WORLD BANK

Food and Agriculture Organization of the United Nations

CONTEXT 6

INTENSIVE (RUMINANTS & MONOGASTRICS) SYSTEMS

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ISL Tool Guidance: Context 6

This brief provides an overview of the Investing in Sustainable Livestock (ISL) Guide and the full application of the accompanying ISL Tool to intensive (ruminants and monogastrics) systems (referred to below as Context 6).

CONTEXT 6: INTENSIVE (RUMINANTS & MONOGASTRICS) SYSTEMS

INTRODUCTION TO THE ISL GUIDE

The online ISL Guide (**www.sustainablelivestockguide.org**) is an information resource for designing and implementing environmentally sound livestock development projects. The guide has an interactive tool that provides context-specific guidance, suggested activities, and indicators to help livestock projects contribute to environmental sustainability; it also includes references for further investigation.

The ISL Guide is grounded in tested theory and evidence organized in seven principles for sustainability in the livestock sector. The World Bank and the Food and Agriculture Organization of the United Nations (FAO) specifically developed the following principles for the guide:

1. Contribute to a sustainable food future
2. Enhance carbon stocks
3. Increase productivity at animal and herd levels
4. Source feed sustainably
5. Couple livestock to land
6. Minimize fossil fuel use
7. Foster an enabling environment

Because the ISL Tool understands "sustainability" in a broad sense, it will eventually comprise elements not only of the environment but also of animal health and welfare, public health, and equity issues such as gender and inclusion. Thus, in due course, the World Bank and FAO will expand the scope of the tool to include guidance for addressing these issues in livestock projects.

STRUCTURE OF THE ISL TOOL

The ISL tool provides guidance for improving the environmental outcomes of livestock projects in the following 6 contexts, which cover the different livestock farming systems found worldwide:

Context 1: Grazing dry - Pastoral (ruminants)
Context 2: Grazing temperate (ruminants)
Context 3: Grazing sub-humid (ruminants)
Context 4: Mixed crop-livestock, dry (ruminants)
Context 5: Mixed crop-livestock, humid (monogastrics)
Context 6: Intensive (ruminants and monogastrics)

The guidance provided for each of these contexts is organized according to objectives and interventions that are typically found in livestock investment projects. A broad review of projects funded by the World Bank Group and other Financial Institutions allowed to identify :

- Five broad objectives that livestock sector development commonly seeks to achieve: (i) improved productivity of livestock, (ii) improved market access and development of value chains, (iii) improved input and services delivery, (iv) climate change resilience and emergency response, and (v) strengthened policies, knowledge, and information.

- For each of these five objectives, a series of project interventions typically implemented (e.g. "improve animal health and welfare" for the objective " improved productivity of livestock"), as well as more specific project activities that might be implemented under each intervention (e.g. "undertake vaccination campaigns"). For each objective, the identified interventions and activities differ according to the context of the project.

CONTEXT 6: INTENSIVE (RUMINANTS & MONOGASTRICS) SYSTEMS

For every combination of context and intervention, the ISL tool provides -specific guidance for improving the environmental outcomes, as well as suggested indicators for project monitoring and evaluation. The guidance integrates the trade-offs that may occur between environmental objectives where relevant and considers compromises among these trade-offs that can lead to submaximal environmental outcomes.

OVERVIEW OF CONTEXT 6: INTENSIVE (MONOGASTRIC) SYSTEMS

Context 6 covers highly specialized systems found mostly in middle-to high-income countries. Common features include high productivity animals, industrial management, and sourcing of feed produced off-farm.

Description of typical situation

Industrial livestock production systems are characterized by their relatively large scale, a high level of specialization, limited direct land use, reliance on off-farm production of feeds and other inputs, and use of high-productivity breeds. Pig and poultry are the predominant species found in these systems, but dairy and beef may also be produced in such settings. Industrial livestock production systems are found all over the world, although mostly in middle- to high-income countries, where their development took place in response to high demand, well-developed infrastructure (making transport and processing of inputs and outputs feasible), and a relative scarcity of land. Industrial systems are also the most rapidly growing form of animal production, accounting for more than 60% of the world's pork production and more than 85% of the world's poultry meat production.

Intensive poultry is the most widely disseminated and standardized of these systems. For pork, the major industrial production regions are East and Southeast Asia, Western Europe, and the United States. China alone produces almost half of the world's supply. Feedlots (and the upstream systems that supply the fattening animals to them) are estimated to contribute 15 to 20% of global beef production and are mostly (about three-quarters of production) located in OECD countries. Highly intensive dairy systems are also mostly concentrated in affluent countries as well as in places where growing consumption is supplied by new production, e.g. China.

