Position paper

Dairy for nutrition, employment and sustainability

An action agenda for the Dutch contribution to dairy development in Africa and Asia

Food & Business Knowledge Platform

Agri Pro Focus

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This position paper is the product of valuable collaboration between many organisations. The process started with the organisation of the workshop "Dairy, the motor for healthy growth", attended by 115 participants on 13 August 2019 in Nairobi. A follow-up meeting in Veenendaal, the Netherlands, was organised on 27 November 2019. Ninety participants joined this event on "Dairy Development in emerging economies: A motor for sustainable and healthy growth?" to discuss needs of, and challenges and opportunities for dairy development in emerging economies.

Both events were co-organised by AgriProFocus/Food & Business Knowledge Platform and the Netherlands East African Dairy Partnership (NEADAP), a consortium of SNV Netherlands Development Organisation, Wageningen University & Research, Bles Dairies Consultancy and Agriterra. The WUR - LIQUID programme contributed to the Veenendaal event.
The action agenda for the Dutch contribution to dairy development in Africa and Asia that is presented in this paper emerged from the discussions at these events and the input from various private-sector players, practitioners and experts.

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The events preceding, and the development of, this position paper have been facilitated by the Food & Business Knowledge Platform and AgriProFocus. In the course of 2020 these organisations merge into the **Netherlands Food Partnership (NFP)**, whose aim is to accelerate the country's contributions to SDG2. NFP will continue to organise the exchange of knowledge and support coalitions working on new dairy initiatives and programmes.

AgriProFocus
Food & Business Knowledge Platform

Foreword

The world's population is growing rapidly and there are more and more mouths to feed. By 2030 we want to end hunger (SDG2) and ensure access to healthy, sustainable and safe food in sufficient quantities for everyone, while we also want to achieve the other SDGs, most notably those related to poverty, gender, inequality, sustainable production and consumption, climate action and protecting the environment. This requires a transformative change of our food systems.

The COVID-19 pandemic and the need to adjust our societies and economies to living with its effects provide an opportunity for change that can help us tackle the interwoven challenges of food security, climate change and international trade. In emerging economies, dairy development can play an important role in this. Milk and dairy products not only form part of a healthy diet for many people, they are also a source of income and rural employment. Manure from dairy livestock is used as an organic fertiliser that contributes to soil fertility and helps to close the nutrient cycle in agriculture. When locally produced dairy proteins are essential for a country, it should aim for a dairy sector which is sustainable and based on the principles of circular agriculture.

The Netherlands has long been a successful exporter of dairy products all over the world. This success is the result of strong collaboration among stakeholders, as this creates a climate that is conducive to innovation and production. The Ministry of Agriculture, Nature and Food Quality and the Ministry of Foreign Affairs are very proud of this, but also feel a responsibility to share our expertise and experience as part of our contribution to finding solutions to global challenges. These increasingly complex and interrelated challenges cannot be solved by one party alone. That is why we stimulate the generation of coalitions by initiatives such as the Netherlands Food Partnership, because we believe we can contribute to addressing these global challenges by combining forces and getting things done together.

We are therefore very grateful for this paper as it makes available the experience of many stakeholders. Today the Netherlands supports an extensive portfolio of dairy development initiatives, and based on many years of experience this paper presents six leverage points and proposes an action agenda for dairy development in developing countries and emerging economies. The paper is intended to inform practitioners and policymakers on effective contributions to SDG2 and can be of use when designing new sustainable dairy programs. At a time when access to healthy nutritious foods is under further pressure as a result of the pandemic, this is all the more important.

In this way, we contribute to global food security – *together*.

Carola van Rijnsoever
Director Inclusive Green Growth,
Ambassador Sustainable Development
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Ministry of Agriculture, Nature and Food Quality

Summary

This position paper presents an action agenda for Dutch dairy development support in African and Asian countries.
The Netherlands has a history of development and innovation in all agricultural sectors including dairy. Key to its success is the 'Dutch Diamond approach', a metaphor for the collaboration between private companies, knowledge institutions, civil society organisations and government bodies. This Dutch Diamond approach can also contribute to transitioning dairy in emerging economies towards successful, sustainable and inclusive dairy sectors.

The contributors to this paper represent all facets of the Dutch Diamond, working in the private sector, knowledge institutions, civil society organisations and government, and the paper is based on their extensive knowledge of and experience in dairy development in many African and Asian countries. They have drafted an action agenda to further unlock the potential of the Dutch Diamond to contribute to dairy development in developing countries and emerging economies. This action agenda is intended to serve as inspiration for existing and future dairy initiatives and programmes.

Dairy for nutrition, employment and sustainability

Dairy production and consumption can contribute to sustainable food and nutrition security. Dairy products such as milk, cheese, yogurt or butter are a culturally accepted source of high-quality protein and micronutrients for many people. In emerging economies, the demand for dairy products is on the increase, offering opportunities for the dairy sector. It can spur economic growth and increase employment, also for youth. Dairy production can also play a role in contributing to ecologically sustainable agro-food systems, provided developments are smart.

The action agenda presented in this paper aims to contribute to three objectives:

1. Affordable, safe and nutritious diets
2. Gainful employment and improved livelihoods
3. A sustained agro-ecological base.

Six leverage points to trigger change

The action agenda is based on a food systems approach and focuses on six key leverage points that are expected to trigger a cascade of positive changes in the dairy system. For each leverage point, an agenda for future support and investment priorities has been formulated. Together these form a comprehensive core agenda for all actors working in dairy development in developing and emerging economies.

The first four leverage points directly relate to the production and consumption of dairy products:

1 Contribute to affordable and nutritious diets

Dairy can contribute to healthy nutrition. In particular, dairy products can be a valuable element in the diets of pregnant and breastfeeding women, children over the age of two, and adolescents. To unlock the potential of dairy to contribute to affordable and nutritious diets, this agenda proposes three themes for future support and investment:

- Increase access to affordable and good quality dairy products, for example through improved intra-household distribution, school milk programmes or milk dispensers.
- Increase consumer knowledge of healthy nutrition; interventions may be directed at consumer awareness, private-sector self-regulation or policy regulation.
- Develop and scale interventions to improve diets through dairy, based on a solid knowledge base.

2 Keep milk safe

Over the past years, there have been several scandals concerning the safety of milk. These incidents are a threat to human health, lower consumers' confidence in the sector, and place farmers' income at risk. Keeping milk safe is essential for a successful dairy sector.

To tackle this issue, the agenda proposes that support and investment are focused on three themes:

- Support consumer awareness and trust, through unbiased and trust-building communication with consumers.
- Assure quality by advancing quality-based milk payment systems, where farmers are rewarded for delivering quality milk.
- Develop laboratory capacity. Assessment and documentation of milk quality by a national reference laboratory is needed.

3 Strengthen inclusive and competitive business models

The dairy sector can contribute to an inclusive, healthy and sustainable food system. For this, all producer types including smallholder farmers, women and youth should be involved in business models. Inclusive business models, which deliver services and inputs for farmers and market their dairy products, also need to be competitive, with sufficient business and client focus. To promote inclusive *and* competitive business models, interventions should:

- Target the inclusion of smallholders, youth and women. Dairy cooperatives, producer organisations, and input suppliers can be instrumental in matching inclusivity with a business approach.
- Develop and support the scaling of successful business models for input and service delivery and milk marketing. Key success factors should be investigated.

4 Make dairy sustainable

Dairy production can contribute to sustainable food systems, if developed carefully and integrally. At present, however, much dairy production contributes to environmental pollution and degradation. In developing countries, challenges include low productivity with high greenhouse gas emissions per unit of product, land degradation, competition for land, and manure overload in peri-urban areas. Ways should be found to increase production that are resilient and that restore rather than deplete the agro-ecological base. Future support and investment should:

- Couple dairy production to land for feed production. Priority should be given to upgrading low input–low output land-based dairy systems with own feed production and good herd management.
- Develop, pilot and scale sustainable dairy practices that contribute to people, planet and profit, with context-specific research and development trajectories.
- Assess, monitor and evaluate the sustainability of interventions, including their impact at system level and on dealing with trade-offs.

The other two leverage points are cross-cutting and concern the enabling environment of dairy business:

5 Strengthen future dairy professionals through training, education and extension

A successful dairy sector can only develop when there are sufficient dairy professionals with high standards of knowledge, skills and expertise, who can offer adequate services in a client and market-oriented way. Many developing countries have low levels of theoretical instruction, insufficient practical skills training, and a lack of training on business and entrepreneurial spirit. Future support and investments should:

- Support the professionalisation of dairy experts, by improving training and education. This requires investments in the entire education system.
- Improve skills and entrepreneurship using blended learning, combining online and face-to-face teaching methods with practice at company and farm level.
- Focus on improving quality and impact of the support, not on numbers of people trained.
- Create a Dairy Network of Excellence to share knowledge and to build upon, link and enhance existing and new knowledge.

6 Get the development, trade and investment policies right

A successful dairy sector requires government policies that are geared towards creating an enabling environment. In many emerging economies and developing countries, the dairy sector is part of a politically sensitive arena in which potentially conflicting interests are at play. These may include issues concerning attaining self-sufficiency, the price of milk for consumers and producers, dealing with an informal chain, food safety, and fighting malnutrition. Dutch dairy development support projects have shown that, with support of the Netherlands' Embassies and in collaboration with local partners, Dutch actors can play a constructive and influential role in inclusive and comprehensive policy development, in addition to achieving concrete results on the ground. This requires the Embassies and both the Ministry of Foreign Affairs and the Ministry of Agriculture to play an active role. To further this, the action agenda proposes to:

- Support national governments in policy agenda setting. Dutch government support should focus on initiatives that can drive systemic change in the dairy sector.
- Invest in diplomatic and stakeholder relations to support an enabling policy environment, which can advance (Dutch) private-sector development.
- Develop an integral Dutch policy on dairy development support, using the experience and evidence from dairy development projects.

General principles

The paper concludes with some general principles for Dutch dairy development support. The biggest gains in developing dairy farming systems that contribute to sustainable and inclusive food systems are likely to be achieved by upgrading and improving low input-low output-low risk dairy farming systems. This can be done by developing, testing and supporting innovations. This should be done in an integrated manner, considering economic aspects, inclusivity aspects and environmental aspects.

Interlinked transformation

The paper gives guidelines on how to achieve an interlinked transformation towards a sustainable and inclusive dairy sector. The six leverage points presented are not an either-or agenda. They have been drawn up to reinforce each other through concurrent action.

Developments on each of these leverage points are at different stages in each region and each country. Actions and support on the leverage points should be context-specific and tailor-made to each country or region.

To support sector transformation, it is essential to develop an integrated process. Such a process should be part of any larger dairy development programme, alongside more tangible deliverables and outcomes. It should include:

a **Development of a common vision** amongst relevant stakeholders, that provides guidance and stimulates innovations while maintaining an appropriate level of detail. This can be achieved through targeted multi-stakeholder processes with a large variety of actors and by forming focused coalitions.

b **Building of networks** among private sector, government agencies, NGOs and knowledge institutes. Networks form the basis for innovations, enlarges the scaling arena and promotes faster adoption. Each actor, whether in the private sector, government, NGOs or knowledge institutes, has a key role to play in securing a sustainable inclusive future for the dairy sector.

c **Support for uptake by the sector** through piloting, learning and experimenting in a number of fields including good animal husbandry practices, diversified market demand, infrastructure, business models, policies and regulations.

Engagement of the Dutch Diamond representatives with their counterparts in Africa and Asia will require carefully conducted multi-stakeholder processes, if sound benefits are to be achieved for all. The proposed Dairy Network of Excellence will be helpful for facilitating the knowledge sharing and applied action needed for this multi-stakeholder process to further co-develop effective dairy development strategies.

Based on the action agenda presented in this paper, new coalitions can be built to develop or strengthen existing and new dairy initiatives and programmes. This is supported by the new Netherlands Food Partnership, which was launched on World Food Day 2019. In 2020, the Food & Business Knowledge Platform and AgriProFocus will merge to form the Netherlands Food Partnership working organisation.

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Reading guidelines

Part 1 provides an introduction to the potential contribution of dairy to nutrition, employment and sustainability worldwide and presents the Dutch action agenda for dairy development in Africa and Asia.

Part 2 concretises this agenda for action by describing in detail six leverage points with coherent strategies.

Part 3 describes the process envisioned to achieve interlinked transformation by supporting sustainable and inclusive dairy development.

Appendix 1 provides background information on the context and characteristics of dairy in developing countries and emerging economies, upon which the action agenda is based.

Appendix 2 provides background information on the food systems approach which was used to develop the action agenda.

Appendix 3 provides a list of Dutch supported dairy development projects in Africa and Asia.

part
1

Action agenda for dairy development

Introduction: Dairy development for food and nutrition security

Global food and nutrition security is one of the main challenges we face today. Food security exists when all people, at all times, have physical and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. In 2014, the Netherlands' government set three objectives in its food security policy, and these were reconfirmed in the 2019 policy brief 'Towards a World Without Hunger in 2030: the Dutch contribution'[1]:

1 **End hunger and malnutrition (SDGs 2.1 and 2.2),** with the Netherlands aiming for a sustainable improvement in the nutritional status of 32 million young children over the period 2016-2030;

2 **Promote inclusive and sustainable growth in the agricultural sector (SDG 2.3)**, with the Netherlands aiming for a sustainable increase in productivity and income for eight million small-scale food producers over the period 2016-2030;

3 **Achieve ecologically sustainable food production systems (SDGs 2.4 and 2.5)**, with the Netherlands aiming for the ecologically sustainable use of eight million hectares of agricultural land over the period 2016-2030.

In addition to direct activities that support these objectives, the Dutch food security policy devotes attention to improving enabling circumstances for food security, such as knowledge and capacity building, private-sector development, land-use rights, position of women and linkages with other sectors and themes.

Dairy production and consumption can contribute to sustainable food and nutrition security in developing countries and emerging economies. Dairy products (such as milk, cheese, yogurt, butter) are a culturally accepted source of high-quality protein and micronutrients for many people. A minimum amount of high-quality protein is particularly important for the growth of infants and young children, and for the health of adolescents. While this paper focuses mainly on dairy production using cattle, this does not exclude dairy products from other animals, such as goats, camels, buffalos.

In emerging economies, the demand for dairy products is expected to increase by 25-60% over the next decade. This growing demand offers multiple opportunities for the dairy sector. It can spur economic growth and increase employment, also for youth, in these economies.

The dairy sector also has a potential role to play in contributing to ecologically sustainable agri-food systems, provided developments are smart.

At the same time, the livestock sector, including dairy, faces severe challenges related to growing demand, food safety, inclusive development, and greenhouse gas emissions and environmental pollution. These challenges require a global transformation of the livestock sector, so that it contributes to the objectives of sustainable food and nutrition security.

A history of innovation: gains and side effects in the Netherlands

The Netherlands has a long history of agricultural development and innovation. During the 1950s and 1960s, investments in research, extension and education, combined with market and land policies, resulted in world-famous improvements in the agricultural system, leading to huge productivity increases. As a result of this the Netherlands became the world's second exporter of agricultural products, including dairy. Dutch businesses and knowledge spread around the globe. During the same period, there was an enormous decrease in the number of farms and farmers in the Netherlands as a result of intensification and scaling. This was accompanied by a concomitant rise in the number of hectares and animals per farm.

