

Climate-smart livestock sector development: the state of play in NAMA development

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CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS)

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Working Paper

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Abstract

Given the projected increase in the demand for animal-source foods in developing countries, trends in livestock GHG emissions and other environmental impacts, there is an urgent need to change livestock production. Despite its significant role in global GHG emissions, the livestock sector also has a large potential to reduce its environmental impacts while increasing productivity. Mitigation practices also have other co-benefits, addressing land degradation (conservation of natural resources), livestock waste, resource efficiency and income generation for the rural poor.

Progress in implementation of mitigation actions has been slow. There is limited information on emerging experiences with Nationally Appropriate Mitigation Actions (NAMAs) development and implementation, pointing to the need to better document what is being done and to share knowledge and experience among interested countries. In particular, interested countries would benefit from better knowledge of the technical and stakeholder processes through which NAMAs are being developed; links between NAMAs and other livestock sector policies and programs; barriers to adoption of promoted practices and means to address them and financing arrangements for NAMA implementation. Supporting interested countries to share experiences in these and other dimensions would help reduce the gap between ‘intent’ and actual NAMA implementation.

Keywords

livestock; mitigation; climate change.

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Acronyms

CCAFS	CGIAR Research Program on Climate Change, Agriculture and Food Security
GHG	greenhouse gases
MRV	monitoring, reporting and verification
NAMA	Nationally appropriate mitigation action
REDD	Reducing Emissions from Deforestation and Forest Degradation
UNFCCC	United Nations Framework Convention on Climate Change

1 Livestock development and emission trends

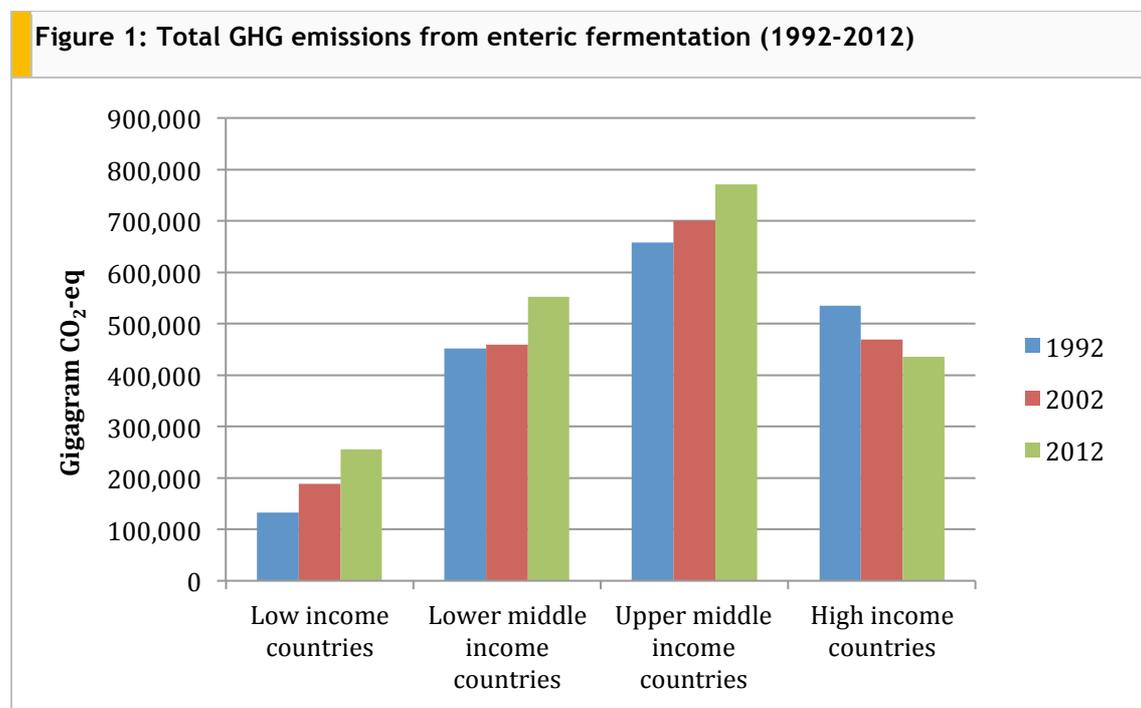
Globally, the livestock sector is a significant source of livelihoods, contributing to employment of at least 1.3 billion people and directly supporting 600 million smallholders in developing countries. Livestock is an important provider of nutrients, traction, can act as insurance and provides manure for crop production (Herrero *et al.* 2009). With an expected growth of the world population from 7.2 billion to 9.6 billion in 2050 and growing prosperity and urbanization, the demand for animal-source foods is expected to increase. Compared to consumption levels in 2000, it is projected that by 2030, demand for pork and eggs will increase by 65-70%; demand for beef, dairy products and mutton will increase by 80-100%; and demand for poultry meat may increase by 170% (Robinson and Pozzi 2011). There will be regional variation in these trends, with growth demand particularly strong for poultry products in South Asia (mainly driven by trends in India), for beef and dairy products in East Asia (mainly accounted for by trends in China) and strong growth for all product types across Africa. The highest growth in total and per-capita consumption of animal-source foods is projected to occur in low and lower middle income countries (Robinson and Pozzi 2011).

