

Discussion paper

# Milking to potential

Strategic framework for dairy sector development in emerging economies

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## Abstract

In emerging economies population growth occurs together with an increase in income per capita. In many of these economies dairy sector development is recognized as a crucial element to underpin the ongoing growth process. This paper provides an approach to achieve dairy sector development.

The central framework of this approach consists of five steps. The first step is to organize stakeholders who are motivated to build a dairy sector development strategy. The second step is to make an analysis of (a) the present situation of the broader context around the sector, (b) the dairy chain and (c) farming systems. This analysis is the base for the diagnosis in the third step that results in opportunities and constraints for sector development. The fourth step for the stakeholders involved is to choose goals. The final step is to identify interventions to achieve these objectives.

When working from constraints and opportunities towards goals and interventions, the stakeholders will have to deal with many dilemmas experienced in dairy development. These dilemmas are discussed in this paper, together with some lessons learned during the implementation of development activities in the past. The major dilemmas have to do with markets, sizes of farms and dairy plants, dairy farm management, cooperatives, milk quality, and training of skills and entrepreneurship.

The Centre for Development Innovation (CDI) and Wageningen UR Livestock Research are part of Wageningen University & Research centre. They both have an extensive international track record on issues such as animal production, dairy farm management, food and nutrition security, and sustainable farming systems and markets. In our experience, only an integrated approach leads to sustainable change. Our staff have a unique combination of substantive knowledge, an international network and excellent process management qualities.

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## 1. Introduction

Population growth, economic growth, and food security are challenging dairy sectors all over the world. How can dairy sectors develop to meet the domestic and global demand for milk? There is no clear-cut answer to this question. The development pathway depends on the local context. This is why this document attempts to give a more profound conceptual framework for analysis of the dynamics in national dairy sectors. Based on this analysis, stakeholders will be able to discover constraints and opportunities that will lead them towards useful interventions for further development of the dairy sector. It may help them to create a shared language, shared objectives and a shared strategy. This paper is made on request of the Directorate General Agro of the Ministry of Economic Affairs, in order to improve

### Box 1. Key characteristics commercial dairy farming

- Food security for the urban population.
- Milk is produced on a daily basis and will only keep for a few days. The milking process, transportation and storage require strict and comprehensive quality regulations that are much more far-reaching than in other agricultural sectors.
- In many countries production and consumption of liquid milk and dairy products have a long tradition; however, in East and Southeast Asia dairy consumption traditionally was low and is a rather new phenomenon.
- The vast majority of the dairy farmers are small-scale producers with a weak and vulnerable position in the market. They strongly depend on milk processors or traders that buy and haul their raw milk. In many countries this position has led to the establishment of cooperatives that transport and process raw milk and sell dairy products to the retail sector. In many developing countries dairy cooperatives also provide additional services for farmers, like feed supply and veterinary services.
- Dairy cows depend on fodder for the production of milk and their health. Land is required to produce quality fodder. In many developing countries land availability for fodder production is a major limiting factor to increase milk production.
- The productivity of local cattle and land in many tropical areas (like Africa) is low compared to Europe, North America and Oceania.
- Due to the dependency on land and fodder, the high fixed costs per cow, and the labour intensive character of milk production, dairy farmers are able to adjust to market changes in a gradual way only. Growth percentages of over 5% are rare. Breeding extra milking cows from the own herd takes three years before extra milk production can be realized.
- Many people can only afford to become (urban) consumers once their income reaches a certain level. Growth of dairy consumption hence is correlated with the growth of the middle class.

*Adjusted from Schelhaas (1999)*

understanding of approaches that are effective for dairy sector development and will contribute to food security and local economic development in emerging economies and developing countries.

### 1.1. Aim of this paper

The purpose of this paper is to support the development of integrated strategies for the dairy sector in emerging economies and developing countries. The dairy sector is defined as the combination of the farming systems and the dairy chains of which the dairy farms are part. "Integrated" means that the strategies take into account the influences that socio-political, economic and biophysical circumstances have on farming systems and dairy chains. "Integrated" also stands for involving regional stakeholders in a stakeholder process that will lead to the desired objectives. When setting objectives, we assume that regional objectives come first. The main result of the development plan are interventions that are developed and supported by stakeholders and that align with the regional objectives. Our way to support dairy strategy development is to provide a framework - presented in this paper - that will enable and support the private sector, non-governmental organizations (NGOs) and governments to improve their interventions in dairy sector development in countries around the world.

The main regional dairy development goals for stakeholders in developing countries and emerging economies are related to objectives like food security, food safety, alleviation of poverty, self-sufficiency, and farm income. The framework and the experiences with dairy sector development offered in this paper, support the process of achieving these goals. The framework and the process itself are however independent from the objectives the users are aiming at. This makes them useful for all individuals and collectives who will work on dairy sector development in the countries mentioned.

The main target audiences for this paper are international and Dutch stakeholders involved in dairy sector development in emerging economies and developing countries. These stakeholders include policymakers of the Dutch Ministries of Economic Affairs and Foreign Affairs (including staff of embassies), international private companies, consultants, NGOs, and knowledge institutes. The framework presented in this paper is first of all meant for stimulating the dialogue about the way Dutch stakeholders approach dairy development in these countries. This dialogue is organized by the Dutch Ministry of Economic Affairs as part of the government policy to better connect development aid, trade and investments.

## 1.2. Background

The increasing global attention on food security and food safety and the growing demand for dairy products has led to a significant increase in Dutch public and private involvement in dairy activities in Africa and Asia since the early 2000s. Increasing activities by international food and retail companies and new government programs for dairy sectors create new opportunities for many stakeholders. This increased interest in the dairy sector and the experiences with developing dairy sectors have led to a call for reflection on the approaches used by Dutch actors who have been involved in local dairy sector development. In this process of sector development, collaboration with local as well as global players becomes increasingly important in responding to regional needs: national governments can focus on higher milk production; local producers can increase local milk production; and Western companies can increase dairy exports.

The three global trends that strongly affect dairy sector development in almost all emerging economies and developing countries are:

1. Population growth, urbanization and growth in income resulting in a higher demand for animal protein, better and more diversified quality products and more supermarkets with packed and cooled products supplied by formal chains.
2. Globalization of markets by of economic free trade agreements and liberalization of world trade means that local production has to compete with imported products.
3. The role of the private sector in dairy sector development is increasing and direct government involvement is decreasing.

These trends lead to different opportunities in different countries. The key to successful dairy sector development is first to observe in detail what country-

specific context factors have to be taken into account when analysing the present state of the sector. The emerging economies and developing countries we focus on in this report are mainly countries in Asia and Africa. Appendix 1 lists key figures for milk production in these countries. The development of dairy production in Latin American countries is not covered in this report, but the approach suggested here may also be used in countries in that region.

The dairy sector in most countries is complex, so clear-cut strategies and interventions cannot be easily identified. No single strategy framework can be designed that fits the dairy sector in every country. Similarities between countries do exist, especially between countries that are following similar sector development pathways, but the complexity of dairy sectors requires a tailor-made approach. Rather than focusing on blueprints or recipes, this paper advocates adherence to a proper process, making use of cross-case learning where appropriate. The paper uses a range of examples in describing the process, examples of past and present experiences in sector development.

## 1.3. Conceptual framework

Due to the complexity of dairy production and marketing systems, a deliberate process of analysis and strategizing is required. This process is illustrated in the conceptual framework in Figure 1 and has five steps:

1. **Organizing stakeholders** – The local dairy sector actors are key throughout the entire process and need to be organized into a commonly acceptable format.
2. **Analysis** – The dairy sector can be analysed by looking at the farming systems and the dairy chain(s) in their context. A proper analysis pays attention to the economic, biophysical and socio-political factors that have shaped the dairy sector in the past and present.

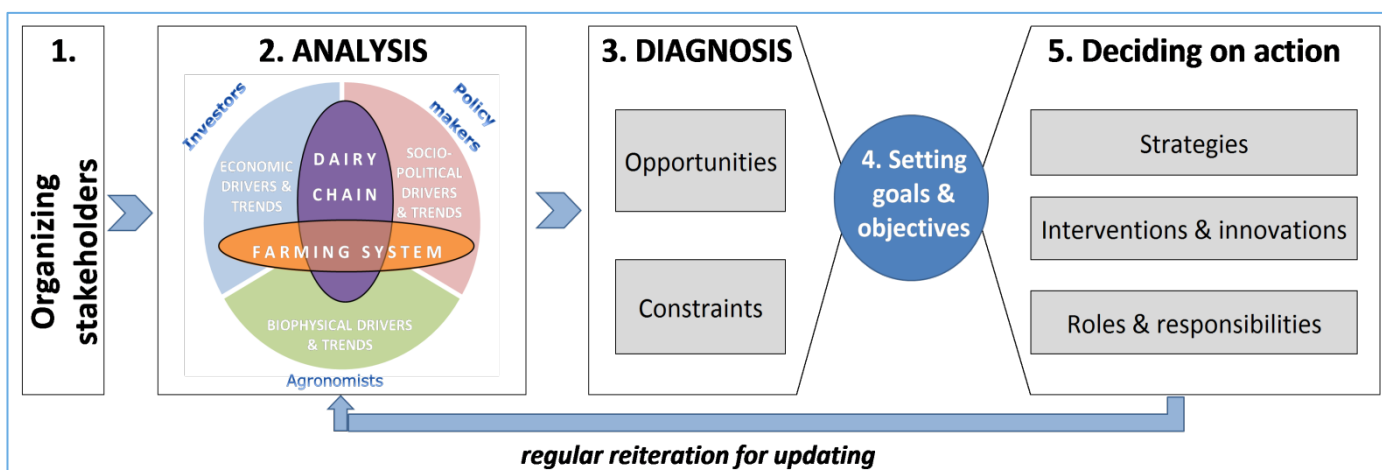


Figure 1. Conceptual framework for dairy sector strategy development

Some prominent questions include:

- What are the influences of the economic, biophysical and socio-political contexts on the evolving dairy sector?
- What is the present situation and what development of the dairy chain and the farming systems is expected?
- Which trends and drivers can be observed in the interaction between farming systems, the dairy chain and the broader context?

**3. Diagnosis** – The next step in the development of a strategy for committed stakeholders pays due attention to prioritizing constraints and opportunities. Key question:

- What are the key constraints and opportunities for further development that can be derived from trends and drivers?

**4. Goal and objective setting** – Goal setting can be particularly arduous, as different stakeholders can have very different ideas about the goals and objectives to pursue. Some prominent questions include:

- What are the key goals for the dairy sector according to different stakeholders?
- What common goals and objectives can be pursued?

**5. Decisions for action** – In this last step actors need to agree on intervention strategies interventions, and the roles and responsibilities regarding the implementation of these. Some prominent questions:

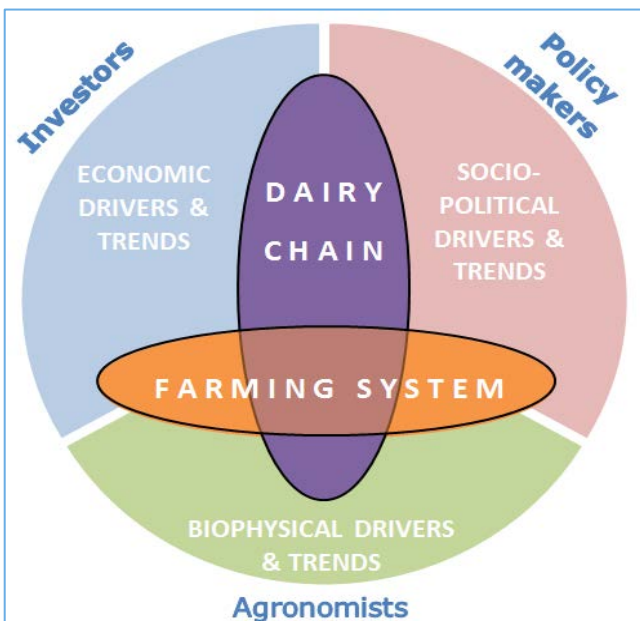


Figure 2. Dairy production and marketing are operating in a dynamic context of economic, biophysical and socio-political drivers and trends (Van der Lee, 2014)

- What strategies and interventions can help capture the opportunities and alleviate key constraints?
- What innovation areas may require specific attention?
- Which actors have what kinds of roles to play and how can they cooperate?

#### 1.4. Reading guide

This paragraph describes the content of the different chapters in this paper. After an overview of the dairy sector in chapter 2, the analysis of the present situation in its broader context is described in Chapters 3 and 4. The basic model for analysis of this present situation is presented in Figure 2. The diagnosis based on this analysis is presented in Chapter 5. The design of the dairy sector development plan is described in Chapter 7. Between the diagnoses in Chapter 5 and the definition of a development strategy in Chapter 7, we present in Chapter 6 a series of typical dairy sector issues that many stakeholders will have to deal with. Chapter 8 concludes the main body of this paper, which is then followed by key dairy sector data in appendix 1 and country examples in appendix 2.

## 2. Overview of the dairy sector, its context, and stakeholders

Every dairy sector is part of a broader economy. Its opportunities for further development depend not only on the characteristics of the farming systems and on supply and demand for dairy products, but also on the broader context. Figure 2 presents this broader context around the dairy sector, showing three partly overlapping context factors: the economic, the biophysical and the socio-political. The dairy sector itself is the combination of a variety of farming systems that are connected to a variety of dairy chains. The figure as a whole portrays the interactions between the five mentioned elements. The next two chapters elaborate on these: Chapter 3 details the three broader context elements, and Chapter 4 details the dairy chains and farming systems. Since this report describes development processes, the description focuses on the dynamics within each of three context elements.

