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08:30 Climate-smart livestock systems: lessons and future research

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Livestock are an important global sector contributing significantly to the economies of countries and the food security and livelihoods of millions of people around the world. Livestock systems also have a large environmental footprint. They use 30% of the global land, 32% of water and emit around 18% of greenhouse gas emissions. The last two decades have seen a proliferation of work on livestock and climate change. The two main threads have been on mitigation of greenhouse gases and on adaptation to climate change. Initially these research agendas were studied independently. Recently, there is growing demand from decision-makers and policy to address them in a more integrated manner as their agenda has moved towards the development of solutions. Integration of these two aspects can exploit synergies and minimize trade-offs between mitigation and adaptation or avoid maladaptation that could potentially increase GHG footprint. This paper gives a brief account of the lessons learnt from this body of research.

Heterogeneous solutions for heterogeneous systems: Livestock systems are diverse for a variety of reasons including agroecology, physical location, production objectives, market orientation, and socio-economic context. 'Silver bullets' for climate challenges, like for many other aspects of agriculture, are elusive and are often not well suited to heterogeneous systems where impacts in one component of the system can lead to unintended consequences elsewhere. Maladaptation can be costly. We have also learnt that systems are constantly in transition due to a variety of drivers: population density, incomes, diet shifts, public perception, resource constraints and others. The study of climate-smart livestock systems needs to incorporate these aspects explicitly. This is about the futures of today and the evolution of the linked systems. Climate needs to be recognized as just one of many risk faced by livestock systems.

Most efforts still concentrated on technological fixes (incremental adaptation): What have we tried? Many practices associated with sustainable intensification: better feeds, genetics, health, improved pastures and others. These often show great technical potential, with increases in productivity, incomes and a reduction in emissions per unit of product, but not necessarily to reductions in gross emissions per household, hectare or enterprise. The reality is that many of these practices still exhibit low adoption rates due to lack of investment and research in incentives and policy instruments, promotion of market orientation, development of value chains and institutions, risk perceptions and others. These are crucial barriers that merit more attention. More effort is needed in incorporating the impacts of a variable climate on adaptation and mitigation strategies. This will likely lead to increased understanding of their constraints to adoption. We also recognize that incremental adaptation will only provide resilience to modest climate change and so some larger scale adaptation options will be required in order to ensure long-term viability.

Transformational adaptation needs to be considered in livestock systems. Some observations:

1. Structural change in livestock systems could lead to significant adaptation and mitigation. Systems shifts towards diversified mixed systems seem beneficial as yield gaps of crops and livestock are often large and can be exploited at low cost and risk. This strategy leads to net reductions in carbon dioxide equivalent emissions mostly through the indirect effects of reducing LUC and promoting land sparing, when demand targets are held constant.
2. The structure of some livestock systems (i.e. high population densities, too small farm sizes) might prevent further actionable agriculture and livestock adaptation and mitigation strategies. Identifying these areas is crucial.
3. Systems diversity is essential to prevent risks for the global food system: for example, over-reliance on monogastric systems at the expense of ruminant systems, for the sake of increased efficiencies would pose significant zoonotic and infectious disease risks for the provision of animal products.
4. Relocation of livestock production could be essential for food security and reducing environmental loads under climate change impacts.
5. Transformations need new modes of interaction between actors and new information. This understudied area merits further research.
6. Transformations are not cost-free, and this applies to many dimensions. There are many social impacts associated with transforming systems and these need to be properly studied. Additionally, transformations are not emissions nor resources-free, and new areas of production and new systems could be subject to significant perturbations in the process.

Policies are essential to achieve adaptation, mitigation and the sector's growth and to reduce leakage effects. Adapting livestock systems and intensifying them can be profitable, but profit can lead to expansion of operations and increased supply of animal products. Under these conditions mitigation is not achieved. Additionally, practices targeting reductions in emissions through land sparing can lead to substantial leakage and reallocation of emissions and growth in other sectors. Taxes and subsidies of different kinds can help regulate these processes. However, there are few tangible examples of how these can operate, especially in the developing world.

Livelihoods indicators and farmers objectives need to be better understood and at the centre of the agenda. The study of climate-smart livestock systems is still too biophysically centered. This is ironic as farmers are the smart ones, they have a wealth of knowledge that they use together with new information to make decisions about their systems and livelihoods. Unfortunately, we do not understand well how farmers and other actors make decisions, their political economy and their incentives, and this is crucial for developing solutions that will really be applicable in a variety of systems.

Towards climate and nutrition-smart livestock systems: The food security agenda is transforming into a nutritional security agenda due to the acknowledgement that human diets link nutrition, health and the environment. It is also recognized that managing the demand for livestock production could play a significant part in both reducing the adverse health impacts of overconsumption and improving malnutrition, while reducing the environmental footprints of livestock systems. Targeting climate and nutrition-smart research simultaneously could yield multidimensional benefits for society, our food systems and the planet.