The livestock sector also plays an important role in global environmental issues and is often subject of debate. Livestock systems are estimated to use about 45% of the global surface area (Reid, Galvin and Kruska 2008), contributing to land and forest degradation and deforestation (Barona *et al.* 2010). Intensive livestock production often causes water and soil pollution. In addition to direct impacts, livestock products have large water footprints and often represent less efficient uses of nutrients than other foods (Mekkonen and Hoekstra 2012, Bouwman *et al.* 2011).

Livestock supply chains are a significant source of global greenhouse gas (GHG) emissions, and emit an estimated 7.1 gigatonnes of carbon dioxide-equivalents per year, representing approximately 14% of all human-induced emissions (Gerber *et al.* 2013). GHG emissions of the livestock sector are mainly comprised of methane (44%), nitrous oxide (29%) and carbon dioxide (27%). Enteric fermentation, a natural part of the digestive process for many ruminant animals, accounts for 39% of livestock sector emissions. Other significant sources of emissions are feed production and processing (45%) and manure storage (10%). The

remaining 6% of GHG emissions is attributable to the processing and transport of livestock products (Gerber *et al.* 2013).

Figure 1 presents trends in total GHG emissions caused by enteric fermentation from 1992 to 2012, classified by country income levels. Total GHG emissions from enteric fermentation have increased most rapidly in low-income economies (+94%) and lower-middle income economies (+22%), while high-income economies decreased (-19%). The projected increase in demand for animal-source foods, trends in livestock GHG emissions and other environmental impacts emphasize the need for improvements in the efficiency and sustainability of livestock production in developing countries. **There is an urgent need to address the environmental impacts of livestock production and to change the pathway of livestock emissions as they continue to grow.**



Source: Authors' calculation based on FAOSTAT (2014) and The World Bank, Data, Country and Lending Groups.

http://data.worldbank.org/about/country-and-lending-groups - Low_income (accessed 06 November 2014).

