

Dairy Development in Emerging Economies

A motor for sustainable and healthy growth

Dairy discussion paper

How can the Dutch Diamond contribute in an effective way?

DRAFT VERSION – Working paper

Authors: Geert Westenbrink, Jan van der Lee, Simone van Vugt, Jos Bijman, Bertken de Leede, Martin de Jong, Adriaan Vernooij, Wim Goris, Richard Hawkins, Diane Bosch, Jos Creemers, Joris Tielens



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Preface

The demand for dairy products in emerging economies will increase in the coming decades. This offers good opportunities for further development of the dairy sector in these economies. Dairy can also contribute to fighting malnutrition. The Netherlands is famous for its dairy worldwide.

This paper is meant as a discussion paper for the Dairy event on 27 November 2019 organized by Wageningen UR, Food & Business Knowledge Platform (F&BKP) and AgriProFocus in collaboration with NEADAP and is a draft working paper. The event is meant to result in a development and learning agenda of the 'Dutch Diamond' - Dutch business, civil society, knowledge institutes and government - for dairy development support in African and Asian countries. Coalitions that want to develop new dairy initiatives and programs can then be supported by the [Netherlands Food Partnership](#)¹, which was launched at World Food Day 2019.



¹ The current Food & Business Knowledge Platform and AgriProFocus merge into the Netherlands Food Partnership working organization, which will build on the knowledge and experience of both organizations and will implement the required changes to realize the ambitions of the Netherlands Food Partnership. The Netherlands East African Dairy Partnership (NEADAP) is a consortium of SNV Netherlands Development Organisation, Wageningen University & Research, Bles Dairies Consultancy and Agriterra.

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Part I. Introduction: dairy as a food system

Why dairy development?

In the Netherlands, and broader in the EU or the North generally, the ecological sustainability of dairy and other livestock sectors recently is much debated, as part of the transition from animal to plant-based protein in food. In low- and middle-income countries, however, the situation is different, as the sector potentially can play a relevant role in broad based economic growth and reaching the Sustainable Development Goals. The increase in demand for dairy products in emerging countries up to 2030 is estimated to be between 25 and 60%. Milk, cheese, yoghurt and other dairy products can contribute to healthy diets: they provide an important source for high-quality protein and micronutrients, in a culturally accepted way. This is of importance in the diet of young children during the first 1000 days. Already 6 billion people are consuming milk and dairy, and demand increases driven by population growth, increasing urbanization and an expanding middle class.

Increasing demand brings economic opportunities. Few emerging countries are as yet able to fulfil their present demand, let alone the expected increase in demand. Promoting the dairy sector is therefore also important to prevent the drain of scarce foreign exchange currency through import of dairy products. For Africa, this already amounts to 500 million US dollars each year. Moreover, developing the dairy sector can bring gainful employment. Compared to other agro-products, dairy has high labour demands per hectare, fits well in intensive farming systems, and can create employment for youth.

At the same time dairy and the wider livestock sector face several global challenges. Firstly, the prevention and combating of contagious diseases, in particular zoonotic diseases. Secondly, resistance against antibiotics, which is partly caused by high use of antibiotics in livestock, especially in a number of emerging countries. Thirdly, the relatively high claim on land for livestock production, the relatively high greenhouse gas emissions, and poor manure management causing serious environmental problems. Fourthly, a common issue is that the milk consumed often does not meet safety standards, for example contamination with mycotoxins or antibiotic residues is an upcoming issue. The dairy community and development partners must address these complex issues when developing strategies for development of the sector. For more information see the [Global Agenda for Sustainable Livestock](#).

Of course, the livestock sector faces the impact of climate change as well and can be part of the solution. With a proper set up and management, intensive dairy farming can contribute to improvement of the resource base, circularity of mixed farming systems, and mitigation of CO2 emissions.

In sum, dairy development can contribute to three goals: healthy food for the first 1000 days, gainful employment for youth and smallholders, and sustaining the agro-ecological resource base. These correspond with Sustainable Development Goals 2, zero hunger; 8, decent work and economic growth; and 13, climate action.

In realizing these contributions, policy makers in emerging countries face the following key questions:

1. How and with what mix of policies do we meet the fast-growing demand for dairy products, especially within the upcoming middleclass, preferably with locally sourced, reasonable priced dairy products, in such a way that the current or foreseen drain on foreign exchange is minimized and the share of informal milk channels is reduced?
2. How to make best use of the growing demand for milk in upgrading and transforming the dairy sector and put it on a sustainable growth path, in such a way that it becomes one of the motors for sustainable rural development and for youth employment generation?
3. How to ensure that dairy contributes to fighting malnutrition, especially in the first 1000 days of development of young children?

KEY FACTS

Demand

Over 6 billion people around the world regularly consume milk and dairy products. Global consumption of fresh dairy products is expected to grow by 2.1% annually over the next decade¹. In ten years, people in developing countries will consume 67% of the fresh dairy products. Demand growth is mainly expected in Asia.

Supply

Total world milk production is set to increase by 35% to 304 million tonnes in 2030². While currently 47% of global dairy production is produced in low- and medium-income countries, this will grow significantly towards 2030, especially in South Asia (+64%), Africa (+36%) and Latin America (+33%)³.

Trade

Key exporters include the EU-28, Argentina, Australia, New Zealand and the USA. Together they account for

around 80% of global dairy exports⁴. While some low- and medium-income countries are self-sufficient, for example India, most partly depend on imports⁵. The milk deficit for East Africa is 78%⁶. African milk imports are worth 500 million US dollars annually.

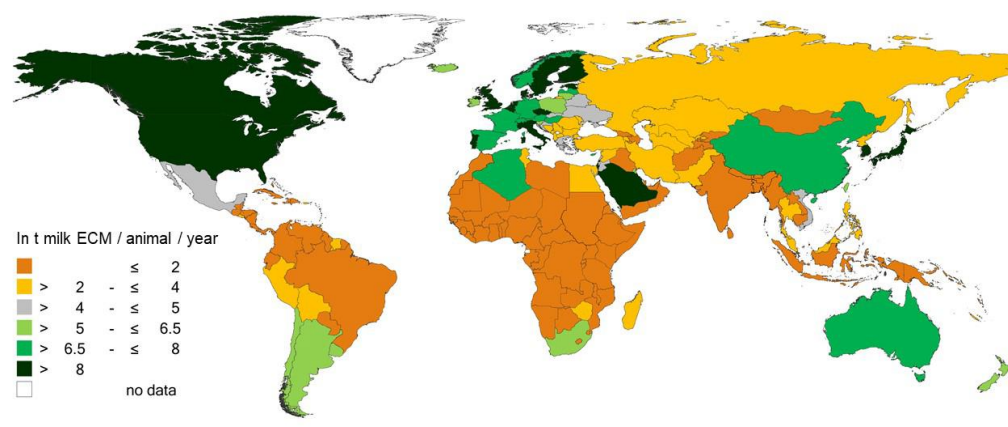
Livelihoods

With 363 million dairy cows on 133 million dairy farms worldwide, predominantly small-scale family farms, the global dairy sector supports the livelihoods of 1 billion people -around 600 million people on-farm and 400 million in the value chain⁷. For the majority of family farmers, it is however a challenge to earn a decent livelihood from dairy production.

Sources:

1. OECD/FAO, 2017 OECD-FAO Agricultural Outlook
2. IFCN, 2018
3. FAOSTAT, 2017
4. AHDB Dairy 2018
5. OECD-FAO, 2018
6. Makoni et al. presentation
7. FAO, 2016

FIGURE 1 - Average milk yield for cows and buffaloes in 2017 in tons energy-corrected milk per animal per year
 Source: IFCN Database. Status of data: 08/18. National statistics, AMI, FAO, IFCN Estimates
 Calculation: Milk production of cows and buffaloes divided by the number of milking animals.