In this paper, “dairy sector” is defined as all the actors and activities in a country that are involved in producing and marketing milk through a variety of dairy chains,

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both informal and formal, licensed<sup>1</sup> chains. Along with dairy farmers<sup>2</sup> and their organizations, actors include all dairy chain actors such as input suppliers, processors, retailers and consumers, as well as service providers, research, vocational training and education providers, quality assurance institutes, sector associations, policy makers and law enforcers.

All these actors can be considered to be stakeholders in dairy sector development. They may have diverging perspectives on the direction sector development has to take and how to get there. Typical perspectives in the approach in this paper include the perspectives of investors, policymakers and agronomists. The investor traditionally focuses on economic drivers and trends; the policymaker is traditionally closely connected to the socio-political context; and the agronomist specializes in the biophysical context. These extreme perspectives are added in Figure 2 to explain the context elements more in detail. When designing dairy development plans, the entire context shown in Figure 2 needs to be taken into account. Many of the professionals involved in the stakeholder process will be able to use all the three perspectives portrayed in Figure 2.

### 3. Analysis: broader context dynamics

This chapter describes the main context drivers and trends that underlie the dynamics in the dairy sector. These are illustrated with key indicators to characterize the context. Some of these context drivers and trends are global, some are regional or national, and some are strictly tied to the local situation. Therefore, the geographic dimension of a dairy sector development plan is important; every context analysis should be tied closely to the region considered.

#### 3.1. Economic context – markets and business climate

Key economic drivers and trends and key indicators for the development of the dairy sector include economic

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<sup>1</sup> Definitions of formal and informal markets, as used in this paper (Anwarul Hague, 2009):

**Informal market** - Markets near to producer locations where producers directly or through traders collecting milk from farmers' homesteads sell milk to consumers or middlemen suppliers of sweetmeat shops, bakeries or against other trading contracts.

**Formal market** - The guaranteed market for smallholder milk producers in which regular processed milk and milk dairy products supply consumers, including institutional buyers such as hotels, restaurants, airline kitchens, superstores, etc.

Data from other sources may use alternative definitions for formal and informal markets.

<sup>2</sup> "Farmers" includes women, men and youth that are working on dairy farms.

factors that influence the attractiveness for investments in dairy:

- **Population growth, income growth and urbanization:** These three major factors for dairy consumption occur together in many emerging economies. In these countries this leads to a strong increase in purchasing power for dairy products. The increase in consumption in China and South-East Asia is an illustration of this phenomenon. But the same trend is – on a lower level – visible in Nigeria and Kenya. All three factors are also driving forces for the development of longer food chains in which transport, food processing, and marketing become important elements. In developing countries the two main factors are population growth and urbanization, income growth is less dominant. Supplying more people with basic dairy products is here the challenge.
  - **The development of retail chains:** Urbanization and income growth are also driving forces for the development of retail chains, including the logistics and sale of cooled and more diversified dairy products. These chains are a pull factor for the growth and continuity of dairy processors, because they require large volumes and constant quality delivery. They offer guarantees for the processor to invest in further development of relations with suppliers and marketing.
  - **Favourable business climate for dairy sector development:** A high growth rate of the economy combined with liberal market policies attracts foreign and local investors to import and market milk powder and other dairy products. Further development of dairy consumer markets may be an important catalyst for domestic dairy development. In most countries more specialized dairy farming initiated by private companies starts with urban and peri-urban dairy farming in and around the cities with opportunities for (informal and formal) marketing of fresh milk. Examples of this can be found in Turkey, Ethiopia, Thailand and China. The physical conditions (climate and feed supply) for dairy farming in these areas are often less favourable.
- Additional opportunities are created when financing, land tenure and import and export opportunities all create a better climate for local and international investors. Once the sector is emerging, it will offer many new opportunities for farmers, processors and suppliers. The growth process will accelerate further if the "enabling environment" also facilitates and stimulates further developments for all actors in the dairy chain: input and service suppliers, processors

and retailers. Key indicators for the business climate are the effectiveness of sector collaboration (e.g. cooperatives of dairy farmers); quality assurance and food safety systems; and collaboration between private and public sectors that results in market-oriented research and development, education and farm advice. Continued growth might lead to transition from smallholders to mid-size dairy farms that source dairy processors.

- **Dynamics in other sectors:** The interest of farmers and dairy companies to invest in local dairy production depends not only on demand, but also on the comparative advantages as compared to other agricultural sectors (crops and products). For example, a declining coffee market will cause renewed interest in dairy in Kenya and other countries. In Malaysia dairy farming has to compete with land for oil palm or horticulture. The ability to switch to alternative crops or livestock also depends on the resilience of the farming system and the entrepreneurial skills of the farmers involved (see also section 4.2 for more detailed analysis of these issues).
- **Globalization and free trade agreements:** World Trade Organization liberal trade agreements and regional free trade agreements (e.g. in ASEAN, MERCOSUR, and East African Community) have led to a reduction in trade barriers. This has reduced options for governments to protect particular commodities against strong world market influences. The increasing trade also leads to more emphasis on food safety and quality, so that quality standards applied in western countries become more and more required in international trade. The increasing global character of commodity markets comes into focus through: more South–South trade and investments by developed countries in developing economies (primarily by BRIC and Next Eleven countries); a growing role of retailers within the dairy chain; and increased attention to food safety issues, zoonotic and emerging diseases. A well-known example is the melamine crisis in China, which has boosted imports of infant milk powder from suppliers that are perceived as “safe”.
- **Costs of producing milk:** Production costs at farm level depend heavily on prices for land, feed, labour and equipment. Profitability as a driver at farm level is further described in Chapter 4.
- **Improvement of physical infrastructure:** Electrification, road building and investments in bulking and cooling equipment offer new opportunities to smallholder farmers as well as to small- and medium-scale enterprises (SMEs) such as processors and agricultural and veterinary input

stores. These investments are tied to notions of suitability of the production area and access to (new) markets.

- **Technology development and innovation:** The level of technology used in production and processing depends strongly on development stage and the size of farms and processing plants. In general, the level of innovation<sup>3</sup> in local production and processing systems is low, caused by limited knowledge and investment capital. Improvements are often copied from developed dairy sectors. Investment decisions of farmers and the availability of technology through suppliers both play a crucial role in the innovation process.

During a workshop with Dutch experts in dairy development, held in December 2013, the participants concluded that the most important economic factors for the dairy sector in emerging economies and developing countries are purchasing power of consumers, feed and land availability, competitive processors and dairy farmer entrepreneurship combined with profit of milk production. A high potential for further investments in the dairy sector can be expected where these conditions are met.

Appendix 1 lists key figures of dairy production in 19 countries. Relevant indicators for a quick overview of the economic development stage of a dairy sector include figures about population, income, dairy consumption, milk production, farm size, self-sufficiency rates for dairy and increase in domestic milk production over the last ten years. These figures also clarify what the development stage is of countries and dairy sectors within countries. In many countries in South-East Asia annual income per capita is quickly increasing to levels above \$ 3.000,-, while in the East African countries listed in Appendix 1 it remains below \$ 2.000,-. The longer tradition with dairy production in East African



<sup>3</sup> Innovation here refers to technologies and methods that are new in the context where they are applied.

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countries combined with lower incomes results in high self-sufficiency rates, whereas the strong rise in dairy consumption and limited tradition with dairy production in South-East Asia leads to high imports and low self-sufficiency rates.

Income per capita is an indicator for the development stage of the economy. This stage and the tradition of dairy production in a country play a decisive role in the interventions desired to further develop the dairy sector. On a low income per capita level the informal sector dominates, whereas when income increases the dairy chain will be more and more formalized.

### 3.2. Biophysical context: agro-ecology and infrastructure

An area's agro-ecological suitability for dairy is a major factor in production potential, determining both the natural resources available to dairy farmers and the vulnerabilities they face. The regional infrastructure facilities strongly influence access to input and output markets (see above).

A number of key drivers and trends and key indicators derive from this biophysical context:

- **Availability of land, feed and water:** The number of dairy cattle that a certain area can feed depends on the agro-ecological suitability of the area ("dairy potential" as defined by water and fodder availability), but also on demand for resources by other agricultural and non-agricultural activities. In principle, the agro-ecological suitability and carrying capacity of an area determines the dairy potential, although supplies and management also influence this strongly. Where dairy farming systems become more intensive, typically in densely populated areas, the limited feed and fodder production in the area can be circumvented by i) increased use of by-products, especially from large-scale food processing plants (including beer and fruit juice by-products), and ii) purchase of fodder and concentrates from other areas. This may lead to local excess manure, resulting in environmental problems, and to a higher cost price of milk because of the costs of by-products and/or disposal of manure. This can also lead to the question where the milk should be produced: in areas where the feed comes from or areas where it is consumed? Related to this is the competition between food, feed and fuel. In densely populated countries such as China and Kenya, competition for land between dairy farming on the one hand and industrial and residential areas, roads and infrastructure on the other hand tends to be fierce,

especially in peri-urban areas that would be well suited for commercial dairy. Dairy farmers without land or with limited land face the challenge of getting sufficient fodder and feed. Mechanization in crop farming, the use of fertilizer and more efficient use of manure may relieve pressure on fodder and land, as less of it will be needed for draught animals and their parent stock (e.g. in Ethiopia). Changes in soil fertility, precipitation, irrigation and vegetation type further influence the carrying capacity. Production of milk requires lots of water. In many countries water supply is a major obstacle leading to insufficient water intake of cows, resulting in a lower production of milk. This can also cause seasonality in milk production caused by seasonality in rainfall.

- **Land-tenure and land-rent systems:** The land-tenure system and possibilities to rent or lease land may influence yields and the responsibility farmers feel for proper soil fertility management. If farmers or other investors invest in land, this will usually generate incentives to aim at higher production per hectare.
- **Milk potential of cows:** Most local breeds have a rather low genetic potential for milk production and have not been selected for a higher milk production but are well adapted to climate, local diseases and feed resources. Ways to establish a better genetic base for milk production are imports of exotic dairy cattle and improvement of local cattle by crossbreeding by means of artificial insemination (AI) or improved bulls. Imports of exotic cattle are still practised in countries with limited dairy herds and high demand (e.g. Vietnam, China, Turkey and Russia). Experiences have proven that imports of pedigree cattle from Western Europe or North America often lead to disappointing results because they are not adapted to climate and farm management practices in Africa and Asia (IOV, 1987). High temperatures and high humidity's will create heat stress at cows resulting in less production, poorer fertility and more diseases, finally resulting in increased mortality. Experiences in China and Middle Eastern countries have shown that Holstein Friesian cows require very particular circumstances to produce as well as they do in developed countries. Creating these conditions leads to high production costs. All these factors limit the geographic areas where high productive cows can be kept to obtain economic viable dairy farming. Not every region of the world is suited for commercial dairy farming.

Crossbreeding with local breeds has been practiced in many countries. The growth of the dairy herds in most East African countries is achieved by

crossbreeding with AI. However, cross breeding should be accompanied by good breeding programs. Artificial insemination and sexed semen also offer opportunities to speed up the milking potential of the animals. All these breeding techniques should be combined with improved animal husbandry or else will lead to disappointments and wasted money. If this level of animal management is not available, farmers will be better off with natural breeding schemes with high grade crossbred bulls owned and leased by farmers. This concept has proven to be successful in African countries, but is lagging interest of government officials.

- **Environmental stresses and shocks:** These result in vulnerabilities that can put dairy farming at risk. Examples are droughts or excessive rain, but also pollution due to nutrient surpluses, improper use of chemicals, poor manure management or loss of agrobiodiversity. Climate change may deteriorate or improve the conditions for dairy farming in some areas. Over time, farmers may need to adapt their farming in terms of water source improvements, irrigation or fodder species selection. The effects of these environmental stresses and shocks can differ significantly across locations.
- **Animal health risks:** Intensification of animal husbandry leads to risks of emerging and zoonotic diseases. At the same time the potential for prevention and control of infectious diseases usually is better in large herds than in smallholder systems. Where governments do not invest in veterinary services, private services have to be developed.

### 3.3. Socio-political and cultural context: policies and institutions

Social, political and cultural drivers and trends and key indicators of this context element stem from the specific historic, cultural and policy context in a country. Key factors include:

- **Is there a dairy tradition to build on?** Countries such as Turkey, India and Kenya have a long-standing dairy tradition where dairy is part of the diet and plays a role in religious practices and social relationships. These countries often have a variety of dairy chains, which differ in terms of products and formalization. The sector can build on traditional dairy products and on indigenous knowledge about milk handling and processing. Sociocultural institutions around gender and youth integration in the system affect the production and handling of milk. In other countries such as Vietnam, Thailand and West Africa, dairy consumption has started

relatively recently as a result of global influences on diet.

- **The political system affects the relevant institutions:** The prevalent political system (democracy versus semi-democracy) and the particular political history of a country (e.g. previous communist system) can significantly influence current dynamics. For example, the differences in land-tenure systems between Ethiopia and Kenya cannot be understood without taking into account the socialist period in Ethiopia and the colonial period in Kenya. Attitudes towards cooperatives, the business climate, public-private power relations, international companies and private investments are also strongly influenced by the present or past political system. Institutions around dairy in any given country are largely fixed and are the result of long-standing processes of collective action, representation, policymaking, devolution of power, planning culture and other related factors in the triangle of politics-institutions. While transition of value chains necessitates institutional change, such change processes by nature require time and concerted effort.
- **Policies create their own dynamics:** The policy goals of (inter-)national and local governments can vary significantly. Box 2 offers a range of policy goals. Different policy goals bring different dynamics, as they are connected to government and private sector investment. Openness to private sector investments and foreign investments usually creates a challenging business climate. A proper stakeholder analysis may be essential to identify what stakeholders think about improving the business climate. Different stakeholders may have different goals and differ in power to influence policy development. Good governance in a country will make policies more effective.

