



Photo: ILRI

# Livestock and climate change

The world is highly varied. Take meat. While many people in the industrialised world view too much meat eating as a health hazard, it is too little meat consumption that is a major problem in developing countries, where hunger stalks the lives of a billion people. And while factory farming in rich countries can pollute environments and harm public health as well as animal well being, livestock in poor countries are typically herded across open rangelands or raised on small farms that mix crops and farm animals in the original ‘organic’ production system.

Raising and selling cattle, goats, sheep, pigs, poultry and other farm animals allows more than 1 billion people, living in developing countries on less than two US dollars a day, to make a daily subsistence living. But as essential as they are for food, income and health, these tropical livestock systems can damage as well as enhance land and water resources, and, like all livestock

systems, they generate greenhouse gases that cause global warming.

This climate and environmental damage due to livestock production systems is likely to increase if we do not act. That is because demand for milk, meat and eggs is rising rapidly across the developing world, driven by an increasing world population (projected to reach 9 billion by 2050), urbanisation and incomes. In addition, changes in climate, water availability, and farm technologies are all also substantial, causing agro-ecosystems to evolve faster than expected. These changes will, singly and together, have profound and multifarious impacts on human and environmental well being.

## ■ Environmental ‘bads’

*Livestock’s Long Shadow*, a 2006 report of the Food and Agriculture Organization of the United Nations (FAO), assesses the large ecological footprint of the global livestock sector. For example, forests are being felled in Latin America to create pastures for cattle, much of it exported, or fields of soybeans to feed pigs and chickens in China. And with water becoming critically scarce, livestock and irrigated feed crops account for over 40 percent of the water used in agriculture. Land is also becoming a key constraint to sustainable increases in livestock production, with pressure on resources rising as the global population increases and the amount of arable land remains virtually the same.

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### ■ Greenhouse gases

If one includes the amount of carbon released as forests are felled for livestock pasture or feed, livestock production systems globally contribute up to 18 percent of all our human-induced greenhouse gases, the cause of global warming. These gases include methane produced by cattle, goats, sheep and other ruminant animals as they belch to expel gas as they ruminate (25 %), carbon dioxide released when rangelands are degraded or changes are made in land use (32 %), and nitrous oxide released in some methods employed to manage manure and slurry (31 %). Among the most hotly debated causes of greenhouse gas emissions generated by livestock systems are those caused by rapidly expanding industrial livestock operations in Asia and livestock-linked deforestation in Latin America.

Total greenhouse gas emissions are several times higher in developed than in developing countries, whose poorer populations have a dramatically lower environmental impact than rich ones. The overriding priority in poor countries is economic growth and improved livelihoods. About two-thirds of poor people in developing countries depend on agriculture and livestock for a significant part of their livelihoods. It is thus critical when assessing the impact of livestock on climate change and the environment to take into account the livestock livelihoods of a billion poor people so that we can identify sustainable interventions – those that provide real incentives for good environmental stewardship.

### ■ Adaptation strategies

Poor people in poor countries rely greatly on highly variable natural resources and have few safety nets. Chronic to severe poverty and little access to credit and other infrastructure reduce their adaptive capacity. Climate change is likely to strongly affect

*To cope with variable climates, livestock herders migrate with their animals in search of pasture and water.*

the world's poor livestock keepers and the ecosystems on which they depend, in places reducing the productivity of rainfed crops and forages; reducing the availability of water; and increasing the severity and distribution of human, animal and crop diseases. Households will be forced to adapt to changing circumstances by introducing new production technologies, embracing sustainable natural resource management practices and, in some cases, changing the way they make a living.

To cope with variable climates, livestock herders migrate with their animals in search of pasture and water, with the average distances trekked tripling in drought years. Herding communities typically reserve some pastures back at their homesteads for grazing by vulnerable animals left under the care of women during migration seasons. The herders also ensure that the composition, size and diversity of their animal herds (e.g., a mix of bowers and grazers) suit their variable feed resources and serve to protect them against droughts that could otherwise wipe out their animal stock.

Research activities at the International Livestock Research Institute (ILRI) and its partners include development of risk management options that help



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poor livestock households enhance their resilience and cope with a wide range of shocks. These options include enhancing access by the poor to markets for livestock inputs and outputs, enabling small farmers and herders to tap into export markets, providing emergency fortified feeds for starving animals and implementing livestock insurance schemes to mitigate the consequences of livestock losses in prolonged droughts, and stimulating early de-stocking through livestock markets.