However, these successes also brought negative side effects. Intensive livestock production systems have been the subject of heated public debate in the Netherlands, for example, the issues of animal disease and welfare, loss of biodiversity, the effects of livestock production on public health, and excessive manure and the associated environmental pollution. More recently, the challenges concerning nitrogen emissions and livestock's contribution to greenhouse gas emissions have been debated. Dutch driving forces are now focusing on overcoming these challenges and devising innovative approaches to develop Dutch agriculture in a more sustainable way. Circular farming is such an approach.

In contrast, developing countries and emerging economies face very different circumstances from those of north-west Europe. Generally, the challenge for the dairy sector in developing countries is to increase productivity and reach markets. The main issues concerning environmental sustainability are overgrazing of communal lands, leading to erosion, and pollution of ground and surface water in peri-urban areas. In supporting improvement of production, we need to be aware of and anticipate on the environmental problems experienced in developed economies and address these on time. In short, 'doing the same things better' is not good enough, we also need to find ways to 'do better things'.

This requires actors involved in dairy development to reflect, rethink and redefine their efforts and contribution in dairy development. A systems approach to dairy development, focusing on dairy as part of the broader food system, will enable an integrated approach. This includes considering the enabling environment and related institutions of the food systems.
The Food Systems Approach (FSA) offers tools and insights for systemic improvements, focusing on the desired outcomes of the food system. This position paper takes the Food Systems Approach as a starting point for reflecting, rethinking and redefining dairy development support, the ultimate aim being to contribute to the objectives of the Dutch food security policy. For more explanation on food systems thinking, see Appendix 1.

A Dutch Diamond approach for inclusive and sustainable dairy

Prior Dutch investments in research, extension and education have more recently advanced into a Dutch Diamond – involving collaboration between the private sector, knowledge institutes, societal organisations and governmental agencies (see box). Due to the Netherlands' leading role in global food production and innovation, many of these actors are active in the agricultural and dairy sectors in different parts of the world. Dutch-supported projects such as EDGET, DairyBISS and Bridge (Ethiopia), KMDP (Kenya), TIDE (Uganda), Dairy4Development (Indonesia), Dairy4Growth (Vietnam) and LIQUID (Kenya, Tanzania, Vietnam and Indonesia) have been working on different aspects of dairy

The Dutch Diamond

The 'Dutch Diamond approach' is the term that has been coined for the mutual collaboration between companies, knowledge institutions, civil society organisations and government agencies. This consent-based way of working together has been the foundation for the successful development of the Dutch food and agricultural sector since the Second World War. The Diamond approach has become an example of how to successfully realise and scale innovations. It is based on developing a joint agenda and joint programming and networking. Innovations initiated by frontrunners and coalitions of the willing are stimulated and supported by providing incentives for scaling and mainstreaming. Adopting the Diamond approach in the context of small-scale agriculture in developing countries requires intensive exchange of valuable local knowledge and experience by all stakeholders.

development for many years (a list of Dutch-supported dairy projects can be found in Appendix 3). This has brought a wealth of information, learning and success in dairy development that can benefit dairy sectors in many developing countries. Through this Dutch Diamond approach, the players involved can now further contribute to transitioning the dairy sector in Africa and Asia towards sustainable and inclusive development.

This paper builds on the 2014 Milking to Potential strategic framework for dairy-sector development. In the past years, this framework has guided dairy development support. In the mean time, thinking and experiences have further developed. The focus is now on developing dairy as part of the wider food system it operates in, starting from the desired outcomes of the food system. This enables the necessary attention to be paid to consumers and to the broader environment that the dairy sector is part of.

The paper presents an action agenda for dairy development support in the period up to 2030, working towards desired outcomes of dairy development. It focuses on six key leverage points which have been identified by key actors working in dairy development. These are followed up by coherent strategies and investment priorities that contribute to food and nutrition security, to inclusive and sustainable growth, and to ecologically sustainable food production systems.

Out of the results of several expert meetings – combined with input from private-sector players, practitioners and experts – a 'Dutch Diamond' development and action agenda has emerged for dairy development support in African and Asian countries. The input is based on experiences over the past years and on intensive debates with a large group of experts.

The action agenda presented in this paper serves as inspiration for (new) coalitions that intend to develop or strengthen existing and new dairy initiatives and programmes. This is supported by the new Netherlands Food Partnership.

Three objectives for the Action Agenda for Dairy Development

In line with the Dutch government's policy on realising global food and nutrition security, the action agenda has three objectives:

1 Affordable, safe and nutritious diets

The dairy sector plays an important role in realising food and nutrition security. Impaired growth of children as a result of undernutrition is a big problem in emerging economies, especially in Africa[2]. Good nutrition, particularly for pregnant and lactating women and for children over the age of two, has a positive influence on health and children's learning capacity in later life. Dairy products form an important part of good nutrition, provided they are safe and not contaminated by antibiotics, chemicals or micro-organisms. Measures to improve and guarantee milk safety should be a priority of dairy development.

Objective for support in dairy development:
Focus on broad access to affordable and safe dairy products as part of a nutritious diet, particularly for pregnant and breastfeeding women, children over the age of two, and adolescents.

2 Gainful employment and improved livelihoods

Advancing the dairy sector can spur economic growth, create an opportunity for import substitution (African milk imports are worth USD 500 million annually), and bring gainful employment. The global dairy sector supports the livelihoods of 1 billion people – around 600 million people on-farm and 400 million in the value chain – the majority of them in developing countries, according to FAO. For the majority of farmers, however, it is a challenge to earn a living wage from dairy production[3]. With the growing demand for dairy products, further development of the dairy sector can contribute to employment creation and play a role in lifting poor people out of poverty[3]. Dairy farming is labour intensive and can provide regular cashflow and a secure means of income. Input and service supply, milk collection and distribution can also generate considerable direct and indirect employment. Employment generation in the processing and retail sectors depends on the predominant dairy product types. Over the next decade, millions of young people are expected to enter the labour force. Non-farm and urban sectors will not be able to absorb all new labour market entrants.

Objective for support in dairy development:
Work on dairy sector development strategies that unlock and harness the multiple opportunities that the growing demand for dairy offers for gainful employment, and that realise youth inclusion, reduction of workload (especially for women) and equity between men and women.

3 Sustained agro-ecological base

Due to the growing demand for meat and dairy products, the contribution of livestock (including dairy production) to local and global environmental pollution and unsustainable natural resource use is on the rise. At the same time, dairy can play an important role in realising sustainable (mixed) farming systems and food systems. Opportunities abound for dairy to contribute to sustainable land use and the agro-ecological base, for example through integrated soil fertility management or principles of circular agriculture and climate-smart agriculture. In all cases, sustainable production of quality fodder is an important aspect. Existing and new ways for dairy to contribute to a positive impact on the agro-ecological base need further attention. The achievable and optimal productivity level for dairy is context-specific and should be carefully thought through in each case.

Objective for support in dairy development:
Support dairy development that contributes to sustaining the agro-ecological base, based on principles of circular farming, integrated soil fertility management and on restoration and multiple use of communal land.

Action Agenda for Dairy Development

The Action Agenda for dairy development support is focused on achieving three desired outcomes. The Agenda for Action constitutes of six leverage points, that are seen as hotspots in the food system where change can be triggered to realise the objectives. Part 2 of this paper discusses the leverage points and the related strategies in more depth.

The Agenda for Action is summarised on the next page.

Action Agenda for Dairy Development

Desired outcome 1	Desired outcome 2	Desired outcome 3
Affordable, safe and nutritious diets	Gainful employment and improved livelihoods	Sustained agro-ecological base

Contribute to affordable and nutritious diets

- Increase access to affordable and good quality dairy
- Increase consumer knowledge of healthy nutrition
- Develop and scale interventions to improve diets through dairy

Keep milk safe

- Support consumer awareness and trust
- Assure quality by advancing quality-based milk payment systems
- Develop laboratory capacity and cold chains

Strengthen inclusive and competitive business models

- Target interventions at inclusion of smallholders, youth, women
- Develop and scale successful business models for input and service delivery, and marketing

Make dairy sustainable

- Couple dairy production to land for feed production
- Develop, pilot and scale practices that contribute to sustainable dairy
- Assess, monitor and evaluate the sustainability of interventions

Strengthen future dairy professionals

- Support the professionalisation of dairy experts
- Use blended learning to improve skills and entrepreneurship
- Create a Dairy Network of Excellence to share knowledge

Get the development, trade and investment policies right

- Support national governments in policy agenda setting
- Invest in diplomatic relations to support an enabling policy environment
- Develop integral Dutch policy on dairy development

part
2

Six leverage points for dairy sector transformation

We have identified six key leverage points that have the potential to trigger positive changes, leading to a transformation of the dairy system. These are based on the context and characteristics of dairy farming (see Appendix 1 for more detail) and on long-term experiences in several dairy development interventions. The leverage points are concretised through strategies that are considered essential for reaching the objectives of the Action Agenda for Dairy Development.

Four leverage points relate directly to the production and consumption of dairy products:

1. Contribute to affordable and nutritious diets
2. Keep milk safe
3. Strengthen inclusive and competitive business models
4. Make dairy sustainable.

The other two leverage points are cross-cutting and contribute to the enabling environment of dairy farming:

5. Strengthen the future dairy professional
6. Get the development, trade and investment policies right.

The strategies we propose for each of these interlinked leverage points, will contribute to the objectives of the Dutch food security policy, as outlined in Part 1.

Each leverage point is separately discussed in the following section, with a short introduction to the issue, the key challenges to improve, possible solutions and good practices. Based on this, an agenda for future support and investment priorities is defined for each leverage point. While each section can be read as a stand-alone, the crux of the matter is to work on system transformation by linking the different leverage points. This is outlined in Part 3 of this paper.

Leverage points: triggering change

Leverage points are places within a complex system 'where a small shift in one thing can produce big changes in everything – leverage points are points of power'[26]. They are the right places in a system where small, well-focused actions can produce significant, enduring improvements.

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Leverage point 1: Contribute to affordable and nutritious diets

Introduction

While global food production provides for sufficient average calories per capita, the unequal distribution of food and nutrients around the globe still results in food insecurity for over 820 million people. Even more suffer from malnutrition due to low-quality diets[4]. Child growth failure through chronic and acute undernutrition is an issue in many developing countries, especially in Africa[2].

Dairy products are a crucial element for diets of pregnant and breastfeeding women, children older than two years and adolescents. Children under 6 months should be exclusively breastfed, and breastmilk continues to be the main source of high-quality protein and nutrients in children 6 - 24 months of age. Dairy products can further improve the intake of important nutrients in children in this age range, as long as they are being provided in addition to breastmilk.

Some regions over-consume dairy products, while other regions have not yet reached the recommended dietary intake[4]. According to 2016 data, sub-Saharan Africa is on average consuming just about 30% of the recommended daily intake for dairy (see Figure 1 below). With an estimated population of 1 billion people, the 70% gap means a deficit of 64 million kg of milk per year.

The nutritional value of dairy

Milk contains protein, fats, lactose, and crucial elements such as vitamin A, B2, B12 and D, calcium, phosphorus, potassium, magnesium, zinc, and iodine. Dairy products (milk, cheese, plain yogurt) can play a role in meeting the global demand for animal-sourced foods, providing an important source of culturally accepted high-quality protein and micronutrients.

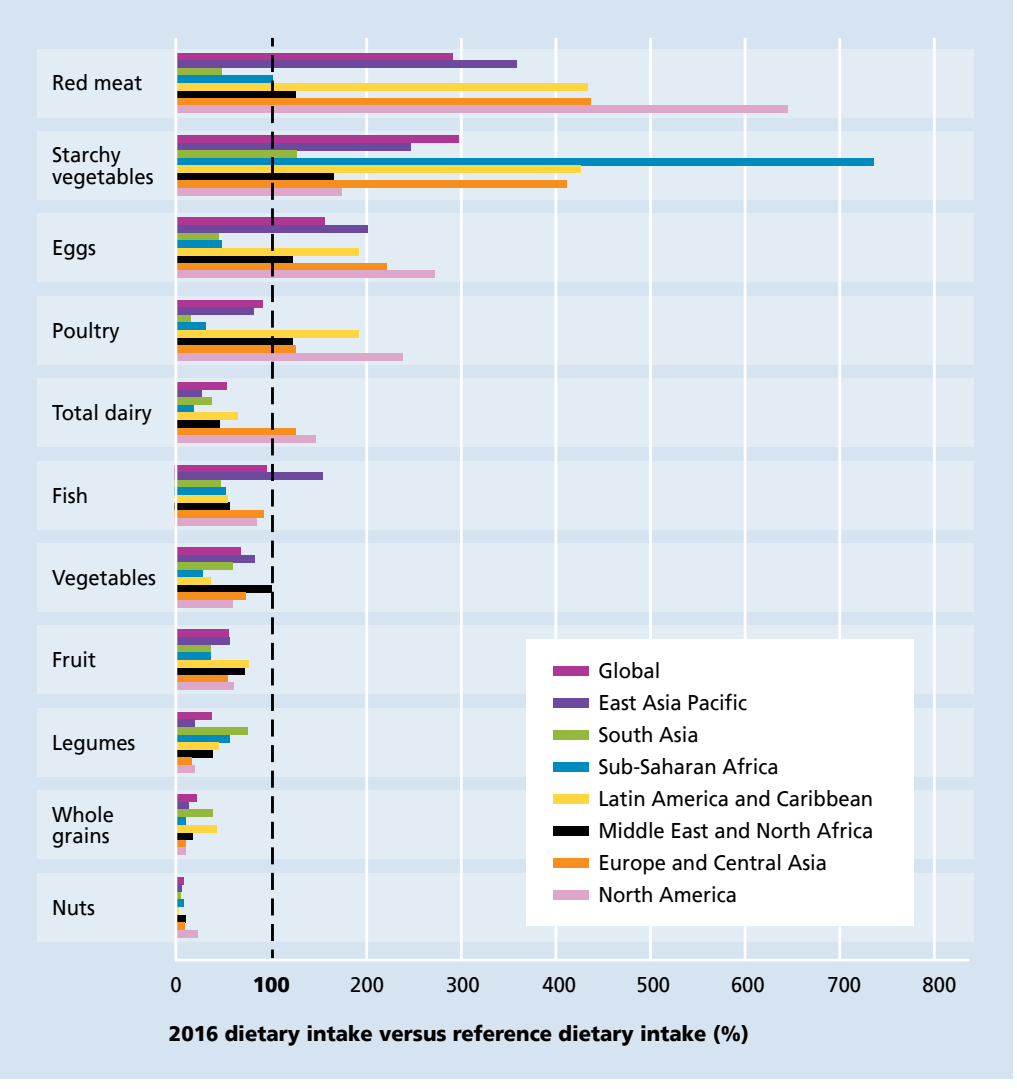

Figure 1
Gap between actual dietary intake in 2016 and dietary intake recommended by the EAT-Lancet commission (represented by dotted line).

Data source:
Global Burden of Disease database

Key issues

Limited awareness of nutritious diets

Consumer awareness on the nutritional value of food in general (and food safety, see Leverage Point 2), and the role of dairy in a safe and nutritious diet, is limited. In many countries, per capita milk consumption rate is far below the FAO recommended standards. This is especially true in countries with chronic undernutrition, such as Ethiopia, where very low percentages of children meet the requirements for minimum acceptable diets, and low percentages of children consume dairy products.

