Sustainable livestock production in Europe:

A question of food security, climate and innovation

This policy paper has been drafted and edited by Knowledge for Innovation - an open, independent, non-profit platform advocating for favourable framework conditions promoting innovation activities in Europe - , working together with a group of experts providing input as interested stakeholders. The members of the informal stakeholder group are listed below. Elanco Animal Health (a division of Eli Lilly and company) provided financial and organizational support. The sponsor provided comments on the document, however the content of the document reflects consensus from the members of the expert group who had full editorial control. The expert group acknowledges that there are diverging views on some issues and welcomes feedback from the wider audience towards a sustainable EU livestock production. The content of the document has been prepared by the members of the expert group. It reflects the views of the authors and is not an official position of Knowledge4Innovation.

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Introduction

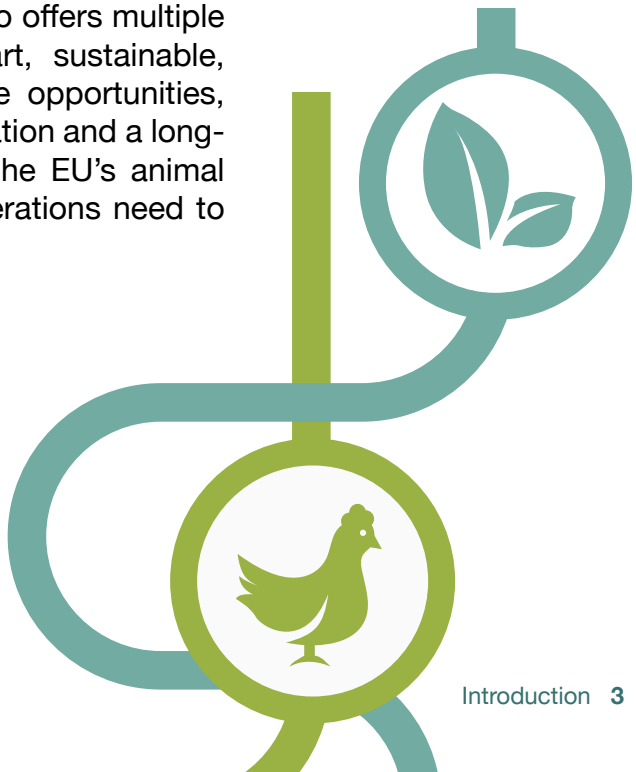
The global population is expected to surpass 9 billion by 2050[1], from 7.3 billion today. With improvements in life expectancy, increasing urbanization, accelerating migration, and in the light of the finite environmental resources, these population trends will have far-reaching implications for generations to come. At least 3 billion people are expected to join the middle class by 2050[2] and the Food and Agriculture Organization of the United Nations (FAO) estimates that this will lead to a 60% increase in demand for high quality protein such as milk, meat, and eggs.[3]

Meeting current and forecast demand in a sustainable way is a challenge, especially given that we are already using the earth's resources at rates thought to be unsustainable.[4] The livestock sector currently constitutes the world's largest user of natural resources: with 80% of all agricultural land used for grazing or animal feed production and 8% of the global water use, primarily for irrigation of feed crops.[5] Moreover, climate change is expected to further challenge food security through more extreme weather events and other challenges at both regional and global scales.[6]

Thus, the European Union (EU) is faced with a dual challenge: it is called to produce larger quantities of high quality and affordable meat, milk, and eggs in response to an increasing global demand, while doing so through production systems that are environmentally sound, socially responsible, and economically viable.

The EU has a major role to play in addressing global food and nutrition security. Firstly, by showcasing sustainable livestock production models that maintain or improve productivity, which will allow more supply of quality livestock products. Secondly, the EU should enhance the overall competitiveness of the EU agri-food sector and improve substantially the environmental performance of its livestock production.[7] Key to preserving our resources is the development of sustainable ways of increasing agricultural output from the majority of current agricultural land. The FAO estimates that 70% of the increased production needed to meet the growing global demand for food and protein is going to come from the use of technology. This applies to farm operations of all sizes and across different production systems.[8]

The livestock sector presents challenges, but it also offers multiple opportunities for contributing to a climate smart, sustainable, and competitive EU. To take advantage of these opportunities, enabling policies are needed, with an eye on innovation and a long-term approach to increasing the productivity of the EU's animal production in a sustainable way. All these considerations need to be appropriately translated into European policies.[9]



Why this policy paper?