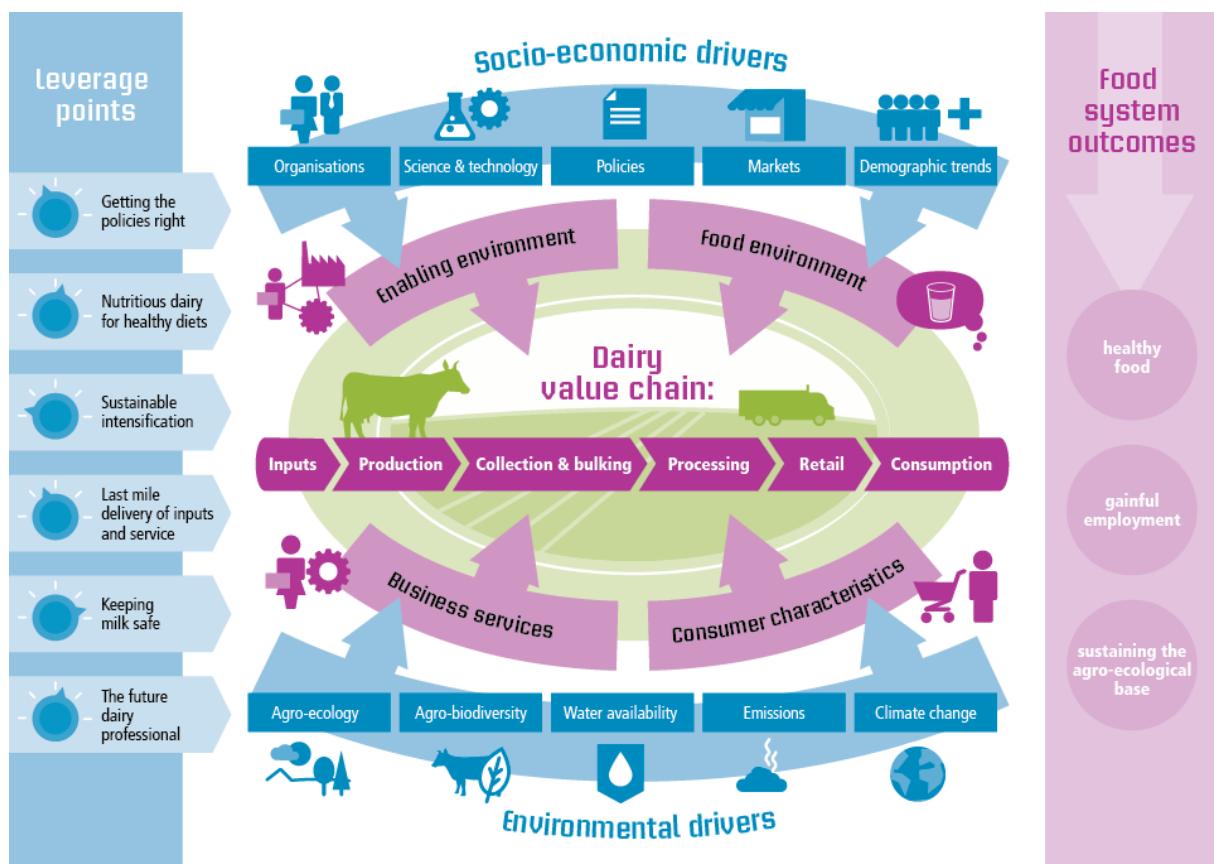
Food system perspective

To ensure a broad picture of the challenges and opportunities for dairy sector development, we take a food system perspective. A food system perspective takes the intended outcomes as starting point and comprises all the processes associated with food production and food utilization: production, harvesting, packaging, processing, transporting, marketing, consuming and disposing of food remains (Berkum and Dengerink, 2018). Figure 1 shows how the dairy food system operates, is influenced by drivers and can be influenced through leverage points. The key benefits of using a food system approach in analyzing and developing the dairy sector is that it pays explicit attention to the interaction among various elements of the system. In other words, a food system approach considers trade-offs and synergies, interaction among technological and behavioural change, multi-stakeholder interests and interactions, issues of scale and scope, and alternative options (Berkum and Dengerink, 2019). An example of a trade-off is that intensification of dairy farming may lead to lower inclusion of women.

Key **outcomes** expected from the dairy food system can be summarized as:

- Healthy food for the first 1000 days
- Gainful employment for youth
- Sustaining the agro-ecological resource base.

FIGURE 2 – Dairy food system



Production takes place in the **farming system**, which is broader than just dairy production and integrates other crops and livestock. Factors that play a role in the farming system: crop-livestock combinations, farm sizes, herd composition, barn types, other functions of dairy animals in farming system (manure, draught power, savings), market-participation level, off-farm employment, nutrient cycle.

Enabling environment: cost-price of milk, value addition, competitiveness of dairy; laboratories for milk, feed, drug testing; infrastructure - roads, electricity, water, fuel; business licensing; enforcement of regulations.

Food environment: availability of dairy alternatives; media coverage of agriculture & food issues; dairy culture, diets, taboos.

Business services: feed & fodder supply; AI and breeding; veterinary services; farm advice, skill training of chain actors; financial services (credit, insurance); quality requirements and quality-based payment systems; business models for input and service provision, supply contracting; hardware provision (mechanization, barns, milking parlours etc.); transportation

Consumer characteristics: nutrition and safety-consciousness; out-of-home consumption; consumer stratification (BoP, middle class, elite).

Drivers

Drivers are the factors that influence the functioning of the dairy food system. They can be social, political, cultural, technological, economic or environmental. Demographic drivers of the dairy food system include population growth, urbanization, emerging middle class, pressure on land, and social tensions around high youth unemployment rates. Economic drivers are infrastructure, cost of production factors, land ownership and governance, trade and foreign exchange balance. Environmental drivers include loss of agro-biodiversity, shrinking water resources, climate change and agreements on mitigating emissions.

Many low- and middle-income countries face a mismatch between the existing producer base and the growing market for high-quality dairy products. Pressure on land is high. Most of the land is farmed by smallholders. Farms get more and more fragmented due to population growth and lack of alternative employment, which reduces the

opportunities for young people to be gainfully employed in agriculture. Farm households face the question that is framed as “to hang in, step out or step up” – to remain farming as they did but face increasing challenges, to quit farming and seek other livelihood, or to upgrade their farming methods. The inability of these small farms to produce a surplus leads to a growing gap between demand and local supply, leading to increased imports of milk products.

Four environments – Dairy production and marketing always operates within a context that strongly influences its performance. For example, these context factors determine whether disease risks are adequately dealt with or whether zoonotic disease outbreaks, mastitis, or side-effects of antibiotics play a large role. We distinguish between:

- **The enabling environment** of regulations, services, infrastructure, standards, institutions etc.
- **The food environment** – cultural factors that determine how dairy is part of the local diet.
- **The business environment** that determines whether inputs and services are available, of good quality, and affordable, and whether there is space to operate as a business.
- **Consumer characteristics**, for example nutrition and safety-consciousness, that shape market demand.

Leverage points

Leverage points are the issues on which interventions can be focussed to address root causes and trigger positive change. One may regard these as the levers in the dairy food system that can be turned to change the system. We identified six main leverage points:

1. Getting the dairy trade and investment policies right
2. Sustainable intensification of the dairy farming system
3. Nutritious dairy contributing to healthy diets
4. Last mile delivery of inputs and service to dairy farmers
5. Keeping milk safe
6. The future dairy professional: training, education and extension.