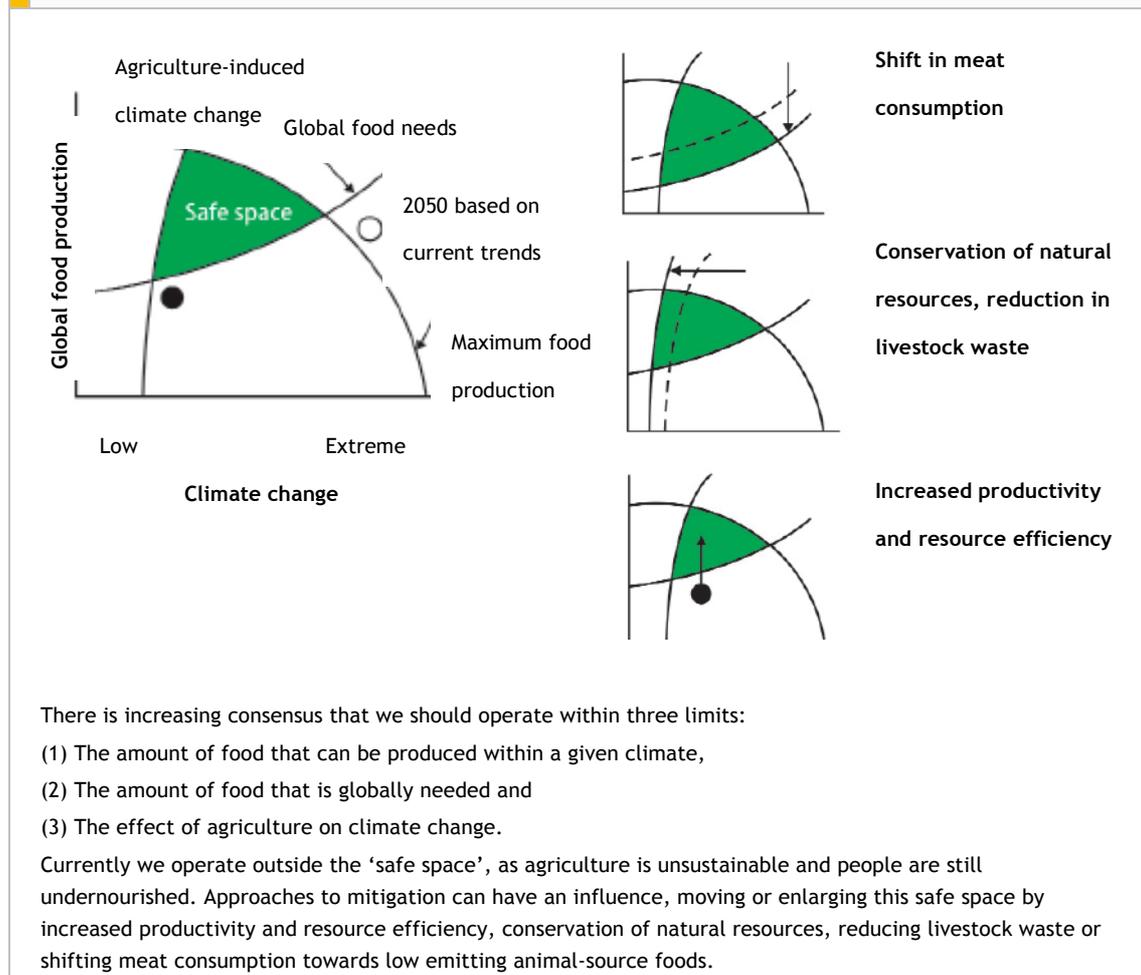
2 Synergies between GHG mitigation and livestock development

The livestock sector has a large potential to reduce greenhouse gas emissions. Mitigation (reduction or prevention) of the sector's emissions could be achieved by a reduction in production or consumption, by an increase in production efficiency to reduce emissions per livestock product, or by shifting the structure of production towards less emission-intensive animal food types. Many technical options to reduce emissions exist, including feed supplements and feed management, grazing land and manure management, health management and improved animal husbandry practices. FAO estimates that by applying practices with the lowest emission intensity, emissions could be reduced by 18-30% without reducing overall output (Gerber *et al.* 2013). Most of these mitigation technologies and practices may also improve productivity and contribute to food security and poverty alleviation.

Many developing countries have elaborated livestock sector development strategies that aim to conserve natural resources, raise productivity, expand production and optimize the allocation of natural resources (Seinfeld and Mack 2014). Most livestock sector development strategies aim to alleviate poverty and secure the availability of food, and thus focus on increasing productivity and expanding production. Their environmental impacts may be reduced if synergies with mitigation practices are recognized. Four general approaches to mitigation in the sector are discussed below:

- i. *Increasing productivity and efficiency of resource use;*
- ii. *Conserving natural resources;*
- iii. *Addressing livestock waste; and*
- iv. *Promoting development and consumption of lower emitting animal-source foods (for example, poultry replacing beef). See Figure 2.*

Figure 2: Synergies between mitigation and livestock objectives



Source: Adapted from Beddington *et al.* 2011.

Increased productivity and resource efficiency

Mitigation supports livestock development through the development of increased productivity, which reduces the emission intensity of production and increases the efficiency of resource use. Mitigation measures, such as the use of feed additives or improved feeding practices, can achieve lower emission intensities by improving feed efficiency (higher feed conversion ratios) and animal productivity. Enteric and manure emissions are reduced while productivity is increased at animal and herd levels. Better husbandry and health management can reduce the unproductive part of the herd, not only reducing loss of animals but also increasing reproduction efficiency, resulting in fewer emissions for the same production level (Gerber *et al.* 2013).