This paper is the outcome of a participatory process involving stakeholders engaged in the livestock sector in the EU. The informal expert group worked together to develop recommendations on EU policy action for addressing the challenge of food security and sustainable livestock production, as described in the introduction. We favour multi-stakeholder and integrated policies and practices that promote the sustainability of the EU livestock sector and support it in addressing the challenges of global food and nutrition security.

Why an EU policy paper?

For every significant change to be met successfully, there are two prerequisites: undertaking the right actions and acting in a supportive framework. Much of the relevant policy areas in the livestock and agricultural sectors are EU competences and EU policies can furnish that supportive framework, provided they are based on science and take a holistic approach towards sustainability.The European Union has already started to grasp the problem and is looking into the most appropriate policies and actions to address it. Given the trans-boundary character of the problem, EU-wide action is the most promising way forward. The members of the group drafting this paper have considerable expertise in livestock matters and agri-environmental policy issues. They have participated in several initiatives around the links between livestock and the climate/environment as well as the social and economic pillars of sustainability. We are therefore happy to share these insights with policymakers, in helping them formulate policies in this field.

Why livestock?

The EU livestock sector is the largest in the world and meat, milk, and eggs make up 40% of the EU's agricultural production value.[10] It accounts for 48% of total EU agricultural activity, with an estimated €130bn output value annually (at producer prices) and creates employment for almost 30 million people.[11] Besides contributing to the EU's economy, the livestock sector supports the livelihoods in rural areas and has the potential to bring about a better functioning agro-ecosystem and climate-smart agriculture.[12]

Meat, milk, and eggs make important contributions to global calorie and protein supplies and can be an important source of essential micronutrients in the human diet. Nutrition security is threatened if quality proteins are not accessible. It is therefore imperative that the EU livestock sector plays an important role in realising global food and nutrition security in a sustainable way.

Why production?

Improving the sustainability of food systems will have to encompass several elements. Crucial elements are promoting healthy diets and lifestyles, and sustainable consumption patterns (i.e. addressing malnutrition and overconsumption), as well as tackling waste. Meat and dairy are two of the food categories with least waste along the supply chain: 21 and 16% respectively globally, compared to 44% of fruits and vegetables and 28% of grains.[13] Since 2012, the EU has been working actively to reduce food waste[14] and to address unsustainable consumption patterns. Livestock specific EU actions to further tackle waste and to turn waste into resources are needed.

It is important to note that, even if all waste is successfully reduced or recovered, it is likely that there would still be a requirement to increase global livestock production to meet demand for animal-sourced protein by 2050. It is therefore also essential to look into additional solutions to make livestock production more efficient and sustainable.

Another reason why sustainable animal production is so important is the opportunities and challenges this sector presents. In terms of opportunities, chickens have the best rate for converting feed into meat, among commercial meat species and cattle are efficient in producing human edible proteins per unit of land use, on those lands which can only grow grass and forage. Moreover, ruminants are capable of consuming residues left over from human food, fibre, and energy processing and convert these by-products into high quality protein. Furthermore, animals provide manure and thus nutrients as well as organic matter that are recycled in crop production.

With regard to challenges, the contribution of the EU livestock sector to greenhouse gas emissions has been estimated to account for 9.1% of total EU emissions (if we include the impact of sourcing animal feed, for which the EU is a significant importer).[15] Livestock is also criticized because animals can eat carbohydrates and protein that might otherwise be eaten directly by humans[16]. Both, opportunities and challenges underline the importance of balancing resource-efficient production and consumption for achieving food security in a sustainable manner. This group wants to highlight opportunities and propose ways to address challenges and foster the role that farm animals have and can play in a sustainable EU economy.

What is sustainable livestock **farming?**

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.[17] Translating this definition to the livestock production field, sustainable agriculture is "the efficient production of safe, high quality agricultural products, in a way that protects and improves the natural environment, the social and economic conditions of farmers, their employees and local communities, and safeguards the health and welfare of all farmed species".[18]

Sustainable livestock farming refers to a system based on three pillars. It is:

Sustainable livestock farming requires a systems approach to farm management, based on a commitment to continuous improvement, which means that performance gaps are identified and addressed, while recognising that actions taken must maintain an appropriate balance among the three interdependent pillars of sustainability. A systems approach requires attention to detail and adopting innovative practices to move farm businesses towards delivering better on sustainability goals.[19, 20, 21, 22.]