#### Box 2. Some policy goals affecting dairy

- Food security for the urban population
- Child nutrition improvement
- Protection of local agricultural production
- Import substitution / export promotion
- Market development
- Smallholder inclusion in commercial agriculture
- Rural poverty alleviation
- Privatization of government services
- Climate change mitigation/adaptation
- Youth employment
- Responsible development cooperation
- Food safety
- Public investments



**Policies that directly influence milk consumption or dairy market protection**

Tax payments on imports, school milk programs, subsidies for dairy farmers and value added tax regulations may all influence the profitability of dairy farming and the consumption of milk.

**4. Analysis: dairy sector dynamics**

This chapter describes the combination of drivers and trends that underlie the dynamics in dairy chains and farming systems, and key indicators of the present situation of both. Most of the drivers and trends are tied to the local situation. Therefore every dairy sector analysis should be tied closely to the region considered. As mentioned in section 1.3 the dairy sector here is defined as the combination of the dairy chain as a whole and farming systems within the dairy sector. Although farming systems are a part of the chain, but for the analysis of the dairy sector they are of such great importance that they are described separately. Paragraph 4.1 covers the drivers and trends and key indicators of the dairy chain as a whole. Paragraph 4.2 deals with the drivers and trends and key indicators of farming systems.

**4.1. Dairy chains**

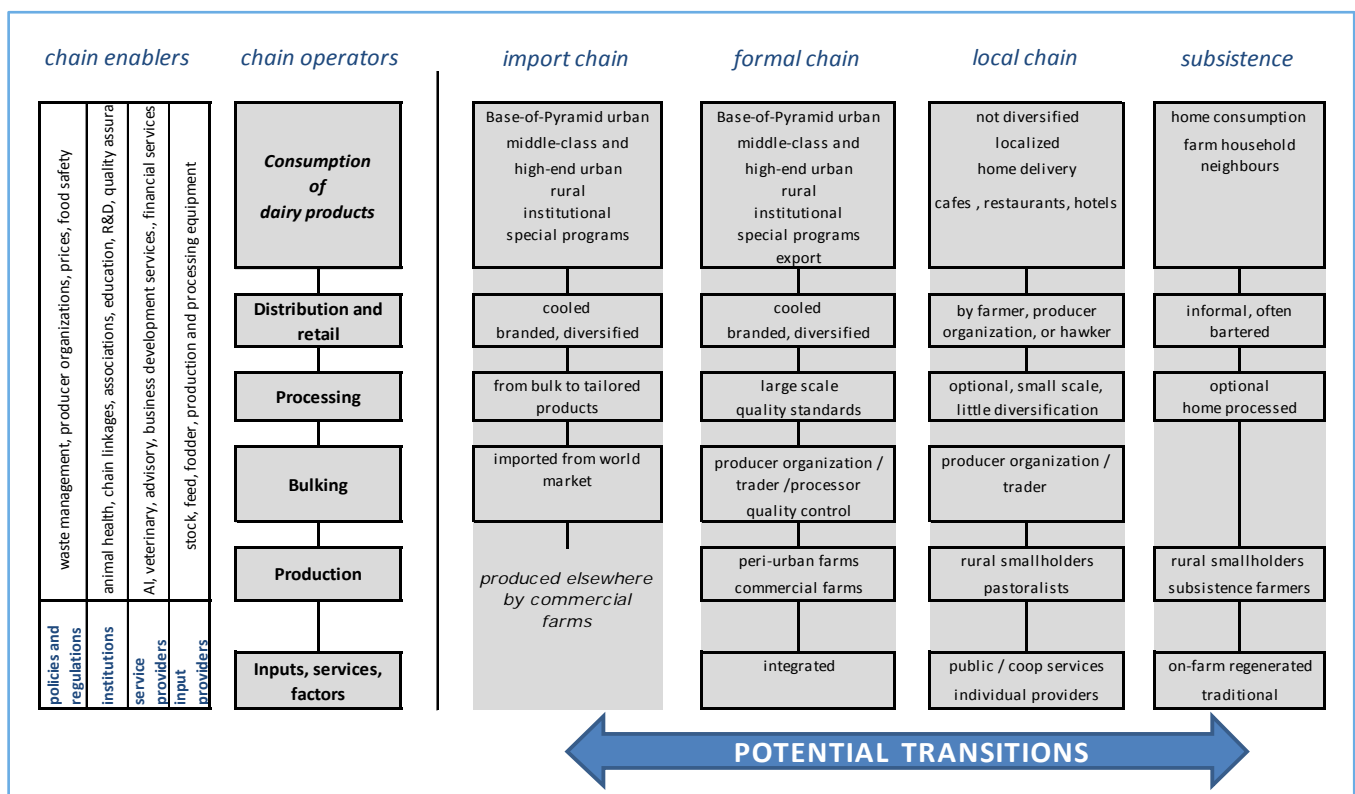
The dairy chain is defined as all operators from feed production to the sale and consumption of dairy products – dairy farmers, farmer organizations, input suppliers, processors, retailers and consumers – as well as chain

providers, quality assurance institutes, and regulatory bodies (see Figure 3). Chain enablers are those actors who help create an enabling environment for chain operation (see Figure 3). With reference to Figure 2, it is noteworthy that a farm(ing system) can be part of a range of commodity chains and can be part of different dairy chains at the same time. In other words, a farm may produce grains, tubers, meat and milk, and the dairy products may be sold to neighbours, traders and a processing plant. Chains are the core of the marketing system.

Key indicators of dairy chains that help explain their dynamics include:

- **Market share of formal dairy chain:** Figure 3 shows four main types of chains, their characteristics and possible variation within each type. The market share of each chain type varies significantly between countries and over time. Plotting of the total volume and the relative market share of each chain type and how these develop over time, as schematically illustrated for an example in Figure 4, offers important insights about the relative strength of these chains and long-term trends within the dairy sector (Van der Zijpp, 2014). The division of the milk production volume over chain types is usually related to the development stage of the sector in a region. Figure 4 shows a fictional country where the market volume for informal milk is rather stable but the volumes for formal milk and imported milk are increasing.

Figure 3. Main dairy value chain types (Van der Lee, 2014)



Co-existence of different dairy chains should not be considered as a problem. It can be considered as a measure of resilience in the dairy sector and an opportunity for growth in multiple directions. Mixed farming systems – or co-existence with other commodity chains – can also illustrate resilience, but at the same time can be an indicator of the development stage for the agricultural economy.

- **Growing demand for dairy products by competing chains:** Purchasing power for dairy products grows in relation to population growth, rising incomes and changing diets of an urbanizing population. In emerging economies this is demonstrated particularly by the growth of the formal or licensed chain that supplies cities with diversified quality products. These products come from either from peri-urban dairies or through transport over longer distances (from domestic origin or import). Peri-urban dairy farmers are often in a better position to supply the city than rural dairy farmers, because they can often choose between alternative marketing channels to the city population.

Rural farmers usually have fewer opportunities to supply the city by informal marketing and therefore have to change to more formal chains to deliver dairy to the cities. In the case where governments do not restrict imports of dairy products, these imports may be more competitive to meet the growing urban demand than developing domestic production.

- **Milk collection infrastructure and cooperation between processors and farmers:** Collection and bulking of milk for processing requires significant investment in a collection grid and cooling and transportation equipment. Decisions made in the past about layout and ownership (farmer organizations, processors or government) significantly impact present options.

In many regions private milk collectors and vendors play a crucial in the collection of raw milk. Their possibilities to meet quality standards and their attitude towards adding (sometimes harmful) additives to increase milk value influence the quality of milk and the costs dairy plants have to detect additives. Better milk quality testing and payment systems based on quality will contribute to the awareness of quality at farmers' and collectors' level.

Cooperatives can play a very positive role in collection and selling of milk, based on quality standards. But this requires an effective board, fair quality standards and testing, logistics, cooling, etc.

In many countries the dairy processing industry – either cooperative or private – plays a leading role within the dairy chain. Worldwide the dairy chains are dominated by multinational dairy companies. In general these companies were reluctant to invest in development of local milk production. This tends to change to some extent. Vertical integration of milk production and milk processing is more practised by local dairy companies and becoming a trend in East

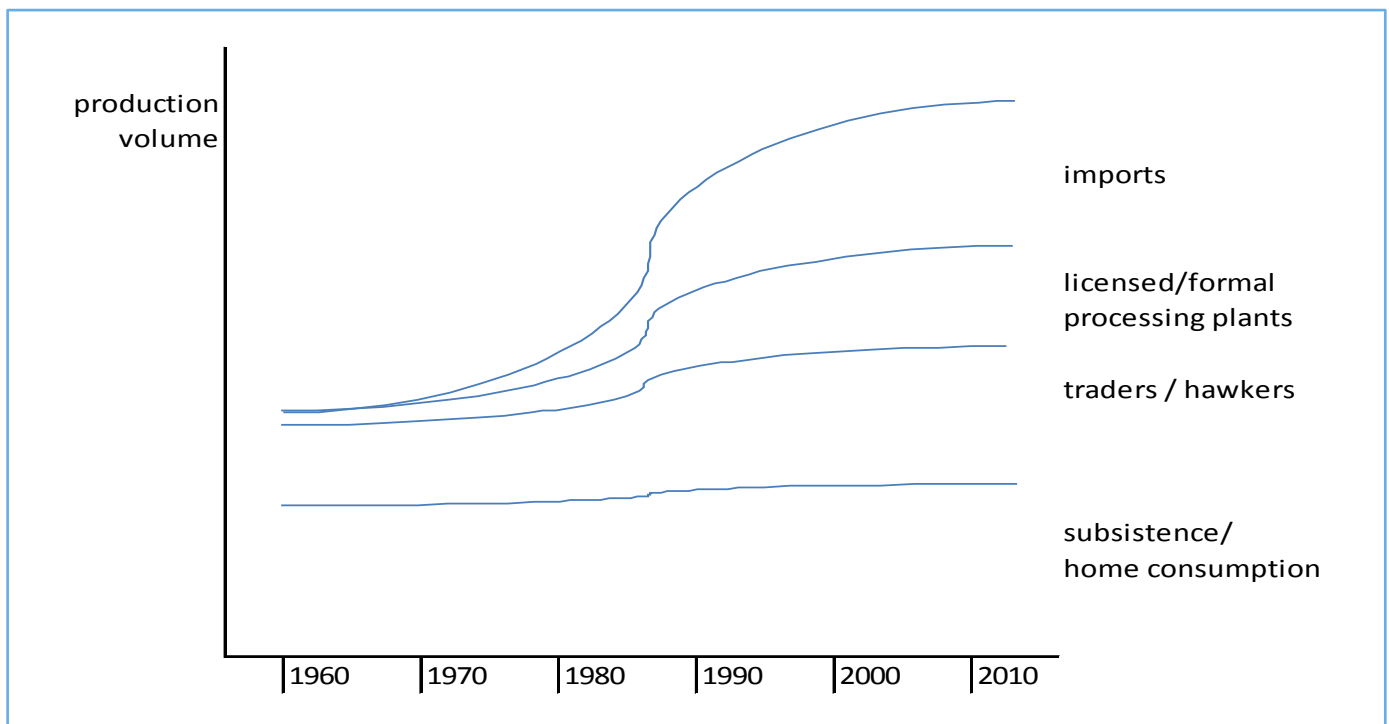


Figure 4. Trends in relative shares of main value types in a country (Van der Lee, 2014)

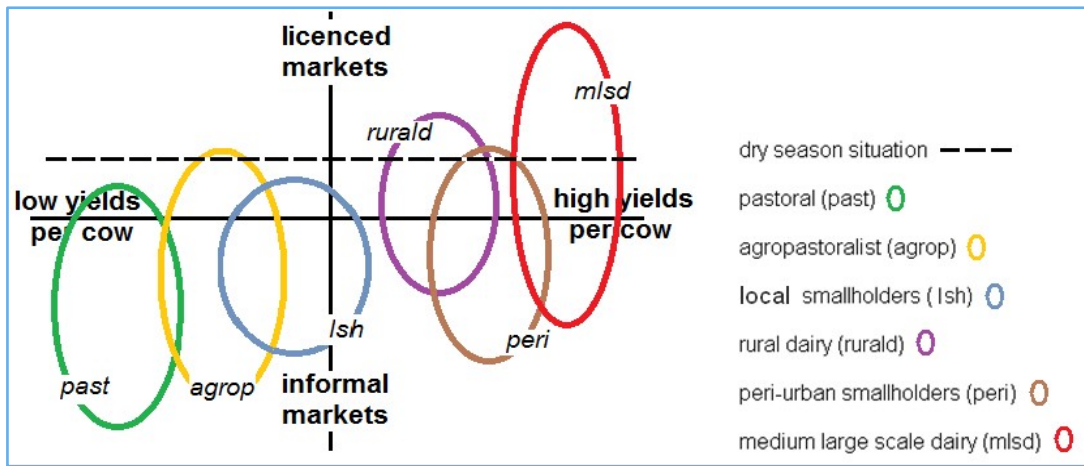


Figure 5. Policy quadrant with major production systems in Tanzania 'overlaid' with the major types of dairy chains (Nell et al., 2014)

and South East Asia.

