SDG nexus network

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Sustainable Development Goals and the livestock sector in Central Asia

A course outline

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Abstract

The livestock sector contributes greatly to human nutrition and economic wellbeing, but it is also associated with negative impacts on the environment and human health. This document outlines a course which examines the sector through the framework of the Sustainable Development Goals, examining trade-offs and synergies between different goals associated with pasture use, intensification, commercialisation and livestock product consumption. The course introduces the international literature on each of these topics and examines the issues raised in detail for the Central Asian region, considering the importance of SDG synergies and trade-offs for different types of producer, and asking how government policies can maximise the contribution of livestock towards the achievement of SDGs.

Keywords: livestock, SDGs, teaching module, Central Asia.

JEL codes: A23, P28, Q12, Q56.

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Sustainable Development Goals: trade-offs in the livestock sector

The livestock sector occupies over 30% of the earth's land surface and has been associated with land degradation, biodiversity loss, high greenhouse gas (GHG) emissions, diminished water quality, low land use efficiency and epizootics. Yet it produces 33% of global agricultural GDP and contributes to the livelihoods and food security of over 700 million poor smallholders. Livestock can use land unsuitable for arable crop production, converting low-quality roughage to protein for human consumption and facilitating nutrient cycling. They contribute fertilizer and traction, and insurance and savings in markets where credit and banking needs are poorly served. Livestock production has been intensifying and increases in efficiency have partially mitigated negative effects. But steeply increasing demand for livestock products and rising intensity of impacts on human health and the environment mean that it is more important than ever to examine the trade-offs associated with the sector in different countries and production systems.

This course examines these trade-offs using a framework based on the Sustainable Development Goals (SDGs; Figure A.). Divided into five units based on various aspects of livestock production, marketing and consumption, international literature on each topic is presented and SDG synergies and trade-offs are discussed, using examples from Central Asia. The course is based on a research review which uses existing literature and statistics to analyse SDG trade-offs in the Central Asian livestock sector, putting these in a global context.[1] This report is a key reference for the course and also reviews much of the literature given in the reading list.