Environmental soundness

An environmentally sound livestock system is one that, among others, should strive to:

- Generalise the adoption of practices and technology for more efficient use of natural resources per unit of animal food produced, whilst maintaining or increasing production.
- Improve environmental impacts, including emission intensity of greenhouse gas (especially methane and nitrous oxide) via improved production efficiency, and decrease air, water, and soil pollution (ammonia, nitrate, phosphorus, etc.).
- Implement practices to improve air quality.
- Manage manure in ways that ensure recycling of nutrients and energy, and minimise release of gases with high global warming potential.
- Use, where applicable, efficient grazing systems.
- Use energy-saving devices and practices and foster the use of renewable energies.
- Ensure the maintenance or improvement of soil health and fertility.
- Maintain or enhance biodiversity, respect ecosystems and the cultural landscape.
- Approach sustainable sourcing and innovation to minimize the environmental and social impacts of food/feed imports to the EU.
- Reduce waste and maximising opportunities to reuse and recycle it.[23]

There have been many initiatives in the EU to help agriculture achieve these goals. For example, the EU has introduced legislation to reduce environmental and climate impacts (i.e. the Industrial Emissions Directive 2010/75/EU). Since 2003, the 'Cross Compliance Principle' of the CAP incentivises farmers' compliance with EU and national standards of environmental quality and animal welfare. Several multi-stakeholder initiatives, some promoted by policymakers and legislators, stand out. For example:

- The EU-supported PEF (Product Environmental Footprint) project[24] is developing a harmonised methodology for assessing the environmental impact of meat and dairy products throughout the products' life cycle.
- The FAO-led initiatives: a) Livestock Environmental Assessment and Performance (LEAP) Partnership[25] which publishes guidelines and methods for the life cycle assessment of GHG emissions from livestock food chains, and b) The Global Agenda for Sustainable Livestock.[26]
- RuminOmics[27] and Animal Change[28] which developed technology for improving the environmental impacts of livestock animals
- The ENVIFOOD Protocol[29], which set out to establish a scientifically reliable, practical and harmonised environmental assessment methodology for food and drink products across Europe.
- The High Level Forum for a Better Functioning Food Supply Chain which put forward a joint declaration on 'Actions towards a more sustainable European food chain'[30].
- The Code-EFABAR[31], which follows the principles of sustainable breeding to ensure environmental and animal welfare standards are maintained.

These examples demonstrate the willingness of stakeholders and policymakers alike to address food production sustainability by enhancing resource efficiency and by reducing environmental impacts through innovation and good practices. However, despite these efforts, a number of challenges persist and EU livestock production is underperforming on several environmental indicators.

Environmental soundness

Reducing greenhouse gas emissions and resource use is paramount. We need to reduce the amount of land, energy, and water needed to produce the same or higher amount of food. Hence, we will need to minimise the environmental impact per unit of product and leave more opportunities for enhanced ecosystems and biodiversity. An example is broiler chicken production: to satisfy demand by 2050 at current production rates we would need to raise 131 billion birds compared to current 56 billion, a 134% increase globally.[32] This means using much more land, water, energy and feed. An alternative approach is to adopt innovation which improves the efficiency with which animals convert natural resources into edible animal products in a balanced way, without pushing their biological limits. This way we can minimise the growth in the number of animals and related resources required to meet future global demand, while maintaining good animal welfare standards.

Regarding climate change mitigation, it should be noted that the amount of emissions generated on-farm for each kilo of meat or litre of milk produced has decreased significantly (range: 38% to 76% for various livestock products) from the 1960s to the 2000s.[33] However, innovative agricultural practices, technologies and products will have to be deployed to reduce emissions further.

The role of the livestock sector in mitigating climate change

The livestock sector in the EU and worldwide can play a key role in mitigating climate change through adoption of improved technologies. A good example is dairy: innovative approaches could reduce methane emissions by 40%. These approaches include precision livestock farming for optimising feed quality and digestibility, breeding for reduced methane emission, fostering the microbiome (microbial populations that natively inhabit the animal), fortifying animal robustness, potential vaccines and potential methane inhibitors to abate methane production. While advances in agriculture have often resulted from innovations on single components (such as chemical inputs and irrigation technologies), future solutions are expected to arise by optimising multiple factors through a systems approach which takes into account the interplay between the system components.

