise production and processing throughput, while simultaneously expanding the market for goat yogurt products. Focusing purely on production without looking at interventions downstream will not be successful. While our research highlights the portfolio of potential options, we have not thoroughly addressed which basket of options would be the most cost-effective. Further quantitative techniques, such as those proposed by Rich et al. (2011), would be a worthwhile exercise to examine these issues in the future. Many of the strategies discussed require large resources, both in terms of capital and knowledge. Twawose has limited access to both these resources and upgrading the chain might prove to be a challenge that is difficult to overcome.

Replicating the existing value chain in other areas is also an option for development. This can be achieved by franchising the Twawose value chain or by establishing independent new value chains in other areas of Tanzania. Franchising would benefit from Twawose's experience, knowledge, and up-in-coming brand, as well as training from the farmers in yogurt production. This would require a large amount of resources, and for a small cooperative like Twawose this is unlikely to occur in the short-run. It would also create an internal competition in a limited market. Replicating the value chain elsewhere in its current or a modified form could be possible with support from SUA, or non-governmental organizations for instance. This requires a large amount of dairy goats in close proximity and would also be relatively capital intensive. But if facilitated by an external institution, it would increase the number of smallholder farmers that can benefit from this new type of local dairy value chain. Already, the value chain has been replicated in the Hanang district in Northern Tanzania, where the research base for the SUA goat project is located. In this area, one larger farm processes yogurt and sells it to the children's department and cantina at the local Haydom Lutheran Hospital.

Distributional Benefits of Twawose's Value Chain

Goat milk increases by about 50% in value when processed into yogurt. The value is distributed along the chain. In 2010 about 42 %⁵ of the value of yogurt went to the milk suppliers and 37 % remains in the processing link, when including costs of production. The remaining 21% are used for purchased inputs (Lie 2011).

Suppliers of goat milk in Twawose's value chain are supposed to receive additional income when profit is distributed at the end of the year. However, during interviews with board members and several suppliers, it was clear that this profit sharing arrangement was not implemented at the end of 2010. Based on the profit from 2010, 180 USD, and the intention that 50% of the profit will be distributed to the farmers, we estimate that a farm supplying Twawose with five liters of milk two times a week would receive an end-of-the-year bonus of 10.6 USD. This can be a motivational factor for supplying to the MCPC instead of the local informal market -indeed, if the profit bonus is included, the farmer would have received only 0.02 USD less per liter compared to the informal market.

Twawose further provides employment benefits within its value chain. Twenty-nine percent of the Twawose's 2010 financial costs are paid as an allowance to MCPC workers and to board members when they have official meetings. Those Twawose members that serve as a processor for a three-month period also receive a combined monthly allowance of 31 USD. This is a good salary for working four short days a week (two processing days and two sales days), considering that 17.5 USD⁶ is the mean monthly income per capita across all household members in rural Tanzania, and that rural wages are considerably lower than the urban minimum wage of about 50 USD (HBS 2007).

Many farmers in Mgeta are subsistence farmers. To these households, a constant source of petty cash income is very important, especially since the small amount of farming products they are able to sell are seasonal. Interviewed dairy goat owners stated that their goat milk earnings

⁵ The calculation has not included workload.

⁶ The mean monthly income per household in rural Tanzania is 74.6 USD (HBS 2007).

enabled them to pay for their children's school fees, substantiating past studies conducted by UMADEP (2001) that found that 80% of dairy goat keepers in Mgeta use their earnings from dairy goats to pay school fees for their children. One dairy goat owner noted that he was even able to send his children to a better school in the city. In addition, some were able to improve their houses.

The MCPC also benefits other actors in the value chain besides dairy goat farmers. The MCPC depends on local purchases of sugar, old water bottles, plastic cups, pots, and other small equipment. This represents valuable income for local retailers. Literature suggests that each dollar of additional value added in agriculture in Africa generates \$0.3-\$0.5 of additional rural non-farm income (Omore et al. 2004).