We view these leverage points as our priority issues, but we are of course open for discussion. Apart from the ones we mention, others may be important.

How to bring about interlinked transformation?

When we link the leverage points to key issues of interest, possible trade-offs and investment opportunities, pathways for transformation of the dairy sector can be defined, and a development agenda for tomorrow can be crafted, as is done in the next section of this paper.

In general, at least three interlinked sector transformation should take place:

1. Dairy products to become an attractive, affordable, healthy and safe part of diets for (urban) consumers in all social classes.
2. Dairy herds to become productive in terms of milk per hectare and per cow, with cost price in line with European dairy farmers; production to become resilient against climate change and based on high quality roughage.
3. Value chains to become driven by shared interest, high efficiency and fair distribution of benefits.

How these general transformations are ‘translated’ in practice and whether specific interventions will be effective, depends very much on the specific local context. As a general principle, the various stakeholders in the sector need to be involved in order to arrive at a workable agenda (see Van der Lee et al. 2014. Milking to Potential discussion paper).

Below, we discuss development pathways around the main leverage points, including case studies as inspiring practice. We very much welcome your input during the event, when most of these pathways will be discussed in more detail.

KEY CHARACTERISTICS OF DAIRY FARMING FOR THE MARKET

- Milk is produced daily 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. While India and Pakistan are major dairy producers with age-old dairy cultures, in East and Southeast Asia dairy consumption traditionally was low and only recently has started to grow quickly due to more urbanised lifestyles. Many (urban) people can only afford dairy consumption once their income reaches a certain level. Growth of dairy consumption hence is strongly correlated with the growth of the middle class.
- The vast majority of 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 emerging economies, dairy cooperatives also provide additional services for farmers, like feed supply and veterinary services. The role of cooperatives in providing these services is necessary, but often is hampered by poor cooperative management and lack of knowledge of the demands of an intensifying production system. Hence, processors may favour integrated supply chains with embedded services.
- Dairy cows depend on fodder and 24/7 access to clean water to produce milk and for their health. Land is required to produce quality fodder. In many emerging economies, land availability for fodder production and access to water are major limiting factors in increasing milk production.
- Most local cattle in tropical systems have been bred for other purposes than milk production but have superior disease resistance and heat tolerance. In most systems, crossbreeding with (Western) dairy breeds combines the best of both worlds, but needs proper breeding programming.
- Due to the dependency on land and fodder, the high fixed costs per cow, the long lifecycle of cows, and the labour-intensive character of milk production, dairy farmers can adjust to market changes in a gradual way only. Annual production growth percentages of over 5% are rare.

Part II. Six main leverage points towards dairy sector transformation

1. Getting the trade and investment policies right

An overarching key component in sector transformation is the trade and investment policy for the dairy sector. A major issue is what type of policies the government puts into place to manage imports of milk products. Next to that are also the special facilities and conditions for import of crucial inputs, medicines, semen, fodder seeds, micro-minerals and machinery and equipment. Investment policies have to do with licensing of companies, tax regimes and tax holidays etc.

In developing a trade and investment policy, policy makers are basically faced with the following overarching questions:

- How to ensure that safe dairy products are always available for consumers at reasonable prices? How to prevent that, in times of low world market prices, the national market is flooded with cheap imported products and thereby hampering the development of a national dairy industry?
- How best to 'protect' the national dairy industry in a way that it provides the right incentive for farmers, processors and service providers, to invest and realize growth and so improve the national dairy production, but also at the same time minimize the risk of rent seeking and the continuation or upcoming of oligopolistic arrangements? How to do this only temporary as not to raise costs of production through complacency?
- Should investment facilities be uniform across the country or be directed to areas where the long-term potential is good, but where at present the infrastructure is poor?
- What should be done regarding urban and peri-urban dairy, in view of increasing land prices around town, the high dependency on purchased roughage and concentrates, and the pollution caused by these dairy farms?

In this discussion paper we cannot address all these questions in an extensive manner (also because the answers will be very country-specific). We can only make some remarks on the options for 'managing imports in such a way' that incentives are provided for investing in and realising growth of local production.

Basically, we see the following modalities working in practice:

- An import duty on imports – Example is Kenya's import tariff of 60% that offers local producers a windfall
- A local sourcing obligation for a percentage of the value or volume of imported dairy products. Examples are Thailand and Nigeria.



2. Sustainable intensification

Key issues in sustainable dairy farming systems

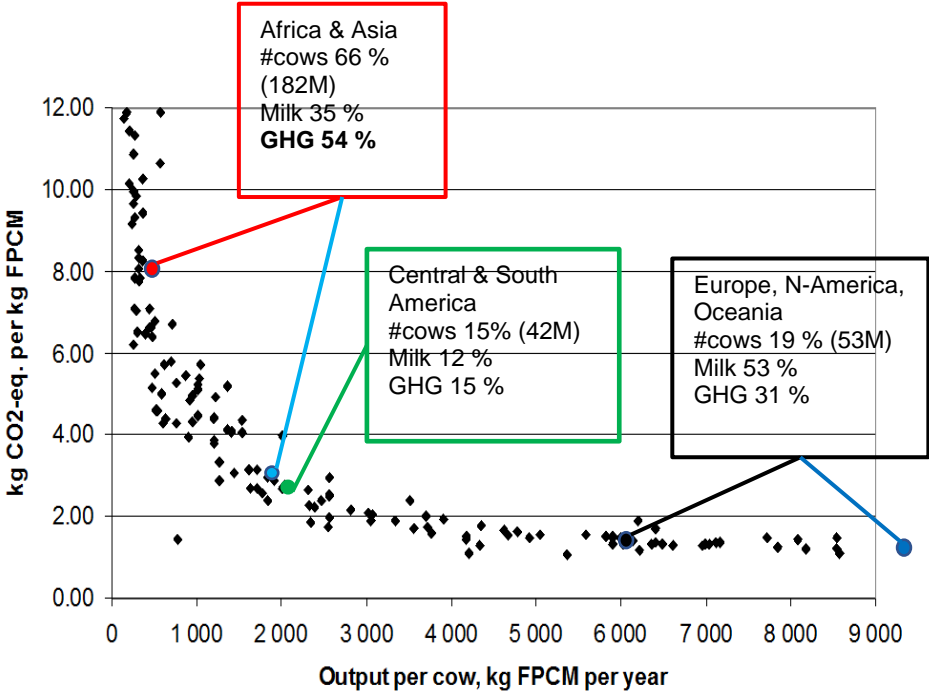
Much variation exists in dairy farming systems across developing and emerging economies. It is not possible to give them all due attention in this discussion paper. On one end of the spectrum are extensive grazing systems, such as in Mbarara, Uganda. On the other end, such as in areas around Nairobi in Kenya and around Addis in Ethiopia, peri-urban dairy farming systems where the major part of the fodder is sourced from areas over 100 km away. Dairy farming systems in Indonesia and Vietnam are mostly based on a combination of on-farm fodder production and purchasing from outside. In Bangladesh and in Ethiopia, dairy farming is very much based on crop residues. Presently, in most countries most of the milk comes from farmers with less than 5 cows, with relatively few farms having more than 20 cows. At the same time, we notice a small but growing number of farms with over 1000 cows in countries such as Indonesia and Vietnam.