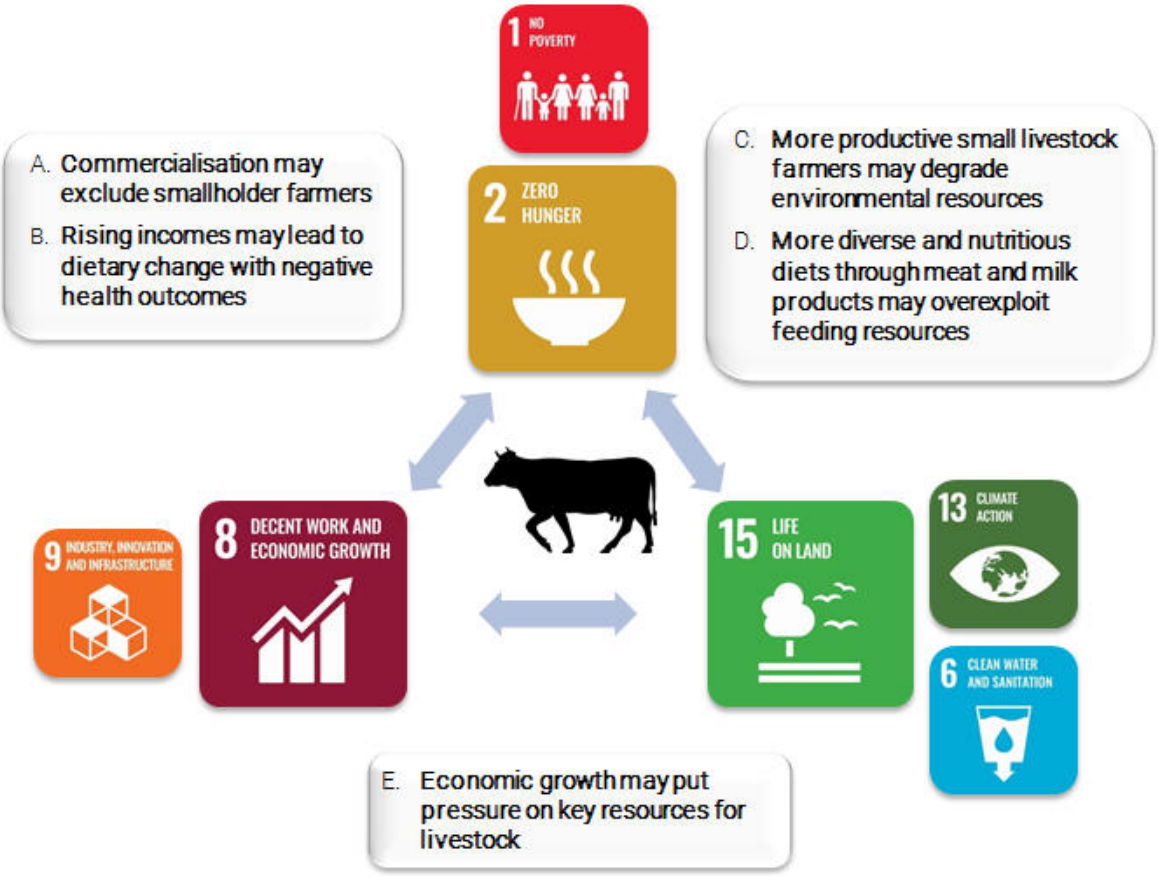


Figure A. SDG trade-offs in the livestock sector

[1] Robinson, S. & M. Petrick (2021). Trade-offs among sustainability goals in the Central Asian livestock sector, SDG^{nexus} Network Working Paper 01-2021. Center for international Development and Environmental Research (ZEU), Justus Liebig University Giessen.

List of Units

There are five units (listed below and in Figure B) covering different aspects of the livestock sector, associated SDG trade-offs and potential synergies. Each includes an overview of the topic, mostly through review papers and textbooks on the global literature, before focussing on the situation in Central Asia. Unit outlines presented here each comprise an introduction to the topic, a table presenting subtopics covered and suggested references for reading. A schematic diagram illustrates links between the topic and SDG areas, as well as the external processes and policies influencing change in the topic area.

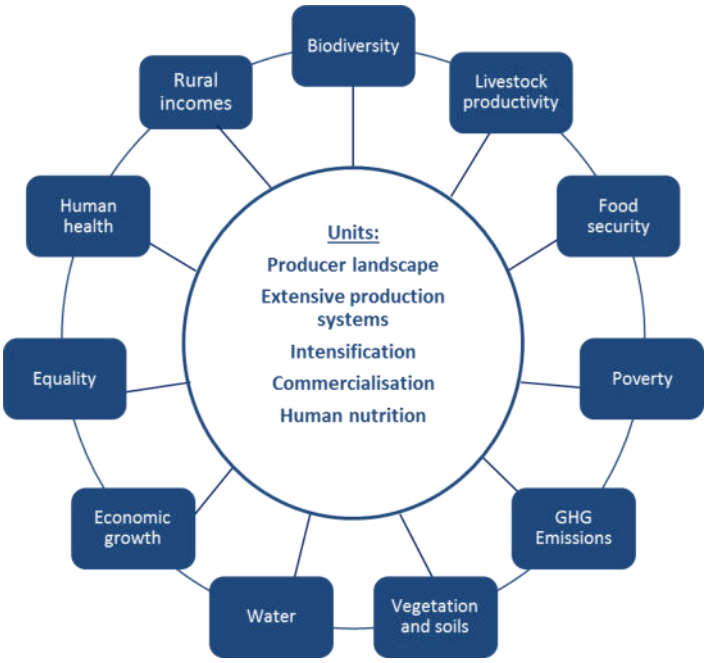


Figure B. List of units and related SDG areas

Unit 1. Livestock producers: Covering different types of livestock producer in terms of farm size, access to land and commercial orientation, this unit examines the objectives of livestock keeping for each group, and looks at relationships between scale, value generation and efficiency. The role of government policy in shaping the producer landscape, and consequences for SDGs are explored.

Unit 2. Extensive production systems: This unit looks at extensive grazing systems, including relationships between grazing livestock and vegetation; environmental trade-offs associated with pastoral systems; and benefits in terms of opportunity costs, food security and income for producers. Factors affecting how livestock use and access pasture are described, with a focus on land tenure policy and institutional arrangements.

Unit 3. Intensification: This unit covers factors affecting livestock productivity, including fodder, genetics and animal health, and looks at where and how change is occurring in these areas. Environmental trade-offs are examined, as well as routes to sustainable intensification through land access arrangements, irrigation management systems and investments in animal health and genetic improvement.