Increased market access versus in-home consumption

Increased dairy production does not automatically lead to better diets in the dairy producer household. It may even lead to reduced consumption at home. It makes economic sense that poor farmers in dairy markets exchange dairy for cheaper sources of proteins. In Uganda, research showed that the number of large ruminants owned or managed has a positive effect on household dairy consumption. However, a weak association was found 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), while no association with being stunted was observed.

Unhealthy additives

A healthy diet also means minimising or omitting unhealthy additives, such as sugar and colourants. Average intake figures do not distinguish between intake of more healthy dairy products (fresh milk) and less healthy products such as sweetened yogurt or cheeses. Consumption of healthy dairy products by consumers with low purchasing power often is much lower. Not much is known yet about lactose intolerance in some countries and the effects of increased dairy consumption on this.

Accessibility

Access to affordable, healthy dairy products for consumers with low purchasing power is a challenge. In many countries, milk is an expensive product, due to the high cost of production and inefficient chains.

Good practices and possible solutions

Milk vending machines

Milk ATMs (automated dispensers – see Box) provide processed milk at lower costs to urban consumers. The machines provide a shorter dairy value chain, as milk from the farmers can immediately be pasteurised and sold in the dispenser. This provides farmers with an alternative milk outlet, improving their bargaining position, and reduces the price for the consumer by avoiding the cost of packaging. Quality and safety of the milk in milk ATMs can be an issue.

Include nutritionist in projects

Several Dutch-led dairy projects are paying attention to the role of dairy in a healthy and nutritious diet by including nutritionists in their project team. The BRIDGE project in Ethiopia is currently working on intra-household distribution and dairy consumption during fasting period, including fasting of young children. It also pays attention to intra-household distribution of dairy consumption in dairy-producing households and in non-producing households living around them. The TIDE project in Uganda works with school milk and yogurt programmes, in combination with social campaigns and awareness raising, in collaboration with processors and authorities. Results and learnings need to be shared more widely, to make good practices common and more widely implemented.

Enrich products

Dairy products can be even more nutritious when enriched with fortifiers. In northern Senegal, a dairy value chain was leveraged to distribute a micronutrient-fortified yogurt. Milk supplied by local dairy farmers was used to make fortified yogurt to improve blood iron levels among pre-school children from the same dairy farm households. The micronutrient-fortified yogurt was produced by a local dairy farm that established a contractual arrangement with the dairy farmers.

Agenda for future support and investment priorities

- **Increase access to affordable and good quality dairy products**

This is especially important for children over the age of two and for adolescents, and pregnant and breastfeeding women. Mechanisms include improved intra-household distribution, school milk programmes, and milk dispensers. Safety and quality of dairy products is of utmost importance, for example cooling of school milk and boiling of raw milk (see the next chapter for strategies to ensure milk quality).

- **Increase consumer knowledge of healthy nutrition**

For groups that consume below recommended dairy intake, interventions such as behaviour-change communication should be directed at increasing nutritional knowledge. For urban middle-class consumers this will be about overconsumption and the risks of added sugar and colorants in dairy. Interventions may be directed at consumer awareness, private-sector self-regulation and/or policy regulation. This includes quality assurance of milk from ATM vending machines (see Box).

- **Develop and scale interventions to improve diets through dairy**

Over the past decade, an exponential increase has been achieved in the body of evidence, and its quality, on how agriculture can contribute to nutrition improvements. It is crucial that this knowledge base is further expanded, and that interventions are developed and scaled that target issues such as healthy diets from informal dairy chains, lactose intolerance, healthy and unhealthy additives, and school milk results.

Milk Vending Machines (ATMs) in Kenya

Milk ATMs are a recent retail innovation that provide access to pasteurised milk for a broad group of consumers. Urban demand for milk in Kenya is expected to increase, while currently only 30% of the country's milk is formally marketed. Milk ATMs are now widespread, located in various strategic outlets: retail shops, farms, cooperatives, supermarkets and milk bars.

A milk ATM is an automated facility that dispenses chilled, pasteurised, 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 make monitoring of sales turnover easier. Consumers expect ATMs to enhance hygiene; milk is more affordable and can be purchased 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 exposes consumers to serious health risks.

Leverage point 2: Keep milk safe

Introduction

In recent years, there have been several scandals around the quality and safety of milk in developing economies: an aflatoxin crisis in Ethiopia, milk powder contamination in China, high level of antibiotic residues in Indonesia, contamination of milk by use of dirty equipment or adding (dirty) water elsewhere. In Kenya, studies have shown the presence of antimicrobial residues, aflatoxins, hydrogen peroxide and microbial loads exceeding acceptable levels[5]. Similar examples can be found in regions worldwide. Such incidences threaten human health, lower consumers' confidence in the sector, and put farmers' income at risk. Keeping milk safe is a prerequisite for dairy if it is to contribute to healthy nutrition, especially in the case of young children and pregnant women.

Several initiatives have been working to regain consumers' trust by improving milk quality and systems that support assured milk quality. Regulations and compliance constitute challenges. The new proposed Kenyan dairy regulations place much emphasis on milk hygiene and quality. Due to be implemented in 2019, their introduction was put on hold due to public criticism, mainly related to the severe punitive sanctions for non-compliance and the ban of direct milk sales by farmers. To date, the regulations have not been passed and the sector still suffers from milk quality challenges.

What is milk quality?

Milk quality is related to food safety issues including contamination with bacteria, 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 factors like fat, protein, Total Solids (TS) or Solids Non-Fat (SNF) – these are milk composition parameters and are the basic elements for the value of milk and determine the milk price.

Key issues

Poor milk quality

Being made up of 87% water, milk is prone to adulteration with (dirty) water and other substances (mainly by middlemen). Other factors that frequently contribute to rapid deterioration in the quality of milk are traditional milking and milk handling

practices, poor hygiene at farm level, rampant use of non-food-grade plastic milk containers, poor milk transport infrastructure, and lack of efficient cold chains.

Testing

Good quality raw milk is essential for the production of dairy products with long shelf life and for reducing processing costs. A milk processor or trader will only be assured of the quality of raw milk if certain basic quality tests are carried out along the value chain. Milk quality improvement should be based on relevant legislation and enforcement; however, the latter is often weak.

Consumer awareness and trust

Consumer awareness and trust play an important role in dairy. Recent quality and safety scandals have lowered consumer confidence, but consumer trust in new and safe products can also be an issue. For example, in Pakistan, where drinking fresh milk has a long tradition, the media has played a large role in developing distrust of packaged UHT milk. Consumer awareness also plays an important role in increasing the demand for safe milk. If there is no financial benefit to be gained from improving milk quality and as long as farmers are able to sell milk without having to consider its composition and food safety parameters, few chain actors will be interested or able to improve milk quality.

Local context and trade-offs

To improve milk quality and safety – and be able to decide which interventions should be made – requires a thorough understanding of the local situation, factors influencing consumers' perception, and interlinkages between other potentially competing factors, such as women's income. Here we provide three examples of country-specific challenges. In the Mbarara milkshed in Uganda, it was common for women to skim milk and sell the cream or use it for the household. This meant that the milk sold through the cooperative for processing had a very low fat content. In Kenya the addition of hydrogen peroxide, mainly done by milk traders, as a preservative for milk is common. Farmers also sell milk too soon after treating a cow with antibiotics. In Ethiopia, long distances to collection points extend the duration between milking and delivery, thus increasing bacterial load and the risk that water is added along the road.

Good practices and possible solutions

Quality-based milk payment system (QBMPS)

Financial incentives appear to be the main driver for improving milk quality in the dairy supply chain before processing. In recent years, several pilots on quality-based payment have been implemented in a number of countries including Kenya, Indonesia and Uganda. A Quality Based Milk Payment System (QBMPS) is a tool to enhance quality and safety of raw milk, in which payment for milk is based on quality: a higher price is paid for the desired quality parameters and a lower price for

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the milk below those quality parameters, and milk not meeting minimum standards is rejected. However, introduction of food safety tests adds to the cost of raw milk collection, which has to be paid either by the consumer, the processing plant, the milk transporter or the farmer. Investments need to be made in milk testing equipment; calibration services; trustful communication on the test results; training and coaching of farmers, middlemen, milk transporters and milk collection operators; and in hardware for farmers and transporters, such as stainless-steel milk buckets, milk cans and chilling tanks. At the same time, experience shows that introduction of QBMPS can be the trigger for a change from opportunistic behaviour in the value chain towards shared interest and joint action. For more information on this topic, we refer to the recent White Paper on milk quality which is developed within the NEADAP-project.

Regulations and enforcement

Quality assurance needs to be embedded in adequate and relevant national legislation, accompanied by strict enforcement, to create an equal playing field for all actors engaged. When such regulations exist, a processor can introduce quality based payments. Regulations to reduce the time between milking and collection, or to harmonise collection and acceptance standards, can also help. Enforcement requires significant public investments in milk quality monitoring systems and adequate penalising of defaulters. Other solutions to improve milk quality include reconfiguration of the value chain: engaging motorcyclists as collectors but not as traders, as trade will often lead to adulteration.

Agenda for future support and investment priorities

- **Support consumer awareness and trust**

Unbiased and trust-building communication with consumers is key, on issues such as milk quality, and guaranteeing safe milk to drink. Focus on quality dairy products will only result in improved public health if consumers understand safe consumption behaviour. An example of this is boiling raw milk purchased from a trader before consumption. Also, test results should be communicated, and advertising on dairy products should support healthy behaviour. A recent study[6] within the 3R Kenya project showed that this is clearly an area where public and private interests interact.

- **Assure quality by advancing quality-based milk payment systems**

QBMPS are primarily useful if they lead to a functioning quality assurance system at dairy-sector level, rather than only at single processor level. This requires both private and public investments, not only in QBMPS for all processed dairy, but also in regulation and enforcement of quality assurance, in restricting raw milk sales and in support to chain actors in meeting standards. This requires technical assistance, coaching and investment support. The success of QBMPS also depends on the maturity of the dairy market in terms of volumes and demand for quality. 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 rural areas.

- **Develop laboratory capacity and cold chains**

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 and/or ring testing, as is re-formulation of national milk standards. A five to ten-year action plan is needed to move from current milk quality levels to a new set of standards. Needs include investments in basic ultrasonic milk testing equipment at milk collection centre level, and advanced mid-infrared spectroscopy milk testing equipment at milk processor and relevant government organisation levels.

Quality-Based Milk Payment System in Uganda

The Quality Based Milk Payment System (QBMPS) developed in the Uganda TIDE project is private-sector driven, working within the national policy and using a partnership approach involving three milk processing plants, ten cooperative milk collection centres, five milk traders, one thousand farmers, a dairy union and a Dutch team of technical experts.

For the first three months, milk was just tested, and the results were shown to the farmers in order to raise their awareness of its 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 to show the higher payments that the farmers would get if the QBMPS were operational. After six months, the quality-based milk payment actually started. During the first quarter of full QBMPS operation, a total bonus of close to USD 80,000 was paid to the participating milk collection centres and farmers. During the pilot, it emerged that some cooperatives paid only part of the bonus to farmers. Later on, this was adapted by introducing a new strategy to pay 50% of the milk premium to the cooperative and 50% directly to the farmer. The QBMPS has now been scaled up to include 4,000 smallholders and some larger farmers.

The pilot phase of QBMPS led to the formulation of a national guideline on milk quality payments, to be followed by all milk processors. The pilot generated trust between farmers, milk traders, cooperatives and processors that testing can be done in an unbiased manner, benefitting all.

Leverage point 3: Strengthen inclusive and competitive business models

Introduction

For the dairy sector to contribute to a competitive, inclusive, healthy and sustainable food system, smallholder and medium-sized farmers, including women and youth need to be included in value chains. Although most dairy producers are smallholders, and in areas such as East Africa about 70% of smallholder dairy farmers' labour force is made up of women, these groups are not always well-represented in the businesses and organisations that dominate the value chains. Women and youth often do not own assets and therefore are excluded from decision-making processes.

Inclusive Business Models (see box) aim to find economically viable ways to integrate smallholders, youth and women in value chains. This can be realised through cooperatives and other producer organisations (POs), dairy hubs, farmer-owned businesses and other inclusive enterprise models. In situations where input and service provision are underdeveloped, POs can provide the business solutions that farmers need. Where input and service provision are well developed, POs may be outcompeted by commercial providers. In any situation, POs must apply sound business practices themselves and consider their costs and benefits for farmer-members.

Inclusive Business Models

Inclusive Business Models are defined as 'commercially viable models that benefit low-income communities by including them in a company's value chain on the supply side as producers, entrepreneurs or employees in a sustainable way, and/or on the demand side as clients and consumers'. In agriculture, Inclusive Business Models focus on the integration of less advantaged groups – such as smallholders, youth and women – in the value chain, leading to livelihood improvement and empowerment through the facilitation of access to inputs (such as feed, fodder, medicines and equipment), services (such as veterinary, artificial insemination, extension and financial), knowledge and markets. For more information on this topic we refer to the recent white paper on Inclusive Business Models which was developed within the NEADAP-project.

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In many countries, dairy POs play a major role in dairy value chains. They are important in sustaining and scaling the involvement of disadvantaged groups in the dairy sector[7]. These organisations can focus on a single business activity, such as just collecting and selling the milk of the members, or on providing a wider range of input and output services to their members. Through improved access to services, member farmers introduce new practices such as silage making, semi/zero-grazing units, improved breeds, and better animal healthcare. As a result, the quality and volumes of milk supply can be expected to improve. POs combine the functions of inclusiveness, employment and sustainability with business functions of input supply and milk marketing. Performing well on all these objectives is not easy, but with professional leadership, some outside support and good member commitment, POs have been successful. Field research has shown that well-tuned input and extension services are the most critical factor in realising inclusiveness.

Key issues

This section is based on lessons collected from Dutch-funded development projects in the East-African dairy sector.
A full list of these projects can be found in Annex 3.

Cultural setting

Inclusion involves both business and cultural dimensions. For example, cow ownership and handling by youth, women and smallholders often has cultural connotations. Cooperatives, companies, service providers or other organisations involved have to deal with these. While a culture around dairy livestock may have deep roots, adjusting organisational structures and processes may be possible. From research and practice it is known which organisational factors are conducive to inclusiveness (see examples of lead farms and youth groups below). The future challenge is to translate this knowledge into (training) action to help business organisations become more inclusive.

Lack or loss of business focus

One of the problems that can follow initial success of service delivery by POs is the pressure for POs to deliver a growing diversity of services to their members. Pushed by members and often also by local policymakers and donors, POs may take on too many activities. This leads to a lack of business focus, problems of management quality and high business risks.

Side selling

When improving service delivery, it is expected that productivity will increase and lead to improved income for PO members. A trade-off may occur between increased production and side-selling, resulting in reduced milk supply to the PO. Scarcity of milk in the dry season and the need for fast cash may result in side-selling to traders or direct sales to processors. Lack of delivery contracts and an active informal market contribute to these options. This undermines the investment in services by the PO. Creating more member commitment and loyalty is key for the POs. Commitment can be fostered in different ways, including financial incentives, more regular payments, norm building, social mechanisms, participation in decision-making and contracting[8]. Using a proper mix of these tools requires a broad set of social and technical skills of the PO's leadership.

Reduced time for household

Taking care of dairy cows can be an extra burden for women already busy with tasks in the household. A study in Tanzania, Kenya and Malawi[9] found that higher female market participation puts constraints on women's time, which in turn may have negative consequences on nutrition and health due to reduced time for childcare, healthcare seeking, food preparation, and leisure. FAO[10] 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.