In general, the productivity is relatively low in terms of milk/cow/day and in terms of the proportion of cows in lactation. Labour- and land productivity are generally low. This low input-low output-low risk strategy can be a rational strategy when there is poor market access and lack of services. In peri-urban systems almost all feed must be purchased, and farm systems are generally based on limited use of purchased roughage of poor quality and high use of concentrates, leading to a high cost prize. This is economically viable only because urban farmers can sell their milk at a higher price as compared to rural farmers.

Why intensification is needed

Due to increasing pressure on land, increasing prices of land and increasing demand in food both the extensive dairy and the peri-urban dairy system will come under pressure. Dairy has to compete for land with other high-value 'cash crops. Regarding feed components for concentrates, dairy competes partly with humans and partly with poultry and pigs. At the same time, Dutch-supported and other projects show that with cultivation and feeding of high-quality roughage, combined with improved management, big steps can be made in productivity and much better incomes can be achieved with less animals. Dairy can 'outcompete' other cash crops. The gains of intensification, producing more milk with less cows, are particularly high when transitioning from low to medium productive systems. Each improvement in feeding, management and breeds will result in relatively big gains in efficiency and decrease of GHG emissions per kg of product. For example, a study in Oromia, Ethiopia by Solidaridad and Wageningen UR showed that, per unit of milk, a cow producing 3000 litres per year emits less than 25% of the GHG emissions of a cow producing 500 litres per year.

FIGURE 3 - Relationship between milk productivity and emission intensity, per kilo fat and protein corrected milk.



WHAT WE BELIEVE IN

- Sustainable dairy intensification means producing more with less in all aspects of the dairy food system.
 - More milk per cow using less land with efficiently produced fodder and more efficient use of agro industrial by-products in well-balanced feed rations
 - More qualified services from fewer, better and more professionally organised input and service providers and government regulators
 - More efficient supply chains with reduced transaction costs and less environmental impact (fuel, electricity, water use)
 - Significant investments in the human capacity base for sustainable milk production and for quality input and service provision.
- Sustainable dairy intensification can be based on the positive elements of the Dutch Diamond: competences of partners are combined, and the various goals, funds, risks and responsibilities are pooled together. The corporate efficiency and market-oriented methods of the private sector are linked with the local knowledge of civil society organisations and the regulatory authority of the government.

Given the above, we state, also for sake of discussion, that in donor-funded projects priority should be given to upgrading the low input-low output-low risk and small-scale dairy farming systems through testing and supporting pathways towards productive commercially viable and sustainable systems. In this way, opportunities offered by a growing demand can best be tapped into. Generating better incomes from dairy, less toil for farmers and alternative employment options will inspire part of the younger generation to take up dairy farming – stepping up or stepping out rather than hanging in.

At the same time, it needs to be stressed that the intensification route can be quite risky for farm households. One must allocate part of the scarce farm land to fodder production and incur expenses for forage seeds or planting material, fertilizers and concentrates, contracted labour, and investments in better housing. Risks that one's cows get sick or do not become pregnant remain. In many situations milk collection is unreliable, milk prices drop in the rainy season, and input services such as veterinary, AI and extension services are sub-standard. In such inconducive environments, the intensification route may be too risky. Supporting intensification should therefore go hand in hand with improving the market conditions and improving the delivery of services.

Fodder, genetics and manure

Central in intensification is feeding of quality roughage, combined with formulation of good quality rations. Generally, energy and protein from good quality roughage is cheaper than from concentrates. The options for fodder production depend on the agro-ecological conditions, farm size, and competition with other crops or livestock. Improving feeding in the dry season is key, for example with better ways to conserve fodder such as silage making. A crucial element in producing more and better roughage is access to new and superior varieties of fodder crops (grasses, legumes, fodder grains etc.). Varieties should be drought resistant, easy to conserve, climate resilient and affordable for farmers. For this intensive cooperation with CGIAR-institutes and international seed companies is needed.



More intensive fodder production implies application of fertilizer and/or manure, which causes an increase in more CO₂ emissions. There is a balance, with on the one hand less CO₂-emission through higher milk production and sequestration of CO₂ in fields with permanent fodder crops, and on the other hand extra emissions through application of fertilizers. How this balance works out is calculated with Life Cycle Analysis methodologies (LCA). LEAP (Livestock Environmental Assessment and Performance Partnership) is a public-private partnership, coordinated by FAO that develops a 'golden standard' for LCA's for livestock. The Dutch ministry of Agriculture (LNV) is member and provides financial support (www.fao.org/partnerships/leap).

A proper genetic profile of the dairy herd is important. Most local breeds have a low potential for milk production. Often, crossbred cows are inseminated with semen of Holstein Friesians and other Western breeds with a far too high milk production potential but low resistance against ticks and heat stress. A breeding policy and practice should be based on the agro-ecological conditions, management level and available feed rations.

In peri-urban situations and most large-scale dairy operations, manure from dairy is causing serious pollution of surface water. Improving manure management is crucial to contribute to strengthening the farming system and soil fertility, along with planted forage crops.

BUSINESS MODELS FOR THE YOUTH

Innovative work was done on forage production and conservation for the dry season within the former Kenyan Market-led Dairy Project (KMDP). New business models were introduced. This included youth groups that got involved in fodder production and fodder conservation and made a business as service providers. Another innovation was an advisory software tool for calculating optimal rations, called Rumen8. It allows dairy advisors to manage forage-based dairy cow diets, to increase production and reduce costs. More information in the [Close out magazine of KMDP](#).



Concurrent actions for interlinked transformation

In the end, the key question is how to successfully intensify dairy farming in a suboptimal or non-conducive environment. What minimum set of conditions should be met before it is justified and promising to sensitize, support and guide farm households to embark on the route towards a more intensive dairy farming system. In identifying actions in this domain, two arenas need to be distinguished: the dairy farming system and the value chain.

First, the foundation for transforming the dairy farming system is improving fodder production and feeding and breeds and breeding. They will only come to potential if other components in dairy management are also covered, such as calf rearing, fertility management, preventive health care, hygiene and fodder seed supply. In other words, intensification requires attention and continuous improvement of all aspects of the dairy farming system.

Secondly, sustainable intensification is not feasible when milk collection and milk prices are irregular and when veterinary and AI services are not reliable. Farmers need to be able to trust that their milk will be collected and paid for in time and that services are available. At the same time, processors will only invest in improving milk sourcing in a particular area if they foresee that farm households will stay in dairy and will improve dairy farming. The pivotal

component in this interaction is the increase of milk production in the dry season. Typically, there is a big flush of milk during the rainy season and a major drop during the dry season. This leads to low use of the available processing capacity, inefficiencies and additional costs. The best contribution that sustainable intensification can make to concurrent and interlinked transformation is improved milk production in the dry season.

Agenda for the future

With the remark that the set of challenges for sustainable intensification are very much country specific or even region specific, we are convinced that the following three elements need attention in all emerging economies:

1. **Analysis.** In the socio-economic and sustainability analysis for milkshed development, more attention is needed for identifying whether the minimum conditions at farm- and value chain level can be met to make investments feasible. This analysis may look at possibilities, feasibility, risks, trade-offs and impact of sustainable intensification of dairy farming systems.
2. **Fodder.** Develop and realize context specific Research & Development trajectories to pilot and scale improved fodder production, conservation and feeding, based on ration calculation. This should also include optimum use of by-products of the processing industry like brewer grain, citrus pulp, and maize bran tech. This needs to be complemented with innovation in manure handling and with developing know how and skills in all aspects of herd care and dairy management. Public-private partnership trajectories need to be setup and implemented to test, register and distribute to farmers the nationally and internationally available superior varieties of fodder crops (grasses, legumes and fodder grains).
3. **Improved breeding.** Engage in a conversation with stakeholder on developing breeding policy in the countries where the Netherlands is supporting dairy development, and possible start a trajectory towards a breeding policy. Such a policy should consider the agro-ecological conditions and climate change, the prevalent and upcoming diseases and the perspective and possibilities for better rations and improvement general herd care.