- **Stable milk contracts and agreements:** Local conditions, trade traditions and negotiations influence the way the dairy market operates. In Kenya, poor roads make processors decide to only collect milk close to the dairy plant in the high productive rainy season. During the less productive dry seasons they try to also collect milk from further away to meet the demand. But these farmers from further away refuse to sell their milk to them during the dry season, since they prefer an year round contract instead of changing from one buyer to another with the change of the season. In Ethiopia, processors are careful not to put too much milk in the shops, as they themselves rather than shop owners bear the cost of unsold milk. This arrangement creates an image of "unmet demand". These examples illustrate the need for close collaboration between processors and retail chains and for a more long term joint strategy of farmers and processors.
- **Farmer access to inputs: feed, land, water, labour and capital:** The dynamics in the input markets also play an important role in determining the prospects for profitable, equitable and environmentally responsible dairy production and marketing. The feed and fodder markets are the key input markets, as these inputs constitute the major share of production costs. High land prices might lead to high fodder prices and can indicate high competition for land between different sectors. Decline of margins of other commodities can result in increased availability of land and water. Public capital from government or donors can initiate or accelerate capital investments in dairy development. In many countries public investments have played or still play an important role in dairy development, particularly in development of local milk production.
- **Transaction costs in the chain:** Transaction costs in the chain will determine also the competitiveness of local milk production. High transactions costs

because of milk collection, transport costs and less efficient processing and distribution and product losses (due to quality) will have an impact on consumer prices and prices paid to the farmers. Chains with small-scale producers and processors are in general less efficiently organized than chains with a few actors. In countries with dairy production based on import of dairy ingredients, the milk processors are in general located close to the urban markets which are not always close to the best locations for local milk production (South East Asia, West Africa etc.)

#### 4.2. Farming systems

The large variation in contexts and chains results in a wide variety of dairy farming systems in emerging economies and developing countries. Dairy farming can take place in pastoral and sedentary systems; in rural and urban areas; in subsistence, smallholder, emerging and commercial farms; on mixed and specialized farms; and on commercial farming on family-owned farms or (large-scale) investor-owned farms.

Figure 5 (Nell and Schiere, 2013) shows an approach in which Tanzanian farming systems are plotted based on two distinctive characteristics. The existing dairy production systems are shown within a quadrant of production intensity / milk yields (horizontal axis) and formalization level of the chain (vertical axis). This figure shows that the six farming systems shown are related to the type of dairy chain they belong to: pastoralists tend to be connected to more informal dairy chains, and commercial farming to more licenced formal dairy chains.

Key indicators within the farming system that influence dairy sector development have to do with farm size, productivity, on-farm regeneration of feed and young stock, and skills in the fields of farm management, entrepreneurship, and collective action.

More in detail, the key indicators are:

- **Entrepreneurial focus: risk aversion or return on investment:** Livelihood strategies of farmers are complex and evolve over time. To spread risk and ensure continuation of their farm, farmers may market their produce through a variety of dairy chains. An example of shifting between commodity chains is the increased interest in dairy in Kenya following the decline of the coffee market. In general, the main benefit of dairy for a smallholder farm is its ability to generate regular income, rather than its relative profitability. Commercial large-scale farms tend to focus more on return on investment and continuity of the farm in the long term.
- **Success in maintaining and expanding production capacity:** This is the key to the resilience of dairy farms and dairy sectors alike. Experience in dairy farming, the ability to produce sufficient replacement stock, fodder and feed, and the availability of capital are all important factors to save cash to withstand shocks. Underlying factors are soil fertility, water availability and seed reproduction. The limited availability of land and water, inadequate farm management (feeding, veterinary care and reproduction), children leaving the farm to work in the city, and low profitability resulting in low savings can all limit the operating space of farmers. Particular attention should be paid to the fact that many of the processes involved are limited by biological boundaries: even under excellent management, growth of the milk production cannot be expected to exceed approximately 4–5% per year. "Artificial solutions" to these biological limitations, such as importation of stock from other provinces or even

countries, might come with problems such as high disease risks, high costs, and losses.

- **Farm size and farm size distribution:** (see figures 6a and 6b) These often play a major role in determining development pathways for the sector. Large and small farms each have their own strengths and vulnerabilities. While it is hard to achieve consistent quality and volumes from smallholdings, large commercial farms may be more vulnerable to management deficiencies and price fluctuations in input and output markets, especially if they have invested with borrowed capital.
- **Profitability of the farm:** The profitability of dairy farming, as the difference between the revenues for milk and meat and costs for feed and other inputs, is a key indicator for the prospects for dairy production. Milk and feed prices and farm management play a dominant role in this (Figures 6c and 6d). The costs for labour and capital are often lower for small farms because of the input of family labour. Large farms can achieve economies of scale in both revenues (higher milk price) and costs. Political and biophysical factors can strongly affect profitability. For example, import protection may lead to higher milk prices that stimulate the dairy sector to develop. Larger distances to markets and expensive transport put rural farmers at a disadvantage as compared to peri-urban farmers.

Profitability is a key factor for more specialized dairy farms which are directed at selling their produce on the market. In more subsistence or semi-commercial farming systems many other factors play a role like food, status, banking, draught, etc. In countries where (dairy) cattle are traditionally part of the

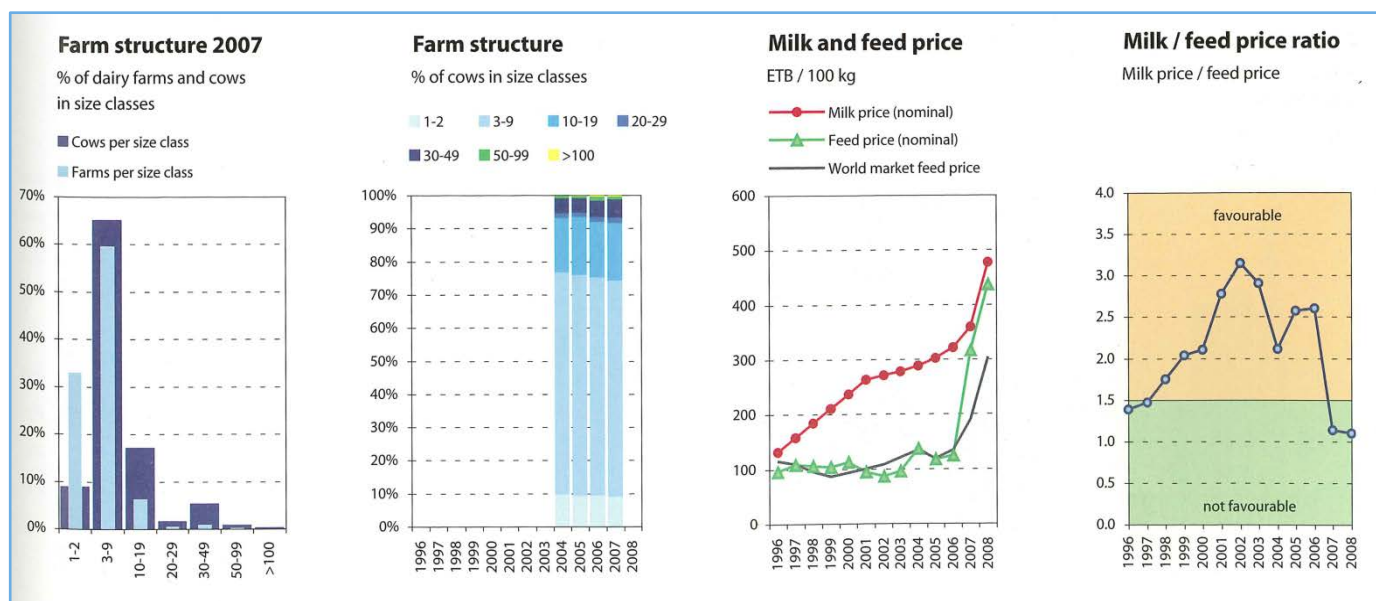


Figure 6. Key indicators of dairy farming systems in Ethiopia with a. Farm size distribution, b. Trends in cow distribution between farm categories, c. Milk and feed price trends, and d. Milk/feed price ratios. (IFCN 2009)

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farming system (Africa, Middle East, Turkey, etc.) and are important for more functions than only cash, dairy production is more resilient and stable than when profitability is the main reason for dairy farming. A strong focus on profitability may lead to quick responses to market changes, often expressed in South East Asian countries. For example: in Indonesia farmers slaughtered dairy cattle in times of high beef prices.

- **Management and entrepreneurial skills:**  
Professional and management skills are very important to achieve good technical and economic results. Dairy farming is much more complex than crop farming, with many interactions in the production process. Many management decisions affect not only direct output but also production capacity in the long term. Larger farms in general require higher levels of skills, and farmers will be more engaged in commercial farming.
- **Collective action and cooperative skills:**  
Collective action can increase the negotiation and market power of small-scale producers. The cooperative model was successfully introduced in certain parts of India (Operation Flood) and copied to other countries and continents. Collective action in terms of cooperative formation works well when there is a collective need felt. In many countries governments have imposed cooperatives as a model for small-scale producers with too little ownership on the farmers' side, resulting in a negative attitude towards cooperatives amongst dairy farmers. Political or business motives of some members also may distort the cooperative system. This is why leadership skills, influence of members and non-corrupt behaviour are important elements for successful cooperative action. In many countries cooperatives are not only involved in processing and selling milk and dairy products, but also in services like buying inputs and concentrates and offering credit. These extra services make the cooperative even more attractive for farmers.

## 5. Diagnosis: identifying constraints and opportunities

### 5.1. Key questions and sector indicators

The previous chapters focused on the descriptive analysis of the dairy sector in a particular context, using the model from Figure 2 as a guide and focusing on the dynamics resulting from trends and drivers. The dynamics of a dairy sector can be summarized using the

elements in Figure 2 as five lenses to observe the sector and its surrounding:

1. How does the socio-political context develop and how does this affect the dairy chain and farming systems?
2. How does the economic context develop and how does this affect the dairy chain and farming systems?
3. How does the biophysical context develop and how does this affect the dairy chain and farming systems?
4. How do dairy chains develop?
5. How do dairy farming systems develop?

As well as through the answers to the above questions, the sector can be understood by looking at the key indicators for the sector itself and for the broader context around the sector. Table 1 contains these types of indicators, which represent information on three levels: country, dairy chain and farm.

### 5.2. Constraints and opportunities

When working towards an intervention strategy, the next step after the descriptive analysis is to identify constraints and opportunities that arise from the dynamics outlined in Chapter 3 and 4, tailored to the country concerned. Within the framework of this paper, this is called the diagnosis phase. The diagnosis is preferably carried out together with stakeholders within the dairy chain. Table 2 offers a general list of constraints and opportunities that may arise. This list was the result of a workshop with Dutch experts in dairy development. The primary goal of listing and prioritizing constraints and opportunities is to form a base for goal setting and intervention strategy design, the process stage that is described in Chapter 6.

Appendix 2 offers example lists of constraints and opportunities for the countries Vietnam, Kenya and Turkey; these lists were the output of an expert workshop that made a quick scan diagnosis for a number of countries.

As shown in the preceding chapters, a variety of trends and drivers determine the constraints and opportunities for local dairy sector development. In economies with relatively low income per capita (e.g. East Africa), the food security aspect is the most important incentive to increase dairy production. In this case increasing dairy production can reduce malnutrition. In emerging economies a higher consumption of dairy products is perceived as improving health and diets in general and contributing to growth of children in particular. In countries where dairy consumption by more affluent consumers is increasing (South-East and East Asia), the perceived need for higher self-sufficiency is the most

important driver with less attention given to improvement of nutrient status, except for school milk programmes. The same need is expressed in countries where dairy traditionally is a basic component of the daily diet of urban and rural consumers (e.g. East Africa, Turkey and South Asia). In all these cases the increasing demand for dairy products offers local opportunities for improved income generation by rural households, diversification of domestic agricultural production and capital transfer from urban to rural areas.

In comparison with dairy sectors in developed countries, the dairy sector in many countries is often fragmented and characterized by the presence of multiple dairy chains (formal and informal), many small-scale producers, many small- and medium-scale processors and a less favourable enabling environment. The degree to which the dairy

sector is fragmented is very much determined by the local context.

Figure 7 provides an overview of the generalized development pathway of dairy sectors when external inputs increase and/or when markets become more diversified. The development stage of a number of countries is included as illustration. The development path starts at the crossing of the axes, with subsistence farming and home consumption. It evolves from an informal chain to a more and more formal chain and ultimately results in product diversification strategies and multiple markets within retail chains or industrial processing of milk ingredients in food and non-food applications. With more sophisticated markets and production systems, the range of market opportunities increases, showing that the number of future opportunities is growing when development proceeds.