Trade-off between inclusiveness and business orientation

Traditionally, POs are community organisations set up to provide a broad range of services to community members. When POs develop a stronger business orientation, the inclusion of all members of the community is no longer self-evident. A focus on efficiency in operations and customer preferences in marketing may result in the PO becoming more selective in admitting members and accepting members' products[11]. This is not to say that POs cannot combine inclusiveness and business orientation, but without explicitly inclusive targeting, the business orientation may crowd-out specific disadvantaged groups.

Good practices and possible solutions

Business approach to service delivery

A business and client-focused approach is key to sustainable service provision. Service provision is an investment that can yield a positive return, provided that the receivers of services pay for this directly (service fee) or indirectly (dependable supply of milk to the service provider in combination with retained earnings). This is not always the case, and while subsidies can help kick-start new services, they may undermine business principles in the longer run. Costs of extension services should be met from the extra milk supply or may be shared between processors, producer organisations and farmers, as in the end all parties benefit from increased productivity.

Adjust organisational structures

Experiences in several (Dutch-led) projects show that it is possible to improve the position of women and youth in POs. These interventions focused on gender awareness, female leadership and employment of women and youth. Adjusting organisational structures of POs, including management, to better reflect the suppliers in terms of age, gender, and farm size, will make them more inclusive. Another good practice is appointing women and youth as lead farmers or extension officers to act as role model.

Working with youth groups

Youth can be involved through youth groups, as a known community structure[7]. The youth-led Service Providers Enterprise (SPE), initiated by SNV in Kenya, is an innovative business model in which young people form a group business to offer silage making services to smallholders through dairy farmer cooperative societies. They may extend the services they offer to include advisory services on feeding, calf rearing and record keeping, farmer training, and input supply[12].

Lead farm approach

To link youth, women and smallholders with successful dairy farmers, the lead farm approach is useful[13]. Lead farms are large, more developed farms that are used to offer services and advice to neighbouring farmers and are said to play a supportive role in commercialising smallholders. While lead farms are not primarily focused on attracting youth or women, the mechanism can support employment of youth and women in the dairy sector. Different lead farm models exist[14], using different mechanisms to include smallholders in the value chain.

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Agenda for future support and investment priorities

Smallholders, youth and women are not 'automatically' included in the support interventions of dairy development organisations or in those of POs. Their important potential contribution to the dairy sector has therefore yet to be unlocked. Based on research on Inclusive Business Models and on other past experiences, we present the following recommendations.

- **Target interventions at inclusion of smallholders, youth, and women**

Dairy POs and other 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 that different groups have. Men and women, young and old, small and large farms all require a tailored approach. Therefore, it is recommended that a clear and focused approach be adopted, with tailored trainings and support packages. Tailored services for smallholders may include special products and techniques that can be adopted by smallholders with limited resources, for example, small quantities of inputs, tailored technologies, or subsidised inputs. Farmers often need access to micro-credit or other financial products before they can make an investment in farm improvement. Space and an enabling environment can be created for women and youth, for example by setting up women/youth committees or councils in cooperatives, supporting them to take up leadership positions and providing leadership training, or by proactively employing women and youth at POs and processors.

- **Develop and scale successful business models for input and service delivery and marketing**

Not all business models of input and service delivery are equally successful and scalable. To make an informed choice, the merits of various business models need to be assessed. Business models to compare should include cooperatives (at primary or federated level), other PO models, individual entrepreneurs, joint ventures, social enterprises, state-owned enterprises, or combinations of these models. Local service providers in these models should be able to target the right actors and provide tailored services. Key success factors must be investigated for the business models that work well and can be scaled. A better understanding of the investment constraints and risks involved will provide insights into which initiatives to support and which not. Food-system actors should take responsibility to ensure that their interventions for inclusive dairy chains do not create dependency and do not overburden POs. Donor-funded projects should be aware that their financial support may undermine a business approach to service delivery and should only be used as a kick-start for new services.

Producer organisation-led services model

The Abesigana Dairy Farmers Cooperative Society in Uganda provides a diverse range of services to active milk suppliers. This has resulted in a "one stop service hub" at cooperative level offering a wide range of services, such as extension services, input supply, and financial services through its savings and credit cooperative. It also offers access to affordable energy, machinery rental services and social services, such as tent and chair rentals for funerals. Some services target specific groups, such as engaging women in yogurt making or employing youth in milk collection. All activities are managed by the cooperative. The total package ensures that the diverse needs of members are addressed.

Members appreciate the services provided by the cooperative, as they are cheaper and more readily available compared with those of 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 could further be improved by providing milk cans, AI, training by extension officers, and milking parlours.

Leverage point 4: Make dairy sustainable

Introduction

Making food systems environmentally sustainable is one of the three objectives of the Dutch global food security policy. Dairy production can contribute to sustainable and inclusive food systems. However, if not developed carefully and integrally, dairy production can also be a source of environmental pollution and degradation. Moreover, climatic changes cause extreme weather events, such as prolonged droughts or higher temperatures, which require adaptations in agricultural production systems to withstand these changes.

In developing countries, dairy production faces many challenges including low productivity with high greenhouse gas emissions per unit of product, environmental degradation, competition for land, and manure overload in peri-urban areas. We need to be aware of and anticipate on the environmental problems that developed economies have experienced with intensive dairy systems, and address these on time. The Dutch dairy ambition, therefore, is to find ways to increase production efficiency, i.e. increasing the productivity (milk yield per cow) while improving the agro-ecological base and with use of less land (per litre of milk produced), while also sustainably increasing the income of the farmer. These ways need to make the agro-ecological base resilient and restore it rather than depleting it, taking into account soil quality, nutrients, water use, biodiversity and emission of greenhouse gases. The role and contribution of dairy to the entire food system should be taken into consideration.

Key issues

Competition for land

Due to increasing demand for food, increasing pressure on land and increasing prices of land and water, both extensive and peri-urban dairy systems 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 a global scale, the competition for land is leading to substantial land-use changes (for example deforestation).

Manure and nutrients

Mixed crop-livestock farming systems have relatively high re-use of nutrients. Animal manure is often used as fertiliser for crop production and crop residues are fed to the animals. Due to competition for land and intensification of production, production of feed tends to become geographically more and more disconnected from animal production. Using manure for crop products is more challenging when fields are miles away. In peri-urban and urban dairy farming and in most large-scale dairy operations, manure from dairy is causing serious pollution

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of surface water. Improving manure management and nutrient recycling is crucial to strengthening the farming system and soil fertility, along with planting forage crops.

Low productivity

Although much variation exists among dairy farming systems across developing economies, most are characterised by relatively low productivity, stemming from various factors. Cows may have an insufficient and low-quality diet, including their water intake. Large numbers of animals in the herd may have other functions (draught oxen, aged cows, social functions or as a buffer for times of food insecurity). Breeds may have low dairy production and low reproduction rates. Finally, inadequate management can be a reason for low productivity. Low input–low output dairy farming leads to relatively high emissions of greenhouse gases per kg of product.

As explained in Figure 2, the first steps toward sustainable intensification in low-input dairy supply chains can lead to relatively big results in terms of GHG mitigation.

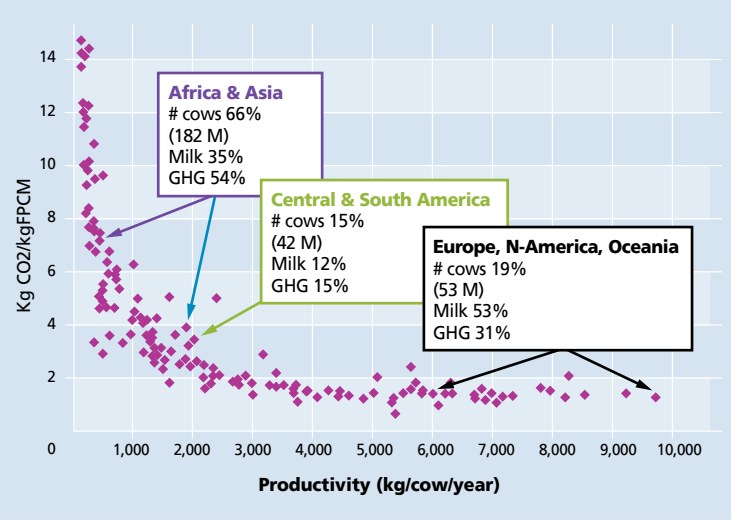

Figure 2

This figure shows the relationship between milk productivity and GHG emission intensity, per kilo fat and protein-corrected milk. Production systems with a higher milk production per cow, have relatively lower greenhouse gas per kg of milk produced. The reason for this is that, at low production levels, the major share of the animals' nutrient intake is used for body maintenance and not for milk production. Note that the 182 million cows in Africa and Asia (66% of cows in the world) contribute 35% to world milk production and 56% to global GHG emissions from cows.

Getting the basics right

Improvement starts with 'getting the basics right' along the whole chain: a combination of good feeding, health and veterinary services, suitable breeds, opportunities for milk collection and availability of a consumer market. In this way, large steps can be realised in improving dairy productivity. Good feeding is one of the key elements of productivity improvements. This can be achieved through good pasture management, feeding high quality roughage and formulating balanced rations, in combination with matching the number of animals with the available feed resources. Having water available at all times is crucial. A reliable supply of quality fodder seed is also needed to improve productivity.

Good practices and possible solutions

Integral approaches to boost farm productivity

Developing sustainable dairy production in a food system requires an integrated approach that assesses risks, synergies and trade-offs between multiple economic, social and environmental aspects. The basic measures above should be assessed in terms of potential gains for people, planet and profit. For the 'planet' dimensions of sustainability, it concerns land use, nutrient balances, biodiversity, soil quality, water use and greenhouse gas emission.

A set of integration principles is displayed in the Box on page 42. The essence is to increase milk production per cow while using less land *and* increasing revenues for farmers. More and better fodder and balanced rations are the key elements, also because feed often represents a large share of the production cost.
The concepts of circular agriculture, climate-smart agriculture and agro-ecological intensification can be helpful in realising dairy farming systems that are profitable and ecologically sustainable, and resilient in the face of climate change. We will explain them here briefly.

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Circular agriculture

Circular agriculture is an integrated approach that considers residues of agricultural biomass and food processing and the nutrients they contain as valuable resources within the food system.[15] Circularity can take place at different spatial scales: at farm, regional, food system, or national level. By being much more careful with scarce resources and wasting less biomass, fewer inputs need to be imported into the system. Key in dairy-crop farming systems is optimal use of crop residues: by-products like brewers' grain, maize bran or oilseed cakes; and manure. Apart from introducing biogas, the improved use of manure has so far received little attention in Dutch dairy development efforts. A first manual on improved use of manure was produced in 2015 by Wageningen University and Research[16]. In addition, the Dutch Ministry of Agriculture has supported a project on improved use of manure among small-scale dairy farmers in West Java.[17]

The task is to build on this body of knowledge and the experience gained in the project in Indonesia and elsewhere and further develop good practices and low-cost small-scale technologies for optimising the use of manure in smallholder dairy farming systems.

Climate-smart agriculture to increase resilience

Climate-smart agriculture aims to tackle three main objectives: sustainably increasing agricultural productivity and incomes; adapting and building resilience to climate change; and reducing and/or removing greenhouse gases, where possible. In both Asia and Africa, the impact of climate change is resulting in prolonged droughts, excessive rainfall and high temperatures. In developing profitable and sustainable dairy farming systems, it is important to factor in the expected local or regional effects of climate change. Examples include conservation of forage for the dry season; improving soil quality and water content; using feed crop varieties that are drought resistant or water efficient, easy to conserve and affordable for farmers, or by planting leguminous fodder trees; establish water basins to collect water for the dry season; and using crossbreds with a genetic profile suited to the prevailing agro-ecological conditions, available feed rations and disease threat.

Agro-ecological production

Production based on agro-ecological principles has recently received renewed attention from the FAO[18]. This works from an ecosystem perspective, whereby healthy soils are taken as the basis for productive and sustainable agriculture, and focuses on improving the water and nutrient cycles. These principles can be put into practice in mixed crop-livestock systems, at farm scale or a cluster of farms working together. Examples are crop rotation, mixed cropping and alley cropping, in which food and fodder crops are planted between rows of trees.

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Agenda for future support and investment priorities

While the set of challenges for dairy to contribute to profitable, sustainable and inclusive food systems is very specific to a particular country or even region, we are convinced that dairy development support should at the least consider the following three elements:

- **Couple dairy production to land for feed production**

Feeding more and better-quality fodder, in combination with 'getting the basics right', is the cornerstone of a profitable and sustainable dairy business. Both from the long-term economic perspective and the ecological perspective, dairy production should be promoted in areas where livestock can be coupled to land. Prioritise support to improving low input–low output land-based dairy systems with their own feed production, and make use of marginal lands that cannot otherwise be used for producing crops. Look for options to restore and improve the use of communal lands. Look for opportunities to use crop-residues and by-products as feed, use crop rotation and improve and optimise the use of manure for food crops. Other factors that determine where to locate dairy development include a favourable climate, and good infrastructure. The Milk Mapping tool, developed and tested for Ethiopia[19], is useful for identifying the most favourable areas for dairy production and areas in which dairy and arable farming can be optimally combined.

- **Develop, pilot and scale practices that contribute to sustainable dairy**

For milksheds with good prospects, joint context-specific research and development trajectories need to be supported to develop, pilot and scale innovative practices and dairy farming systems, using the approaches and considerations described above. These should work towards productive, profitable dairy farming systems which sustain (or restore) the agro-ecological base and which are robust and resilient. The seven principles developed by the World Bank (see Box below) can be taken as guidelines for these development trajectories.

- **Assess, monitor and evaluate the sustainability of interventions**

In milkshed development, attention needs to be paid to whether sustainability conditions at farm and value-chain level are being sufficiently met to make investments feasible. Action research and ex-ante sustainability assessment of interventions need to be done, and this should include assessment of their contributions to improving sustainability at system level and to avoiding negative trade-offs. Ongoing and future interventions should further explore ways to systematically monitor the carbon stored in grassland or the emissions avoided in dairy production.

Seven principles for sustainable dairy development

Sustainable dairy intensification means producing more with fewer inputs and less impact on the environment. The World Bank recently developed a context-dependent approach to address the complexity of combining livestock production objectives with environmental objectives in developing countries. This approach proposes seven relatively simple principles that contribute to livestock production and environmental objectives. They are based on lessons learned from livestock development projects.

- **Principle 1. Contribute to a sustainable food future.**

Before a policy is made or a project is formulated, the comparative advantage of dairy production over other activities that could meet the policy or project objectives should be evaluated, including minimising feed-food competition.

- **Principle 2. Enhance carbon stocks.**

Dairy development presents an opportunity to protect and enhance carbon stocks, for example by restoring degraded grassland and by reforestation in silvo-pastoral systems.

- **Principle 3. Improve efficiency at animal and herd level.**

Where yields of dairy cattle are low, increase productivity. Growth in animal numbers should be avoided.

- **Principle 4. Source feed sustainably.**

Dairy development often requires use of feeds with high nutritional quality. Whether grown on-farm or sourced elsewhere, such high-quality feeds should be produced with low impact on the environment.

- **Principle 5. Couple livestock to land.**

Intensification of dairy farms may result in high surpluses of N and P per ha. N and P surpluses should be applied to land as fertiliser somewhere and this can be facilitated by manure management (storage, treatment and transportation).