Industrial production systems evolved from more circular forms of production, such as backyard systems where livestock scavenged for feed, or feed was supplemented with kitchen wastes, crop residues and locally available food processing residues. Scaling up of such backyard systems, driven by demand for animal food products and/or pressure on land, is often not a gradual process: When the number of pigs, poultry or cattle on a farm or in a geographical location increases strongly, feeds need to be sourced externally, housing is required to control the production environment and avoid predation, livestock health becomes an issue because of the high concentration of animals, and the local community may complain because of odor, water, and air pollution, and animal welfare perceptions. This results in the need for sophisticated buildings and equipment, thus in higher production costs, which are generally offset by strong economies of scale. Consequently, pig and poultry production, as well as beef feeding, is generally found either as backyard systems or as medium- to large-scale industrial systems without much space for intermediary systems. This is less the case for dairy production: the relatively more labor-intensive animal management and forage-based feeding is less prone to economies of scale. In most low- to middle-income countries, ruminant based mixed crop-livestock systems, as well as backyard pig and poultry production are still important contributors to meat, milk and egg production. For example, backyard systems contribute about one-third to China's pork production and are the major supplier of pork to Vietnam.

Common environmental issues

Farms with these systems often have large nutrient surpluses because of the high nutrient imports through feed and the limited land available for the application of the nutrients in manure. Discharge and involuntary losses of nitrogen and phosphorus may occur and cause pollution of soil, water, and air, with repercussions on biodiversity, climate, and human health. This issue is exacerbated when production units are geographically concentrated, overshooting the recycling opportunities of neighboring lands. The concentration of animal production in and/or in the vicinity of densely populated areas also raises societal resistance related to odor, transport movements, animal welfare, noise, landscape aesthetics, and local pollution. High manure transport cost is a key constraint to viable land/livestock balances. One the one hand, large production units have larger surpluses than medium-scale units which increase the risk for environmental pollution. However, large operations generally have better access to technology and finance, and can also tap into economies of scales to develop manure processing and treatment approaches that are out of reach on medium-scale operations (Principle 5).

CONTEXT 6: INTENSIVE (RUMINANTS & MONOGASTRICS) SYSTEMS

Globally, pigs and poultry account for about 9% and 8% respectively of global greenhouse gas (GHG) emissions associated with livestock supply chains. This contribution is mainly through emissions associated with feed (60%) and manure storage and processing (27%). Consumption of fossil fuel is the highest for this context, taking place along the entire supply chain, e.g., fertilizer production, transport, machinery, animal houses, and cooling. Cattle contribute 65% of GHG emissions associated with livestock supply chains. While there is no detailed analysis of the share of these emissions generated in industrialized beef and dairy cattle systems, it can be estimated at one-third to one-half. (Principles 5 and 6).

Feeding animals with high-quality feed is the norm in these industrial systems. Although crop residues, agro-industry byproducts, and household waste also contribute to the ration, these systems highly rely on products such as maize, soy, wheat, and barley and grasses grown on arable land suited for food crops. The resulting pressure on land and water, land use change, and biodiversity losses tendentially caused by feed production are important issues associated with industrial animal production in this context (Principle 4).

ISL TOOL GUIDANCE TABLE: CONTEXT 6: INTENSIVE (MONOGASTRIC) SYSTEMS

The section below includes guidance for improving the environmental outcomes of five broad objectives that livestock development projects commonly seek to achieve. Typical interventions and specific activities are suggested under each objective, as well as guidance and indicators for improving environmental outcomes and monitoring and evaluating progress toward these outcomes. The guidance also references relevant Principles of Investment in Sustainable Livestock (Principles 1 – 7 or “P1” through “P7”) for further reading.

INTERVENTION: EXPAND FEED RESOURCES AND BALANCE FEED RATIONS

ACTIVITIES

- Increase the use of resources locally available for livestock feed.
- Source (ingredients for) concentrate feed from international markets.
- Adopt phase feeding: tailor feed ration to each animal cohort in the herd (e.g., piglet versus fattening pigs versus sows); and possibly precision feeding: tailor feed ration to each animal.

GUIDANCE

P3 Adequate feed ration balancing already contributes to reducing greenhouse gas (GHG) emission intensities. Feedipedia, NCAT 2013.

P4 Explore the scope for including more by-products and food waste: availability, practical arrangements for collection and processing, and regulatory framework to avoid public health issues.