3. Nutritious dairy contributing to healthy diets

Key issues in dairy nutrition

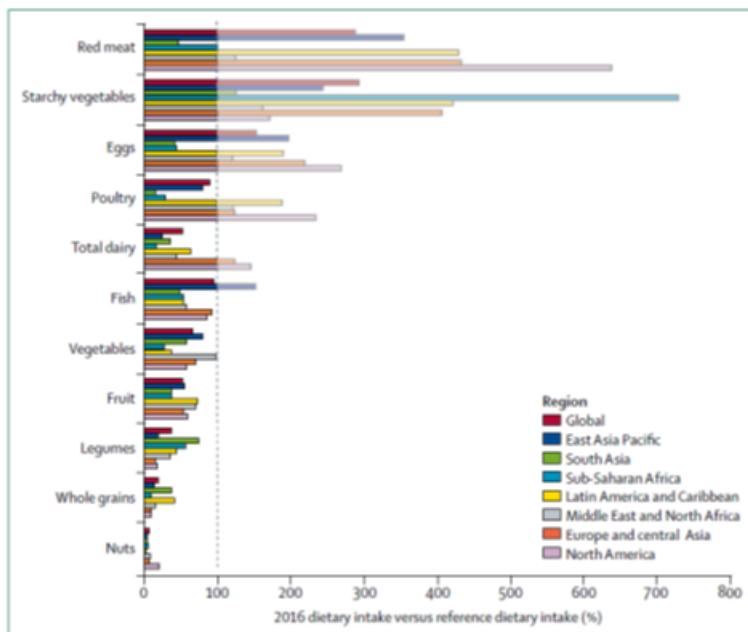
Globally there is a high demand to increase the production and consumption of nutritious food for optimizing human health. To many, a diet rich in plant-based foods and with fewer animal-sourced foods confers both improved health and environmental benefits. Dairy (milk, cheese, plain yoghurt) is crucial to meet the global demand for animal sourced foods, which is contributing to healthy diets: they provide an important source for high-quality protein and micronutrients, in a culturally accepted way.



The EAT-Lancet commission studied the evidence on the impact of dairy consumption for human health, focusing on calcium and dairy fat intake. Negative health effects were not found for the daily intake range of 0-500 g of dairy products. It concluded that a wide range of intakes of dairy products is compatible with good health. The commission is recommending a maximum consumption of 250 grams per day for people two years and older. At the same time, daily consumption of 250 grams per day is also environmentally sustainable.

The EAT-Lancet commission also looked at dietary gaps, globally and by region, shown below in Figure 4. Although some regions have reached the dietary intake for dairy, this does not apply for sub-Saharan Africa which according to 2016 data is providing just about 30% of the recommended daily intake for dairy.

FIGURE 4 – Diet gap between dietary patterns in 2016 and reference diet intakes of food. Data on 2016 intakes are from the Global Burden of Disease database. The dotted line represents intakes in reference diet.



The dairy sector is responsible for providing culturally accepted nutritious dairy products. This includes elements of food safety across the chain and minimizing or omission of unhealthy additives, such as sugar and colorants. At the same time the sector can leverage opportunities to add value to dairy products, e.g. through fortifying products.

In Northern Senegal, a dairy value chain was leveraged to distribute a micronutrient-fortified yogurt, using milk supplied by local dairy farmers to improve blood iron levels among the pre-school children from the same participating dairy farm households. The micronutrient-fortified yogurt was produced by a local dairy firm that established a contractual arrangement with dairy farmers and used the micronutrient-fortified yogurt as an incentive to increase milk supply from farmers.

Trade-off: Increased market access, reduced consumption at home

Increased market access may lead to a reduced consumption at home. An example was found in Ethiopia, where cow ownership had an association with growth in dairy consumption at home, but only among households that had limited access to markets. Household cow ownership was found to be less important where there is good access to either formal or informal local markets. In Uganda, research found that the number of large ruminants owned or managed bears a positive effect on household dairy consumption. However, they found only a weak association between livestock ownership and child nutritional status, specifically on the probability of being underweight and wasted (limited to children between 2 and 5 years of age), but no association to stunting.

Trade-off: More cows, less time for children

Cow ownership can also reduce time available for caring practices for children. A three country study, Tanzania, Kenya and Malawi, found that higher female market participation puts constraints on women's time, which in turn may have negative consequences on nutrition and health by reducing time for childcare, healthcare seeking, food preparation, and leisure. FAO found that women empowered by dairy farming have increased income and influence over household expenditures, which boosts their social and economic capital. However, the impact on women's workload was not considered in this review, although this literature research supports the notion that livestock ownership in developing countries may significantly improve nutrition outcomes.

MILK VENDING MACHINES (ATMS) IN KENYA

A recent retail innovation that provides access to pasteurized milk for a broader group of consumers is the introduction of milk vending machines, popularly known as milk ATMs. Demand for milk is expected to increase in Kenya and about 30% of milk produced in Kenya is formally marketed. ATMs are now widespread and are in various strategic outlets: retail shops, farms, cooperatives, supermarkets and milk bars.

An ATM is an automated facility that dispenses chilled, pasteurized, ready-to-drink milk, that is sold unpackaged. It offers several advantages: For the business, the elimination of packaging increases volumes sold due to lower retail prices. Its automated business transactions reduce labour and ease monitoring of sales turnover. Consumers expect ATM milk to enhance hygiene. It offers affordable milk at any desired volume. The general consumer perception is that milk sold at ATMs is safer than raw milk and as safe as packaged milk.



Despite the good uptake of milk sold at ATMs, some challenges remain. Testing of milk sold at ATMs shows that the milk is largely non-compliant with national and international standards for milk quality and safety. However, this is the case for most packaged milk as well. Severe limitations exist in surveillance and quality control of ATMs and intentional non-compliant behaviour expose consumers to serious health risks.

Agenda for future investments

Several studies over the past decade have provided knowledge on how agriculture can contribute to nutrition improvements. The body of evidence, and its quality, have increased exponentially. It will be important in the near future to expand this work to look at issues of sustainability, scale-up, and cost-effectiveness, and to explore how the new body of evidence can help inform broader agriculture policy and investment decisions. With the rich set of ongoing studies, we have a greater understanding of what agriculture can and cannot do to contribute to nutrition improvements. With a solid commitment to achieving the Sustainable Development Goals, the next 10 years promise to bring new evidence, action, and successes in improving nutrition through agriculture. This is also applicable to the dairy sector.

More experimentation is needed on how different types of markets can support improvements in diets through dairy and nutrition. The effectiveness of interventions needs to be tested that support increased

production diversity and nutrition knowledge, through targeted behaviour-change communication in communities where access to markets continues to be limited. In addition, the choice of dairy products, preferably without added sugar and colorants, that are being developed needs additional attention to avoid possible negative nutritional consequences, such as overweight and obesity.