Table 1. Key indicators for the dairy sector on three levels: country, chain and farm

| Country/region   | Dairy chain  | Farm  |
|--|--|---|
| <b>Economic context</b> <ul style="list-style-type: none"> <li>- Population</li> <li>- Income per capita, incl. distribution</li> <li>- Urbanization</li> <li>- Production in kg milk equivalents</li> <li>- Consumption in kg milk equivalents</li> <li>- Self-sufficiency</li> <li>- Import and export of dairy products</li> <li>- Infrastructure</li> <li>- Education and training</li> <li>- Research and development</li> </ul>  | <ul style="list-style-type: none"> <li>- % of milk in different chains (formal, informal and import)</li> <li>- Average milk price (farm gate)</li> <li>- Consumer milk price</li> <li>- Number and size of milk collection centres / coverage</li> <li>- Number of milk processing plants</li> <li>- Size of processing plants</li> <li>- Product portfolio</li> <li>- % milk in different chains (formal/informal/imports, etc.)</li> <li>- Investments</li> <li>- Financial viability</li> <li>- Employment in different chains</li> <li>- % milk processed by cooperatives</li> <li>- Animal health infrastructure</li> <li>- AI and breeding</li> <li>- Number of concentrate plants</li> <li>- Number of meat processing plants</li> </ul> | <ul style="list-style-type: none"> <li>- Farming systems</li> <li>- Number of farms</li> <li>- Number of hectares</li> <li>- Number of employees</li> <li>- Size of farms (surface, milk volume, number of animals)</li> <li>- Cost price breakdown</li> </ul>  |
| <b>Biophysical context</b> <ul style="list-style-type: none"> <li>- Land surface used for dairy</li> <li>- Altitude / climate dairy areas</li> <li>- Potential hectares available</li> <li>- Imports of fodder and feed</li> <li>- % fodder from outside the farm (roadside or bought)</li> <li>- Seasonality of fodder availability and milk supply</li> <li>- Water availability / Rainfall / distribution</li> <li>- Imports of inputs for dairy</li> <li>- Important diseases</li> <li>- Disease pressure</li> </ul> | <ul style="list-style-type: none"> <li>- Milk density / km<sup>2</sup></li> </ul>  | <ul style="list-style-type: none"> <li>- Number of cows, breeds</li> <li>- Milk yield per cow</li> <li>- Milk yield per ha</li> <li>- Fertility</li> <li>- Health</li> <li>- Replacement rate</li> <li>- Calf rearing</li> <li>- Age at first calving</li> <li>- Labour</li> <li>- Fodder yields per ha for different fodder crops</li> </ul> |
| <b>Socio-political context</b> <ul style="list-style-type: none"> <li>- Dairy tradition</li> <li>- Data on nutrition, malnutrition and obesity</li> <li>- Vitality of rural areas</li> <li>- Agric. policy and regulations</li> <li>- Dairy development policy</li> <li>- Environmental policy</li> <li>- Involvement of youth and women in dairying</li> </ul>  | <ul style="list-style-type: none"> <li>- Dairy development programmes</li> <li>- Sustainability issues within the dairy chain</li> <li>- Milk quality systems</li> <li>- Gender issues in chain functions</li> <li>- Access to support services</li> <li>- Legislation and enforcement of legislation</li> </ul>   | <ul style="list-style-type: none"> <li>- Gender role division</li> <li>- Age build-up of dairy farmers</li> <li>- Sustainability issues on dairy farms</li> <li>- Milk quality standards on farm</li> </ul>   |

Table 2. Main constraints and opportunities in dairy sectors

|  | Constraints   | Opportunities (incl. recommendations)  |
|--|---|--|
| Dairy chain issues   | <b>Low milk volume</b>  |  |
|  | Milk collection: small farms and small volumes of raw milk supply   | Strong market demand for milk; Small-scale processing; Start-up of professional processors; Large numbers of small-scale producers that can produce higher volumes   |
|  | Underutilization of capacity of dairy plants  |  |
|  | Seasonality of milk supply  |  |
|  | <b>Poor milk quality</b>  |  |
|  | Quality standards absent or not enforced (problems with cleaning procedures, contamination and adulteration)  | Introduce quality-based payment systems and enforcement with strict measures when non-compliance with legislation<br>Consumer awareness on milk quality issues   |
|  | Inadequate transport facilities   | Improve infrastructure: roads, transport and trade   |
|  | Lack of testing facilities  | Milk testing laboratories  |
|  | No cold chain facilities  | Cold chain equipment, storage and transport  |
|  | <b>Weak cooperation within dairy chain</b>  |  |
| Weak cooperation within dairy chain  | Set up institutions for collective improvement of quality and efficiency  |  |
| Poor institutional strength on food safety                                       | Desire to improve efficiency and know-how   |  |
| Poor communication between processors and smallholders                           | Development of cooperation for processing and marketing milk<br>Processors offering support services to the farmers   |  |
| Farming system issues  | <b>Low milk volume</b>  |  |
|  | Small farms and small volumes of raw milk supply  | Strong market demand for milk: up-scaling of farms<br>Collective farmer organizations for collecting and marketing milk  |
|  | Seasonality of milk production  |  |
|  | <b>Poor know-how of farmers</b>   |  |
|  | Poor technical and entrepreneurial skills   | Farmers eager to improve skills and facilities; Training and education; Commercial orientation of dairy farmers  |
|  | Poor commercial orientation farmers   |  |
|  | <b>Poor farm facilities</b>   |  |
|  | Poor quality of raw milk  | Improve awareness on milk quality issues; Improve facilities and technical know-how  |
|  | Environmental problems  | Desire to improve efficiency and know-how  |
|  | Insufficient and poor quality fodder  | Commercial feed and fodder supply; Supply better inputs and services   |
|  | Low reproduction rates  | Improve young stock rearing; Improve animal feed and supplements;<br>Robust breed development; Use of modern technology to improve production; Improve animal health and veterinary services;<br>Improve farmer entrepreneurship |
|  | <b>Poor access to finance (&amp; other services)</b>  | Improve finance facilities; Improve regulations around collateral  |
|  | <b>Insufficient training, education and research</b>  |  |
| Practical education and training insufficient                                    | Good trainers, training and extension and facilities  |  |
| Research and extension not tailored to needs of chain actors                     | Tailor-made practical training and extension; Research and development; Training of trainers, private advisors  |  |
| <b>Ineffective farm size policy</b>  |   |  |
| Small inefficient farms  | Restructuring small farms; Long-term dairy farm policy; Increase import duties to protect local dairy   |  |
| <b>Poor milk quality</b>   |   |  |
| Inadequate food safety and milk quality regulations not enforced or not adequate | Set up legislation and enforcement on food safety and milk quality<br>Quality assurance systems<br>Dairy board regulating quality                                     |  |
| Poor enforcement of quality legislation (raw milk and animal health)             |   |  |
| <b>Poor governance of coops</b>  | Build clear and transparent governance and finance systems  |  |
| <b>Poor quality infrastructure/roads</b>   | Improve infrastructure: roads, water, electricity and transport<br>Quality regulations on import of supplies: e.g. minerals, seeds, calf milk powder, machinery, etc. |  |



Figure 7. General development pathways of dairy sectors as function of increasing external inputs and diversifying markets (adapted from Van der Lee, Groot and Helder, 2014)

At the same time the total value added to the raw product increases, which increases requirements for technology and capital.

Within a certain context, local and formal/licensed dairy chains may operate side by side. Developing less formal into more formal dairy chains uses a range of interventions that are generally quite stage-specific (see Figure 7): while the build-up of rural people organizations such as cooperatives is helpful in linking smallholders to the market, these organizations have to become more entrepreneurial when the dairy chain formalizes and development of agribusinesses is called for. Public-private partnerships only become useful for farmers who are already market-oriented.

Corporate social responsibility and supply-chain management become important in high-end markets where consumers and retailers have more dominant roles in the chain.

## 6. Dilemmas: typical dairy sector development issues

The process of analysis and diagnosis as described in the previous chapters will result in a number of issues that can be considered as typical dairy sector development

dilemmas. These dilemmas have to be considered when developing interventions that will lead to a more prosperous dairy sector as outlined in Chapter 7. Many of these dilemmas are frequently encountered in emerging economies and developing countries. This chapter therefore explores the backgrounds of these issues with the aim of offering a better base to solve them.

### a. Investing in the formal or the informal dairy chain?

Growth of the formal chain (see Figure 7) by increasing local supply to dairy plants is one of the critical transitions in dairy development, requiring concurrent changes in farming and processing capacity. The key challenges that need to be overcome are the quality of milk supplied, the high costs of processing due to (seasonal) mismatches between milk supply and processing capacity; lack of cooperation in the dairy chain for improving efficiency and quality; difficulties in fitting in traditional dairy products in chains using modern technology; and meeting the needs of base-of-pyramid consumers. How this transition could be best stimulated and supported by the private sector, governments and donors remains a point of debate: should farmers gradually increase their volume and quality of marketed milk (and thus start from gradually improving the informal chain), or should processors drive this process by building new formal chains with



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increased quality standards? Both approaches meet constraints that may seem insurmountable. The path followed seems to be very dependent on the drive of individual players and determines to a large extent the resulting power relationships in the dairy chain (including the role of cooperatives). While a few strong players may initiate quick growth, only well-balanced relationships in the chain will result in continuation of that growth.

#### *Presence of a local market*

The presence of a local market offers opportunities to small-scale producers for direct marketing of fresh milk or home-made dairy products. The informal market channels often offer better milk prices for farmers than the formal marketing channels and may stimulate dairy development in certain areas like peri-urban areas. Informal marketing of milk is still dominant in many countries with a tradition of dairy consumption like India, Turkey, Kenya, Ethiopia, etc. Development of formal dairy chains with licensing and quality assurance will only be successful if a surplus of milk can be created (for example areas with a limited market, or high amounts of milk per farm). The creation of a formal dairy chain with processing of milk into dairy products and better quality control is not always increasing the total local milk production since the milk shipped to the informal market will be channelled to the formal dairy chains. Many farms supply to both markets .

#### *Informal and formal chains*

In countries with no tradition in dairy consumption and farming it depends very much on government policies and regulations whether the formal or (semi-)informal dairy chains will be dominant. In Vietnam the formal dairy chain was there from the start. Also in Indonesia the largest part of the milk is channelled through the formal chains. As the government issues more licences to small processors the semi-informal chains (with little or no quality control) become larger. The question is: who will invest and in which chains in the future? The larger investments in the dairy sector in the various countries take place in the formal dairy chains to satisfy the needs of the growing number of urban consumers. Investments in the informal chains most likely will be done by governments and donors and NGOs (with not so much emphasis on dairy sector development but with emphasis on rural development, local food and nutrition security). Private investments (CSR investments) most probably will contribute. Investments in local milk production in countries with low competitive advantages is mainly driven by political considerations (urge to become more self-sufficient and less depending on imports). Clear examples of this are the milk production

in certain parts of China, South East Asia and West Africa.

#### **b. Focus on dairy imports or local milk production?**

To meet the fast growing demand for dairy products, stakeholders face the question whether to (further) develop the dairy sector or to import more dairy products? When looking at this dilemma from the economic perspective the question is whether local milk and dairy production will be competitive in the long run. If so it justifies investments in developing the dairy sector. If not, the government should prefer to focus on activities and sectors that can compete internationally and accept that dairy foods come from elsewhere. As argued before, in many countries the goal of self-sufficiency also plays a role in decision making. If this results in the choice to increase domestic milk production, the next questions to answer are e.g.: How to increase production? Who will invest? Does the decision to increase domestic production require extra protection or financial aid for domestic dairy farmers?

#### **c. Quick or steady increase of milk production to meet fast growing demand?**

Increasing the milk production from dairy farms requires extra stock and feed. Experiences since the mid-1990s have shown that rapid increases in domestic production of over 5% per year are rare (IFCN, 2012). The limited growth of milk production is caused by biophysical constraints (land, feed and cows) and by the limited capacity of farmers to change their farming system and their mind-set. While foreign direct investments in the local dairy industry can help create increased awareness about quality standards and improve processing efficiency, the volume growth they achieve is often tied to dairy imports that do not necessarily favour the local production. Over the past 15 years only China and Vietnam managed to realize growth rates of about 15%. These performances were only possible by creating special conditions: well-designed and enforced policies, import of high-grade cattle and experienced farm managers, high investments in barns and equipment and favourable arrangements for land tenure. They only seem to work in countries where top-down planning models are effective.

#### **d. Linking smallholders to formal dairy chains or establishing large-scale farms?**

Small-scale producers are large contributors to the world milk supply, as is illustrated by India's high national milk production of 143 billion tons produced by an average farm size of two cows (IFCN, 2013). The majority of these producers operate in informal dairy chains. Increasing productivity and inclusion of smallholders in

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formal dairy chains offers great opportunities to meet the growing demand of the urban population. However, some major constraints hinder the inclusion of small-scale producers in formal dairy chains: small milk volumes result in high transaction costs (investments to be made in collection, storage, milk cooling, transport, etc.); bulking of small milk volumes, poor hygiene, and long transport times result in poor raw milk quality and low milk prices for producers; poor physical infrastructure (roads and electrification) hampers access to formal market channels; and low productivity results in low profitability. The productivity of smallholder dairy farming is often limited by lack of land, poor soil fertility, lack of inputs and services, and lack of knowledge and know-how.

An alternative for local milk production by smallholder dairy farms is large-scale industrial farming linked to dairy processing companies (often vertically integrated). In several countries (especially in China, Vietnam, Pakistan, India and Indonesia) this is becoming a trend. Dairy chains linked to large-scale industrial farms can produce dairy products for consumers who demand high quality. Challenges in relation to large-scale dairy farming include sensitivity to milk price fluctuations; insufficient access to finance; limited availability of land, fodder and feed; environmental issues (excess manure); and insufficient technical and professional skills to run these farms.

#### **e. Inside out or outside in? - Starting from the business environment or from the business?**

Good government policies and regulations can contribute to dairy sector development in the areas of food safety, business climate, private sector development and support for extension and education. A good enabling environment can create a level playing field that creates equal opportunities for all actors in the dairy sector and hence facilitates dairy sector development. The issue here is how to strike a balance between i) improving the enabling environment in order to foster dairy business development, and ii) strengthening dairy chain actors' capacity and collective action in order to lobby effectively for improvement of the enabling environment.