P4, P7 Raise awareness among feed crop producers and provide technical assistance and financing options to produce feed crops sustainably, for instance, in relation to the use of water and pesticides and to tillage practices. , FAO 2012b, FAO 2014a.

P4, P7 Source imported feed sustainably, considering the fossil fuel emissions generated for feed production and transport, the use of heavy metals, and other environmental impacts on land and water resources. Include the environmental impacts associated with imported feed in project environmental impact assessments. LEAP 2016b. Promote the piloting of a livestock feed certification and labeling scheme.

P3 Reductions in production cost and income gains resulting from improving animal productivity may result in growing demand and thus in an overall production increase. Assess the potential adverse effects on human diets and natural resources. LEAP 2018a, LEAP 2018b, LEAP 2016c.

INDICATORS

Reduced net GHG emissions (CO2-eq) per unit (kg) of product for selected agricultural commodities (e.g., milk, meat, and eggs) — Percentage. This indicator measures the climate impact — i.e., net greenhouse gas (GHG) emissions, including soil carbon sequestration — of agricultural commodity production. It measures the change in the net emission of GHG per unit of agricultural product, including sources and sinks along the supply chain. GHG emissions are converted to carbon dioxide (CO2) equivalent using standard global warming potential values. Quantification can be performed using IPCC 2006 Guidelines, calculators (e.g., GLEAM-i, Cool Farm Tool). The team may consider using certified methodologies, such as the Gold Standard Small Holder Dairy Methodology to generate tradeable GHG mitigation outcomes as well as the LEAP 2018 guidelines for assessing environmental performance in pig supply chains and in large ruminant supply chains.

➔ Quantification may be undertaken at the start of the project, at medium term, and during terminal evaluation, using dedicated surveys to parameterize models, together with activity data from the monitoring system.

Farmers/extension agents/service providers trained on environmental issues and options in the livestock sector — Number. This indicator measures the number of stakeholders along the supply chains that have been made aware of and trained on environmental issues in the livestock sector, for instance, through the inclusion of environmental issues and options in curriculums, extension manuals, capacity development programs, etc.

➔ Quantification may be undertaken annually or at the start of the project, at medium term, and during terminal evaluation, using dedicated surveys.

Irrigation water used in feed production — Cubic meter per unit of feed. This indicator measures the amount of irrigation water used for feed production (e.g., expressed in cubic meter per unit of dry matter of cubic meter per unit of digestible energy).

➔ Quantification may be reported annually based on sampling and direct measurements following a predefined protocol. LEAP 2016 Environmental performance of animal feeds supply chains.

Pesticides used in feed production — Amount per unit of feed. This indicator measures the amount of pesticides used for feed production (e.g., expressed per unit of dry matter or per unit of digestible energy).

➔ Quantification may be reported annually based on sampling and direct measurements following a predefined protocol. LEAP 2016 Environmental performance of animal feeds supply chains.

Competition with food production — Share. This indicator reports the change in the portion of feed consumed by livestock in the project that is not directly human-edible or is produced on land not suited for crop production.

➔ Quantification may be undertaken annually or at the start of the project, at medium term, and during terminal evaluation, using dedicated surveys.

INTERVENTION: IMPROVE ANIMAL HEALTH AND WELFARE

ACTIVITIES

- Undertake vaccination campaigns and improve disease prevention and control.
- Avoid spread of antimicrobial resistance (AMR).
- Improve animal welfare.
- Improve biosecurity.

GUIDANCE

P3 Animal welfare improvements already contribute to sustainability by reducing stress on the animal (animal welfare). This, in turn, avoids the GHG emissions and other environmental impacts associated with losses in feed conversion ratios.

P3, P7 Provide technical assistance and raise awareness among stakeholders about the consequences of using antimicrobials as growth promoters in animal production. Develop regulatory controls to phase out antimicrobials as growth promoters, as well as monitoring systems for the sale and use of antimicrobials in animal production, including the monitoring of residues in animal products. Avoiding the emergence and spread of AMR also improves the resilience of animal production systems to pathogens.

P3, P7 Provide technical assistance and raise awareness among stakeholders about the benefits of improving animal health and welfare. Develop guidelines for good animal welfare in industrial systems, where housing conditions and crowding are often challenges. FAWC 2009, FAO 2013b, FAO 2017b, RAF 2007.

INDICATORS

Farmers/extension agents/service providers trained on environmental issues and options in the livestock sector — Number. This indicator measures the number of stakeholders along the supply chains that have been made aware of and trained on environmental issues in the livestock sector, for instance, through the inclusion of environmental issues and options in curriculums, extension manuals, capacity development programs, etc.