4. Last mile delivery of inputs and services

Key issues

To make the dairy sector healthy and inclusive, and meet the growing demand for milk, smallholder farmers, including women and youth, need to be embedded and fostered in the dairy sector. Although most dairy producers are smallholder, smallholders are not always well represented in management of producer organisations. About 70% of smallholder dairy farmers labour force in East Africa are women. Women and youth often don't own assets and do not necessarily take part in decision-making on dairy. They too are not always well-represented in membership and leadership of producer organizations. The lessons learned on service delivery to smallholders, youth and women, as described in this section, were collected from Dutch funded projects in the East-African dairy sector, under the NEADAP project.

Inclusive business models in dairy, and interventions to include women and youth in the dairy chain, are not limited to service delivery. Yet last mile service delivery– from service provider to farm – plays an important role. Inclusion in supply chains will only be possible if smallholder suppliers meet volume and quality requirements and receive a fair payment for this. This requires well-organized bulking and chilling activities and further improvement of productivity and seasonal stability.

Reaching the resource-poor smallholder, women and youth can be realized either by producer organizations, processors, other related value chain actors, or blends of the same. These inclusive business models offer smallholders i) access to inputs, such as feed, fodder, medicines and equipment; ii) access to services, such as veterinary, artificial insemination (AI), extension and financial services.

Several producer organisations have shown that providing a wide range of services improves trust and loyalty to the organization and stabilizes milk supplies. In response processors depending on supply from smallholders are investing in similar models as well, be it through producer organizations or through private service providers. Processors who used to focus mainly on larger farmers, become more willing to invest in inclusive business models when they need smallholders to increase their milk supply.



Trade-off: increased production, more side-selling

When improving service delivery, a trade-off may occur between increased production and side-selling. Cooperatives may focus on providing a wider range of services to members, for example through input shops and milk collection. Through the improved accessibility of these services, member farmers introduce new practices such as silage making, semi/zero-grazing units, better breeds, better animal health. As a result, the quality and quantity

of the milk can be expected to improve. Sometimes however, one sees rather the opposite: milk supply to the cooperative declines. Side-selling to traders or direct sales to processors may be the reason. This occurs on a regular basis, undermining the investment in services by the cooperative.

PRODUCER ORGANISATION-LED SERVICES MODEL

Abesigana Dairy Farmers Cooperative Society (Uganda) is an example of a service model that is led by the producer organisation. The cooperative provides a diverse range of services to actively suppliers. This has resulted in a “one stop services hub” at cooperative level, offering a wide range of services such as extension services for skills and knowledge transfer, input supply, and financial services through their own savings and credit cooperative. It also offers access to affordable energy, machinery rental services and social services like tent and chair rentals for funerals. Some services target specific groups, such as engaging women in yoghurt making and employing youth in milk collection and transportation. All activities are managed by the cooperative. Such a total package allows for addressing the diversified needs of members.

Members appreciate the services provided by the cooperative, because they are cheaper and readily available as compared to those from other providers. Advance payments and loans are the most appreciated, but Abesigana DFCS is unable to meet the full demand due to limited financial capital. Services can further be improved by providing milk cans, AI, training by extension officers, and milking parlours.



Processor supported extension services

Another best practice is observed in Kenya at BAMSCOS union, a marketing union. The processors that the union supplies to pay 0,5 KSH cents milk extension bonus to the union, and the union reserves this money to invest in extension services. The main processor started with this practice and BAMSCOS was successful in negotiating the same arrangement with other processors, with encouraging results: milk supply to the processors is increasing significantly with 12% per annum. The number of extension officers expanded significantly, some of which are paid on a 50% subsidy basis for one year only. Calculations are made that after the subsidy, BAMSCOS can retain the extension officers from additional income through improved milk supply.

Agenda for the future and investment priorities

Smallholders, youth and women are not ‘automatically’ included in the support interventions of Dutch dairy development organisations and neither by those of producer organisations and processors. Their (potential) contribution to the dairy sectors is therefore yet unlocked. Based on research on last mile delivery of services and inputs and based on our experience with interventions in the past, we identify a number of recommendations.

Business models. Different business models of inputs and services delivery need to be supported and compared. From research and practice we know that different business models have been tried and developed, but that not all are equally successful. Question is what are the key success factors of the business models that work well, and how we can scale this success formula. Examples of different business models to compare are cooperative

business models (primary versus federated cooperatives), individual entrepreneur business models and joint business models (other than cooperative).

Inclusiveness. Being inclusive, for instance of youth and women, is determined by the cultural setting as well as the organisational characteristics of the service provider. Changing a culture may not be easy but adjusting organisational structures and processes may be possible. From research and practice we know which organisational factors are conducive to inclusiveness. The future challenge is the translate this knowledge into (training) action to help business organisations become more inclusive.

Based on experience with interventions in the past, we know that being clear and focused in designing interventions for smallholders, youth and women helps. Processors, producer organisations and input suppliers can improve the uptake of their services by being aware of the different roles people play in the dairy sector, and the different needs they have. Men, women, young and old, all require a tailored approach. Therefore, it is recommended to apply a targeted approach with tailored trainings and support packages. Tailored services for smallholders may be special products and techniques that can be adopted by smallholders, who have few resources to invest: Financial products, small quantities of inputs, tailored technologies, or subsidised inputs. Access to micro-credit is often needed before an investment in farm improvement can be made. It is also a good idea to create space and an enabling environment for women and youth, for example by opening up leadership positions and providing leadership training. Or by proactively employing women and youth at producer organisations and processors.

Investments and risks. Building a successful business model for services and input delivery requires investments by the companies involved. A better understanding of the investment constraints and risks involved will give insights in what initiatives to support and which not.

Side selling or being loyal. Farmers are entrepreneurs. Thus, we need to understand what their drivers and constraints are in terms of entrepreneurial action. If farmers side sell, it means that that is a more attractive business option, at least in the short term. What can we do to convince farmers to be more committed and more loyal?

Business focus. One of the problems that arise from practice is the large diversity of services that cooperatives want to deliver to their members. Pushed by members and often also local policy makers, cooperatives step into too many activities. This leads to a lack of business focus, problems of management and a high business risk. From research on cooperatives businesses, we know that cooperatives that want to be strong business entities, need to focus on a limited number of activities and objectives. The challenge for practice is to convince cooperatives to be more focussed.

Practical experience also shows that a business focus is key. Service provision is an investment that can yield in a positive return on investment, provided that the receivers of services pay for it directly (service fee) or indirectly (loyal supply of the milk to the service provider). This is not always the case. Hence, a business approach to service delivery is needed. The approach should be client-focused: Farmers define what is needed and play an active role in the service delivery system. Costs of extension services should be met from the extra milk supply. Costs of extension services may be shared between processors, producer organizations and farmers, as in the end they all benefit from increased productivity.

5. Keeping milk safe

Key issues

Milk quality is related to food safety issues such as contamination with bacteria and adulteration with, amongst others, mycotoxins (aflatoxin), antibiotic residues, chemicals (pesticides or hydro-peroxides) and heavy metals. These parameters determine the food safety and shelf life of the processed products. Milk quality is not related to parameters like fat, protein, Total Solids (TS) or Solids Non-Fat (SNF) – these parameters are milk composition parameters and are the basic elements for the value of milk and determine the milk price.

Being made up of 87% water, milk is prone to adulteration. Factors that frequently contribute to rapid deterioration in the quality of milk along the dairy value chain are traditional milking and milk handling practices, poor hygiene at farm level, rampant use of plastic milk containers, water addition by unscrupulous middlemen, poor milk transport infrastructure and lack of an efficient cold chain.

Milk quality improvement should be based on relevant legislation and enforcement. However, practice has proven that improvement of milk quality is driven by financial incentives for those engaged in the dairy supply chain before processing. In other words, if there is no financial benefit to improve milk quality and as long the farmers are still able to sell milk without regard for milk composition and food safety parameters, no one is interested or able to improve milk quality.