Conservation of natural resources

Conserving natural resources is relevant to both livestock sector development strategies and mitigation policies, and is an objective of many livestock sector development strategies. In extensive grazing systems, managing grazing land and improving its productivity is vital to its sustainable use. The Ministry of Agriculture, Livestock and Fisheries of Kenya (2010) recognizes the importance of sustainable land management and environmental conservation, not only for livestock production but also to maintain and increase crop productivity, enhance soil water and nutrient capacity and reduce loss of agricultural land. Policies and measures that reduce or reverse grassland degradation can sequester carbon and improve provision of other ecosystem services, while programs to reduce emissions from deforestation and forest degradation (REDD+) also conserve forests and biodiversity.

Livestock waste

An increase in livestock production will result in an increase in livestock waste. Improving production efficiency by improved feed efficiency and animal productivity can result in less livestock waste and lower emissions for the same production level. The value of livestock waste as fertilizer is currently underutilized in Kenya (Ministry of Agriculture 2010). Better residue management and utilization of livestock waste can improve nutrient availability for the production of grasslands and crops and also reduce nutrient overloads and pollution in other areas.

Shift in meat consumption

Feed conversion efficiency of livestock types varies considerably, as does animal physiology. As a result, emission intensity varies among species. Per unit of protein provided, beef and dairy products are much more GHG-intensive than other sources of animal protein such as poultry or fish. Although meat is an important source of nutrients, consumption of (processed) meats is associated with a range of health risks. Promoting production and consumption of less resource- and GHG-intensive livestock types can change the emissions trajectory of the livestock sector, and may also have other environmental and health benefits. For example, in its Green Economy Strategy, Ethiopia supports the consumption of lower-emitting sources of protein such as poultry to reduce emissions from its growing livestock sector (Federal Democratic Republic of Ethiopia 2011).

3 NAMAs as a mechanism for GHG mitigation: the state of play

Nationally appropriate mitigation actions (NAMAs) are a type of planning instrument for national mitigation. There is no strict guidance on what defines a NAMA; it could be a national or sectoral goal, strategy or program, or a project-level action. Within the United Nations Framework Convention on Climate Change (UNFCCC), NAMAs are mitigation actions undertaken to support national sustainable development and can be implemented with domestic resources (unilateral NAMAs) and with international support in financing, technology or capacity building (supported NAMAs). Both types of NAMAs may be registered in the UNFCCC NAMA Registry, which records NAMAs seeking international support and facilitates matching support.

3.1 Current state of development

Many developing countries have expressed interest in GHG mitigation in the agricultural sector. Reasons for prioritizing mitigation in the agricultural sector vary depending on national circumstances and include food security, increased efficiency and trade competitiveness, synergies with adaptation to climate change and synergies with policies to address drivers of deforestation and pollution of water sources (Wilkes *et al.* 2013).

“In Kenya, several initiatives are currently ongoing for the development of a NAMA. A dairy NAMA will be one of our first priorities, as the sector not only has a large potential to reduce its emissions, but can also provide income and generate employment opportunities.”

Stephen King’uyu, Climate Change Secretariat of the Ministry of Environment, Water and Natural Resources

By May 2013, 57 countries and the Group of African States had communicated their intent to implement NAMAs to the UNFCCC (UNFCCC 2014). Of these 57 NAMAs, 23 make specific references to mitigation activities in the agricultural sector, and seven (African

Group¹, Brazil, Gambia, Guinea, Jordan, Malawi and Mongolia) specifically mention the livestock sector (see Table 1). Of the seven submissions that specifically refer to NAMAs in the livestock sector, only two (Brazil and Mongolia) have started the implementation process. Other countries have submitted statements of intent and outline concepts of proposed mitigation actions (UNFCCC, 2013).