➔ Quantification may be undertaken annually or at the start of the project, at medium term, and during terminal evaluation, using dedicated surveys.

INTERVENTION: IMPROVE ANIMAL GENETICS

ACTIVITIES

- Continuous breed improvement for production performance, product quality, and disease resilience.
- Import animals/animal semen with improved genetics for cross-breeding.
- Develop artificial insemination.

GUIDANCE

P3. Improving animal genetics already contributes to sustainability by improving feed conversion ratios and disease resistance. FAO 2010, ILRI 2017b.

P3 Consider the resilience of any exotic breeds to local agroecological conditions, water availability, climate variability, and drought. Ensure that farm buildings and farm equipment respond to these animal requirements in an environmentally safe way (e.g., water use, energy use efficiency).

P4 Cross-breeding with high-productivity breeds may require more and higher-quality feed, potentially increasing the environmental impacts of feed production. Ensure that any increased demand for higher-quality feed is met sustainably.

INDICATORS

Reduced net GHG emissions (CO2-eq) per unit (kg) of product for selected agricultural commodities (e.g., milk, meat, and eggs) — Percentage. This indicator measures the climate impact — i.e., net greenhouse gas (GHG) emissions, including soil carbon sequestration — of agricultural commodity production. It measures the change in the net emission of GHG per unit of agricultural product, including sources and sinks along the supply chain. GHG emissions are converted to carbon dioxide (CO2) equivalent using standard global warming potential values. Quantification can be performed using IPCC 2006 Guidelines, calculators (e.g., GLEAM-i, Cool Farm Tool). The team may consider using certified methodologies, such as the Gold Standard Small Holder Dairy Methodology to generate tradeable GHG mitigation outcomes as well as the LEAP 2018 guidelines for assessing environmental performance in pig supply chains and in large ruminant supply chains.

➔ Quantification may be undertaken at the start of the project, at medium term, and during terminal evaluation, using dedicated surveys to parameterize models, together with activity data from the monitoring system.

INTERVENTION: DEVELOP PRODUCER ORGANIZATIONS AND PRODUCTIVE ALLIANCES

ACTIVITIES

- Establish and/or build the capacity of new/existing producer organizations.
- Provide financing for subprojects under productive alliances.

GUIDANCE

P7 Raise awareness among producer organizations about environmental issues related to industrial livestock systems.

P7 Provide producers and producer organizations with training on developing environmental management plans, embedding environmental objectives in business plans, monitoring and evaluating environmental benefits, and gaining access to climate and environmental finance.

P7 Include environmental criteria in subproject selection. Establish a line of credit for activities with additional environmental benefits.

INDICATORS

Farmers/extension agents/service providers trained on environmental issues and options in the livestock sector — Number. This indicator measures the number of stakeholders along the supply chains that have been made aware of and trained on environmental issues in the livestock sector, for instance, through the inclusion of environmental issues and options in curriculums, extension manuals, capacity development programs, etc.

➔ Quantification may be undertaken annually or at the start of the project, at medium term, and during terminal evaluation, using dedicated surveys.

INTERVENTION: CONSTRUCT/UPGRADE POST-FARM-GATE FACILITIES

ACTIVITIES

- Improve transport and storage capacity.
- Improve/build processing plants, slaughterhouses, dairy processing, and wet markets.

GUIDANCE

P6 Improve access to energy-efficient storage, processing, transportation, and refrigeration equipment to minimize loss and waste as well as improve food safety. Ensure the resilience of infrastructure to damaging climate and weather events. IEE 2007, LEAP 2016c, LEAP 2016d.

P6 Provide technical assistance and financing options for integrating renewable energies along the value chain, for instance, to power processing plants. Integrate cost-of-fuel savings into financial analyses.

OBJECTIVE 2:
IMPROVE MARKET ACCESS AND DEVELOP VALUE CHAINS

P5, P7 Develop guidelines for environmentally sustainable waste management in industrial livestock processing as well as regulations for waste disposal. SNV Biogas, GMI 2013, University of Wisconsin, Teenstra et al. 2014, CCAC 2015, FAO 2013a.