In order to produce dairy products with a long shelf life, good quality raw milk is essential. A milk processor or handler will only be assured of the quality of raw milk if certain basic quality tests are carried out at various stages of the value chain, from producer to processor, and finally to the consumer.

Challenges

A quality-based milk payment system is a tool to enhance quality and safety of raw milk and thereby of the final product. The aim is to continually improve quality and safety by paying a higher price for the desired quality parameters and to pay a lower price for the milk below those quality parameters, or to reject milk at all when it does not meet minimum standards. However, introduction of food safety tests will add to the cost of raw milk collection, which is either to be paid by the consumer, the processing plant, the milk transporter or the farmer. Investment need to be made in milk testing equipment and additional operational costs, calibration services and communication on the test results. Furthermore, investments are needed in training and coaching of farmers, milk transporters and milk collection operators. Finally, investment is needed in hardware for farmers and transporters, like stainless steel milk buckets and cans.



This all must be embedded in an adequate and relevant national legislation along with strict law enforcement to create an equal playing field for all engaged in order to ensure safe milk and dairy products to the consumer. Enforcement requires significant public investments in milk quality monitoring systems and adequate penalizing of non-compliers. Moreover, quality dairy products will only result in improved public health if consumers understand safe consumption behaviour and if advertising on dairy products is supporting healthy behaviour. Clearly this is an area where public and private interests interact, as a recent 3R Kenya study on public and private costs and benefits of a Quality Based Milk Payment System in Kenya showed (Ndambi et al., 2018).

QBMPs: THE SOLUTION?

Over the past four years, several pilots have been implemented on milk quality testing and payment in, amongst others, Kenya, Indonesia and Uganda. Each pilot had its own approach, investment level and operational cost. The Quality Based Milk Payment System (QBMPs) of the Uganda TIDE project had a very basic approach. It is private-driven, working within national policy and using a partnership approach involving three milk processing plants, ten milk collection centres, five milk traders, 1,000 farmers, the UCCCU dairy union, the Dairy Development Authority (DDA) and a Dutch team of technical experts. The first step was to document the current milk quality aspects and milk payment structure. Based on these zero measurements, milk standards for food safety and composition and payment levels were formulated and agreed between all chain actors involved.

For a period of 3 months, milk was tested, and results were provided to the farmers in order to document the poor quality and the need for training. Over the next three months, training was provided, and milk was tested in order to document the milk quality improvements as well as the higher payments that the farmers would get in case the QBMPs would be operational. After six months, the QBMPs was activated. During the first three

months of the QBMPs, this led to a bonus payment of close to 80,000 US\$ to the participating Milk Collection Centres and farmers. During the pilot it emerged that some cooperations paid only parts of the bonus to farmers. Later this was adapted, with a new strategy to pay 50% of the milk premium to the cooperative and 50% directly to the farmer. Not all Milk Collection Centres were able to meet the quality standards every day, but the bonus payments were a huge stimulant to meet the quality standards for the next day.

The pilot phase of QBMPs led to the formulation of a national guideline on milk quality payments, to be followed by all milk processors. Currently all milk processing companies are preparing to implement this guideline. Contamination with, amongst others, antibiotics and aflatoxin was not addressed in this QBMPs. However, the pilot generated trust between farmers, milk traders, coops and processors that testing can be done in an unbiased manner benefitting all. This trust will be the basis for increasing the milk quality testing parameters and will also be the basis to agree on the division of costs coming along with increased testing.

Agenda for the future and investment priorities

Quality-Based Milk Payment Systems are primarily useful if they lead to a functioning quality assurance system at dairy sector level, rather than just at single processor level. This requires both private and public investments. Not only in QBMP systems for all processed dairy, but also in regulation and enforcement of quality assurance, in banning of raw milk sales and in support to chain actors in meeting standards. This demands technical assistance, coaching and investment support. Public awareness campaigns on food safe are needed as well, for example on the risk of drinking non heat-treated milk.

Quality assurance in smallholder supply chains is relatively more expensive than in large farm supply chains, as testing of small supplies is just as expensive as that of large supplies. The search is on for low-cost tests that can be performed in remote conditions. Needs include investments in basic ultrasonic milk testing equipment at MCC level, advanced mid-infrared spectroscopy milk testing equipment at milk processors and relevant government organisations.

Data on milk quality are often fraught with political interests. Assessment and documentation of the real milk quality levels is necessary, by a national reference lab, as is re-formulation of national milk standards. A five to ten-year action plan is needed to move from the current milk quality levels to the new set standards.

6. The future dairy professional: training, education and extension.

Key issues

A [recent scoping study](#) showed that East Africa has a diverse offer in dairy training and education. Firstly, the “informal”, short-term, on-the-job training, offered mainly by staff of dairy development projects, government extension agents, and a small but growing number of private advisory services. Secondly, the vocational certificate or diploma that students can get through Technical and Vocational Education and Training (TVET) is offered mainly by agricultural colleges and is sometimes competence-based. Thirdly, the university level education, where dairy production and processing usually are among a number of courses in broader agricultural or animal production degree programmes for BSc and MSc. Fourthly, training offered by electronic platforms are upcoming, such as [i-Cow](#). These platforms use inputs from all the previous.

The demand for professionals who are apt to service in a client- and market-oriented way is growing, and the digitalisation has had a positive effect. Still, the professional consultancy and advisory services are not yet achieving the high standards needed and the formal programmes remain traditional.

More generally, the lack of human capacity to achieve the desired improvements is a major issue, both in developing countries and in the Netherlands. Fewer and fewer people are being involved in the dairy sector. Development interventions focus less on the production aspect of dairy and much of the specialised staff on international (and tropical) dairy development is lost, be they from public, private, knowledge or civil society sectors.

Context in more detail

In general, public advisory services and formal training are not valued highly by the private sector or development projects. They are regarded as too academic and not practical enough. Most extension agents are trained in general livestock production and do not have sufficient practical experience in dairy to effectively serve farmers. This is also true for Ethiopia, where the livestock Development Agents cover all livestock and where the government offers limited space for private services. In Kenya, training of farmers has suffered since livestock production and veterinary services were devolved to counties without national guiding principles and policies. Standard training manuals for farmers and other value chain actors are scarce, as is support to extension services. Those regulating the sector do not seem to understand their role. As one Kenyan

interviewee put it: “It is a jungle out there”. In Uganda, the various reforms to the extension service over the last two decades have also had a detrimental effect on effective support to the dairy sector.

Occupational standards and relevant curricula for practical, competency-based education and training (CBET) have been developed or are planned in a number of countries for several professions, for example dairy farm production manager or processing plant manager. At the same time, the lack of instructors with expertise in delivering practical skills, as well as suitable facilities and infrastructure at colleges and universities, like farms or processing plants, remain key limitations.

Dairy industry stakeholders (commercial farms, processors, input suppliers and service providers) universally agree that current graduates from both TVETs and universities typically lack practical skills, such as cow and herd management, milk handling, dairy business and marketing and organizational management. There is a need for skills development through formal education, for example through increasing the quality of competency-based and practical training in certificate/diploma programmes. However, there is an even greater need for continuing professional development and skills upgrading through short courses and the use of virtual learning platforms.

Consequently, livestock development projects such as the Dutch-supported KMDP, TIDE, EDGET and DairyBiss projects, have focussed on enhancing the skills of specialised dairy trainers and advisors, through training of trainers, and associated development of training materials and training facilities such as Practical Dairy Training Farms (PDTFs).