A third way of looking at value creation is in a non-monetary way. Knowledge of yogurt processing and quality control provides smallholders with an increased skill base. Milk contributes to reducing food insecurity and improving the household nutritional value according to studies conducted by Eik et al. (2008). The presence of an MCPC can increase the motivation of farmers to produce milk and may result in more dairy goats in surrounding areas, and more people having access to the nutritional benefits of milk. If a replication model is chosen, additional communities will enjoy the benefits of this local dairy value chain.

Conclusions

In this paper, we assessed the potential of local dairy value chains as an approach for smallholder farmers to improve their livelihood. The Twawose's semi-formal dairy value is based on the successful introduction of Norwegian dairy goats in Mgeta, Tanzania. The most important questions in the Twawose case study is whether the establishment of Twawose's local dairy value chain has contributed to and has the potential to further improve smallholder livelihoods. To answer these questions, we have studied how Twawose's value chain was established, how it is maintained, what challenges are faced in the continued development of the chain, as well as possible upgrading strategies. The major challenges to further develop Twawose's value chain include the following:

- Unstable milk supply;
- Limited local market demand;
- The lack of adequate quality assurance and packaging;
- Limited access to cooling systems, given sporadic to no access to electricity;
- Limited access to information, particularly on new marketing opportunities.

By producing yogurt, considerable value is added to goat milk. In a locally controlled value-chain such as Twawose, the value accrues to farmers since the chain is controlled by the farmers themselves through a cooperative. The production of goat milk yogurt has increased the market for dairy goat milk in general, but currently the marketed volumes are not large enough to involve all dairy goat owners in Mgeta or all Twawose members. There is therefore the potential to generate benefits for even more dairy goat owners, and other actors indirectly involved in the chain, by scaling up production.

Our research tentatively suggests an initial focus on the local market, with more aggressive marketing of the product in local villages. This would require an expansion of milk and yogurt production, establishment of a mini collection center, and development of new distribution channels. A good strategy would be targeting the local primary schools with external financial support to start up a school yogurt program. This will provide a constant market, and provide valuable experience in processing a fixed amount of high quality yogurt at set delivery times, without large infrastructural challenges and the need to incur high costs in new or expensive technology. It also leads to improved nutrition for children in the local community.

Increased production of goat milk yogurt would result in additional income for a number of dairy goat owners, but will depend on its marketability too. Based on the prospects of supplying more goat milk to the MCPC, more farmers in Mgeta might decide to acquire dairy goats. This is of value in itself, because new households will have easier access to nutritional goat milk for their own families and have the potential to realize increased income through local sales of goat milk. Additional supplies of goat milk for processing into yogurt will also result in increased processing throughput, which would lower unit costs and improve the competitiveness of goat milk products. Increased yogurt production might also lead to the hiring of a MCPC manager, which is another valuable local job created. The ancillary services created by value chain expansion could create a host of downstream opportunities in input supply, packaging, and transport as well. This case demonstrates the broader, village-level benefits of increased knowledge in goat husbandry, increased milk processing, marketing, and business knowledge skills in a range of activities and services within the value chain.

The focus of this case study has been to reveal what factors have been crucial in creating and maintaining this value chain. The existing asset base that has been built over the past several years has been important for Twawose. The participatory farmer-led cooperative mode of organization and the cooperative governance structure in the value chain is crucial for the distribution of value and local development of the chain. All profit that is generated throughout the chain accrues the farmers themselves. At the same time, constraints such as poor infrastructure and limited access to information and services that are common in rural areas are present in this case study.

The Twawose case shows that by pooling the resources of individual farmers and with support from a network of universities, organizations and extension officers, it is possible for smallholders themselves to establish and run a semi-formal local dairy value chain. The nearby university, SUA, played an important role in enhancing farmer assets by introducing dairy goats and creating new opportunities for adding value to goat milk. Public-private coordination like this is crucial for developing a new and fairly simple value chain for smallholders, but its sustainability depends on long-term commitment. In this case, the focus of Twawose has been on supply-side interventions, with less attention paid to marketing strategies necessary to expand markets. Developing integrated interventions that simultaneously improve producer incentives for supply while opening up potential markets and marketing channels, will be critical for this case to be sustained in the future.

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