Sources: a) GRA and SAI, 2014. Reducing greenhouse gas emissions from livestock: Best practice and emerging options, b) European Commission. DG for Agriculture and Rural Development. Towards a Long-term Strategy for European Agricultural Research and Innovation by 2020 and Beyond. Workshop Background Paper. Expo Milan, 19 June 2015

Social responsibility

The social responsibility component of sustainability in livestock production includes elements such as:

- Improving and maintaining the societies and communities where livestock food products are produced.
- Safeguarding the health, well-being, and social rights of workers, farm managers, and their families. Good working and social conditions are valid regardless of gender, age, religion, nationality, ethnicity, personal preferences, or conviction.
- Guaranteeing food safety and public health.
- Improving and safeguarding animal health and welfare.

Measures for social preservation of agriculture in marginal areas are an important aspect; these areas account for a big proportion of the territory in the EU. This means that farmers and workers need access to training and education, as well as assistance when unemployment, illness, or invalidity occurs. Furthermore, they need the space to deploy their entrepreneurial skills in order to grow their business and deliver the kind of in-field innovation the sector partially depends on.

Farm animals depend on human care and it is society's responsibility to respect their welfare, including health. According to the internationally recognised Five Freedoms[34], the ideal state to strive for is that farm animals should be free from hunger and thirst, discomfort, pain, injury and disease, fear and stress, and they should be free to express normal behaviour. Key to getting as close as possible to this ideal state are the knowledge, skills, and personal qualities of the caretaker. These are the so called 'Three Essentials of Stockmanship'.[35] High animal welfare standards contribute to an efficient livestock production. Animal welfare is vital for a sustainable livestock production, which takes into account the three pillars of sustainability.

Under the One Health approach[36], healthy livestock and healthy people are inextricably connected. Guaranteeing food safety and public health is paramount. At the livestock production level, this can be achieved through, for example, good husbandry practices, by preventing and controlling animal diseases, and by promoting the responsible use of veterinary medicines, including antimicrobials.

Reducing losses due to animal mortality and morbidity could greatly improve the supply and access to animal protein. Currently, 20% of annual livestock production is lost because of animal diseases.[37] Animal health plans should address prevention, control, treatment, and eradication of existing and emerging diseases. A veterinary-client-patient-relationship is fundamental for developing and implementing sound animal health plans.

Greater investment in safe and scientifically sound technology and innovation can do much to improve food sustainability and efficiency of farm production. According to a recent survey, 2 out of 3 interviewees are in favour of such investments.[38] Nevertheless, consumers are also concerned about potential side effects of innovative tools. The thorough assessment of new technologies for animal production (e.g. animal health products, feed ingredients, and feed additives) in terms of safety for human health, animal welfare, and the environment is crucial before approval for use in European livestock. Given the importance of innovative tools for a sustainable livestock sector, a sound, transparent, multi-stakeholder approach is therefore needed to address consumer concerns and indeed to better secure the sustainability of the sector.

Livestock products as part of sustainable diets in Italy

The FAO defined sustainable diets as those diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations. In recent years, consumption of meat has become the subject of much attention and criticism essentially for nutritional and environmental reasons. The meat sector in Italy conducted a scientific analysis leading to an Environmental Hourglass model which multiplies the environmental impact of food (the Carbon Footprint) by the weekly amount suggested by international nutritional guidelines.

As part of a Mediterranean diet that limits the consumption of meat to 650g per week, the CO2 emitted to obtain the recommended portions of animal protein is very close to the amount emitted to produce carbohydrates and vegetables eaten in a week. The environmental footprint of food is not only measured by CO2 emissions, therefore it is important to take into account other indicators as well. However, the environmental hourglass encourages a new approach, which assesses the impact of food on the basis of the amount actually consumed as part of healthy balanced diets.

Source: Carni Sostenibili; FAO Sustainable Diets and Biodiversity: Directions and solutions for policy, research and action

Economic viability

Food production must be economically viable: the farmer and other food chain stakeholders must be able to prosper and to sustain investment, while consumers need access to quality food that is affordable. From an economic standpoint, sustainable livestock farming systems are therefore characterised by elements such as:

- Enabling economically viable food production along the food chain, while accomplishing social and ecological goals.
- Ensuring that farm operations obtain a fair share of the profits achieved in the food chain.
- Supporting the ability of livestock producers to invest in sustainability improvements.
- Adopting innovation and approaches that help farmers deal with market volatility and hence the prices of products and inputs.[39]

Economic and financial crises can impair the purchasing power of many EU consumers.[40] The 2011 Foresight project on the Future of Food and Farming concluded that there is a significant threat that increases in demand, combined with competition for land, water, and other agricultural inputs might lead to rises in global food prices.[41] In 2013, more than 20 million households in the EU say they cannot afford a meal with meat, fish, chicken, or a vegetarian equivalent every other day.[42]

Price fluctuations and market volatility cause uncertainty for farmers around the world. Analysis from the European Commission's Directorate General for Agriculture made in 2011 estimated that approximately 20% of the European farmers suffered an income drop of more than 30% compared to his/her average income of the preceding three years.[43] Whilst currently the price of oil, fertilisers, and feed have fallen, the increase in demand and associated pressure on resources is predicted to lead to greater price volatility which will impact food security, unless farming operations become more resilient to such price fluctuations. Farmers need support to be better positioned to have economically viable operations.