One recommendation here would be to identify and develop possibilities for creating educational experimental farms for training and demonstration or use farmer field schools and local/regional farms that represent desirable exemplary practices where farmers can meet and learn from each other. Here apprenticeship learning could take place: a special form of peer-to-peer learning in that some ‘peers’ have more knowledge and experience than others and are seen as ‘experts’, while others with less knowledge and experience are seen as ‘novices’. In this case both government and the private sector will need to play a facilitating role to allow farmers to make their workplace environments more conducive to education and learning.

Concluding, there is much interaction between the five training/educational areas mentioned. Universities may offer vocational certificate programmes or use practical dairy training farms established by external projects. One can view the spectrum of dairy training and education as an integrated skills, knowledge and information development “system”, rather than separate “practical” and “academic” institutions aligned to private sector, colleges or universities. The quality of extension advice, offered by either private or public actors, is a direct result of this system.

PDTFs AS AN EFFECTIVE INVESTMENT?

Practical Dairy Training Farms (PDTFs) have been developed by both TIDE in Uganda and KMDP in Kenya. On these commercial farms, the owners or associated trainers offer training services, usually on a commercial basis. Courses at PDTFs usually last between 1 and 4 days, with trainees accommodated on-farm.

Nevertheless, the sustainability of PDTFs as a business is uncertain. The commercial development of training activities often takes a back seat to the “core business” of dairy production. A combination of poor marketing of courses, the inability of trainees to pay the fees, and the fact that practical dairy managers may not make good trainers have all limited the impact and sustainability of PDTFs. One option to upgrade PDTFs, as being explored in Kenya, is to link PDTFs to specialised training and advisory firms, that can take responsibility for providing qualified trainers, course marketing, logistics, etc. A number of private firms already offer dairy training in the different countries.

How to reach impact at scale?

In the past, the Netherlands Initiative for Capacity development in Higher Education (NICHE) and the Netherlands Fellowship Programmes (NFP) specifically targeted higher education and training organizations. Given the size and growth rate of the dairy sector, further support to only a few organizations is unlikely to have a widespread and sustainable impact on dairy sector performance in LMICs. Impact at scale can better be achieved through a more generalised support to a range of training organizations. The digital era and the speed of internet penetration in East Africa allows for a regional approach in training for dairy skills. The Netherlands, through public-private partnerships with knowledge institutes, is developing comprehensive and practical blended-learning materials for the Dutch dairy sector. Bearing in mind key differences between countries, these can be adapted for use in emerging economies. These blended-learning materials could support regional or national learning platforms and can be used by a broad array of educational institutes and training providers, to develop the skills demanded by the labour market. One example is [the “franchise model” of Dairy Training Centre](#). Online learning platforms already have been developed by the Dairy Training Centre, HAS Den Bosch, ZuivelAcademie (NL), Cornell university and many others. The potential – and competition – is obvious.

FROM SIMULATION TO DIRECT HANDS-ON APPLICATION



Serious gaming

FarmSimulator has one million players worldwide, of which 10% are farmers (to compare, FarmVille peaked at 83 million monthly users). According to this [Article in The Guardian](#), manufacturers pay to see their vehicles featured in-game.



CowSignals

The training company CowSignals combines live and online training. Since 1995, the network has grown to 400 certified trainers offering workshops in over 50 countries. [CowSignals.com](#) contains a series of training manuals and educational videos.



MOOC

WUR and the University of Reading launched a Massive Open Online Course on climate-smart agriculture. Over 5,000 people participated in 2017. One week out of three is a [dairy module](#).

Agenda for the future and investment priorities

The situation of the dairy training and education system in East Africa is likely to be similar for other emerging economies. So, what should be the Dutch Diamond Agenda for Dairy Development for training, education, extension and learning?

Dutch support to dairy in emerging economies seems to focus mainly on civil society and private sector. There short-term gains and impact are easiest, and transaction costs are lowest. Support to knowledge institutions has been too segmented to have significant impact on the sector. Support to governments, for example in policy development has been avoided, as these governments are perceived as inefficient at best, corrupt at worst. However, longer-term dairy sector development will require more holistic, longer-term action and **multi-lateral cooperation at institutional levels**. Continued support to the professionalisation of the training and education sector seems a smart intervention.

The diamond links are crucial: government, knowledge institutes, civil society, private sector and farmer organizations need to cooperate to develop dairy education, training, extension and learning. As the Dutch private sector continues to invest in the private dairy sector, other parts of the Dutch Diamond will look at the Dutch government to support capacity building in knowledge institutions, sector organizations, SMEs, policy development etc.

A recommendation is **to invest in blended learning**. The new regional dairy education programme EARNED includes plans for a blended learning platform. This will improve organizational capacity of consortium partners and participating TVETs to deliver innovative, practical, blended learning that balances knowledge and skills. The potential of blended learning was also discussed during the [Dairy Africa \(APF, EKN, NEADAP\) workshop in Nairobi in August 2019](#). Recommendations included accelerating of E-Learning via online platforms, connecting students to practitioners, organising accreditation of trainers and advisers, for example through an association of alumni that studied dairy in the Netherlands.

To serve separate countries as well as regions and in order to build on and enhance existing knowledge, a “platform for learning” or “Dairy Platform of Excellence” could be established. This could include windows for a knowledge information system, training, digital advisory services (Q&A) and action research and learning events around longer-term learning questions. It could also host a Community of Dairy Practitioners for business, farmers, NGOs, policy makers, advisors and projects.

Part III. A Dutch Dairy Development Agenda for the Future with its investment priorities

The different pathways outlined in this paper are not an either-or agenda, but rather reinforce each other. Within a food system approach, interventions and investments focusing on different leverage points should be concurrent – solving one issue while forgetting another will not further the whole system. Still it is clear that trade-offs are real and should be well considered, as our current nitrogen oxide dilemma illustrates perfectly. The upside is that in many emerging economies the intensification process is in a much earlier stage, offering opportunities for more balanced sustainability outcomes in terms of people, profit and planet.

Concurrent and interlinked transformation demands a shoulder to shoulder approach by all Diamond actors - private sector including the financial sector, producer organizations and farmers, public sector agencies, civil society and knowledge actors. Each actor has a key role to play in securing a sustainable inclusive future for dairy. For policy makers this is to create of a conducive environment with clear policy choices on trade, investment and regulations. For private sector and farmers to make investments in shared value. Civil society and knowledge institutes are to facilitate the transition and build capacity. Knowledge & skills development is a *conditio sine-qua-non*, as much of the above can only be done with competent technical staff with access to reliable data.

Engagement of Dutch Diamond actors as well as their emerging economy counterparts – it is about their country and about their livelihoods - offers the challenge of proper multi-stakeholder processes that deliver sound benefits for all. An area that seems to be cut out for support by the [Netherlands Food Partnership](#). To remain an attractive dairy development partner, we will need to show our capability to translate the processes behind our own dairy transition to the totally different contexts of emerging economies. The Dutch Diamond collaboration principles are likely to be more key in there than the type of fodder we feed and the type of equipment we use. After all, where would we be without well-trained farmers, strong farmer-owned agribusiness, and close linkages to input suppliers, markets, finance, policy and knowledge institutions?

[The Dairy Event in Nairobi last August](#) and this November 27 event are important steps for input in and validation of the analysis and recommendations in this paper and to sound out common priorities among Dutch dairy development actors. Based on the outcomes of this workshop, we will draft a more definite agenda and plan of action and build commitment from the partners in the Diamond. Of course, these documents also need to be enriched by key actors in the emerging economies we are partnering with.