Unit 4. Commercialisation: This unit covers value chains, looking in particular at integration of smallholders. Export patterns and trading arrangements are examined, along with other policies affecting agricultural incentives and their impacts on value chains, producers and consumers – including extension and veterinary services, subsidies and credit.

Unit 5. Human nutrition: The role of livestock in the nutrition transition is explored, including the contribution of livestock to health where nutrition is limiting, or to ill-health in a context of over-nutrition. The unit covers recent trends in consumer demand for livestock products related to income growth and urbanisation, and the impacts on producers and health.

Course Requirements

- Economic principles of farm management (rationality principle, opportunity costs, productivity vs efficiency vs factor intensity).
- Principles of institutional economics (property rights, principal-agent problems, transaction costs).
- Theories of collective action (social dilemmas & free riding, governance mechanisms market vs government, community governance).
- Theories of consumer behaviour (objectives of human behaviour, dealing with trade-offs, behaviour under risk).
- Key concepts of environmental economics (sustainability, ecosystem services, public and private goods, externalities).
- Basic understanding of biological principles in agriculture (livestock nutrition, soils, carbon and nitrogen cycles).
- Statistical concepts: measures of central tendency and variation.

Learning Outcomes

Students will:

- Develop an understanding of key trade-offs between economic and environmental SDGs in the livestock sector and be able to set up hypotheses regarding potential trade-offs of different livestock systems and development pathways in Central Asia.
- Understand concepts of natural resource management on rangelands, critically evaluate scientific literature on land degradation severity and extent and be able to assess possible impacts of reform policies on environmental and social SDG outcomes.
- Be able to understand the potential social trade-offs related to livestock sector development and commercialisation, including between the poverty and food security SDGs and those related to broader economic growth. They will be able to evaluate how government policies in areas of land reform, producer and market support and trade can promote different SDGs, and favour some types of producer over others.
- Gain a practical understanding of value chains in the livestock sector and an ability to identify or predict the economic and political factors likely to drive or limit smallholder participation in Central Asia.
- Be able to use information on the nutrition transition to suggest hypotheses about links between the livestock sector, diet and health in a Central Asian context.
- Be able to identify key trade-offs, design data-driven approaches for measuring them and conduct trade-off analysis using empirical data.

Introductory Reading

Livestock and SDGs

World Livestock: Transforming the livestock sector through the Sustainable Development Goals. FAO. Rome. 2018. http://www.fao.org/3/CA1201EN/ca1201en.pdf

Livestock and environment

Livestock's Long Shadow. Environmental Issues and Options. Steinfeld, H., P. Gerber, P. Wassenaar, V. Castel, M. Rosales and C. de Haan. Food and Agricultural Organisation, Rome. 2006. http://www.fao.org/3/a0701e/a0701e00.htm

Livestock in a Changing Landscape: Volume 1. Consequences and Responses. Edited by Steinfeld, H., H. A. Mooney, F. Schneider and L. Neville. Island: Washington/Covelo/London. 2010. http://www.fao.org/3/am074e/am074e00.pdf

Rangeland Systems Processes, Management and Challenges. Edited by Briske, D. D. Springer. 2017. https://www.springer.com/gp/book/9783319467078

Fragmentation in Semi-Arid and Arid Landscapes. Edited by Galvin, R., R. Reid, R. Behnke and N. Hobbs. Springer. 2008. https://www.springer.com/gp/book/9781402049057

Grazed and Confused? Ruminating on cattle, grazing systems, methane, nitrous oxide, the soil carbon sequestration question – and what it all means for greenhouse gas emissions. Garnett, T., C. Godde, A. Muller, E. Röös, P. Smith, I. J. M. de Boer, E. zu Ermgassen, M. Herrero, C. van Middelaar, C. Schader and H. van Zanten. FCRN, University of Oxford, Oxford. 2017. https://www.fcrn.org.uk/sites/default/files/project-files/fcrn_gnc_report.pdf

Livestock sector development and economics

Livestock Sector Development for Poverty Reduction: an Economic and Policy Perspective. Otte, A. Costales, J. Dijkman, U. Pica-Ciamarra, T. Robinson, V. Ahuja, C. Ly and D. Roland-Holst. Rome. 2020 http://www.fao.org/3/i2744e/i2744e00.pdf

Harvesting Prosperity: Technology and Productivity Growth in Agriculture. Fuglie, K., M. Gautam, A. Goyal and W. F. Maloney. World Bank, Washington, DC. 2020. https://openknowledge.worldbank.org/handle/10986/32350?deliveryName=DM48951

Theory and methods

Principles of Agricultural Economics. Colman, D. and T. Young. Cambridge University Press. 1989.