Table 1: Livestock in UNFCCC NAMA submissions

Country	Reference to the livestock sector
African Group	The African Group emphasizes the role of agriculture in economic and social development. Investment areas in the livestock sector include: <ul style="list-style-type: none"> • Supplementary livestock feeds; • Promoting improved livestock breeds and broadening the production base through promoting small livestock; • Livestock insurance; • Research and technology development, amongst others in livestock breeding and diseases; • Policies to ameliorate the adverse impacts of livestock production and pastoralism; • Adaptation of livestock to climate stress; • Increased use of resource-conserving technologies in livestock management.
Brazil	Mitigation actions include an integrated crop-livestock system and restoration of degraded grasslands.
Gambia	One of 10 priority NAMAs is to promote an integrated crop-livestock system by planting nitrogen fixing crops and encouraging spot and zero burning practices.
Guinea	Guinea has outlined an agriculture sector NAMA that includes intensification of agricultural and livestock production.
Jordan	Activities specified in the agriculture and forestry sector NAMA include the use of CH ₄ emitted from livestock and chicken production and slaughterhouses.
Malawi	Mitigation options include the enhancement of participatory research and technology development in relation to the production and management of crops, livestock and fisheries and land and water management.
Mongolia	Limit the increase in the total number of livestock by increasing the productivity of each type of animal, especially cattle.

Source: adapted from UNFCCC, 2013

Complementary to NAMAs that have been formally communicated to the UNFCCC Secretariat are those NAMAs currently under development and outlined in the NAMA database². For example, Uruguay has submitted a NAMA on low-emissions technologies in

¹ The African Group is one of the five regional groups of the United Nations and consists of 54 African member states.

<http://www.un.org/depts/DGACM/RegionalGroups.shtml>

² NAMA Database: Download the NAMA database pipeline. http://www.nama-database.org/index.php/Main_Page (accessed 11 November 2014)

agriculture and agro-industrial production chains (including cattle) and is in the process of developing a NAMA for submission to improve the sustainability, resilience and productivity of grasslands (Oyhantcabal 2013). Costa Rica has also submitted a NAMA that is presently under development titled “Eco-competitive livestock sector.”

Box 1: Livestock NAMA development in Mongolia

Mongolia has made considerable progress in the development of a specific livestock NAMA. In 2010, Mongolia submitted intended NAMAs to the UNFCCC Secretariat, which included a NAMA for agriculture and specifically addressed the livestock sector. The objective for the livestock sector is to “limit the increase in the total number of livestock by increasing the productivity of each type of animal, especially cattle.”

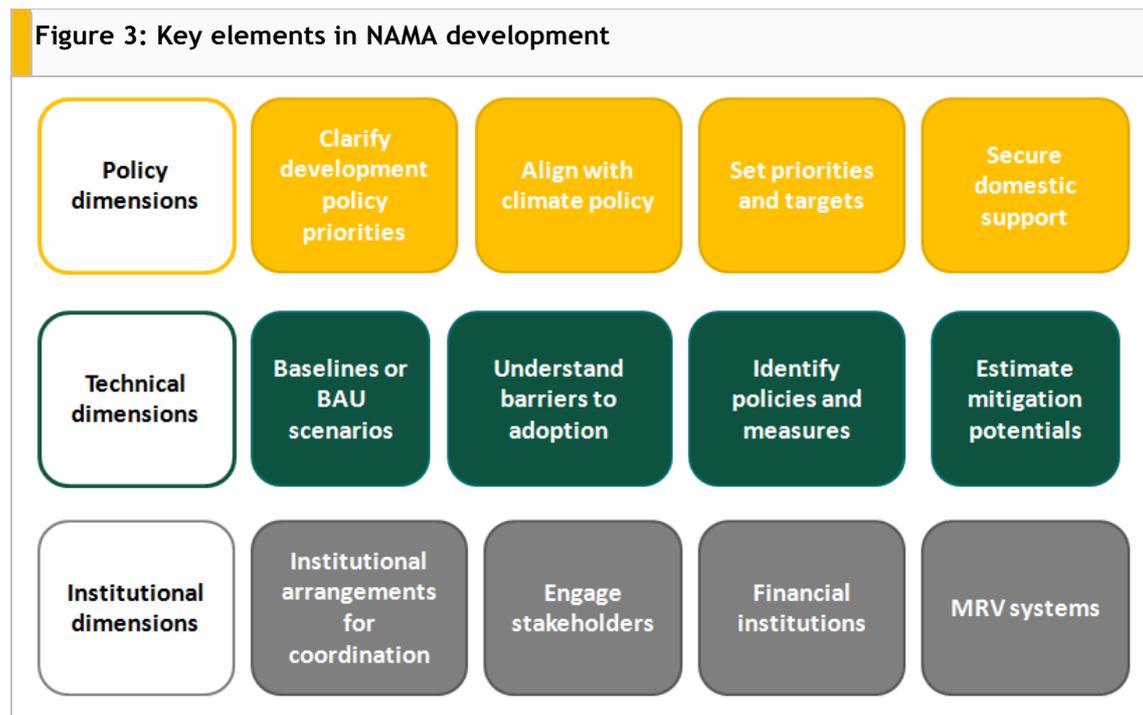
Based on the National Livestock Program (NLP) in Mongolia, a NAMA concept for sustainable management of the livestock and grassland sectors was developed and the state of policy, technical and institutional readiness for implementation was assessed. Readiness for implementation was advanced in some key elements more than others. Based on these findings, a phased approach, including activities divided into three categories (quick wins, fast-tracked actions and key medium-term actions), was identified as the most suitable strategy for NAMA implementation. Proposed activities include:

- (1) developing a results-based monitoring and evaluation system;
- (2) completing assessment of the NLP activity lines; and
- (3) piloting implementation of selected activities of the NLP and associated measurement, reporting and verification procedures (Davgadorj *et al.*, 2013).

3.2 NAMA development process

Despite much interest in GHG mitigation in agriculture, it has received little specific attention in the UNFCCC process, and implementation of mitigation actions has been slow. In addition to general constraints, the agriculture sector faces several specific constraints when planning mitigation actions. These include: limited awareness of the relevance of GHG mitigation in agriculture (especially among politicians, planners and climate finance institutions), limited national research capacities and a variety of barriers to adoption encountered by smallholder farmers (Wilkes *et al.* 2013a).

There is no standardized approach that should be followed in developing a NAMA. The process consists of a number of key elements describing the enabling conditions and technical procedures required to elaborate a mitigation plan (Figure 3). These elements cover policy, technical and institutional dimensions of NAMA development. The process should be developed in a country-specific manner because these elements differ between countries, and each country has its own priorities.



Source: Wilkes *et al.* 2013a

The policy dimensions of a NAMA will describe mitigation policies and measures that support achievement of policy priorities outlined in existing national (agricultural, livestock) development strategies. The technical dimensions of a NAMA require understanding of historical and projected GHG emissions to identify sectors, policies and measures that have significant mitigation potential. Understanding barriers to adoption is essential, and how to overcome these barriers must be addressed in the design of mitigation actions. Finally, institutional dimensions of NAMAs refer to required cross-government support and stakeholder involvement. Funding plays a key role in the facilitation of implementation of mitigation policies and actions. Likewise, monitoring, reporting and verification (MRV) systems should be designed to provide stakeholders with information on progress and effectiveness of mitigation actions.

“Actors within the value chain need incentives to participate in mitigation activities. In the case of a dairy NAMA, various opportunities for different actors exist, such as investment opportunities for processors, uptake of new technology within the feed industry and higher quality milk for consumers.”

Kenya Dairy Board

Box 2: Designing a dairy NAMA in Kenya

Within the framework of the National Climate Change Action Plan, the Livestock Department of the Ministry of Agriculture, Livestock and Fisheries is working on a NAMA in the dairy sector. National development policies, including the Constitution and Vision 2030, provide a supporting investment environment. The dairy sector is acknowledged as priority sector due to its large potential to increase production efficiency and thus increase farmer income, generate employment opportunities and reduce emissions per kilogram of product.

From 2015-2018, activities will include:

- 1) Development of a strong institutional framework;
- 2) Identification and analysis of best practices, business models and finance investment modalities; and
- 3) Development and testing of a monitoring and Measurement, Reporting and Verification (MRV) framework.

3.3 Financing

For many developing countries, an important goal of developing a NAMA is to attract financial support. Funding may come from a range of sources, including public (domestic), private and international sources of finance. However, it is important to recognize that most climate finance is in the form of loans – not grants, and much of it is provided on commercial terms. Public finance should therefore be used to leverage private investment in implementation of mitigation actions. International support for NAMAs may come from climate finance, international funding for REDD+ and/or official development assistance (Wilkes *et al.* 2013). Potentially relevant sources of climate finance are summarized in Box 3.