- **Principle 6. Minimise fossil fuel use.**

Dairy development presents opportunities to invest in energy-efficient technologies and renewable energy generation along the value chain.

- **Principle 7. Foster an enabling environment.**

Enabling institutions, policies, knowledge, and awareness are necessary for achieving principles 1 through 6.

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Cross-cutting leverage point 5: Strengthen the future dairy professional – training, education and extension

Introduction

The scarcity of dairy professionals with high standards of knowledge, skills and expertise who can adequately offer client and market-oriented services is a huge bottleneck. Training and education take place at different levels (see box). Digitalisation has had a positive effect on education and training offerings. Still, the professional consultancy and advisory services are not yet achieving the high standards needed.

Levels of dairy education

A recent scoping study[27] revealed the diverse forms of formal and informal dairy training and education in East Africa:

- Technical and Vocational Education and Training (TVET): offered mainly by agricultural colleges, this is increasingly competence-based.
- University level education, where dairy production and processing courses are typically found within broader agricultural, animal production or food science degree programmes for BSc and MSc students.
- 'Informal', short-term, on-the-job training: offered mainly by staff of dairy development projects to farmers, industry employees, government extension agents, and a small but growing number of private advisory services.
- Training and education are also increasingly organised and given by local companies (i.e. Pearl in Uganda, DeHeus in Ethiopia).
- Training offered by electronic platforms such as I-Cow[28]. These platforms are upcoming and use inputs from all the previous sources.

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Recent and current dairy development projects, such as the Dutch-supported KMDP in Kenya, TIDE in Uganda, and EDGET, DairyBISS and BRIDGE projects in Ethiopia, have focused 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). Nevertheless, support in dairy development that targets knowledge institutions has so far been too segmented to have significant impact on the sector. The lack of human capacity to achieve the desired improvements remains a major issue. This includes human capacity for informal on-the-job training by (Dutch) dairy development projects, which in recent years has mostly focused on increasing production. In addition, many of the specialised Dutch staff with international (and tropical) dairy development expertise are reaching retirement age. Adequate training of professionals, both in terms of quantity and quality, and pan-African peer-to-peer learning should be boosted.

Key issues

Low theoretical levels

The theoretical level of training programmes at all three levels is rather low. Moreover, theory is strongly based on Western dairy principles. More attention should be paid to the local context and what is required to make dairy work in these circumstances. Most dairy teaching programmes focus on specialised dairy farming and devote insufficient attention to other farming systems, or aspects of sustainability and inclusiveness. For instance, smallholders have different resources available than more specialised, generally better-off, farmers, and hence a different approach is needed to improve their production.

Insufficient practical skills training

Practical skills training is insufficient and sometimes even non-existent in formal certificate and diploma programmes. Current graduates from both TVETs and universities typically lack practical skills, such as cow and herd management, milk handling, and dairy business, marketing and organisational management. The main causes are lack of, or disfunction of, practical dairy training facilities (equipment, farms or processing units) at universities and TVETs, and lack of teachers and instructors with good practical skills that they can pass on to the next generation. There is limited, albeit growing, experience in competency-based learning in which theory, skills and attitude are integrated. Trainers and instructors often lack confidence or skills in this mode of instruction.

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Integral approach is lacking in education

Education and training programmes are mostly single-issue focused. Students are either trained in dairy production or in dairy processing, without the two being connected. The managerial capacity of leaders at TVETs and colleges to work on integrated approaches is inadequate.

Also, most extension agents are trained in general livestock production and do not have sufficient practical experience in dairy to effectively serve dairy farmers. In Kenya, training of farmers has suffered since livestock production and veterinary services were left to the private sector and devolved to counties without national guiding principles and policies. In Ethiopia on the other hand, livestock development agents cover all livestock and the government offers limited space for private services.

Business and entrepreneurial spirit are lacking

Training opportunities in dairy as a business, value chain approaches, or taking a broader (food system) approach are limited. Also, entrepreneurship and entrepreneurial skills are weakly addressed in teaching and training programmes, as are linkages between educational institutes and the private sector. As a result, actors in the dairy sector are not taught to develop a business attitude.

Good practices and possible solutions

Competency-based training and education

Formal education needs to focus more on competency-based and managerial training, and to include practical and business skills in curricula. Establishing linkages with the private sector for internships can offer new possibilities, but learning objectives need to be better defined, and practical arrangements negotiated.

A good example is the Practical Dairy Training Farms (PDTFs) in Uganda (see Box on next page), where commercial farming is combined with competency-based training of other farmers. Such ‘educational’ farms offer possibilities for training and demonstration, where farmers can meet and learn from each other under a ‘farmer field school’ model with peer-to-peer learning. In this case, both government and the private sector need to play a facilitating role to allow these ‘educational’ farms to become more conducive to education and learning. Sound strategies for sustaining such dairy training and education centres in the longer term should be part of every project that develops such PDTFs.

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PDTFs - 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 5 days, with trainees accommodated on the farm. Although most on-farm dairy training still requires support from development projects, a few private firms now offer dairy training in Kenya and Uganda, where the commercial dairy sector is more developed.

Nevertheless, the sustainability of PDTFs as a business is uncertain. When development projects phase out, 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, being explored in Kenya, is to link PDTFs to specialised training and advisory firms, with suitable commercial dairy farms, in such a way that each can focus on their 'core business' while exploiting mutual benefits.

Integrate formal and informal education

Interaction between the different levels of formal and informal education is important. Universities may offer vocational certificate programmes and liaise with the Practical Dairy Training Farms. The spectrum of dairy training and education activities should be viewed as an integrated skills, knowledge and information development 'system', rather than as separate 'practical' and 'academic' institutions aligned to the private sector, colleges or universities. The quality of extension advice, offered by either private or public actors, is a direct result of the effectiveness of this system.

Use of digital learning platforms and blended learning

The digital era and the speed of internet penetration in emerging economies will increasingly allow for a regional approach in training for dairy skills. Several comprehensive and practical digital learning modules have already been developed. In Kenya, digital platforms are well used. The development of blended-learning methods, in which a diversity of online and face-to-face teaching methods are combined, can support regional or national learning platforms. These can be used by a broad array of educational institutes and training providers, to develop the skills demanded by the labour market. Another example is the blended-learning platform currently being developed with support from the Nuffic Project 'East African Regional Network of Excellence in Dairy Training' (EARNED), which will improve the organisational capacity of consortium partners and participating TVETs to deliver innovative, practical learning that balances both knowledge and skills.

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Agenda for future support and investment priorities

- **Support the professionalisation of dairy experts**

Continued and long-term support to the professionalisation of local and Dutch dairy experts through better training and education, is needed to support a sustainable and inclusive dairy sector. This demands investments in the entire education system. Tis is an enormous effort that needs an integrated approach involving many partners: local education institutes, universities, local and national governments, NGOs, international development initiatives etc. Longer-term dairy-sector development will require more holistic action and multilateral collaboration at institutional levels. Dutch dairy development support can play a pioneering role in improving dairy education and training together with stakeholders. This includes investment in building new expertise with young international dairy consultants, for example through a Young Expert Programme (YEP) focused on dairy. This will also ensure the continuity of 'tropical dairy' expertise and skills to support Dutch companies aiming to invest in sustainable and inclusive dairy growth in emerging economies.

- **Improve skills and entrepreneurship using blended learning**

Future dairy development support should focus on improving the quality and impact of the support, not on numbers of people trained. Entrepreneurship, skills training and viewing dairy production in its broader context should be focal points of support. Establishing linkages between educational institutes and the private sector – including dairy producer organisations, processors and feed companies – can increase opportunities for internships and practical skills improvement. The potential of blended learning was also emphasised during the dairy workshop in Nairobi in August 2019. Recommendations included acceleration of e-learning via online platforms, connecting students to practitioners, organising accreditation of trainers and advisers, for example through an association of alumni that have studied dairy in the Netherlands.

- **Create a Dairy Network of Excellence to share knowledge**

A Dairy Network of Excellence can build upon, link and enhance existing and new knowledge. Sharing and building on lessons learned is needed to further develop effective dairy development strategies. This could include a knowledge information system, training, digital advisory services (Q&A), action research and learning events around longer-term learning questions, linked with online dairy platforms. It could also host a Community of Dairy Practitioners for business, farmers, NGOs, policymakers, advisors and projects. The Netherlands Food Partnership is aiming to support such coalition initiatives.

Cross-cutting leverage point 6: Get the development, trade and investment policies right

Introduction

In many emerging economies, the dairy sector is a political arena involving many rural suppliers and (urban) consumers. National policies and regulations often represent a compromise between the development of the domestic dairy sector and taking advantage of cheaper imports from elsewhere. Domestic dairy development requires conditions and facilities that are conducive to the import of crucial inputs, such as semen, fodder seeds, micro-minerals, veterinary drugs, machinery and equipment.

In emerging economies, the licensing of companies and tax regimes are key components in creating an enabling environment for inclusive and sustainable business development and entrepreneurship. Generally, a large number of important dairy-sector related policies and regulations are in place that influence dairy-sector development (see Box below for an example). While many of these policies deserve an in-depth technical discussion, we focus on the discussion of development, trade and investment policies with general consideration for supporting dairy-sector development. The role of the Netherlands' embassies in lobbying for and improving the enabling environment is discussed as well. Please note that important policy considerations on dairy development are presented in the other sections of this paper as well. These will not be repeated here.

Key issues

Competing interests

Dairy development is very much a political issue, especially where specific interests of different stakeholder groups are at play. New policies almost always imply that certain groups of stakeholders may 'gain', while others may 'lose'. For example, farmer organisations and processors will lobby for high import tariffs and restriction of imports, while wholesale importers and supermarkets will lobby for easy, low tax imports, based on the argument of affordable consumer prices. At the same time supermarkets and processors may lobby for a ban on raw milk sales. The Ministry of Agriculture may argue for tax-free imports of veterinary drugs, semen and dairy equipment, whereas the interest of the Ministry of Finance is to prevent growing demands for scarce foreign exchange and to improve tax revenue. Furthermore, politicians and donor projects like to donate milk cooling tanks, semen or forage seed to cooperatives, thereby hampering sound business development and encouraging donor dependency.

Political and cultural context

The interplay of the above and other policy issues is of course also strongly influenced by the overall political context. For example, in Ethiopia and Vietnam, the government has a determining role in almost every aspect of the development of the sector, whereas in Uganda the government remains at a distance and plays a more coordinating and facilitating role. In Kenya, politics and stakeholder interests often are interlinked,

A Regional Trade Agreement and its effects

An example of dairy-sector related policies and regulations is the East African Community Treaty, which enables tax-free dairy imports and exports between the partnering countries. For dairy products from non-treaty countries an import duty of 65% is levied. Local producers thus gain a windfall, and trade in dairy products within the region increases. Uganda in particular has benefited from the Treaty, thanks to its relatively low-cost dairy production farming systems, especially in the south-western region. The country's dairy production has increased significantly, resulting in growing exports, especially to Kenya, which has the highest per-capita consumption of milk and value-added dairy products in East Africa.

However, this influx of cheaper milk and dairy products from Uganda has caused the sales of the major Kenyan processors to fall and also lower farm gate prices for Kenyan farmers. As a result, Kenya has imposed import restrictions on milk products from Uganda. This case shows that a policy that may look good on paper can lead to unexpected and undesired side effects and will require further policy dialogue among the East African countries.

which can hamper more rational discussions on improving policies. Working on dairy development therefore requires policy-sensitive approaches.

Lack of capacity and strategic knowledge

In the course of writing this paper it has become clear that leading Dutch companies see improvement of the enabling environment as the most important policy priority, both for development of the dairy sector and for sound business development. The Netherlands' Embassies are in a position to support an enabling trade and investment policy. Their role is much appreciated in relation to addressing concrete bottlenecks with local government institutes. Their role can be difficult when embassies lack the capacity and strategic knowledge to pro-actively participate in sector-specific policy discussions.

Good practices and possible solutions

From the perspective of the need for sector transformation, we advocate further and more active engagement in policy and regulatory discussions and trajectories. To realise this, it would be worthwhile positioning dairy development projects and interventions as vehicles for stimulating and invoking system change. Possible solutions will necessarily be very country specific.

The private sector and successful dairy projects as agents for change

As a follow-up to support for innovations and by combining practical experience with evidence from studies, a number of Dutch dairy development programmes are invoking policy discussions. Initiatives and lobbying by the private sector can play an important role in stimulating policy discussions. Dutch dairy development programmes can play a catalysing role by empowering the private sector with evidence-based advice. A good example is the Happy Cow pilot in Kenya to introduce a Quality Based Milk Payment System, conducted in collaboration with two POs that the company sourced milk from, and supported by a Dutch-funded SNV-KMDP project. Through this pilot, detailed data became available on the poor status of milk quality and safety. The management of Happy Cow presented these data in many different forums, which gave the Kenyan Dairy Board a strong impetus to develop new and more realistic policies and regulations on milk quality.

Local sourcing obligation

A local sourcing obligation for (foreign) importers of dairy products can stimulate local dairy production. Thailand and Nigeria are examples of countries with little tradition in dairy farming, and with high and growing imports due to urbanisation and income growth. Their policies require importers of dairy products to source part of their milk locally. These policies have given an impetus to the development of the countries' dairy sectors.

Agenda for future support and investment priorities

Dutch dairy development support projects have shown that in partnership with Netherlands' Embassies, Dutch actors and local partners, they are able to navigate in different political contexts. In addition to realising concrete results on the ground, they play a constructive and influential role in policy development.

- **Support national governments in policy agenda setting**

Dutch government support should focus on initiatives that can really create dairy system change and not 'just another project that works with farmers'. In practice this means starting with getting the basics right: right feed, health, breeds, market and infrastructure, in combination with developing and working on a common vision. With sound results of such interventions at project level, the projects can and should engage with local authorities and contribute to transformation of the entire system.

- **Invest in diplomatic relations to support an enabling policy environment**

Investing in strong diplomacy and stakeholder relations helps to create a common vision and enabling policy environment for dairy-sector development. This can offer spin-off opportunities for (Dutch) private-sector development. It requires an active role of the Embassies and (collectively) the Ministry of Foreign Affairs and the Ministry of Agriculture. Embassies are a crucial actor in the collaboration between private sector, knowledge institutes and NGOs at country level. They can contribute to creating a common vision and an enabling policy environment for dairy-sector development. This requires a capacity to act proactively in national policy discussions and to align with the private sector, projects and civil society to contribute to system change.

- **Develop integral Dutch policy on dairy development**

Dairy development projects can play an important role in providing experience and evidence from practice as input for policy discussions. The Ministry of Agriculture and the Ministry of Foreign Affairs should use this information, and search for synergy in their policies. Efforts should also be aligned with other projects and donors. Transformations go beyond the investments and interventions of individual (Dutch) projects and companies alone. They should be aligned with wider (donor) efforts, such as those by the World Bank/International Finance Corporation, IFAD and USAID. Cooperation should be strengthened with international platforms such as Global Agenda for Sustainable Livestock (GASL) and Livestock Environmental Assessment and Performance Partnership (LEAP) .

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Organising interlinked transformation

Interlinked transformation towards sustainable and inclusive dairy

In recent years, thinking and implementation has developed from a dairy development support approach based purely on a farming or value chain perspective to one that includes the perspective of the wider food system it operates in and interacts with. The Food System Approach (FSA) is relatively new and ensures a broad spread of interactions between dairy and the entire food system. While it may appear to be a somewhat theoretical approach, we believe it can be helpful for pinpointing root causes and selecting practical strategies that are critical for transforming the sector towards sustainable growth. For more information on the Food System Approach see Annex 2.