#### **f. Improving the local herd or importing grade cattle?**

In the 1970s and 1980s of the twentieth century, the impact of imports of Dutch dairy cattle in developing countries was disappointing, since most smallholder farms in developing countries could not fulfil the high requirements of imported cattle (IOV, 1987). Hence the Dutch government decided to stop supporting these

imports and to focus on developing smallholder farms. Due to recently increased demand for high-grade Holstein Friesian cattle in emerging economies and developing countries, the imports of cattle have resumed. In many cases the results were the same as they had been in the past, confirming that importing cattle does not guarantee increased milk production if the animals cannot be managed according to European or North American standards. Only in countries where high quality feeding, health care and reproduction can be offered will high grade cattle produce to their potential. In Saudi Arabia and China, some well-managed dairy farms with high energy roughage reach the high production levels common in Western countries. If this high level of management, feeding and health care cannot be achieved, local farmers will be better off with crossbreds (local cattle x exotic dairy breeds) that are better adapted to the climate and to the quality of feed available.

#### **g. Will intensification be sustainable?**

Many Western countries have in past decades gone through a process of intensification of production per cow and per hectare resulting in negative side effects in the field of sustainability: excess manure; pollution of water, soil and air; animal diseases; and excessive use of medicines such as antibiotics. Based on these experiences, methods have been developed for proper manure management; decreasing emissions to water, soil and air; and more emphasis on disease prevention. The challenge for emerging and developing countries is to avoid sustainability problems, to monitor the problems and/or to solve them before the negative consequences are experienced.

#### **h. Nutritional value of dairy: under- or overestimated?**

Milk and dairy products are considered to improve human nutrition (FAO, 2013). Milk consumption by young children aged 6–24 months can strongly improve growth, health and life expectancy. In general, milk is considered to address malnutrition and prevent young children from micronutrient deficiencies. Although school milk programmes are quite popular in many countries, it should be emphasized that programs to encourage milk consumption for children aged 6–24 months is much more important than milk consumption in the elementary school ages. For younger children breastfeeding is strongly recommended till at least six months and if possible till 24 months. For older children, much is still unclear about the relationship between dairy consumption and better health. School milk programmes should not, for example, contribute to overconsumption of fat, added sugars and flavouring in milk. But they may play a role in teaching healthy food

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habits, especially if combined with other healthy diet practices such as eating fruit and vegetables.

The comprehensive FAO report *Milk and dairy products in human nutrition* (FAO, 2013) makes a plea for adding nutrition objectives to dairy sector development:

“Dairy-industry development programmes have rarely set out with the explicit objective of raising the level of human nutrition; it is more common that they have the objective of increasing the milk supply and providing a livelihood to milk producers. Neither have commercial initiatives set out to raise nutrition levels – they have aimed at selling milk and securing a solid production base, with diversification into processed, probiotic and fortified products as a way of expanding market share in many cases. Some projects and investments have improved nutrition. Ownership of dairy animals in particular has been associated with improved nutritional status. It is yet to be defined what types of development are best suited to raising the nutritional status of the most vulnerable groups (FAO, 2013).”

The report adds that paying more attention to nutrition objectives will be more effective when it is combined with political commitment, creating awareness for improved nutrition and collaboration within the whole food chain.

Future dairy development plans should preferably be based on human nutrition plans. If malnutrition is the main concern, the focus will be on milk consumption by young children. If emerging economies are developed towards the stage of increased availability of dairy products in supermarkets, the focus will shift to healthy diets. Nutritional guidelines for dairy should then be in line with the ever-increasing diversity of foods in stores.

## 7. Towards strategies and actions

In the previous chapters the present situation and its trends and drivers were analysed, using the conceptual framework of Figure 1. As mentioned above, this framework offers five lenses to observe and analyse the present situation of the dairy sector in a country. Based on this analysis, the next step of identifying constraints and opportunities was also described in Chapter 6. In this last chapter the final steps in defining a dairy sector development strategy (Figure 1) will be addressed: defining goals, strategies, and interventions, and getting commitment from organizations and people who take responsibility for the implementation of the interventions.

### 7.1. Elaborating the process

The last phase in the process of defining a dairy sector development strategy can be divided in three steps:

1. Defining and prioritizing goals and strategic objectives (par. 7.2).
2. Defining strategies, interventions, roles and responsibilities of different stakeholders (par. 7.3).
3. Maintaining the momentum through reiteration, innovation agenda management and monitoring and evaluation (par. 7.4).

The quality and value of the strategy hinge on engagement, power and governance of the relevant stakeholders in the host country, such as dairy chain actors, national and local governments, sector associations and institutions, as well as NGOs and actors ‘from outside’. Actors will be convened by a neutral facilitator and form a steering committee to drive the development of a sector strategy. Starting point for a joint sector strategy may be a sector analysis or joint fact finding exercise (*negotiated knowledge* and *negotiated environment*).

Woodhill and Van Vugt (2011) offer a framework for engaging with the different actors. Four interlinking dimensions are key to engaging stakeholders in an effective way (see Appendix 3 for more detail, as well as Vermeulen et al., 2008):

1. The *Rationale* must be clear: stakeholder processes should act as a mechanism for governance in the dairy sector.
2. *Seven Principles* of change should be taken into account while engaging with stakeholders; varying from changes in institutions and power to changes in learning and communication.
3. The *Practice* of stakeholder engagement is key: Multi-stakeholder processes don’t just happen, but need to be designed and facilitated. Many practical aspects surface when setting up stakeholder engagement: who to involve, the methodologies that can be used, the phases they go through and the facilitation and process capacities required.
4. A number of *cross-cutting factors* are essential for change and innovation to happen; trust, emotion, creativity and critical analysis are needed to make a process successful.

### 7.2. Goal and strategic objective setting

The list of constraints and opportunities explained in Chapter 5 is the primary inspiration source for definition of dairy sector development goals. Goals could also be

derived from goals of stakeholders or can be the result of a brainstorm session. Visioning could further be aided by scenario analysis, where the two most significant constraints are used to develop scenarios to choose from (Van der Lee et al., 2013).

The next step is to put goals in a priority order. This can be done by judging the goals based on criteria defined by the stakeholders. Possible criteria for such a multi-criteria analysis could be appropriateness, sense of urgency, feasibility, expected effectiveness and economic efficiency of intervention (costs and revenues). However, especially in goal setting, stakeholder opinions about “what works and what doesn’t” play a major role. Tools such as “Theory of Change” (Hivos, 2014) identify the change pathways and produce a result chain, that can be used with the

stakeholders to make assumptions explicit and to make stakeholders think “outside the box”. This paper presents a generalized result chain for dairy sector development in Figure 8. This includes the main goals, strategies and interventions that are regularly considered in sector development plans.

Van der Lee et al. (2013) point out that in goal and objective setting by public and private sectors, the notion of trade-offs is central: a choice for one approach comes at the expense of another. For example, while long food chains can increase food supply to urban markets, at the same time they may shift food and added value away from rural areas. Attention to trade-offs in policy choices makes things more complex, but also stimulates more creative problem solving by both the public and private sectors. They further state that in

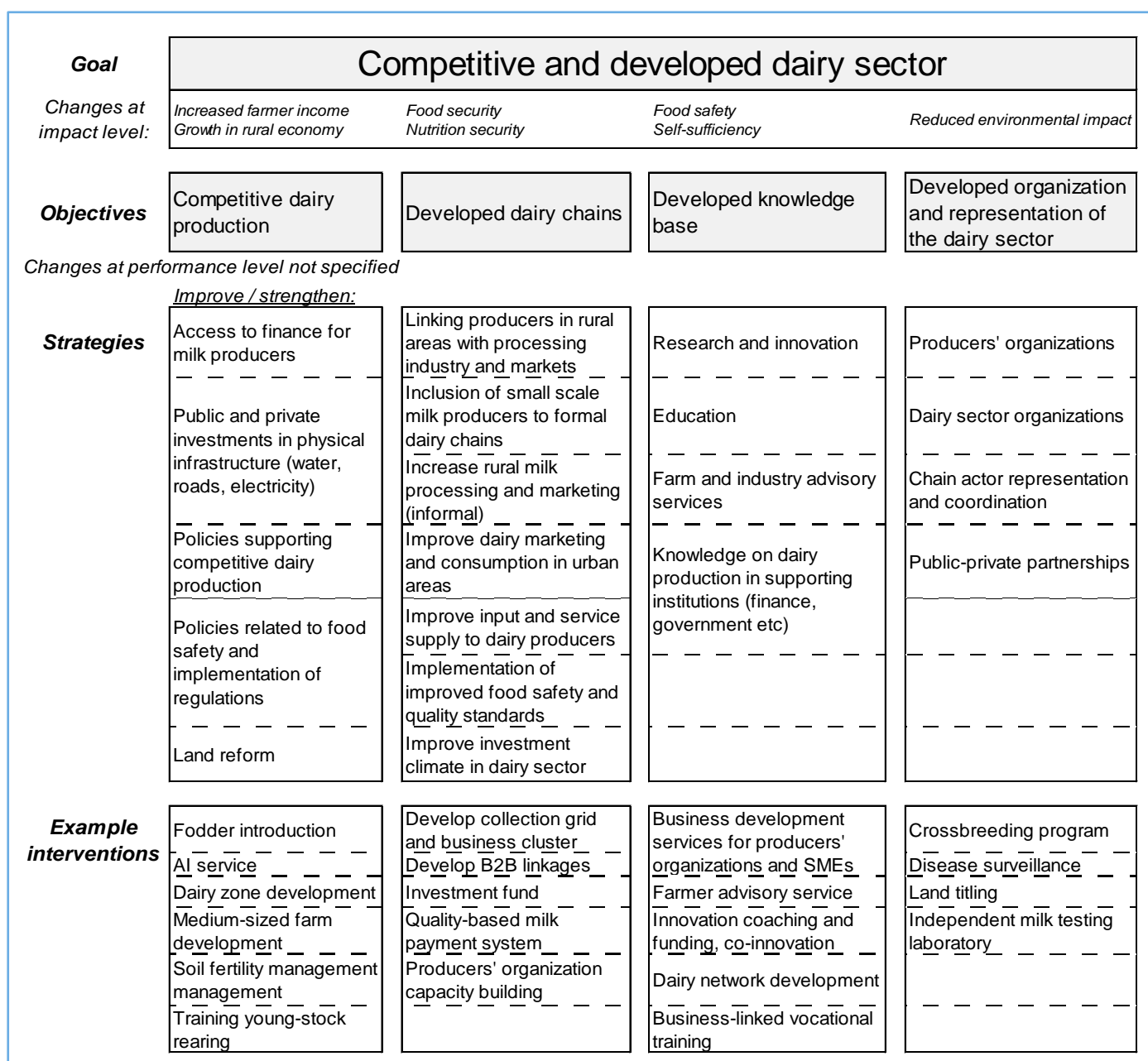


Figure 8. Generalized Theory of Change for dairy sector development

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West Africa, the biggest trade-offs occur when weighing the people, planet and profit interests between local small-scale and international large-scale food systems (the so-called triple bottom line).

At the end of Chapter 3, Box 2 listed possible goals. Each stakeholder may appreciate goals differently, so stakeholders need to come to an agreement on shared goals. Even on the meaning of a goal such as “food security”, interpretations may vary significantly. While national governments tend to interpret this in terms of self-sufficiency at national level, companies may interpret it in terms of consumer purchasing power, and yet other stakeholders may interpret it as healthy nutrition for all at all times. While inclusion of smallholders in the dairy chain may be a natural objective for local governments and NGOs, companies may see no role for themselves in this regard. That may change if their operations do require sourcing from smallholders to generate sufficient volume.

Next, a set of strategic objectives can be defined for further planning. These objectives can be further prioritized based on their contribution to addressing the key strengths, weaknesses, opportunities and constraints identified in the diagnosis. Strategic objectives are then translated into strategies covering the perceived bottlenecks in the value chain, the farming system and the enabling environment. This will produce a result chain: the cause–effect chain of how interventions contribute to outputs, which contribute to outcomes and which contribute to impact at goal level.

Figure 8, which is based on experiences of the authors, shows common goals, objectives, strategies and interventions in dairy sector development strategies.

### 7.3. Strategies, interventions and roles

There is no such thing as a blueprint for strategies and interventions for the dairy sector in a specific country or specific development stage. Application of different strategies by different sets of stakeholders in different unique contexts results in a myriad of interventions. In general, these strategies and interventions can be related to those mentioned in Figure 8, but they have to be adapted by stakeholders and may be augmented with additional strategies. These interventions need to be implemented by actors who are motivated for implementation and who have the skills and the power to implement them. The actors involved are public actors (governments and donors), private actors, farmer organizations, civil society organizations (such as NGOs) and knowledge institutes. In general, the roles of these actors include:

- Public actors: policies and regulations; investments in roads, electricity grids, laboratories (veterinary, milk and feed testing); set-up and monitoring of quality assurance system (jointly with private sector); animal health surveillance; financing of education; attention for smallholders and vulnerable groups; support to innovation processes and stakeholder representation.
- Private actors: transportation, cooling and processing infrastructure; input supply (fodder, equipment, genetics); service supply (financial, veterinary, farm advice).
- Civil society: support smallholder collective action; attention for vulnerable groups; non-formal education.
- Knowledge institutes: research and innovation (jointly with private sector); formal education; non-formal education (jointly with private sector); learning processes.

The provision of farm advisory services to smallholders is an area under particular debate. Should this be left to companies, who will service their suppliers only? Should the governments be responsible for this? Should civil society play the significant role it sometimes does? Should knowledge institutes become involved more? In the end the question is: who is prepared to invest in farm advisory services?

Realizing the interests of stakeholders is an important condition for cooperation with other parties in emerging and developing countries. The significant contribution that the Dutch can make based on experience and expertise (see Box 3) in the context of other countries will be beneficial only to the extent that it aligns with the interests and goals of the relevant dairy stakeholders.