INDICATORS

Reduced net GHG emissions (CO2-eq) per unit (kg) of product for selected agricultural commodities (e.g., milk, meat, and eggs) — Percentage. This indicator measures the climate impact — i.e., net greenhouse gas (GHG) emissions, including soil carbon sequestration — of agricultural commodity production. It measures the change in the net emission of GHG per unit of agricultural product, including sources and sinks along the supply chain. GHG emissions are converted to carbon dioxide (CO2) equivalent using standard global warming potential values. Quantification can be performed using IPCC 2006 Guidelines, calculators (e.g., GLEAM-i, Cool Farm Tool). The team may consider using certified methodologies, such as the Gold Standard Small Holder Dairy Methodology to generate tradeable GHG mitigation outcomes as well as the LEAP 2018 guidelines for assessing environmental performance in pig supply chains and in large ruminant supply chains.

➔ Quantification may be undertaken at the start of the project, at medium term, and during terminal evaluation, using dedicated surveys to parameterize models, together with activity data from the monitoring system.

Processing plants and markets that have adopted a waste management plan — Number or percentage. This indicator measures the number of slaughterhouses, dairies and other processing units, animal gathering points, and markets that have received project support to develop and implement liquid and solid waste management plans. At a minimum, plans should address the reduction of waste streams, waste collection, storage, and treatment.

➔ Quantification may be reported annually using project advancement reports.

Energy-saving and renewable energy production devices and plans supported by the project — Number. This indicator measures the number of energy-saving and renewable energy production devices installed by the project, either directly or indirectly (through policies and energy pricing). Energy-saving investments may include systems for energy recovery in milk cooling; upgraded thermic insulation; efficient burners; and energy use efficiency plans at the company level. Renewable energy production includes solar panels, biodigesters, solar panels, wind power, and micro-hydropower.

➔ Quantification may be undertaken annually or at project start, mid-term, and terminal evaluation, using dedicated surveys.

Reduction of pollution discharge into waterways — Percentage. This indicator measures the reduction in nitrate, phosphates, and BOD and E. Coli discharge (a) at the end of the pipe of the individual farms or community and (b) at critical downstream locations to be defined in the monitoring and evaluation (M&E) plan.

➔ Quantification may be reported annually based on sampling and direct measurements following a predefined protocol. LEAP 2018 Nutrient Flows and associated environmental impacts in livestock supply chains. Guidelines for assessment.

INTERVENTION: CREATE OPPORTUNITIES ALONG THE VALUE CHAIN

ACTIVITIES

- Develop a market demand for the products produced under the project.
- Establish livestock market information systems and support livestock trade associations to access import markets.

OBJECTIVE 2:
IMPROVE MARKET ACCESS AND DEVELOP VALUE CHAINS

GUIDANCE

P7 Raise awareness among consumers about the sustainability of livestock products produced under the project and about their relative nutritional values.

P7 Establish and promote labeling and/or certification schemes for products that are environmentally sustainable.

INDICATORS

Amount of animal source food in diet — Grams per capita per day — variation in percentage. This indicator measures the increase or decrease in animal source food in human diets, within a beneficiary population (kilogram intake per capita per year). It distinguishes populations having low or high baseline consumption, for instance, by using national dietary recommendations as a reference.

➔ Quantification may be undertaken annually or at the start of the project, at medium term, and during terminal evaluation, using dedicated surveys.

INTERVENTION: DEVELOP PUBLIC AND PRIVATE EXTENSION SERVICES

ACTIVITIES

- Provide extension agents with training and capacity building.
- Develop extension manuals and curricula.

GUIDANCE

P7 Include environmental issues in training programs and manuals. Embed environmental management in production practices.

P7 Train extension agents to collect environmental and other data from farms that they serve.

P7 Build capacity among producers through knowledge-sharing mechanisms.

INDICATORS

Farmers/extension agents/service providers trained on environmental issues and options in the livestock sector — Number. This indicator measures the number of stakeholders along the supply chains that have been made aware of and trained on environmental issues in the livestock sector, for instance, through the inclusion of environmental issues and options in curriculums, extension manuals, capacity development programs, etc.

➔ Quantification may be undertaken annually or at the start of the project, at medium term, and during terminal evaluation, using dedicated surveys.

INTERVENTION: IMPROVE PUBLIC AND PRIVATE ANIMAL HEALTH SERVICES

ACTIVITIES

- Provide veterinarians and animal health workers with training and capacity building.
- Develop veterinary and animal health manuals and curricula.

GUIDANCE

P7 During training, raise awareness among veterinarians and animal health workers about environmental and public health issues related to industrial livestock operations.

P7 Introduce links to natural resource management issues and options in animal health manuals and curricula.

INDICATORS

Farmers/extension agents/service providers trained on environmental issues and options in the livestock sector — Number. This indicator measures the number of stakeholders along the supply chains that have been made aware of and trained on environmental issues in the livestock sector, for instance, through the inclusion of environmental issues and options in curriculums, extension manuals, capacity development programs, etc.

