Livestock Impacts on the Environment

Food and Agriculture Organization of the United Nations

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The challenge is to reconcile two conflicting demands: for animal food products and environmental services...

A new report from FAO says livestock production is one of the major causes of the world's most pressing environmental problems, including global warming, land degradation, air and water pollution, and loss of biodiversity. Using a methodology that considers the entire commodity chain, it estimates that livestock are responsible for 18 percent of greenhouse gas emissions, a bigger share than that of transport. However, the report says, the livestock sector's potential contribution to solving environmental problems is equally large, and major improvements could be achieved at reasonable cost.

The livestock sector is undergoing a complex process of technical and geographical change

Based on the most recent data available, *Livestock's long shadow* takes into account the livestock sector's direct impacts, plus the environmental effects of related land use changes and production of the feed crops animals consume. It finds that expanding population and incomes worldwide, along with changing food preferences, are stimulating a rapid increase in demand for meat, milk and eggs, while globalization is boosting trade in both inputs and outputs.

Livestock and the rural poor

Despite its wide-ranging environmental impacts, livestock is not a major force in the global economy, generating just under 1.5 percent of total GDP. But the livestock sector is socially and politically very significant in developing countries: it provides food and income for one billion of the world's poor, especially in dry areas, where livestock are often the only source of livelihoods. "Since livestock production is an expression of the poverty of people who have no other options," FAO says, "the huge number of people involved in livestock for lack of alternatives, particularly in Africa and Asia, is a major consideration for policy makers."

In the process, the livestock sector is undergoing a complex process of technical and geographical change. Production is shifting from the countryside to urban and peri-urban areas, and towards sources of animal feed, whether feed crop areas or transport and trade hubs where feed is distributed. There is also a shift in species, with accelerating growth in production of pigs and poultry (mostly in industrial units) and a slow-down in that of cattle, sheep and goats, which are often raised extensively. Today, an estimated 80 percent of growth in the livestock sector comes from industrial production systems. Owing to those shifts, the report says, livestock are entering into direct competition for scarce land, water and other natural resources.

Deforestation, greenhouse gases. The livestock sector is by far the single largest anthropogenic user of land. Grazing occupies 26 percent of the Earth's terrestrial surface, while feed crop production requires about a third of all arable land. Expansion of grazing land for livestock is a key factor in deforestation, especially in Latin America: some 70 percent of previously forested land in the Amazon is used as pasture, and feed crops cover a large part of the reminder. About 70 percent of all grazing land in dry areas is considered degraded, mostly because of overgrazing, compaction and erosion attributable to livestock activity.

At the same time, the livestock sector has assumed an often unrecognized role in global warming. Using a methodology that considered the entire commodity chain *(see box below)*, FAO estimated that livestock are

responsible for 18 percent of greenhouse gas emissions, a bigger share than that of transport. It accounts for nine percent of anthropogenic carbon dioxide emissions, most of it due to expansion of pastures and arable land for feed crops. It generates even bigger shares of emissions of other gases with greater potential to warm the atmosphere: as much as 37 percent of anthropogenic methane, mostly from enteric fermentation by ruminants, and 65 percent of anthropogenic nitrous oxide, mostly from manure.

Livestock production also impacts heavily the world's water supply, accounting for more than 8 percent of global human water use, mainly for the irrigation of feed crops. Evidence suggests it is the largest sectoral source of water pollutants, principally animal wastes, antibiotics, hormones, chemicals from tanneries, fertilizers and pesticides used for feed crops, and sediments from eroded pastures. While global figures are unavailable, it is estimated that in the USA livestock and feed crop agriculture are responsible for 37 percent of pesticide use, 50 percent of antibiotic use, and a third of the nitrogen and phosphorus loads in freshwater resources. The sector also generates almost two-thirds of anthropogenic ammonia, which contributes significantly to acid rain and acidification of ecosystems.

New measurement for greenhouse gases

Scientists usually tie their estimates of the greenhouse gas emissions responsible for global warming to sources such as land use changes, agriculture (including livestock) and transportation. The authors of *Livestock's long shadow* took a different approach, aggregating emissions throughout the livestock commodity chain - from feed production (which includes chemical fertilizer production, deforestation for pasture and feed crops, and pasture degradation), through animal production (including enteric fermentation and nitrous oxide emissions from manure) to the carbon dioxide emitted during processing and transportation of animal products.