Box 3: Potential sources of climate finance for NAMA support

The **Green Climate Fund**, established at the 16th United Nations Conference of the Parties in Cancun in 2010, aims to make a significant contribution to combatting global climate change. The fund was appointed as operational body of the Convention's financial mechanism and will support developing countries to limit or reduce their GHG emissions and to adapt to the impacts of climate change. The fund is expected to be ready for implementation in 2015 (Green Climate Fund 2014).

The **International NAMA Facility**, jointly established by the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety and the United Kingdom Department of Energy and Climate Change, was officially launched at the 18th United Nations Conference of the Parties in Doha in 2012. The Facility, with an initial budget of € 70 million, supports countries that want to implement NAMAs and applies a competitive selection process (International NAMA Facility 2014). The first call for NAMA proposals ended in September 2013. In the land use sector, coffee in Costa Rica received € 8 million for the development of a NAMA. The second call for NAMA proposals ended July 2014; and results were announced in December for Burkina Faso, Peru, Tajikistan and Thailand.

The **BioCarbon Fund**, a public-private program of the World Bank, mobilizes finance for activities that sequester or conserve carbon emissions in forestry and agriculture. It has committed US\$ 280 million for sustainable ('climate-friendly') land management practices and technologies, including climate-smart agriculture (World Bank 2014).

Other international sources of finance include the NAMA Partnership, the Inter-American Development Bank (IDB), NEFCO (an international financial institution established by Denmark, Finland, Iceland, Norway and Sweden), and the members of the International Development Finance Club, hosted by KfW (in Germany).

In seeking international support, it is important to match proposals with the priorities of climate finance institutions. Although climate finance institutions have not yet standardized practices, a range of criteria have been identified that are commonly considered for the evaluation and selection of NAMA proposals for financial support (Table 2). Some finance institutions will apply specific criteria. The International NAMA Facility for example, defines 'qualified delivery organizations' that are eligible to submit NAMA project outlines and to function as delivery organization.

Table 2: Criteria for financial support		
Effectiveness	Implementation plan	Financing plan
Level of GHG emission reductions	NAMA description with clear boundaries and plans	Budget with national contributions
Transformational change	Alignment with national development plans	Catalytic impact of contribution by international finance institute
Sustainable development benefits	High-level political support and country ownership	Leveraging private-sector investment
Overcomes adoption barriers	Support from sector stakeholders	No duplication with other sources of finance
Overall sustainability and replicability	Capacity for implementation	Clear exit strategy for funders
MRV system		Risk mitigation

Source: Wilkes *et al.* 2013a

4 Discussion

Given the projected increase in the demand for animal-source foods in developing countries, trends in livestock GHG emissions and other environmental impacts, there is an urgent need to change livestock production. Despite its significant role in global GHG emissions, the livestock sector also has a large potential to reduce its environmental impacts while increasing productivity. Both livestock sector and mitigation policies have the objective to increase productivity and improve efficiency. Mitigation practices also have other co-benefits, addressing land degradation (conservation of natural resources), livestock waste, resource efficiency and income generation for the rural poor.

Although the NAMA concept was first introduced at the United Nations Conference of Parties in Bali in 2007, progress in implementation of mitigation actions has been slow. Of the 57 countries that have communicated their intent to implement a NAMA to the UNFCCC, seven make specific reference to the livestock sector, of which only two have started the implementation process. There is limited information on emerging experiences with NAMA development and implementation, pointing to the need to better document what is being done and to share knowledge and experience among interested countries. In particular, interested countries would benefit from better knowledge of the technical and stakeholder processes through which NAMAs are being developed; links between NAMAs and other livestock sector policies and programs; barriers to adoption of promoted practices and means to address

them and financing arrangements for NAMA implementation. Supporting interested countries to share experiences in these and other dimensions would help reduce the gap between ‘intent’ and actual NAMA implementation.

For stakeholders in NAMA development in the livestock sector, it is important to engage with potential sources of climate finance at an early stage. Not only will this raise awareness of the sector’s potentials and finance needs, it will also support the development of ‘bankable’ proposals. Early engagement can also raise awareness among staff of climate finance institutions about the relevance of the livestock sector for achieving transformation of GHG emissions pathways while promoting sustainable development.

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