➔ Quantification may be undertaken annually or at the start of the project, at medium term, and during terminal evaluation, using dedicated surveys..

INTERVENTION: STRENGTHEN PROVISION OF INPUT AND SERVICES

ACTIVITIES

- Provide private service and input providers with training and seed financing.
- Foster the development of new services where gaps exist.

GUIDANCE

P7 Assess demand and provide seed financing for services that contribute to sustainability: green economy (e.g., renewable energy installation construction and maintenance). IEE 2007, SNV Biogas.

P4, P7 Develop sustainable feed markets. Develop a labeling and certification scheme for sustainable feed products.

P5, P7 Develop markets for manure-based organic fertilizers. Provide technical assistance and financing options for processing manure into transportable fertilizer products. Develop a labeling and certification scheme for organic manure products.

INDICATORS

Energy-saving and renewable energy production devices and plans supported by the project — Number. This indicator measures the number of energy-saving and renewable energy production devices installed by the project, either directly or indirectly (through policies and energy pricing). Energy-saving investments may include systems for energy recovery in milk cooling; upgraded thermic insulation; efficient burners; and energy use efficiency plans at the company level. Renewable energy production includes solar panels, biodigesters, solar panels, wind power, and micro-hydropower.

➔ Quantification may be undertaken annually or at project start, mid-term, and terminal evaluation, using dedicated surveys.

Proportion of surplus nutrients sold for use as organic fertilizer. For those farms with nutrient surpluses that are greater than 10-20%, this indicator measures the proportion of the surplus nutrients that is sold for use as organic fertilizer. This indicator is quantified by calculating the total surplus, the amount of that surplus that is applied to crop production on the farm, and the proportion of the remaining surplus that is sold for use as organic fertilizer.

➔ Quantification may be reported annually based on the production unit management data or surveys. LEAP 2018 Nutrient Flows and associated environmental impacts in livestock supply chains. Guidelines for assessment.

OBJECTIVE 3: IMPROVE INPUT AND SERVICES DELIVERY

Farmers/extension agents/service providers trained on environmental issues and options in the livestock sector — Number. This indicator measures the number of stakeholders along the supply chains that have been made aware of and trained on environmental issues in the livestock sector, for instance, through the inclusion of environmental issues and options in curriculums, extension manuals, capacity development programs, etc.

➔ Quantification may be undertaken annually or at the start of the project, at medium term, and during terminal evaluation, using dedicated surveys.

Irrigation water used in feed production — Cubic meter per unit of feed. This indicator measures the amount of irrigation water used for feed production (e.g., expressed in cubic meter per unit of dry matter of cubic meter per unit of digestible energy).

➔ Quantification may be reported annually based on sampling and direct measurements following a predefined protocol. LEAP 2016 Environmental performance of animal feeds supply chains.

Pesticides used in feed production — Amount per unit of feed. This indicator measures the amount of pesticides used for feed production (e.g., expressed per unit of dry matter or per unit of digestible energy).

➔ Quantification may be reported annually based on sampling and direct measurements following a predefined protocol. LEAP 2016 Environmental performance of animal feeds supply chains.

Competition with food production — Share. This indicator reports the change in the portion of feed consumed by livestock in the project that is not directly human-edible or is produced on land not suited for crop production.

➔ Quantification may be undertaken annually or at the start of the project, at medium term, and during terminal evaluation, using dedicated surveys.

INTERVENTION: IMPROVE MANURE, NUTRIENTS, AND WASTE MANAGEMENT

ACTIVITIES

- Improve manure management on farms.
- Develop territorial approaches to improving the nutrient balance.

GUIDANCE

P6, P6, P7 Raise awareness among stakeholders about integrated manure management and its co-benefits for the fertility and resilience of agricultural soils. Develop a regulatory framework and provide technical assistance to ensure that manure is adequately managed: collected, safely stored (concrete floor and roof), and processed (e.g., composted, used in anaerobic digestion, dried, and converted into organic fertilizer), or applied to cropland. Ensure that the timing and dosing are in line with nutrient management plans. Teenstra et al. 2014, LEAP 2018a, CCAC 2015, FAO 2013a, SARE 2018.

P5, P7 Support the development of land/livestock balance regulation and national nutrient management plans to utilize the nutrient value of manure in crop production, contributing to soil health, agricultural resilience, and national food security.