The sheer quantity of animals being raised for human consumption also poses a threat of the Earth's biodiversity. Livestock account for about 20 percent of the total terrestrial animal biomass, and the land area they now occupy was once habitat for wildlife. In 306 of the 825 terrestrial eco-regions identified by the Worldwide Fund for Nature, livestock are identified as "a current threat", while 23 of Conservation International's 35 "global hotspots for biodiversity" - characterized by serious levels of habitat loss - are affected by livestock production.

Two demands. FAO says "the future of the livestock-environment interface will be shaped by how we resolve the balance of two demands: for animal food products on one side and for environmental services on the other". Since the natural resource base is finite, the huge expansion of the livestock sector required to meet expanding demand must be accomplished while substantially reducing its environmental impact.

Greater efficiency in use of resources will be "the key to retracting livestock's long shadow". Although a host of effective technical options - for resource management, crop and livestock production, and post harvest reduction of losses - are available *(see box below)*, current prices of land, water and feed resources used for livestock production do not reflect true scarcities, creating distortions that provide no incentive for efficient resource use. "This leads to the overuse of the resources and to major inefficiencies in the production process," FAO says. "Future policies to protect the environment will therefore have to introduce adequate market pricing for the main inputs."

Action on many fronts

The FAO report recommends a range of measures to mitigate livestock's threats to the environment:

- **Land degradation**: Restore damaged land through soil conservation, silvopastoralism, better management of grazing systems and protection of sensitive areas.
- **Greenhouse gas emissions**: Sustainable intensification of livestock and feed crop production to reduce carbon dioxide emissions from deforestation and pasture degradation, improved animal nutrition and manure management to cut methane and nitrogen emissions.
- **Water pollution**: Better management of animal waste in industrial production units, better diets to improve nutrient absorption, improved manure management and better use of processed manure on croplands.
- **Biodiversity loss**: As well as implementing the measures above, improve protection of wild areas, maintain connectivity among protected areas, and integrate livestock production and producers into landscape management.

In particular, water is grossly under-priced in most countries, and development of water markets and various types of cost recovery will be needed to correct the situation. In the case of land, suggested instruments include grazing fees, and better institutional arrangements for controlled and equitable access. The removal of livestock production subsidies is also likely to improve technical efficiency - in New Zealand, a drastic reduction in agricultural subsidies during the 1980s helped create one of the world's most efficient and environmentally friendly ruminant livestock industries.

Removal of price distortions at input and product level will enhance natural resource use, but may often not be sufficient. *Livestock's long shadow* says environmental externalities, both negative and positive, need to be explicitly factored into the policy framework. Livestock holders who provide environmental services need to be compensated, either by the immediate beneficiary (such as downstream users enjoying improved water quantity and quality) or by the general public. Services that could be rewarded include land management or land uses that restore biodiversity, and pasture management that provides for carbon sequestration. Compensation schemes also need to be developed between water and electricity providers and graziers who adopt grasslands management strategies that reduce sedimentation of water reservoirs.

Likewise, livestock holders who emit waste into waterways or release ammonia into the atmosphere should pay for the damage. Applying the "polluter pays" principle should not present insurmountable problems for offenders,

given the burgeoning demand for livestock products.

Consumer pressure. Finally, FAO says, the livestock sector is usually driven by diverse policy objectives, and decision-makers find it difficult to address economic, social, health and environmental issues at the same time. The fact that so many people depend on livestock for their livelihoods limits the policy options available, and leads to difficult and politically sensitive trade-offs.

Information, communication and education will play critical roles in enhancing a "willingness to act". With their strong and growing influence, consumers are likely to be the main source of commercial and political pressure "to push the livestock sector into more sustainable forms", *Livestock's long shadow* says. Already, growing awareness of threats to the environment is translating into rising demand for environmental services: "This demand will broaden from immediate concerns - such as reducing the nuisance of flies and odours - to intermediate demands for clean air and water, then to the broader, longer-term environmental concerns, including climate change and loss of biodiversity".

Back to the countryside?

Intensive animal production systems produce high levels of nitrogen and phosphorus wastes and concentrated discharges of toxic materials. Yet those systems are often located in areas where effective waste management is more difficult. The regional distribution of intensive systems is usually determined not by environmental concerns but by ease of access to input and product markets, and relative costs of land and labour. In developing countries, industrial units are often concentrated in peri-urban environments because of infrastructure constraints.

"Environmental problems created by industrial production systems derive not from their large scale, nor their production intensity, but rather from their geographical location and concentration," FAO says. It recommends reintegration of crop and livestock activities, which calls for policies that drive industrial and intensive livestock to rural areas with nutrient demand.

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