There are different pathways to more economically viable livestock production. From incentives that foster innovation adoption, to consolidation strategies, increasing productivity efficiencies, a fair distribution of profits along the food chain, economies of scale, focus on producing high quality, value-added products as well as production insurance. Other approaches include equipping farmers with better understanding and tools for risk management, farmer's cooperatives, and better contracts with customers in the food processing and distribution sector.

Policy choices should focus on achieving an economically viable livestock sector for farm operations of all sizes, through continuous improvement, innovation, capacity building, knowledge transfer, and translation of research into practice. Efforts are needed for a more knowledge-intensive livestock production, with farmers at the core of education and research initiatives.

Policy recommendations

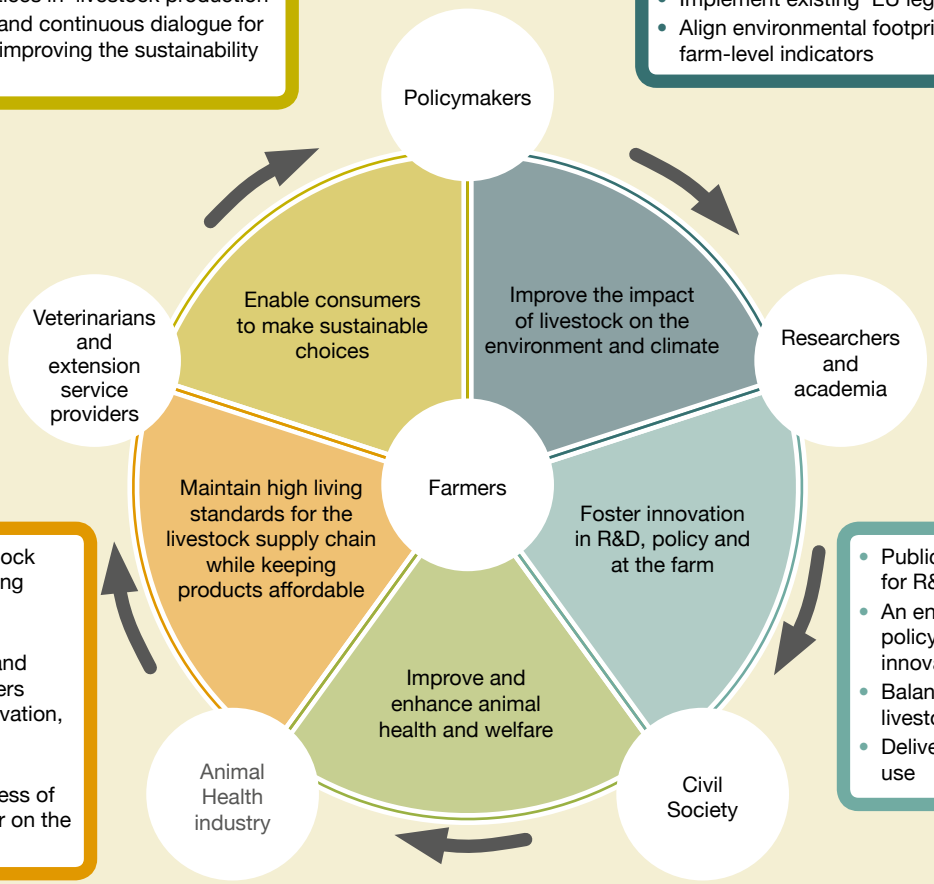
High-level political choices about the future of agricultural policy and innovation can have profound effects on the role the EU plays in global agriculture, whilst at the same time public opinion can have a significant influence on the acceptability of agricultural innovations.[44] Innovation has risen up the political agenda but EU response is still lagging behind. A sustainable livestock system cannot be implemented without constant innovation. It can also not be implemented in isolation but should bring together the views of policymakers and relevant stakeholders, while being supported by informed consumer choices. It must also be noted that policy choices should seek for balance among the different pillars of sustainability and that every choice will impact the ability to make other choices. With this in mind, we recommend the following policy actions towards achieving more sustainable livestock farming systems:

5

- Co-develop and validate reliable and easy-to-understand information on food and nutrition security, sustainability and innovation in livestock production
- Enhance knowledge and understanding of welfare related practices in livestock production
- Set up a structured and continuous dialogue for identifying ways for improving the sustainability of livestock

1

- Adoption of best practices and innovative tools for improving resource efficiency and environmental impact
- Focus efforts in regions with most nitrogen and phosphorus surplus
- Implement existing EU legislation
- Align environmental footprint methodologies and farm-level indicators



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- Attractiveness of livestock farming, specially among younger generations
- Make food production profitable for farmers and affordable for consumers through research, innovation, capacity-building and knowledge transfer.
- Enhance competitiveness of the EU livestock sector on the world market.

2

- Public-private partnerships for R&D and investment
- An enabling and predictable policy environment for innovation
- Balanced research on both livestock and crop production
- Delivery of innovation into use

3

- Comprehensive animal health and welfare plans
- Safeguarding pan-European access to veterinary medicines
- Guidelines on responsible use of veterinary medicines

1 Improve the impact of livestock on the environment and climate

- Support the adoption of best practices and innovative tools (e.g. genomics, IT tools, veterinary medicines, enzymes, feed additives, bio-digesters, etc.) for improving resource efficiency and reducing environmental impacts.
- Focus EU efforts in regions with the most nitrogen and phosphorus surplus to further improve environmental impacts and share best approaches.
- Effectively implement current EU legislation and improve coherence among different food-related policy instruments, taking into account the three pillars of sustainability.
- Align EU and international environmental footprint methodologies and meaningful, operational farm-level indicators to support monitoring and reporting on environmental performance of livestock production.

2 Foster innovation in R&D, policy, and at the farm, as well as a knowledge-based livestock sector

- Maintain and increase public-private partnerships for research and development (R&D), and investment in the livestock sector (Horizon 2020, the European Innovation Partnership etc.) and encourage research into better understanding and supporting the role of livestock production in a sustainable EU.
- Set up an enabling and predictable policy environment, including science-based decision-making for the assessment and adoption of innovation, including emerging technologies in livestock production.
- Develop a long-term strategy for EU agricultural research and innovation, with a balanced emphasis on both livestock and crop production.
- Set up clear goals and actions for the delivery of innovation into use: research and innovation must be translated into better agricultural practice, available for all, through appropriate extension services, involving farmers in knowledge co-creation and appropriation.

3 Improve and sustain animal health and welfare

- Encourage EU-wide implementation of comprehensive animal health and welfare plans on the farm.
- Safeguard pan-European access to a wide range of veterinary medicines to keep animals healthy (prevention, control, and eradication of diseases), minimise losses due to disease, and for better viability of animals.
- Develop and implement EU guidelines on responsible use of veterinary medicines in farm animals that are EU applicable and adhere to scientific evidence. Existing initiatives such as the OIE CH 6.9 guidance[44] and the EPRUMA[45] principles on responsible use of medicines in animals could be used as a basis.

4 Maintain high living standards for farmers and the livestock supply chain while keeping animal protein products affordable for consumers

- Stimulate the attractiveness of livestock farming –especially among younger generations– and help guarantee good working conditions, positive financial prospects, and access to resources, training, and education.
- Develop policies and pathways to make food production viable for farmers and affordable for consumers through the use of research, innovation, investment, capacity-building, and knowledge transfer.
- Enhance the competitiveness of the EU livestock sector on the world market.

5 Enable consumers to make sustainable choices

- Work with stakeholders and consumer representatives to co-develop and validate scientifically reliable and easy-to-understand information on food and nutrition security, as well as sustainability and innovation in livestock production.
- Partner with international organisations and all relevant stakeholders to enhance knowledge and understanding of welfare related practices in livestock production.
- Set up a structured and continuous dialogue between policymakers and stakeholders, including consumers, on identifying ways for improving the sustainability of livestock.

Establishing an overarching EU vision and strategy for a secure, safe, and sustainable food supply in terms of quality and quantity and based on the three pillars of sustainability is essential. We all (farmers, industry, regulators, veterinarians, extension workers, and society) must work together, keeping in mind what Commissioner Hogan has highlighted: "The EU has a responsibility to address food security through forward-looking policies and promoting innovation".[46]

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