The six leverage points outlined in the previous section do not constitute an 'either-or' agenda. They are chosen to reinforce each other to bring about interlinked transformations towards sustainable and inclusive food systems. The strategies and investments of the different leverage points need to be implemented concurrently.

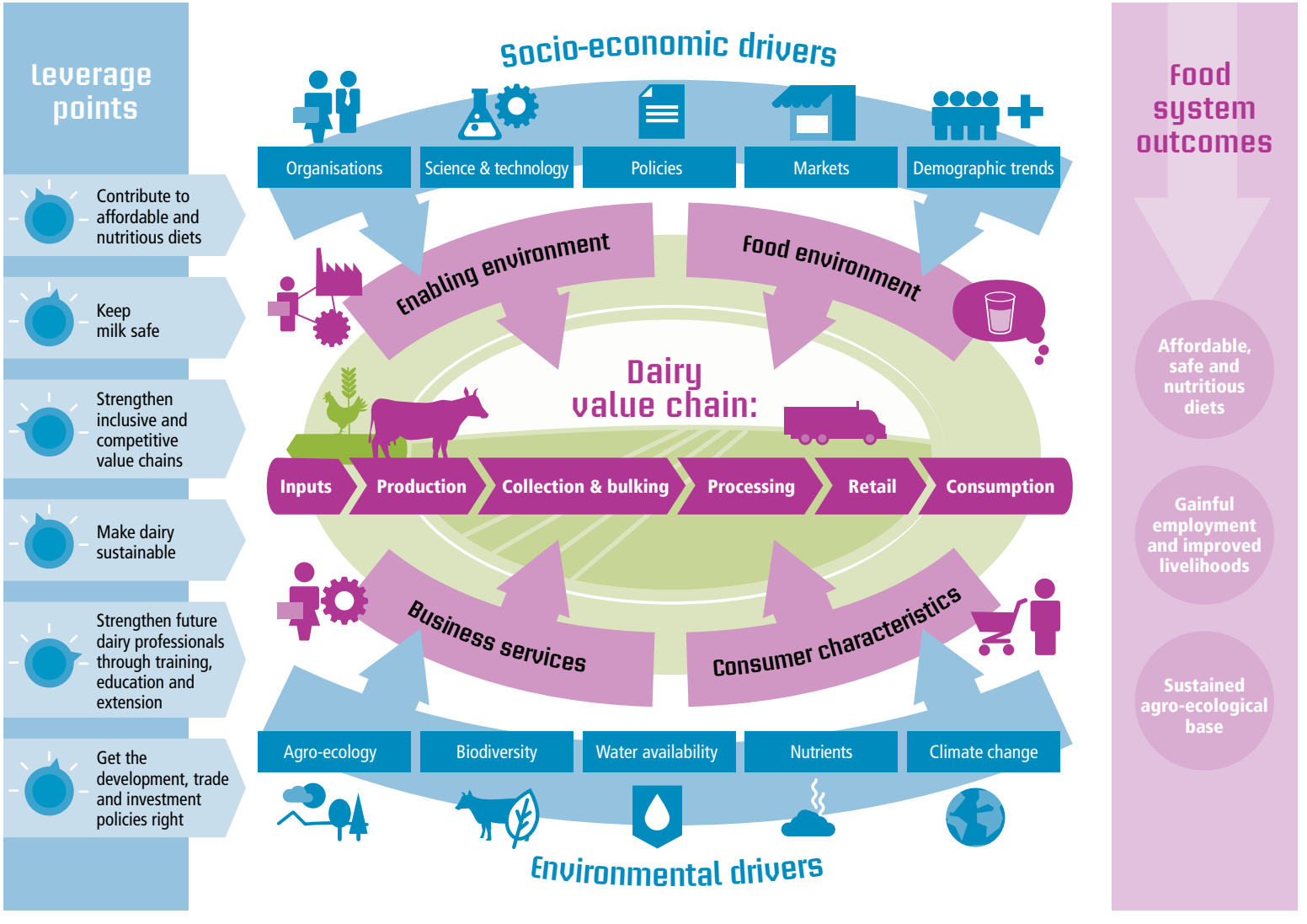
They are hotspots to reinforce positive change in the system, that should lead to at least three interlinked sector transformations:

1. Dairy products becoming an affordable, healthy and safe part of nutritious diets for consumers in all social classes.
2. The dairy sector becoming driven by shared interest and fair distribution of benefits, leading to gainful employment and improved livelihoods, including women, youth and smallholder farmers throughout the entire food system.
3. Dairy farms and companies becoming sustainable and resilient enterprises that contribute to sustaining the agro-ecological base, including sustainable land use, and serving the wider food system.

Figure 3 *(next page) visualises the role of dairy in the wider food system, its desired outcomes and the six leverage points for sector transformation.*

It shows how dairy production in the food system operates: the desired outcomes of the food system, the activities that lead to those outcomes, the context in which these activities take place, and the drivers that influence the activities (see Annex 2 for more detail).

Figure 3 *The role of dairy in a food system.*



Concerted action on all six leverage points can catalyse a change that will bring both production and marketing to a higher level. Improvements to one leverage point support improvements to the others: Sustainable and inclusive dairy systems are only feasible when milk collection and milk prices are regular and when veterinary and AI services are reliable. Farmers need to be able to trust that their milk will be collected and paid for on time and that services are available. Processors will only invest in improving milk sourcing in a particular area if farm households' milk delivery is reliable. Altogether, the strategies presented in part II will support an enabling environment for competent and sufficient dairy professionals to work on more sustainable and inclusive dairy production that delivers products that are safe and of high quality and that contribute to nutritious diets. Nevertheless, trade-offs are real and should be well considered. Considering the interlinkages and possible trade-offs will ensure more effective support.

Developments within each of these leverage points are at different stages in each country and region. As each of the themes and countries follow their own pathway, in their own context, support actions for each leverage point should be tailor-made for the country or regional context. The added value of coordinated support is that it allows for learning and effective implementation of actions. For example, experience with developing quality-based milk payment systems in Uganda can provide valuable lessons and tangible tools for ensuring milk quality in Kenya, Ethiopia and beyond. Concerted action and learning will elevate the knowledge base in the region to a higher level. The proposed Dairy Network of Excellence will contribute to scaling good practices and uptake by the sector, and hence more effective transformations.

General principles for Dutch Dairy Development support

Focus on improving low input-low output dairy farming systems

In general, the biggest gains in developing dairy farming systems that contribute to sustainable and inclusive food systems are likely to be achieved by upgrading and improving low input-low output-low risk dairy farming systems. This can be done by developing, testing and supporting innovations that yield broad improvements in low input-low output dairy farming systems and their contribution to the wider food system. This should be done in an integrated manner, considering economic aspects such as cashflow, net return, risks and financing, inclusivity aspects such as gender and inclusion of smallholders, and environmental aspects such as biodiversity, soil quality, water storage and use, nutrient use and greenhouse gas emissions, and the contribution of dairy to the wider food system.

In this way, opportunities that emerge as a result of growing demand can best be tapped into. The local context and issues are central in any development. Capacity and ambitions of farmers and local actors are crucial.

Use an integrated process

To support sector transformation, it is essential to develop an integrated process. This process should be part of any larger dairy development programme, in addition to more tangible deliverables and outcomes.

It consists of three main actions:

1 **Develop a common vision** amongst relevant stakeholders. It is an art to come to a vision that provides guidance and stimulates innovations but at the same time is neither too restrictive (risk of polarisation) nor too general (risk of insufficient focus). Depending on the ambition and context, this can be achieved through multi-stakeholder processes with a wide variety of actors, or through a more focused and shorter process.

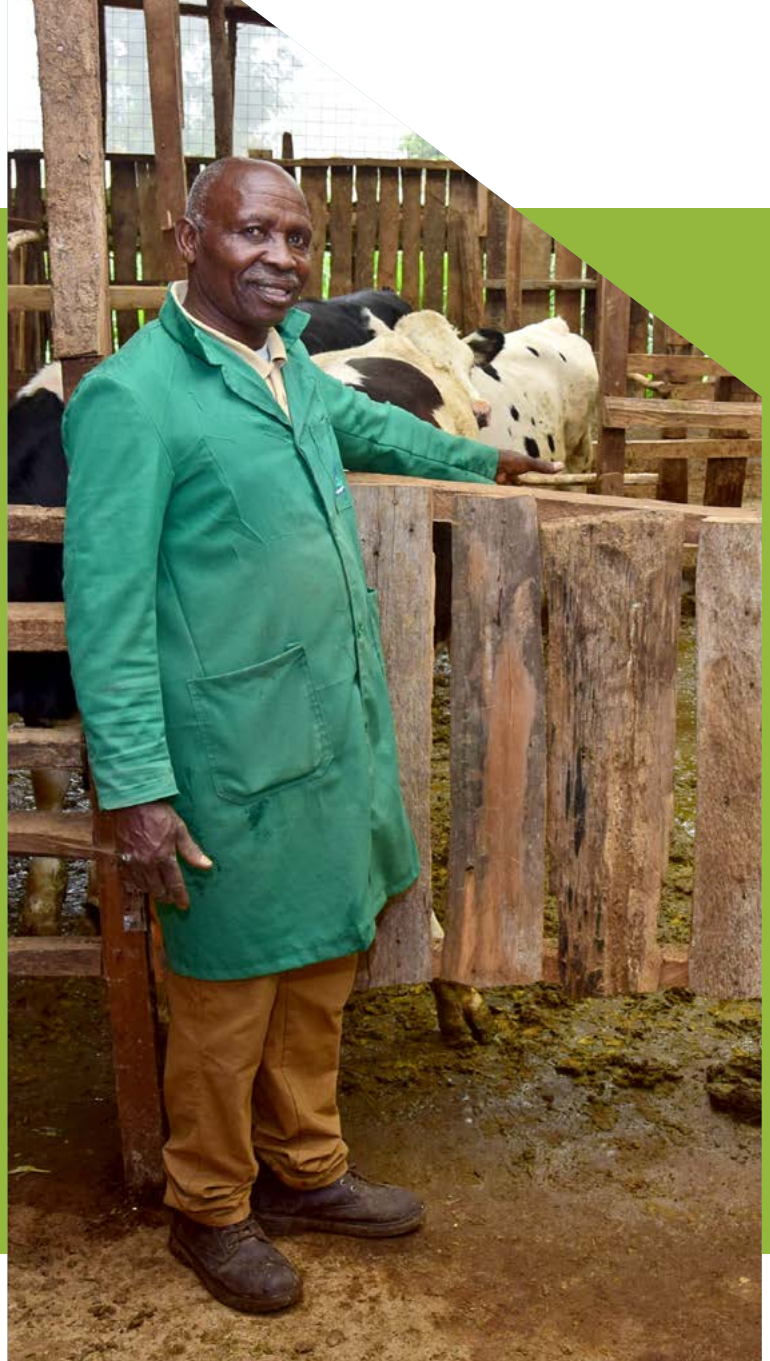
2 **Build networks** among private sector, government, NGOs and knowledge institutes. In this way, the 'resource base' for introduction of innovations can be expanded, the scaling arena enlarged, and adoption speeded up. As a general principle, key stakeholders in the sector need to be involved in order to arrive at a workable agenda. Actors from the private sector, government, NGOs and knowledge institutes, each have a specific role to play in securing a sustainable, inclusive future for dairy. Policymakers' role is to create a conducive environment with clear policy choices on trade, investment and regulations. Embassies can lend support in diplomacy and policy development. Private-sector organisations (including financial institutions) and farmers' roles are to

provide investments and the entrepreneurship needed. Civil society and knowledge institutes' roles are to facilitate the transition, provide knowledge and build capacity[20]. Knowledge and skill development are an essential condition, as much of the above can only be achieved with competent technical staff and access to reliable data.

3 **Stimulate and support scaling and uptake** by the sector through learning, experimenting and piloting on various dimensions such as good husbandry practices, market demand, infrastructure, business models, policies and regulations. This can be based, for example, on a road map, but can also be more open in a stage where a shared vision has not yet emerged.

Engagement of the Dutch private sector, government, NGOs and knowledge institutes, as part of the Dutch Diamond, with their emerging economy counterparts requires proper multi-stakeholder processes that deliver sound benefits for all. Such an integrated process will be supported by the Netherlands Food Partnership. The proposed Dairy Network of Excellence will be helpful to facilitate the knowledge sharing needed for this multi-stakeholder process to further co-develop effective dairy development strategies.

APPENDICES



Appendix 1:
Context and characteristics of dairy

The dairy sector worldwide

According to the FAO, worldwide, around 133 million dairy farms with 363 million dairy cows produce almost 800 million tonnes[21] of milk per year. There is a great variety in dairy farming systems. The majority of dairy farmers are small-scale farmers who have fewer than 5 cows, with relatively few farms having more than 20 cows. At the same time, a small number of farms with over 1,000 cows are emerging in developing countries such as Indonesia and Vietnam. Milk production in India, the world's largest milk producer, is mainly based on small-scale farmers.

Production in industrialised countries is dominated by family farms with over 40 cows, with a historical long-term trend towards larger herds and increased production per cow, together with highly developed input services, advanced processing and well-organised quality-driven supply chains. In emerging economies, much of the milk is sold through informal channels. In Kenya, the percentage of milk sold at the formal market is around 30%. In Ethiopia this percentage is only 2%.

A successful dairy business relies on 'getting the basics right': it depends on a combination of good feeding, health and veterinary services, cattle breed, opportunities for milk collection and availability of a consumer market. The availability of sufficient and quality feed is one of the main challenges in dairy development in developing countries.

Across developing and emerging economies, dairy farming systems range from extensive grazing systems at one extreme, such as that found in Mbarara, Uganda, to peri-urban dairy farming systems at the other, such those found as in urbanised areas in Java, Indonesia or in Kiambu, Kenya. Extensive systems often are based on grazing and use of crop residues. In peri-urban farming systems land for production is scarce. Little or no land is available for dairy farmers to allow grazing or grow fodder and apply manure. This has consequences for the availability of fodder for dairy cows: fodder is sometimes sourced from areas over 100 km away. In the dry season availability can be low in all systems. Dairy farms that have some land available, such as in some parts of Indonesia and Vietnam, use a combination of on-farm fodder production and purchases from outside. In other countries, such as Bangladesh and Ethiopia, crop residues are used to feed animals. In farming systems where almost all feed is purchased, cost of production increases. This is only economically viable in urbanised areas where farmers can sell their milk at higher prices than in rural areas.

Key characteristics of dairy farming for the market

- Milk is produced daily and will only stay fresh for a few days if chilled.
- 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, a large informal sector complicates the realisation and enforcement of quality regulations.
- Many countries have a long tradition of the production and consumption of liquid milk and dairy products.
- 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.
- Usually, (urban) consumers can only afford dairy products 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 in developing countries 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, such as feed supply and veterinary services.
- Dairy cows depend on fodder and 24/7 access to clean water to produce milk and stay healthy.
- Land is required for grazing, or quality fodder needs to be purchased from elsewhere.
- 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 more purposes than high milk yields only. They often have superior disease resistance and heat tolerance.
- In most systems, crossbreeding with (Western) dairy breeds combines the best of both worlds, but this requires proper breeding programming.
- Due to the dependency on land and fodder, the high fixed costs per cow, the long life cycle of cows, and the labour-intensive character of milk production, dairy farmers can only adjust to market changes in a gradual way. Annual production growth percentage rates of over 5% are rare.
- In most countries, women and children play a role in caring for cattle. This role should be assessed when working on dairy production.