The World of Agricultural Economics. An Introduction. Martiin, C. Routledge. 2013.

The Economics of Tropical Farm Management. Makeham, J. P. and L. R. Malcolm. Cambridge University Press. 1985.

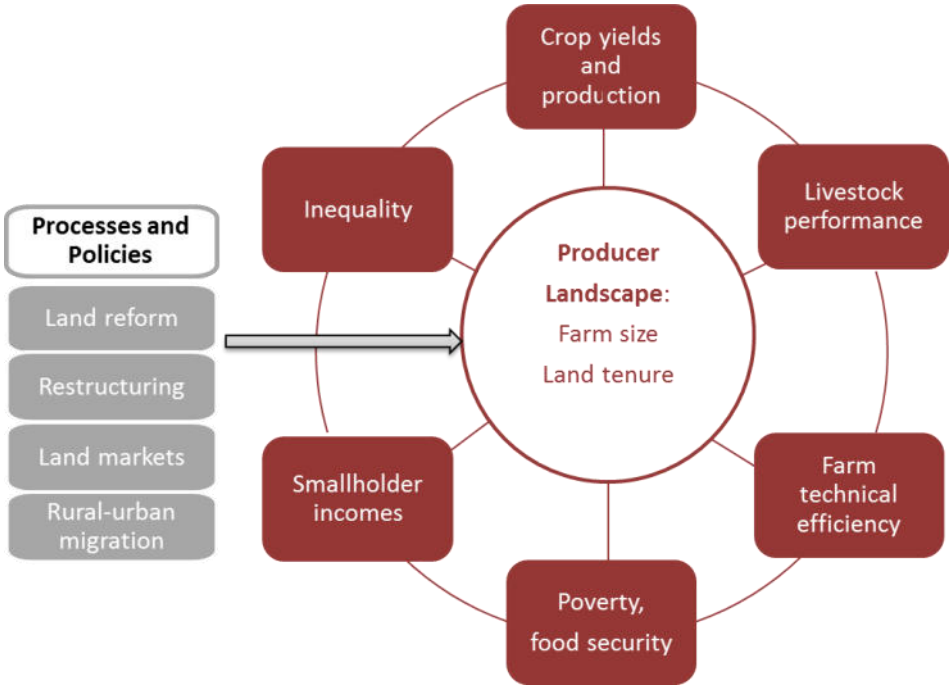
Natural Resource and Environmental Economics (4th edition). Perman, R., Y. Ma, D. Maddison, J. McGilvray and M. Common. Pearson. 2011.

Unit 1. Livestock producers in Central Asia

Trade-offs between poverty reduction and zero hunger (1, 2) and decent work and economic growth (8, 9).

The development of farming structures is rooted in the reform processes which Central Asian republics have followed since their common past in the collectivised agricultural systems of the USSR. All five republics share three basic types of agricultural structure – households (HH), individual farms (IF) and large enterprises (E). Moreover, livestock owners keep animals for different reasons ranging from nutrition, food security and insurance to small scale income generation and commercial business. These different objectives are not always included in economic valuations of the livestock sector

Global literature suggests that in developing economies, large-scale farming by investor-held agro-enterprises is often less efficient than small individual farms, as well as leading to poorer social outcomes in terms of employment and income. There is some evidence for this in Central Asia, in that the advent of private farming is associated with the post-transition recovery and increases in crop yields. But in livestock production scale may have productive advantages, for example concerning pasture use. Land access is associated with poverty reduction, but in many countries, reform was highly inequitable. The majority of livestock remain in households and small farms, which have very small land holdings. Land access distributions, land markets, and potential for employment outside agriculture all have important implications for sector commercialisation and intensification.



Unit 1. The producer landscape of households, farms and enterprises and the relative proportions of land and livestock within each has been largely determined by reform and restructuring (grey boxes). The resulting farming configurations influence multiple SDG targets and indicators (red boxes).