P5, P7 Develop regulations to incentivize the substitution of synthetic fertilizers with manure (e.g., reduced subsidies on synthetic fertilizers, subsidies for manure storage and processing).

P6 P7 Provide livestock farms with technical assistance and financing options for the piloting of biogas schemes to generate renewable energy. SNV Biogas, GMI 2013..

INDICATORS

Reduced net GHG emissions (CO2-eq) per unit (kg) of product for selected agricultural commodities (e.g., milk, meat, and eggs) — Percentage. This indicator measures the climate impact — i.e., net greenhouse gas (GHG) emissions, including soil carbon sequestration — of agricultural commodity production. It measures the change in the net emission of GHG per unit of agricultural product, including sources and sinks along the supply chain. GHG emissions are converted to carbon dioxide (CO2) equivalent using standard global warming potential values. Quantification can be performed using IPCC 2006 Guidelines, calculators (e.g., GLEAM-i, Cool Farm Tool). The team may consider using certified methodologies, such as the Gold Standard Small Holder Dairy Methodology to generate tradeable GHG mitigation outcomes as well as the LEAP 2018 guidelines for assessing environmental performance in pig supply chains and in large ruminant supply chains.

➔ Quantification may be undertaken at the start of the project, at medium term, and during terminal evaluation, using dedicated surveys to parameterize models, together with activity data from the monitoring system.

Processing plants and markets that have adopted a waste management plan — Number or percentage. This indicator measures the number of slaughterhouses, dairies and other processing units, animal gathering points, and markets that have received project support to develop and implement liquid and solid waste management plans. At a minimum, plans should address the reduction of waste streams, waste collection, storage, and treatment.

➔ Quantification may be reported annually using project advancement reports.

OBJECTIVE 4:
CLIMATE CHANGE RESILIENCE AND EMERGENCY RESPONSE

Energy-saving and renewable energy production devices and plans supported by the project — Number. This indicator measures the number of energy-saving and renewable energy production devices installed by the project, either directly or indirectly (through policies and energy pricing). Energy-saving investments may include systems for energy recovery in milk cooling; upgraded thermic insulation; efficient burners; and energy use efficiency plans at the company level. Renewable energy production includes solar panels, biodigesters, solar panels, wind power, and micro-hydropower.

➔ Quantification may be undertaken annually or at project start, mid-term, and terminal evaluation, using dedicated surveys.

Livestock production units that have adopted a manure management plan — Number. This indicator measures the number of production units that have received project support to develop and implement manure management plans. Improved manure management practices and plans should be defined in the project document and address, at a minimum, manure collection, storage, and the recycling schedule. Manure processing and recording of manure transfer may also be included, if relevant.

➔ Quantification may be undertaken annually, using project advancement reports.

Proportion of production units for which nutrient flows are balanced — Percentage. This indicator measures simple nitrogen and phosphorus balances at the production unit level, as the difference between inputs (e.g., fertilizer, feed) and outputs (e.g., animal and crop products, manure exports). Nutrient flows are considered when the difference between inputs and outputs does not exceed 10-20%.

➔ Quantification may be reported annually based on the production unit management data or surveys. LEAP 2018 Nutrient Flows and associated environmental impacts in livestock supply chains. Guidelines for assessment.

Proportion of surplus nutrients sold for use as organic fertilizer. For those farms with nutrient surpluses that are greater than 10-20%, this indicator measures the proportion of the surplus nutrients that is sold for use as organic fertilizer. This indicator is quantified by calculating the total surplus, the amount of that surplus that is applied to crop production on the farm, and the proportion of the remaining surplus that is sold for use as organic fertilizer.

➔ Quantification may be reported annually based on the production unit management data or surveys. LEAP 2018 Nutrient Flows and associated environmental impacts in livestock supply chains. Guidelines for assessment.

Reduction of manure and waste discharge — Percentage. This indicator measures the reduction percentage of production units that discharge waste, manure, and slurry into waterways or unmanaged/unlined lagoons.

➔ Quantification may be undertaken annually or at the start of the project, at medium term, and during terminal evaluation, using dedicated surveys.

Reduction of pollution discharge into waterways — Percentage. This indicator measures the reduction in nitrate, phosphates, and BOD and E. Coli discharge (a) at the end of the pipe of the individual farms or community and (b) at critical downstream locations to be defined in the monitoring and evaluation (M&E) plan.

➔ Quantification may be reported annually based on sampling and direct measurements following a predefined protocol. LEAP 2018 Nutrient Flows and associated environmental impacts in livestock supply chains. Guidelines for assessment.