Growing demand for dairy

The dairy market in many emerging economies is developing at a fast pace. Over 6 billion people around the world regularly consume milk and dairy products. Dairy is consumed as fresh milk, milk powder, yogurt, butter, cheese and other local products, such as ghee in Ethiopia and South Asia. Dairy products are a rich source of high-quality proteins, vitamins and micro-nutrients, and, if consumed wisely, form a good contribution to a healthy diet.

The FAO expects global consumption of fresh dairy products to grow by 2.1% annually over the next decade[22]. Driven by population growth, increasing urbanisation and an expanding middle class, demand for dairy products will especially grow in urban markets in emerging economies. By 2030, it is expected that people in current developing and emerging economies will consume 67% of the globally produced fresh dairy products. A growing demand requires increased production. Few emerging countries are as yet able to fulfil their own present demand, let alone meet the expected increase in demand. Currently, most low and medium-income countries depend partly on importing dairy products to fulfil the demand[23]. Europe, Argentina, Australia, New Zealand and the USA together account for around 80% of global dairy exports[24], while African milk imports are worth USD 500 million annually. This can partly be ascribed to low production, but is also due to inefficient chains that cause the cost of production in many countries to be higher than the world market price. Countries like Nigeria, Vietnam, and

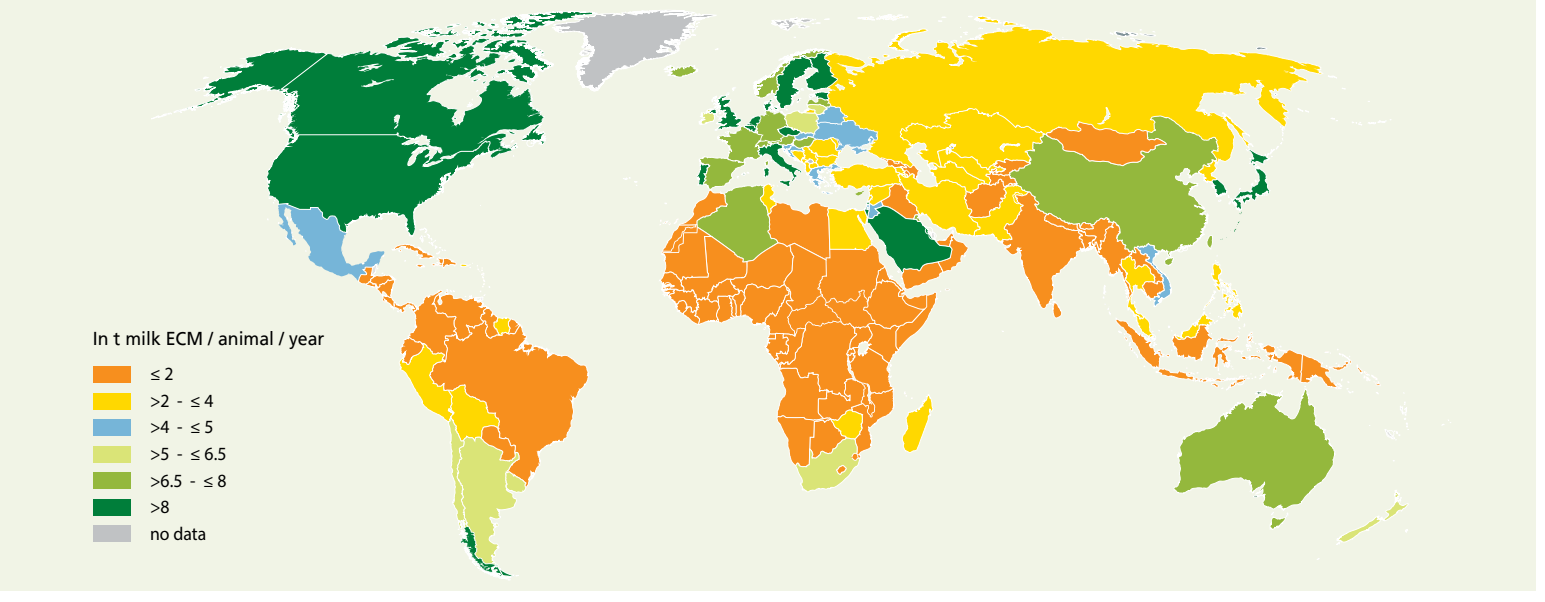
Indonesia rely heavily on imports. Almost all governments in emerging economies have the ambition to increase national dairy production, given the rising demands. Increasing production in a responsible, inclusive and sustainable way is a complicated mission. The challenges of dairy farming in emerging economies and developing countries are listed below. Most are driven by complex interactions.

Challenges in inclusive and sustainable dairy development

Low productivity

In emerging economies, productivity is relatively low in terms of milk/cow/day, see Figure below. Main productivity constraints include lack of good quality and sufficient feed, shortage of water, poor genetic potential, low reproduction rates (leading to relatively high proportions of unproductive animals in the herd), insufficient and inadequate veterinary care, and inadequate extension services.

Figure 4
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



High cost of production

As a result of low productivity and the related inefficient use of feed, the costs of milk production are relatively high. This results in farm-gate prices that can be higher than world market prices. For dairy farming systems based on free grazing on communal land, the cash cost can be low, though labour inputs are high. In countries such as Ethiopia, Bangladesh, Vietnam and Indonesia, farm-gate prices and consumer prices are higher than in the countries of north-west Europe.

Milk quality and safety

Poor milk quality and safety are common issues in emerging economies. Contamination by feed-borne pathogens, mycotoxins, chemical residues of acaricides, pesticides or antibiotic residues is a problem. Enormous losses occur due to poor quality milk. A FAO study (2015) in Kenya, Tanzania and Uganda estimated losses of 251.1 million litres of milk annually, amounting to an annual economic loss of USD 60 million. The concern for safe, good quality dairy products in developing countries is further exacerbated by the huge informal marketing of raw milk.

Animal diseases and antibiotic use

The prevention and control of contagious diseases, in particular zoonotic diseases, is an important public task. Veterinary services are not always adequate. Organised (vaccination) schemes to prevent (the spread of) zoonotic diseases may not exist or may be limited to emergency actions upon outbreak. Use of antibiotics in emerging economies is high, most likely related to the fact that antibiotics are sold over the counter by agrovet shops. The loss of biodiversity and use of exotic breeds that are more productive but less resistant to local diseases, also contribute to the use of drugs in dairy production.

Environmental sustainability

Dairy production is associated with climate change, land-use change, loss of biodiversity, degraded soil quality, local air pollution and water pollution. Poor manure management results in nutrient losses and local pollution. Especially in (peri-)urban dairy farming systems, good storage and re-use of manure is limited due to the geographical distance between fodder production and animal production. In Vietnam, Indonesia and in peri-urban areas around Nairobi, this leads to serious environmental pollution. Feed production for livestock is linked to land-use change, deforestation and biodiversity loss. The dairy sector has an important impact on water, both in terms of consumption and pollution. Finally packaging of dairy products, often in plastic material, is a large source of pollution too.

Global climate change

Livestock in emerging economies causes relatively high emissions of greenhouse gases. Cows predominantly produce enteric methane as part of feed digestion. More intensive production systems have relatively lower greenhouse gas emissions than low productive systems (when expressed per kg of milk produced). For example, a study in Oromia, Ethiopia by Solidaridad and Wageningen University & Research showed that a cow producing 3,000 litres of milk per year emits less than 25% of the GHG emissions, per unit of milk, than a cow producing 500 litres per

year. The gains for GHG mitigation through productivity increase, for example by improving feeding, are particularly high when transitioning from low to medium productive systems.
Global climatic change caused by greenhouse gases results in more extreme weather events, such as longer period of droughts, excessive rainfall, and higher temperatures. Livestock systems are not yet prepared for or adapted to these changes.

Competition for land

The claim on land for livestock production is worldwide relatively high; around 60% of the land in agricultural use is directly or indirectly used for livestock production. Especially in Africa and Asia, the pressure on land is further increasing due to population growth and urbanisation. This also implies that in the future, the competition for available land for food production destined directly for human consumption and for production of animal feed will further increase. Globally most of the agricultural land is farmed by smallholders, and it is becoming more and more fragmented due to population growth, the land tenure system and lack of alternative employment.

Inclusiveness

Many small 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[25]. The inability of many small farms to produce a surplus leads to a growing gap between demand and local supply, resulting in increased imports of milk products. Despite their role in dairy production, women and youth are often not well represented and not taken into account in decision-making processes in cooperatives and processing organisations.

Inadequate policies and enabling environment

Many low and middle-income countries face a mismatch between the existing producer base and the growing market for high-quality dairy products. Promoting the dairy sector is also important to prevent the drain of scarce foreign exchange currency through import of dairy products. For Africa, this already amounts to USD 500 million each year. Also, supporting financial services are scarce. Distrust between processors, traders and farmers, lack of logistics for rural produced milk, and lack of conducive policies further hamper developments.

Knowledge and skills

Emerging economies face a serious challenge in teaching management and practical skills. Though this is true for many sectors, it is particularly visible in the dairy sector due to the complex nature of managing dairy farms. Universities and polytechnics teach mostly theory, while training of practical skills is virtually absent. This results in graduates that are ill prepared for the labour market or to take up farming. Universities generally implement theory-based curricula and the more practically oriented colleges lack facilities and knowledgeable instructors. Investors have have difficulties in finding well-trained and skilled employees. As a result, knowledge and practical know-how is low.

Appendix 2
The Food Systems Approach

Within a food systems approach, concurrent interventions and investments focus on different leverage points. The food system approach is relatively new and ensures a broad range of interactions between the dairy sector and the entire food system. This approach can be helpful for pinpointing root causes and selecting a combination of practical interventions that are critical in transforming the sector towards sustainable growth.

A Food Systems Approach (FSA) 'gathers all elements (environment, people, inputs, processes, infrastructures, institutions, etc.) and activities that relate to the production, processing, distribution, preparation and consumption of food, and the outputs of these activities, including socio-economic and environmental outcomes' (High Level Panel of Experts on Food Security and Nutrition). An FSA takes the intended outcomes as starting point and comprises all the processes associated with food production and food utilisation. The key benefits of using an FSA in analysing and developing the dairy sector are that it aims to take the full complexity of the dairy sector into account, and it pays explicit attention to the interaction among various elements of the system. In other words, an FSA considers trade-offs and synergies, interactions between technological and behavioural change, multi-stakeholder interests and interactions, issues of scale and scope, and alternative options[15]. It helps to identify leverage points within the system that can trigger change or transformation of the entire system.

The FSA details the desired **outcomes** of the food system, the **activities** that lead to those outcomes, the **context** in which these activities take place, and the **drivers** that influence the activities. The different elements are described in more detail below.

Food system **outcomes** can be socio-economic outcomes, environmental outcomes or production outcomes.
Dairy development support should contribute to all three desired outcomes (see part I), along with the Sustainable Development Goals:

1. Contributing to nutritious and healthy diets - SDG 2
2. Gainful employment and improved livelihoods - SDG 1, 5, 8, 10
3. Contributing to sustaining the agro-ecological resource base - SDG 12, 13, 14, 15.

The **activities** relate to the production, processing, distribution and utilisation of food. 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 activities are crop-livestock interactions, farm size, herd composition, barn types, other functions of dairy animals in the farming system (manure, draught power, savings), market-participation level, off-farm employment, and nutrient cycles.

The **context** of dairy production and marketing strongly influences its performance. For example, 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.

Four environments can be distinguished that influence dairy production:

- *The enabling environment*: regulations, policies, infrastructure, standards, institutions, business licensing, their enforcement, and infrastructure – roads, electricity, water, fuel.
- *The food environment*: cultural factors that determine the role of dairy in the local diet, including availability of dairy alternatives and taboos; media coverage of agriculture and food issues.
- *The business environment:* whether inputs and services are available, of good quality, and affordable, and whether there is space to operate as a business. This includes feed supply; AI and breeding; veterinary services; farm advice, skills 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 (mechanisation, barns, milking parlours etc.); transportation.
- *Consumer characteristics* that shape market demand: includes nutrition and safety-awareness; out-of-home consumption; consumer stratification (bottom of the pyramid, middle class, elite).

The **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, urbanisation, emergence of a middle class, pressure on land, and social tensions around high youth unemployment rates. Economic drivers include infrastructure, cost of production factors, land ownership and governance, trade and foreign exchange balance. Environmental drivers include (loss of) agro-biodiversity, shrinking water resources, loss of nutrients, climate change and agreements on mitigating emissions.

Appendix 3
List of projects

Overview of current and recent dairy projects supported by the Netherlands government and/or Implemented by Dutch organisations

Africa

Algeria

Centrum voor Kennis Technologieoverdracht (CKT) Duurzame melkveehouderij (2018-2021)
Implemented by Bles Dairies Consultancy (lead), Roodbont, Norwin College and AgriProm, commissioned by Netherlands Ministry of Agriculture, Nature and Food Quality.
https://www.bles-dairies.nl/new-project-in-north-africa-ckt-algeria-centre-for-knowledge-and-technology-transfer-algeria/

Ethiopia

BRIDGE: Building Rural Incomes through inclusive Dairy Business Growth in Ethiopia (2018-2023)
Implemented by SNV (lead) and Wageningen University & Research, commissioned by Embassy of the Kingdom of the Netherlands in Addis Abeba, financed by Directorate General International Cooperation, Ministry of Foreign Affairs (DGIS-MoFA).
https://snv.org/project/BRIDGE

Greening of Ethiopian Dairy Value Chains: Evaluation of environmental impacts and identification of interventions for sustainable intensification of dairy value chains (2016) Implemented by Wageningen University & Research and SNV Ethiopia, commissioned by the Agricultural Transformation Agency (ATA), Ethiopia.
https://edepot.wur.nl/408614

Promoting dairy impact models in Africa through living labs by alumni of Netherlands knowledge institutions with theme: 'Launching the Pan African Value chain development Forum' - Refresher Course (2020)
Implemented by Van Hall Larenstein University of Applied Sciences (lead), Agrikom (Kenya), Adami Tulu Agricultural Research Centre (Ethiopia), commissioned by Nuffic[1].
https://agriprofocus.com/post/5e60e99c26b72a09b579dc25

1 Nuffic programmes are commissioned by the Directorate General for International Cooperation of the Ministry of Foreign Affairs (DGIS-MFA)

Kenya

KMPD-II: The Kenya Market-led Dairy Programme (2016-2019)
Implemented by SNV, commissioned by the Embassy of the Kingdom of the Netherlands in Nairobi, financed by DGIS-MoFA.
https://issuu.com/victor957/docs/closeout-magazine-v2.5-web2

Practical Dairy Training on skills, knowledge and entrepreneurship for farmers (ongoing)
Implemented by GAD (Global Agricultural Development Foundation), supported by the Rabobank Foundation.
www.gad-foundation.com/en/training

Public-Private Partnership for inclusive dairy business led by Kieni Dairy Product Limited, a farmer owned processing company (2019-2023)
Supported by 2SCALE[2].
https://www.2scale.org/en/partnerships/kdpl-kenya-en

Efficient dairy processing operations and improved dairy extension by Mukuruwe-ini Wakulima Dairy Limited (2014-2019)
Supported by Agriterra.
https://www.agriterra.org/modules/downloads/upload_directory/Factsheet%20Mukurwe%20Ini.pdf

Effective dairy extension and communication by Baringo Agricultural Marketing Services Cooperative Society
Supported by Agriterra, in close cooperation with KIT and NUFFIC.
https://www.agriterra.org/farmer-achievements

AfricaMilk - Promote ecological intensification and inclusive value chains for sustainable African milk sourcing, 2018-2021
Research project Implemented by partners in Burkina Faso, France, Kenya, Madagascar, Netherlands (Wageningen Livestock Research), Senegal, commissioned by NWO-WOTRO, financed by Ministry of LNV.
www.africa-milk.org/acces-reserve

3R Kenya – from aid to trade 2016-2020
Applied research project Implemented by Wageningen University & Research, ACTS, Egerton University, Jomo Kenyatta University for Agriculture and Technology and TradeCare, commissioned by the Embassy of the Kingdom in Nairobi, financed by DGIS-MoFA.
www.3r-kenya.org

Strengthening knowledge, skills and entrepreneurship capacities of cooperative staff for inclusive and sustainable dairy value chain, Moi's Bridge Muungano Farmers' Cooperative Society Limited (MMFCS) – Eldoret (2019-2020)
Implemented by Aeres, commissioned by TMT-Nuffic.
https://www.aeres.eu/cooperations-and-projects/okp-nuffic/tmt-kenya

2 2SCALE is a programme commissioned by DGIS-MoFA and implemented by IFDC, SNV & BoPInc.