Unit 1: Summary and references

Sub-Topic	Summary
Global patterns and trends	
Different producers, different functions	■ Global livestock production systems ■ Functions of livestock in low and middle income countries ■ Objectives of different producers
Structural change and farm scale	■ Global trends in farm scales ■ Relationship between farm size, productivity and efficiency ■ Socialist agriculture ■ Role of land markets
Central Asia	
Agricultural reform	■ Reform trajectories and policies ■ Farm structures and land access ■ Trends in livestock inventories by farm structure ■ Land relations between different actors
Production outcomes of reform	■ Trends in overall value of the livestock sector ■ Volume of livestock products by farm structure ■ Yields and animal performance ■ Technical efficiency at the farm level
Social impacts of farm restructuring	■ Impact on poverty and employment ■ Impacts on nutrition

Key references

Robinson, S. & M. Petrick (2021). Trade-offs among sustainability goals in the Central Asian livestock sector, SDG^{nexus} Network Working Paper No 1. Center for international Development and Environmental Research (ZEU), Justus Liebig University Giessen.Topic 1.

Salmon, G., N. Teufel, I. Baltenweck, M. v. Wijk, L. Claessens and K. Marshall. 2018. Trade-offs in livestock development at farm level: Different actors with different objectives. Global Food Security 17: 103-112.

Lerman, Z. and S. Sedik. 2017. Transition to smallholder agriculture in Central Asia. Journal of Agrarian Change 18.

Deininger, K. 2003. Land markets in developing and transition economies: impact for liberalization and implications for future reform. American Journal of Agricultural Economics 85: 1217-1222.

Additional reading

Akramov, K. T. and N. Omuraliev. 2009. Institutional Change, Rural Services, and Agricultural Performance in Kyrgyzstan. Discussion Paper 00904. International Food Policy Research Institute.

Zorya, S., N. Djanibekov and M. Petrick. 2019. Farm restructuring in Uzbekistan: how did it go and what is next? World Bank, Washington D. C.

Petrick, M., J. Wandel and K. Karsten. 2013. Rediscovering the Virgin Lands: agricultural investment and rural livelihoods in a Eurasian frontier area. World Development 43: 164-179.

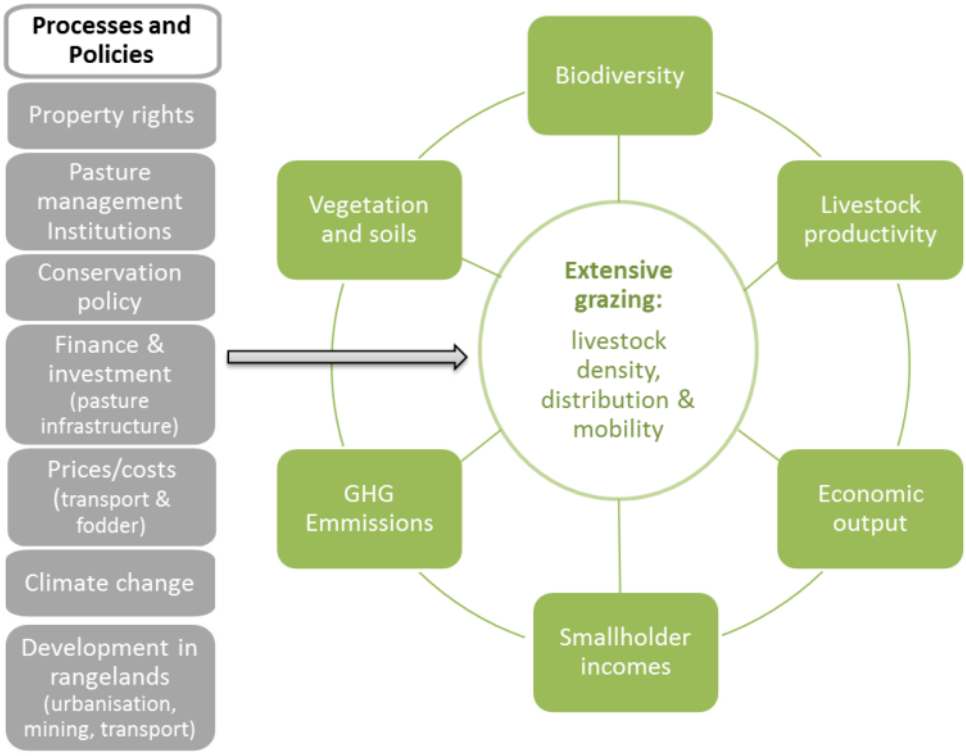
Robinson, S., I. Higginbotham, T. Guenther and A. Germain. 2008. Land Reform in Tajikistan: consequences for tenure security, agricultural productivity and land management practices. Pages 171-203. *in* R. Behnke, editor, The Socio-economic Causes and Consequences of Desertification in Central Asia. Springer, Amsterdam: IOS and Dordrecht; Heidelberg, Germany.