INTERVENTION: DEVELOP RISK MANAGEMENT PROGRAMS AND PRODUCTS

ACTIVITIES

- Develop livestock insurance and credit schemes.
- Establish plans to address disease outbreaks and pandemics.
- Establish an emergency contingency fund.

GUIDANCE

P7 Include appropriate measures to deal with dead and culled animals during disease control interventions. Particular attention should be paid to incineration and burying protocols. LEGS, FAO 2016.

INDICATORS

Contingency fund for livestock emergencies created and operational — Yes/no. This indicator measures the creation and funding of a contingency fund for livestock emergencies related to drought, disease, and other hazards.

➔ Quantification may be reported annually using project advancement reports.

INTERVENTION: ENSURE RESILIENCE OF BUILDINGS AND EQUIPMENT TO EXTREME WEATHER EVENTS

ACTIVITIES

- Develop industrywide crisis response plans.
- Develop seasonal assessments to forecast potential crises.

GUIDANCE

P7 Harmonize early warning information systems with information systems on livestock, climate, and weather.

P7 Embed waste management and other environmental management practices in training and capacity-building programs on crisis response. LEGS, FAO 2016.

P7 Include an assessment of buildings' exposure and vulnerability to extreme weather events in the approval process for new production units.

INDICATORS

Contingency fund for livestock emergencies created and operational — Yes/no. This indicator measures the creation and funding of a contingency fund for livestock emergencies related to drought, disease, and other hazards.

➔ Quantification may be reported annually using project advancement reports.

INTERVENTION: DEVELOP AND HARMONIZE LIVESTOCK POLICIES, PLANS, REGULATIONS, AND PROGRAMS

ACTIVITIES

- Introduce new policies and regulations or update current ones.
- Develop a national livestock master plan.

GUIDANCE

P7 Develop regulations to improve the management of manure and waste waters, for example:
- Policies that improve the geographical distribution of livestock and avoid areas of structural nutrient overloads (e.g. regulations on land/livestock balances, specifying maximum livestock units per area of arable land at the district/watershed level; localization of new public slaughterhouses out of livestock concentration areas).
- Progressive and targeted ban of direct discharge of manure and slurry into waterways.
- Subsidy programs for producers investing in manure storage and processing and for developing nutrient management plans.
- Capacity development programs on waste management for producers and processors. WB 2017

P7 Support the harmonization and improvement of regulations and pricing policy in line ministries, for instance:
- Rebalance subsidy programs for synthetic fertilizers and manure to make manure recycling comparatively more attractive.
- Develop regulations and subsidized pricing policies to allow governments and utility companies to purchase renewable energy (e.g., biogas, solar) from agricultural production units.

INTERVENTION: DEVELOP LIVESTOCK INFORMATION SYSTEMS

ACTIVITIES

- Develop animal identification and performance recording.
- Include livestock data in the agriculture census.
- Develop a database on livestock production at the central level.

GUIDANCE

P7 Include data on environmental performance in livestock information systems (e.g., GHG emission accounting, manure management practices, and farm-level nutrient balances).

P7 Include training and resources for the collection of census data that can enable environmental performance assessment.

INTERVENTION: IMPROVE CAPACITIES AT CENTRAL AND LOCAL GOVERNMENT LEVELS

ACTIVITIES

- Assess and fill capacity gaps in relevant government ministries.

GUIDANCE

P7 Develop a natural resource management unit within the ministry of agriculture. Provide technical assistance, capacity building, and financial resources for monitoring, policy, and extension work, especially focusing on manure management.

P7 Provide relevant ministries (e.g., agriculture, livestock, water, environment, rural development, finance, energy) with capacity building on livestock and environment issues.

INDICATORS

Environment (or natural resource) management unit created within the ministry (department) of livestock — Yes/No. This indicator measures the creation, staffing, and funding of a unit dedicated to environmental management. Its functions may include environmental monitoring, assessments, awareness raising, capacity development among public servants and private sector, administration of environmental funds, and development of policies and regulations.

➔ Quantification may be reported annually using project advancement reports.

INTERVENTION: ESTABLISH RESEARCH GRANTS AND EDUCATIONAL PROGRAMS

ACTIVITIES

- Provide financing options for research and education on livestock development issues.

GUIDANCE

P7 Include calls for science and policy research proposals, for example, on livestock waste management, nutrient balancing, zoning, feed resources and feed use efficiency, animal welfare, labor conditions in production and processing units, and climate-smart livestock development.

P7 In local universities and professional schools, develop educational programs on sustainable pastoral systems.