Assessing the impact of Dutch knowledge institutions on performance of alumni on dairy value chain governance in Kenya and Ethiopia: promoting climate-smart dairy practices for food security and resilience. Refresher Course (2019)
Implemented by Van Hall Larenstein University of Applied Sciences (lead), Agrikom (Kenya), Egerton University (Kenya), commissioned by Nuffic.
https://agriprofocus.com/post/5e60e99c26b72a09b579dc25

Intensifying livestock production to increase incomes and protect the Mau forest (2017-2020)
Implemented by IDH and SNV and commissioned under the Intiative Sustainable Landscapes (ISLA), with funding of the German's Intiative for Climate Change (IKI).

Malawi

Women Integrating Nutrition in Dairy Value Chain (2017-2020)
Implemented by Heifer Netherlands, commissioned by Heifer Netherlands and Heifer International.
https://www.heifer.nl/files/Factsheet/BoerinnenInMelkveehouderijMalawi_factsheet.pdf

Mali

Public-Private Partnership for inclusive dairy business led by Translait Dairy Union (2019-2023)
Supported by 2SCALE.
https://www.2scale.org/en/partnerships/promote-local-milk-production-through-marketing-of-quality-dairy-products-en

Nigeria

Dairy4Growth (2016-2021)
Partnership between FrieslandCampina WAMCO, FrieslandCampina (lead), Wageningen University & Research, IFDC, supported by FDOV-RVO3.
https://www.frieslandcampina.com.ng/sustainability/dairy-development

Public-Private Partnership for inclusive dairy business supporting Fulani milk producers, (2012-2023),
Led by FrieslandCampina-WAMCO, supported by 2SCALE.
https://www.2scale.org/en/partnerships/developing-local-fresh-milk-supply-chain-with-fcw-and-fulani-milk-producers-en

3 FDOV stands for Facilty for Sustainable Entrepreneurship and Food Security and is commissioned by DGIS-MFA

Development of the Dairy Value Chain in Nigeria though Enhanced Capacity of lecturers of Ibadan University, Kwara State University and the Federal College of Animal Health and Production (2019)
Implemented by Aeres, commissioned by TMT-Nuffic.
https://www.aeres.eu/cooperations-and-projects/okp-nuffic/tmt-nigeria

Rwanda

Strengthening educational institutes in providing capacity building services for sustainable agricultural development in Rwanda (2015-2021)
Implemented by Maastricht School of Management, with Mott MacDonald, Delft University of Technology, DLV Plant BV Legal, Q-Point B.V., SNV, Stellenbosch University, Van Hall Larenstein University of Applied Science and commissioned by Nuffic.
https://www.msm.nl/consultancy/project-references/strengthening-educational-institutes-agricultural-development

South Africa

Strengthening Education and Agri-business interaction for sustained employment and agricultural Development in South Africa (2018-2021)
Implemented by AERES, together with Elangeni TVET college and commissioned by Nuffic.

South Sudan

Training on Entrepreneurship, Technology Transfer and Gender in the Dairy Value Chain (2019-2020)
Implemented by Aeres, commissioned by TMT-Nuffic.
https://www.aeres.eu/cooperations-and-projects/okp-nuffic/tmt-south-sudan

Tanzania

Dairy 2025 (2019-2021)
Partnership with Tanga Fresh Ltd., TDCU and Mruazi farm, implementation by Solidaridad, supported by Achmea Foundation, Rabobank Foundation and DOB Equity.
https://www.solidaridadnetwork.org/news/focus-on-farmers-essential-to-grow-tanzanian-dairy-sector

Integrated Dairy Farming for Income & Employment for Women and Youth (IEWY) (2016-2020)
Implemented by SNV, Matchmakers Associates, CABO and Nroga Women Dairy Coop, supported by Comic Relief.
https://snv.org/project/integrated-dairy-farming-income-employment-women-and-youth-iewy

Uganda

TIDE: phase 2 - The Inclusive Dairy Enterprise (2020-2023)
Implemented by SNV (lead) and Agriterra, commissioned by the Embassy of the Kingdom of the Netherlands in Kampala, financed by DGIS-MoFA.
https://snv.org/project/inclusive-dairy-enterprise-tide

Dairy Impact Cluster (2019-2022)
Implemented by Bles Dairies Consultancy (lead), Aeres, Uniform-Agri, Ante BV, Koudijs, Bles Dairies East Africa, supported by the ImpactCluster Facilty of RVO4.
https://www.bles-dairies.nl/dairy-cluster-wants-to-improve-ugandan-milk-production/

Pearl Dairy Development Programme (2018- 2020)
Implemented by Bles Dairies Consultancy (lead) and Vet EffecT, financed by the IFC (International Finance Corporation) and Pearl Dairies.
https://www.bles-dairies.nl/pearl-dairy-development-programme-at-mbarara-uganda/

Strengthening the entrepreneurship of the youth in Bushenyi District of Uganda in the dairy value chain (2019)
Implemented by Aeres and Bushenyi Youth Demonstration Farm, commissioned by TMT-Nuffic.
https://www.aeres.eu/cooperations-and-projects/okp-nuffic/tmt-uganda

Zambia

Training on Integrated Farming Systems: Dairy, Small Livestock (indigenous chickens and goat) and Vegetable Production, Natural Resources Development College, Lusaka (2019-2021)
Implemented by Aeres, commissioned by TMT-Nuffic.
https://www.aeres.eu/cooperations-and-projects/okp-nuffic/tmt-zambia

Increased milk production and quality by Magoye Smallholder Farmers Dairy Cooperative (2016-2020)
Supported by Agriterra.
https://www.agriterra.org/upload_directory/files/Factsheets%202020/Factsheet%20Magoye%20Zambia.pdf

4 ImpactCluster programme is commissioned by DGIS-MoFA

East Africa

NEADAP: Netherlands East African Dairy Partnership (2018-2020)
Implemented by SNV (lead), Agriterra, Bles Dairy Consultancy and Wageningen University & Research, commissioned by DGIS-MFA.
https://agriprofocus.com/dairy-event-with-neadap

EARNED: East African Network of Excellence in Dairy Training (2020-2021)
Implemented by Aeres (Lead), ICRA, Bles Dairies, VHL and Wageningen University & Research in collaboration with FTVETI (Ethiopia), Eldoret National Polytechnic (Kenya) and Mbarara University of Science and Technology (Uganda), commissioned by OKP-Nuffic.

Inclusive and Climate Smart Business Models in Ethiopian and Kenyan Dairy Value Chains (2018-2020)
Implemented by Van Hall Larenstein University of Applied Sciences (lead), Jimma University (Ethiopia), United States International University – Africa (Kenya), Michigan State University, AgriProFocus, Unique (Germany), funded by NWO and CCAFS-CGIAR.
https://ccafs.cgiar.org/inclusive-and-climate-smart-business-models-ethiopian-and-kenyan-dairy-value-chains-global#.XptsRsgzZPZ

Inclusive Low-Emission Development: East African Dairy (2018-2020)
Implemented by Wageningen University & Research, Center for International Forestry Research (CIFOR) Kenya, African Centre for Technology Studies (ACTS) Kenya , Ministry of Agriculture Kenya, Livestock and Fisheries (State Department of Livestock) Kenya, International Livestock Research Institute (ILRI), funded by NWO and CCAFS-CGIAR.
https://knowledge4food.net/research-project/gcp4-inclusive-low-emission-development-led-east-african-dairy/

Alumni as Change-agents in Scaling-up Sustainable Dairy Business Models and Climate-smart Triple Wins Innovations: Refresher Course for Aeres Alumni in Eastern Africa (2020)
To be held in Kenya: Implemented by Aeres, commissioned by Nuffic.

Asia

Bangladesh

SAFAL: Sustainable Agricultural, Food Security and Linkages - An integrated food security programme for 21,000 farmer families, focussing on dairy, aquaculture and vegetables (2015-2021)
Implemented by Solidaridad, commissioned by the Embassy of the Kingdom of the Netherlands in Dhaka, financed by MoFA-DGIS.
https://www.solidaridadnetwork.org/safal

China

Sino-Dutch Dairy Development Center
Partnership between founding partners China Agricultural University, FrieslandCampina and Wageningen University & Research. Partners that have since joined: Qlip, CRV, Yili, Weigang dairy ,Huahuaniu dairy, Eastern Bell, Yunnan Niuniu.
www.sdddc.org

Piloting and scaling of low emission development options in large-scale dairy farms
Implemented by Wageningen University & Research, commissioned by Climate Change, Agriculture and Food Security Programme of CGIAR, co-financed by Netherlands Ministry of Foreign Affairs.
https://ccafs.cgiar.org/upscaling-promising-livestock-options-greenhouse-gas-emissions-asia

India

Dutch Dairy Cluster India (DDCI)
Implemented by Alta, Dd Heus, Kamphuis, Machinehandel Lekkerkerker, Trouw Nutrition, Hoko Farm Group, Kamphuis, Condour, supported by PIB-RVO[5].
www.agrifoodindianl.com/dutch-dairy-cluster-india

Train the trainer for Indian Dairy Sector (2020)
Implemented by HollandDoor (lead), VHL, Wellant college, supported by PIB-RVO.
www.agrifoodindianl.com/dutch-dairy-cluster-india/partners

5 PIB: Partners in Business, a programme commissioned by the Directorate-General for International Cooperation of MoFA

Indonesia

Dairy for Development Programme (2013-2020)
Partnership between Frisian Flag Indonesia, FrieslandCampina (lead), Koperasi Peternak Sapi Bandung Utrara, Koperasi Peternak Bandung Selatan (KPBS) Pengalengan, Wageningen University & Research, Agriterra, Bles Dairies Consultancy, supported by FDOV-RVO.
https://www.rvo.nl/subsidies-regelingen/projecten/development-sustainable-dairy-villages-indonesia

Closing Regional Nutrient Cycles for Low-emission Agriculture (2016-2021)
Implemented by Wageningen University & Research and commissioned by LNV in cooperation with CCAFS-CGIAR.
https://ccafs.cgiar.org/upscaling-promising-livestock-options-greenhouse-gas-emissions-asia

Strengthening of Agricultural Vocational Education and Training (SMK) with a focus on Ruminant production (dairy and meat) (2017-2019)
Implemented by Van Hall Larenstein University of Applied Sciences (lead), Nordwin College, AgriProfocus, DTC, Roodbont, Bles Dairies Consultancy and IPB (Indonesia), commissioned by NUFFIC Innocap.
https://agriprofocus.com/post/5e674fe126b72a09b579dc4a

KPSP Salaju Kuninga dairy cooperative, Cigugur, West Java
Supported by Agriterra.
Fact sheet

Development of the Dairy Value Chain in Indonesia: Capacity Building of Lecturers of Kupang State Agricultural Polytechnic (2019-2020)
Implemented by Aeres and commissioned by TMT-Nuffic.
https://www.aeres.eu/cooperations-and-projects/okp-nuffic/tmt-indonesia

Towards gender-sensitive agribusiness driven poultry and dairy vocational education involving 10-TVET colleges (2019-2021)
Implemented by Maastricht School of Management and Aeres University of Applied Sciences, commissioned by the Embassy of the Kingdom of the Netherlands in Jakarta, financed by DGIS-MoFA.

Mongolia

Improving Productivity of Dairy farms phase II & III (2016-2018)
Implemented by Bles Dairies Consultancy and CPR (Mongolia), commissioned by ERBD (European Bank of Development and Reconstruction).
https://www.bles-dairies.nl/improving-productivity-dairy-farming-mongolia/

Myanmar

Dairy Impact Cluster for development professional small-scale farms in Shan State (2019-2021)
Partnership Implemented by Solidaridad (lead), De Heus, De Laval, supported by ImpactCluster-RVO.

Nepal

Upscaling and improving dairy processing by Kamadhenu Dairy Development Cooperative
Supported by Agriterra.
https://www.agriterra.org/upload_directory/files/Factsheets%202020/200416%20Factsheet%20KDDC%20Nepal.pdf, Fact sheet and YouTube video.

Pakistan

Dairy Supply Chain Development Project (2016- 2018)
Implemented by VetEffecT (lead) and Bles Dairies Consultancy, financed by the IFC (International Finance Corporation) and Nestle.
https://www.bles-dairies.nl/training-of-dairy-development-executives/

Value addition of Milk to Develop Dairy Processing Capacity and Rural Entrepreneurship, training of extension workers of Pakistan Lion Youth Council, Multan (2019-2020)
Implemented by Aeres, commissioned by TMT-Nuffic.
https://www.aeres.eu/cooperations-and-projects/okp-nuffic/tmt-pakistan

Sri Lanka

Sri Lanka Dutch Dairy Solutions (SDDS)
Partnership Implemented by Wellant College and private companies C. van 't Riet, Condor&Partners, Khun, Kornet, Mueller, Rolanka, Wopereis, supported by BIP-RVO.
https://dairysolutions.lk

Improving the Quality of Milk in the Local Dairy Value Chains in Katmale Dairy Products Ltd (2020)
Implemented by Aeres, commisioned by TMT-Nuffic.
https://www.aeres.eu/cooperations-and-projects/okp-nuffic/tmt-sri-lanka

Training on Sustainable Feed and Waste Management in the Dairy Sector (2019-2020)
Implemented by Wellant (lead), HollandDoor, Wageningen University & Research and commissioned by TMT-Nuffic.
https://www.hollanddoor.nl/component/content/article/44-team-member/lisanne-oskam/305-tmt-sustainable-feed-waste-management-in-the-dairy-sector-in-sri-lanka?Itemid=101

Vietnam

Dairy4Growth (2013-2020)
Partnership between FrieslandCampina (lead), FrieslandCampina Vietnam, Wageningen University & Research, DeHeus LLC, Bles Dairies Consultancy, Peoples Committee of Ha Nam Province, supported by FDOV-RVO.
https://www.rvo.nl/subsidies-/projecten/development-sustainable-dairy-sector-vietnam

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