### 7.4. Maintaining the momentum: research and development agenda and reiteration

Planning has to be followed by joint monitoring, review and follow-up planning to be meaningful. This makes it a continuous process. Good planning covers these items and makes sure that roles are divided and stakeholders are committed. A stakeholder board may be useful for organizing ongoing stakeholder involvement and commitment. Some interventions may need prior activities or innovation before they can be implemented or can become effective. This can be a reason to build a separate research and development agenda that lists the interventions that need further elaboration.

### **Box 3. Key areas of Dutch expertise**

The Netherlands has a long tradition of exporting dairy products, dairy cattle and equipment to process milk all over the world. The key areas of investments and exports are:

#### **1. Dairy processing technology**

Milk can be decomposed into many ingredients used in the food and non-food industry. This requires techniques and equipment. Dutch companies are involved in building small and medium scale dairy factories and supplying operational knowledge including testing laboratories for milk as well as feed and food.

#### **2. Expertise and supplies for breeding and feeding**

Dutch companies invest in breeding (production of genetic material) and feed production in third countries. Investment in breeding is not only limited to production of genetic material but also the development of breeding programmes for crossbreeding or improving breeds that are adapted to the regional climate. Feed companies produce concentrate feeds and additives.

#### **3. Sustainable intensification of dairy farming systems**

The Netherlands has developed much expertise with intensive and highly productive dairy farming systems. Dutch companies are designing and fine-tuning farming systems where genetics of cattle and grass, feeding, forage conservation, fertilizer use and plant protection meet high requirements in terms of efficient use of fertilizer and feed and achieving longevity of cows. Since the mid-1980s the Dutch have developed and implemented many new techniques to reduce emissions and nutrient losses to soil, water and air, including techniques to spread fertilizer, inject manure in the soil, save crop protection agents, reduce ammonia emissions from barn floors and process manure into biogas. These techniques have boosted resource efficiency and decreased environmental pollution. Improved animal welfare and reduced use of antibiotics also contribute to higher sustainability standards.

#### **4. The use of technology in dairy farm management**

Intensive use of robots for milking and feeding cows, software to monitor cattle performance and to support the farmer as decision maker and the use of farm data throughout the whole dairy chain offer new possibilities to improve dairy product quality and animal health and welfare.

#### **5. Farmers collaborating in cooperatives**

The vast majority of milk is processed by cooperatives and the vast majority of feed is also supplied by cooperatives. These cooperatives have contributed significantly to building strong dairy chains and in translating market information to the farm.

#### **6. Strong collaboration between government, private sector and knowledge institutions**

The strength of the Dutch dairy sector relies strongly on the collaboration between government, private sector (including farmers and cooperatives) and knowledge institutions. All are dedicated to share information with other chain partners in the interest of all.

#### **7. Integrated dairy chain approach**

The Dutch have a long tradition of combining market opportunities with improved farm management as well as bringing partners within the dairy chain together. This integrated approach results in dairy chain development.

#### **8. Animal health control**

Regional or nationwide programmes to control diseases, surveillance, laboratory development and vaccine production will contribute to prevent cattle from diseases and combat diseases when they occur.

#### **9. Capacity development along the entire education chain**

Research, education and extension are available in all parts of the Dutch dairy chain. Training is available from hands-on level through to scientific levels. The high density of farms, suppliers and processors in the small country the Netherlands (almost 40.000 sq km) offers excellent opportunities for sharing information and providing services. This has led to very competent farmers and employees throughout the chain.

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## 8. Final remarks

This paper provides a framework to set up a dairy development programme in close collaboration with stakeholders. Engaged and experienced stakeholders are the backbone of the process, together with a sufficiently independent facilitator. Preferably, they are also the ones who are able to translate goals into activities that are supported by actors in the dairy chain. Performing planned activities in everyday practice requires motivation, skills and the power to deliver. Dedicated and decisive stakeholders are the best guarantee that the dairy development plan will be translated into action.

This paper itself came about through active consultation with people involved in dairy development, from the public and private sector, from knowledge institutes and from NGOs. As authors we sincerely appreciate the valuable contributions and feedback received in all stages of the process.

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## Appendix 1 – Key dairy sector data

|   | units            | South-East Asia |           |         |          |         |          | South Asia |          |            |           | Source                |
|---|------------------|-----------------|-----------|---------|----------|---------|----------|------------|----------|------------|-----------|-----------------------|
|   |                  | China           | Indonesia | Vietnam | Thailand | Myanmar | Malaysia | India      | Pakistan | Bangladesh | Sri Lanka |                       |
| <b>Population</b>                       |                  |                 |           |         |          |         |          |            |          |            |           |                       |
| Population                              | million (2013)   | 1350            | 251       | 92      | 67       | 55      | 30       | 1.221      | 193      | 164        | 22        | cia.gov/library       |
| Gross Domestic Product (GDP)            | \$/capita (2012) | 9.300           | 5.100     | 3.600   | 10.300   | 1.400   | 17.200   | 3.900      | 2.900    | 2.100      | 6.200     | cia.gov/library       |
| Urbanization rate                       | % (2010/2011)    | 51              | 51        | 31      | 34       |         | 73       | 31         | 36       | 28         | 15        | cia.gov/library       |
| Annual rate of change 2010-2015         | %                | 2,9             | 2,5       | 3,0     | 1,6      |         | 2,5      | 2,5        | 2,7      | 3,0        | 1,4       | cia.gov/library       |
| <b>Dairy consumption</b>                |                  |                 |           |         |          |         |          |            |          |            |           |                       |
| Consumption dairy products              | kg ME***/capita  | 31              | 12        | 14      | 26       |         | 30       | 118        | 242      | 37         | 46        | IFCN-DairyReport 2012 |
| Self-sufficiency dairy products         | % (2011)         | 89              | 51%       | 27%     | 59%      | 90%     | 8%       | 100%       | 100%     | 93%        | 34%       | IFCN-DairyReport 2012 |
| <b>Milk processing</b>                  |                  |                 |           |         |          |         |          |            |          |            |           |                       |
| Milk delivered                          | %                | 78              | 60%       | 95%     | 95%      |         | 80%      | 16%        | 30%      | 50%        | 44%       | IFCN-DairyReport 2012 |
| Increase milk delivered 1996-2011       | perct. points    | +42             | +11       | 0       | 0        |         | -11      | +2         | +1       | +1         | -6        | IFCN-DairyReport 2012 |
| <b>Milk production IFCN</b>             |                  |                 |           |         |          |         |          |            |          |            |           |                       |
| Milk production 1996                    | Kton ECM**       | 5.600           | 400       | 40      | 400      |         | 40       | 74.600     | 17.700   | 1.900      | 200       | IFCN-DairyReport 2013 |
| Milk production 2012                    | Kton ECM**       | 33.300          | 1.100     | 370     | 1.100    | 1.500   | 70       | 143.100    | 42.800   | 3.200      | 400       | IFCN-DairyReport 2013 |
| Increase 1996-2012                      | % change         | 495%            | 175%      | 825%    | 175%     |         | 75%      | 92%        | 142%     | 68%        | 100%      |                       |
| <b>Milk production forecast OECD</b>    |                  |                 |           |         |          |         |          |            |          |            |           |                       |
| Milk production 2013                    | Kton             | 46.886          | 1.455     | 406     | 878      |         | 58       | 135.304    | 33.415   | 4.112      |           | stats.oecd.org        |
| Outlook milk production 2022            | Kton             | 57.968          | 1.723     | 492     | 956      |         | 69       | 176.404    | 41.538   | 6.002      |           | stats.oecd.org        |
| Expected increase 2013-2022             | % change         | 24%             | 18%       | 21%     | 9%       |         | 19%      | 30%        | 24%      | 46%        |           |                       |
| <b>Characteristics dairy production</b> |                  |                 |           |         |          |         |          |            |          |            |           |                       |
| Average farm size                       | cows/farm        | 4               | 4         | 8       | 14       |         | 41       | 2          | 3        | 3          | 4         | IFCN-DairyReport 2013 |
| Farms with < 5 cows                     | %                | 75              |           | 83      | 69*      |         |          | 97         | 60       | 90         | 63        | IFCN-DairyReport 2013 |
| Farms with 5-10 cows                    | %                |                 |           | 12      |          |         |          | 2          | 37       | 6          | 21        | IFCN-DairyReport 2013 |
| Farms with 10-20 cows                   | %                | 21              |           |         | 23       |         |          |            | 2        | 1          | 9         | IFCN-DairyReport 2013 |
| Farms with 20-30 cows                   | %                |                 |           |         |          |         | 90       | 1          | 1        | 1          | 3         | IFCN-DairyReport 2013 |
| Farms with > 30 cows                    | %                | 4               |           | 5       | 8        |         | 10       |            |          | 1          | 3         | IFCN-DairyReport 2013 |
| Milk yield per cow                      | kg/cow/year      | 4.400           | 2.000     | 2.200   | 3.600    |         | 2.100    | 1.200      | 2.000    | 800        | 400       | IFCN-DairyReport 2012 |

\* sum of farms in size classes < 5 cows and 5-10 cows

\*\* energy corrected milk (standardized for fat and protein content)

\*\*\* milk equivalents (dairy products converted to liquid milk equivalents)



|   | units            | West Africa |       | East Africa |          |       |        | Eurasia |        |         | Source                |
|---|------------------|-------------|-------|-------------|----------|-------|--------|---------|--------|---------|-----------------------|
|   |                  | Nigeria     | Ghana | Ethiopia    | Tanzania | Kenya | Uganda | Russia  | Turkey | Ukraine |                       |
| <b>Population</b>                       |                  |             |       |             |          |       |        |         |        |         |                       |
| Population                              | million (2013)   | 175         | 25    | 87          | 48       | 44    | 35     | 143     | 81     | 45      | cia.gov/library       |
| Gross Domestic Product (GDP)            | \$/capita (2012) | 2.800       | 3.400 | 1.200       | 1.600    | 1.800 | 1.400  | 18.000  | 15.200 | 7.500   | cia.gov/library       |
| Urbanization rate                       | % (2010/2011)    | 50          | 52    | 14          | 27       | 24    | 16     | 74      | 72     | 69      | cia.gov/library       |
| Annual rate of change 2010-2015         | %                | 3,8         | 3,5   | 3,6         | 4,8      | 4,4   | 5,7    | 0,1     | 2,4    | -0,3    | cia.gov/library       |
| <b>Dairy consumption</b>                |                  |             |       |             |          |       |        |         |        |         |                       |
| Consumption dairy products              | kg ME***/capita  | 9           |       | 53          |          | 107   | 36     | 259     | 187    | 216     | IFCN-DairyReport 2012 |
| Self-sufficiency dairy products         | % (2011)         | 35%         | 80%   | 100%        | 71%      | 100%  | 101%   | 82%     | 102%   | 107%    | IFCN-DairyReport 2012 |
| <b>Milk processing</b>                  |                  |             |       |             |          |       |        |         |        |         |                       |
| Milk delivered                          | %                | 10%         |       | 1%          | 1%       | 10%   | 6%     | 51%     | 49%    | 40%     | IFCN-DairyReport 2012 |
| Increase milk delivered 1996-2011       | perct. points    | 0           |       | -1          |          | +5    | -1     | +16     | +19    | -1      | IFCN-DairyReport 2012 |
| <b>Milk production IFCN</b>             |                  |             |       |             |          |       |        |         |        |         |                       |
| Milk production 1996                    | Kton ECM**       | 400         |       | 900         |          | 1.900 | 600    | 31.500  | 10.100 | 13.500  | IFCN-DairyReport 2013 |
| Milk production 2012                    | Kton ECM**       | 500         | 100   | 3.400       | 380      | 4.400 | 1.800  | 30.400  | 14.900 | 10.600  | IFCN-DairyReport 2013 |
| Increase 1996-2012                      | % change         | 25%         |       | 278%        |          | 132%  | 200%   | -3%     | 48%    | -21%    |                       |
| <b>Milk production forecast OECD</b>    |                  |             |       |             |          |       |        |         |        |         |                       |
| Milk production 2013                    | Kton             | 528         | 41    | 1.927       | 1.908    |       |        | 33.003  | 17.427 | 11.712  | stats.oecd.org        |
| Outlook milk production 2022            | Kton             | 667         | 48    | 2.626       | 2.948    |       |        | 36.217  | 22.348 | 12.914  | stats.oecd.org        |
| Expected increase 2013-2022             | % change         | 26%         | 17%   | 36%         | 55%      |       |        | 10%     | 28%    | 10%     |                       |
| <b>Characteristics dairy production</b> |                  |             |       |             |          |       |        |         |        |         |                       |
| Average farm size                       | cows/farm        | 13          |       | 4           |          | 4     | 3      | 3       | 4      | 2       | IFCN-DairyReport 2013 |
| Farms with < 5 cows                     | %                | 34          |       | 35          |          |       |        | 98*     | 60*    | 99*     | IFCN-DairyReport 2013 |
| Farms with 5-10 cows                    | %                | 32          |       | 58          |          |       |        |         |        |         | IFCN-DairyReport 2013 |
| Farms with 10-20 cows                   | %                | 13          |       | 6           |          |       |        |         | 30     |         | IFCN-DairyReport 2013 |
| Farms with 20-30 cows                   | %                | 5           |       | 1           |          |       |        | 1       | 6      |         | IFCN-DairyReport 2013 |
| Farms with > 30 cows                    | %                | 16          |       |             |          |       |        | 1       | 4      | 1       | IFCN-DairyReport 2013 |
| Milkyield per cow                       | kg/cow/year      | 100         |       | 300         | 1.600    | 600   | 400    | 3.400   | 2.800  | 3.900   | IFCN-DairyReport 2012 |

\* sum of farms in size classes < 5 cows and 5-10 cows

\*\* energy corrected milk (standardized for fat and protein content)

\*\*\* milk equivalents (dairy products converted to liquid milk equivalents)

## Appendix 2 – Three country case studies as illustration

During an expert workshop that took place in December 2013 six experts on dairy sector development in emerging economies and developing countries carried out a quick-scan of the dairy sector in seven countries. The experts included two private international consultants, two advisors international livestock of Wageningen University and Research Centre, one officer of an international dairy company, and one policy advisor of the Dutch Ministry of Economic Affairs. They appointed trends and drivers, constraints and opportunities and interventions like described in the paper this appendix is part of. The results of three of the seven evaluated countries are presented in brief in this appendix: Vietnam, Kenya and Turkey. These three countries are chosen to illustrate the application of the framework for countries that differ strongly in geographic location, development stage and dairy tradition. More detailed key figures of the dairy sector in these countries and other developing countries are listed in appendix 1.