### ■ Sustainability strategies

ILRI recently led a multicentre study on *Drivers of Change in Crop – Livestock Systems and Their Potential*

*Impacts on Agro-ecosystems Services and Human Well-being to 2030*. This research shows that opportunities for intensifying production on mixed crop-livestock farms differ greatly depending on the production system being used, its location and primary production potential, and the availability of inputs, infrastructure, markets and services. For example, mixed intensive systems in fertile areas with a suitable climate and relatively low population density abound in Central and South America. Sub-Saharan Africa, on the other hand, has suitable land to intensify but is constrained by lack of investments, markets and services. Acknowledging these structural differences is essential – opportunities for sustainable growth are largely dependent on them.

Important productivity gains could be made in the more extensive mixed rainfed areas, because in these areas there is less population pressure on the land. These mixed systems comprise large semi-arid areas of sub-Saharan Africa, notably in western and southern Africa, areas far from population centres in the humid tropics of Latin America, and areas without irrigation in parts of South Asia. In these more extensive systems with less pressure on the land, the difference in crop and livestock yield between what is typically obtained and what could be obtained is often large. Lack of sufficient quantity and quality of year-round feed is the major problem of livestock keepers in the drier systems. Crop improvement programmes are helping to address this by improving the amount and quality of the stover and other crop wastes fed to livestock after the grain has been harvested for human food.

Resource constraints in some mixed intensive systems, such as the irrigated rice farms of Southeast Asia, are reaching a breaking point. Some of these systems may need to de-intensify or stop growing food entirely. Paying local

communities for their management of ecosystem services such as carbon storage would provide real incentives for their continued environmental stewardship (World Resources 2008).

### ■ Mitigation strategies

The need to mitigate climate change adds complexity to the already considerable development challenges faced by livestock production systems. Because demand for meat and milk is increasing, the question is whether cost-effective mitigation options exist to meet it within equitably negotiated and sustainable emission targets for greenhouse gases. Many of the existing technological options that can mitigate these emissions from the livestock sector are discussed in FAO's *Livestock's Long Shadow* (2006). In IFPRI's 2020 Vision for Food, Agriculture, and the Environment policy brief, Herrero and Thornton (2009) argue that emissions from livestock systems can be reduced significantly through technologies, policies and the provision of adequate incentives for their implementation.

Important ways to do this include managing the demand for livestock products; reducing demand in the developed world, for example, could reduce pressures on land and natural resources in developing countries. This could reduce carbon dioxide and methane emissions. The amount of methane produced per unit of animal product can be reduced by giving ruminants better-quality diets. These can be achieved with development of fodder banks, improved pasture species, planted legumes and feed supplementation with crop by-products. These cost-effective practices, widely available in developing countries, can increase milk production, improve the efficiency of methane production, and, together with reductions in the number of animals, can help mitigate methane emissions from ruminant production systems.

Another option is to replace low-producing animals with fewer but better-fed animals, thus reducing total emissions while maintaining or increasing the supply of livestock products. This will require changing breeds or implementing cross-breeding schemes. Switching livestock species to better suit particular environments is a strategy that could yield higher productivity per animal for the resources available.

Sources for more information can be found at:  
[www.rural21.com](http://www.rural21.com)

### Zusammenfassung

Aufzucht und Verkauf von Nutztieren ermöglichen über 1 Milliarde Menschen das tägliche Überleben. Obwohl wichtig für Ernährung, Einkommen und Gesundheit, können die tropischen Tierhaltungssysteme die Land- und Wasserressourcen ebenso stark schädigen wie verbessern; wie die Viehzucht überall auf der Welt verursachen sie Treibhausgase, die zur globalen Erwärmung beitragen. Durch Forschung soll armen Tierhaltern die Anpassung an den Klimawandel, die Suche nach nachhaltigen Wegen zur Intensivierung ihrer Produktion und – soweit möglich – die Übernahme geeigneter Methoden zur Senkung der negativen Effekte der Tierproduktion auf den Klimawandel ermöglicht werden.

### Resumen

El criar y vender animales de granja asegura la subsistencia diaria de más de mil millones de personas. Pero a la vez que son esenciales en términos de alimentos, ingresos y salud, estos sistemas ganaderos tropicales pueden dañar o mejorar los recursos de tierra y agua. Además, al igual que todos los sistemas ganaderos, generan gases de efecto invernadero que traen consigo el calentamiento global. La investigación ayuda a las comunidades ganaderas pobres a adaptarse al cambio climático, hallar modos sostenibles de intensificar su producción y – en la medida de lo posible – adoptar métodos para mitigar el cambio climático inducido por la ganadería.