### Results of the quick scan for the three countries

The first step in the analysis was to characterize general trends in the socio-political, economic and biophysical context combined with those in the dairy chain. These trends were considered to be valid for many countries in the developing and emerging regions, but the strengths of these trends differ between countries. The evaluation results for the three countries are presented in table A. It is illustrated that in general the global trends are stronger in Vietnam and Turkey compared to Kenya. It also shows e.g. that the increase of income per capita - an important driver of dairy development – is the highest in Turkey, followed by Vietnam. This might be the reason why the involvement of multinationals in local on-farm production is still absent in Kenya.

**Table A. General trends in the dairy sector in selected countries**

| Trends next 15 years                            |   | Vietnam | Kenia | Turkey |
|---|---|---------|-------|--------|
| <b>Dairy consumption</b>                        |   |         |       |        |
| 1.  | Growth in dairy consumption per capita  | +++     | ++    | ++     |
| 2.  | Growth in income per capita   | ++      | +     | +++    |
| 3.  | Growth in population  | ++      | +++   | +      |
| 4.  | Change from traditional to western diet   | +       | ++    | ++     |
| 5.  | Increased cooling and processing of milk  | +++     | ++    | +++    |
| 6.  | Urbanisation  | +++     | ++    | ++     |
| 7.  | More dominant role of retail chains   | ++      | ++    | ++     |
| 8.  | More emphasize on food quality and food safety                                    | ++      | ++    | +++    |
| 9.  | Greater role of multinationals and their brands in market share of dairy products | +++     | ++    | ++     |
| <b>Socio-political and economic environment</b> |   |         |       |        |
| 10.   | Less government, more private sector involvement in dairy sector                  | ++      | +++   | +++    |
| 11.   | Less involvement of donor countries, more involvement of private sector           | +++     | ++    | +++    |
| 12.   | More regional free trade agreements   | ++      | ++    | ++     |
| 13.   | From small-scale farms to largel-scale or dual (small and large) type farms       | ++      | +     | +++    |
| 14.   | Greater role of multinationals in local on-farm production                        | +       | 0     | ++     |
| 15.   | Greater role of multinationals in local processing                                | ++      | ++    | ++     |
| 16.   | More emphasize on global issues: corporate responsibility and sustainability      | +       | +     | ++     |

*N.B. 0 = no influence, + = some influence, ++ = moderate influence, +++ = strong influence*

The second step was to identify more specific the national situation of the dairy chain and farming systems for the three countries, followed by the identification of interventions. The table B to D show the results for resp. Vietnam, Kenya and Turkey.

**Table B. Trends, drivers, constraints, opportunities and interventions for Vietnamese dairy sector**

The Vietnamese dairy sector is relatively young and started to develop after the introduction of the market economy. The sector is dominated by small-scale commercial milk producers and a few modern dairy processing companies. Informal marketing of farm milk is hardly existing. The fast growing dairy consumption has led to an increase in import of dairy products. The governmental policy is directed to a higher level of self-sufficiency. A recent trend is the establishment of large dairy farms, organized by vertical integration of local dairy companies.

| Dairy chain:<br>production, processing and retail      |   | Enabling environment:<br>education, extension, infrastructure, institutions |   |
|--|---|---|---|
| Trends   | Drivers   | Trends  | Drivers   |
| - Vertical integration (large-scale)                   | - Self-sufficiency<br>- Quality<br>- Land speculation | - From national to regional dairy policies                                  | - Land policy<br>- Eradication of poverty           |
| - Cold chain development fresh milk                    | - Quality   | - More involvement private sector in education, extension and services      | - Secure supply<br>- Lack of government involvement |
| - Diversification of consumer products                 | - Economic growth                                     |   |   |
| Constraints  | Opportunities   | Constraints   | Opportunities                                       |
| - Lack of know how                                     | - Strong market demand                                | - Lack of education - practical training                                    | - Eager population, open minds                      |
| - Lack of land for fodder production                   | - Use of modern technology can increase production    | - Lack of institutional strength on food safety                             | - Open for advice                                   |
| - Poor access to finance                               | - Commercial orientation of dairy farmers             | - Weak cooperation of dairy chain actors                                    |   |
| - Poor economies of scale                              |   | - Water / electricity / road access   |   |
| - Environmental problems                               |   | - Long term planning and strategy   |   |
| Main interventions for development of the dairy sector |   | Main interventions for development of the dairy sector                      |   |
| 1. Education, extension to improve productivity        |   | 1. Policy development for long term strategies, farming systems             |   |
| 2. Intensification of fodder production                |   | 2. Land policy to provide land for farmers                                  |   |
| 3. New concepts for access to finance                  |   |   |   |
| 4. More attention for sustainability of production     |   |   |   |

**Table C. Trends, drivers, constraints, opportunities and interventions for dairy sector Kenya**

Kenya has a long dairy tradition with subsistence pastoralists and commercial dairy farms stemming from the colonial era. After its independence small-scale dairy farms have taken over commercial milk production from the previous large colonial farms and are now the main suppliers of raw milk. The dairy industry originally was dominated by one major player (KCC) but after the liberalisation of the milk market many dairy processors entered the market. Some consolidation has taken place with major players like Brookside and New KCC. Most of the milk is marketed through informal channels. Milk marketing, service and input supplies for small-scale farmers are organized by cooperatives and through dairy hubs by cooperatives and private companies.

| Dairy chain:<br>production, processing and retail                            |   | Enabling environment:<br>education, extension, infrastructure, institutions |   |
|--|---|---|---|
| Trends   | Drivers   | Trends  | Drivers   |
| - Investments by private and public actors                                   | - Competition formal-informal chains<br>- Greenfield multinationals<br>- Costs of collection, processing and distribution | - Differences in business climate between regions                           | - Devolution of power   |
| - Growth in consumption  | - Population and income growth  | - Industry associations remain weak   | - Little collective action<br>- Associations inactive                     |
| - Trade in fodder  | - Competition for land<br>- Fragmentation of land<br>- Population pressure<br>- Profitability dairy vs other commodities  | - Further privatization of extension and education                          | - Private sector recognizes importance<br>- Decreasing public investments |
| - Poor milk quality  | - Poor animal health care<br>- Poor hygiene extension<br>- Few professional feed companies                                |   |   |
| Constraints  | Opportunities   | Constraints   | Opportunities   |
| - Availability of fodder   | - Commercial feed and fodder supply   | - Weak industry associations  | - New models for collective action in private sector                      |
| - Quality assurance milk and feed  | - Private input and service supply  | - Corruption  | - Vocational training   |
| - Market is not demanding quality  | - Robust breed development  | - Lack of education in/around dairy chain                                   |   |
| - Input and service supply   | - Professionalization of processors   | - Infrastructure  |   |
| - Holdings too small / missing middle size                                   |   |   |   |
| Main interventions for development of the dairy sector                       |   | Main interventions for development of the dairy sector                      |   |
| 1. Feed and fodder supply chain with strong actors and smallholder inclusion |   | 1. Build stronger industry associations                                     |   |
| 2. Stimulate professional processors   |   | 2. Diplomacy  |   |
| 3. "Healthy dairy" consumer campaign   |   | 3. Vocational training tailored to needs of private sector                  |   |
| 4. Support private advisory service  |   | 4. Quality assurance system   |   |
| 5. Quality assurance system, including quality-based milk payment system     |   |   |   |
| 6. Crossbreeding, breeding strategies, reproduction and calf rearing skills  |   |   |   |

**Table D. Trends, drivers, constraints, opportunities and interventions for dairy sector Turkey**

Turkey has a long tradition of dairy production with traditionally a high consumption of dairy products, primarily yogurt and cheese. This tradition has led to a large informal dairy sector with many small-scale milk processors. The modern dairy sector started to develop in the seventies of the last century and was stimulated by the government through imported European dairy cattle, more specialized family dairy farms, and modern dairy processors serving mainly the urban areas. A large proportion of the milk still is marketed through informal channels. A recent trend is the establishment of larger farms either by processors (vertical integration) or private investors.

| Dairy chain:<br>production, processing and retail                         |   | Enabling environment:<br>education, extension, infrastructure, institutions   |                       |
|---|---|---|-----------------------|
| Trends  | Drivers   | Trends  | Drivers               |
| - Industrial dairy farms  | - Supply security<br>- Efficiency<br>- Quality    | - Less government, more private sector in education and extension             | - Costs<br>- Interest |
| - Regional differences (West-East)  | - Urbanization<br>- Quality<br>- Economic growth  |   |                       |
| - Support to small-scale dairy farming in East./Central                   | - Politics  |   |                       |
| - Consolidation and professionalization of dairy industry                 | - Urbanization<br>- Quality/cost<br>- Price/image |   |                       |
| - Large-scale production of traditional products by modern dairy industry | - Urbanization<br>- Image                         |   |                       |
| Constraints   | Opportunities                                     | Constraints   | Opportunities         |
| - Shortage of knowledge/skills  | - Training and extension                          | - Strong government control   |                       |
| - Small-scale of production - Low volumes                                 | - Small-scale processing                          | - Enforcement of legislation (milk quality and independent milk testing)      |                       |
| - Lack of cooperation between chain actors                                |   | - Regional identities (differences)   |                       |
|   |   | - No incentives for foreign investment  |                       |
|   |   | - Education   | Practical training    |
| Main interventions for development of the dairy sector                    |   | Main interventions for development of the dairy sector                        |                       |
| - Capacity building   |   | - Enforcement of regulations around milk quality and independent milk testing |                       |
| - Improve chain coordination  |   | - Capacity building   |                       |

## Appendix 3 – Four dimensions of effective multi-stakeholder processes (MSPs)

### 1. Rationale

The rationale explores the underlying nature of sustainability and equity problems within the context of recognizing that human societies are best understood as complex adaptive systems. So this is also the case in the design and development of the dairy sector strategy. An understanding of this wider context is important for being able to decide whether in a particular situation and context, it makes sense to engage in a multi-stakeholder process (i.e. is there a good rationale for it).

### 2. Principles

MSPs can contribute to bringing about fundamental change in how individuals, organisations and societies behave. Experience with MSPs has shown that the following seven principles need to be taken into account in order to foster transformative change.

- a) *Fostering collective learning*: In order to see new possibilities for change, different stakeholders need to learn together from their respective experience
- b) *Working with complexity*: Effective change processes need to build shared understanding and collective learning processes that enable stakeholders to respond and adapt to the uncertainty of how change unfolds in practice.
- c) *Reinventing institutions*: Formal and informal political, legal, social, cultural, economic and religious institutions all act as both influences and constraints on change.
- d) *Shifting power*: Power is the means by which any change is both brought about and resisted.
- e) *Dealing with conflict*: Conflict is a normal part of any MSP. Conflict may even be necessary for change to occur.
- f) *Enabling effective communication*: Underlying any effective interaction is the capacity for people to communicate with each other in an open, respectful, honest, empathetic and critical way.
- g) *Promoting collaborative leadership*: Effective MSPs require that those in leadership roles - whether these are formal or informal, political, cultural or other - support and promote the collaborative principles on which such processes depend.

### 3. The Practice

The practice of creating and supporting MSPs has three elements:

- a) *A process model* that outlines the main phases of an MSP and the key considerations for an effective stakeholder collaboration - Every stakeholder process is unique and will follow its own path and logic. Nevertheless, experience has shown that there are some common phases and process considerations that, if designed for, will improve the effectiveness of the process.
- b) *A toolbox of participatory methodologies and tools* that can help create interactive learning processes, which manifest the principles and qualities of effective multi-stakeholder engagement.
- c) *A set of facilitation competencies* required by those designing, managing, leading or facilitating MSPs.

### 4. Cross-cutting factors

To make this happen, the following cross-cutting factors need attention:

- a) *Trust*: Building trust between different stakeholder groups and in the processes itself is critical.
- b) *Emotional engagement*: People behave the way they do and change what they do largely because of their emotions. We are emotional beings. To be effective, MSPs need to engage with people at an emotional level. This means creating inspiration, dealing with fear, and creating an environment that is loving in the broadest sense.
- c) *Creativity*: New ideas and innovative solutions come from the human capacity to be creative. Effective MSPs need to use methods and create the space and environment that enable and harnesses human creativity. This means combining intellectual analysis with other approaches, such as visual methods, art, music drama and out of the box activities.
- d) *Critical and informed analysis*: In itself, bringing different stakeholders together is no guarantee of creating intelligent and well thought through outcomes. An effective MSP needs to draw on the best available information; make use of science and research; subject the views and opinions of different stakeholder groups to critical analysis in order to understand the context and the envisioned change.

*Adapted from Woodhill and Van Vugt (2011)*