Unit 2. Extensive livestock production and the environment: grazing and pastures

Trade-offs between poverty reduction & zero hunger (1, 2) and life on land (15) & climate action (13).

Trade-offs between economic growth (8, 9) and life on land (15) & climate action (13).

Central Asian grazing systems were traditionally based on the exploitation of temporal and spatial variability in pasture quality and quantity. Thus, animal mobility is important for both productivity and sustainable pasture management. Today, administrative, economic and physical factors impose high transaction costs to seasonal pasture use. These barriers are often insurmountable for smallholders, with associated food security and poverty implications, but they can be lowered by infrastructure investment and institutional arrangements. Moderate grazing is important for fire control and for the wildlife and vegetation which co-evolved with rangeland ungulates, so livestock production can be more compatible with conservation than use of cropland for fodder production. Moreover, conversion of cropland to pasture is an important carbon sequestration mechanism. Conversely, products from grazing livestock have a higher carbon footprint than those from more intensive systems, due to methane emissions from enteric fermentation. Lack of grazing management institutions and systems has led to underuse of pastures in some areas and overuse in others with implications for livestock productivity, vegetation and soils. More broadly, economic growth associated with transport infrastructure, mining and urban development may negatively affect rangeland resources for livestock.



Unit 2. Patterns of pasture access and use by livestock are determined by numerous social, political, economic and climatic processes (grey boxes). The outcomes on interlinked SDG targets are symbolised by the green boxes.

Unit 2. Summary and references

Sub-Topic	Summary
Global patterns and trends	
Global pastoral systems	▪ Global significance of extensive grazing systems ▪ Pastoral resources– threats and opportunities ▪ Pastoral property rights systems
Environmental trade- offs associated with pasture use	▪ GHG emissions, biodiversity, vegetation and soils
Central Asia	
The pastoral resource	▪ The biological basis for historical grazing patterns ▪ Factors limiting livestock production
Transition, reform and grazing systems	▪ Impacts of transition on grazing patterns ▪ Property rights policy post-independence ▪ Costs and consequences of mobility loss
Impacts of grazing on land	▪ Land degradation: severity and distribution ▪ Livestock raising and land conversion ▪ Grazing and biodiversity
Climate change and livestock	▪ Changes in emissions since independence ▪ Mitigation in the livestock sector

Key references

Robinson, S. & M. Petrick (2021). Trade-offs among sustainability goals in the Central Asian livestock sector, SDG^{nexus} Network Working Paper No 1. Center for international Development and Environmental Research (ZEU), Justus Liebig University Giessen. Topics 2 & 7.

Reid, R., M. E. Fernandez-Gimenez and K. Galvin. 2014. Dynamics and resilience of rangelands and pastoral peoples around the globe. Annual Review of Environment and Resources 39: 217–42.

Mirzabaev, A., M. Ahmed, J. Werner, J. Pender and M. Louhaichi. 2016. Rangelands of Central Asia: challenges and opportunities. Journal of Arid Lands 8: 93–108.

R. Behnke, editor. 2008. The Socio-Economic Consequences of Desertification in Central Asia. Springer.

Robinson, S. 2016. Land degradation in Central Asia: evidence, perception and policy. *in* R. Behnke and M. Mortimore, editors. The End of Desertification? Disputing Environmental Change in the Drylands. Springer-Verlag.

Additional reading

Kasymov, U. and A. Thiel. 2019. Understanding the role of power in changes to pastoral institutions in Kyrgyzstan. International Journal of the Commons 13: 931-948.

Kerven, C., S. Robinson, R. Behnke, K. Kushenov and E. J. Milner-Gulland. 2016. A Pastoral frontier: from chaos to capitalism and the recolonisation of the Kazakh rangelands. Journal of Arid Environments 127: 106-119.

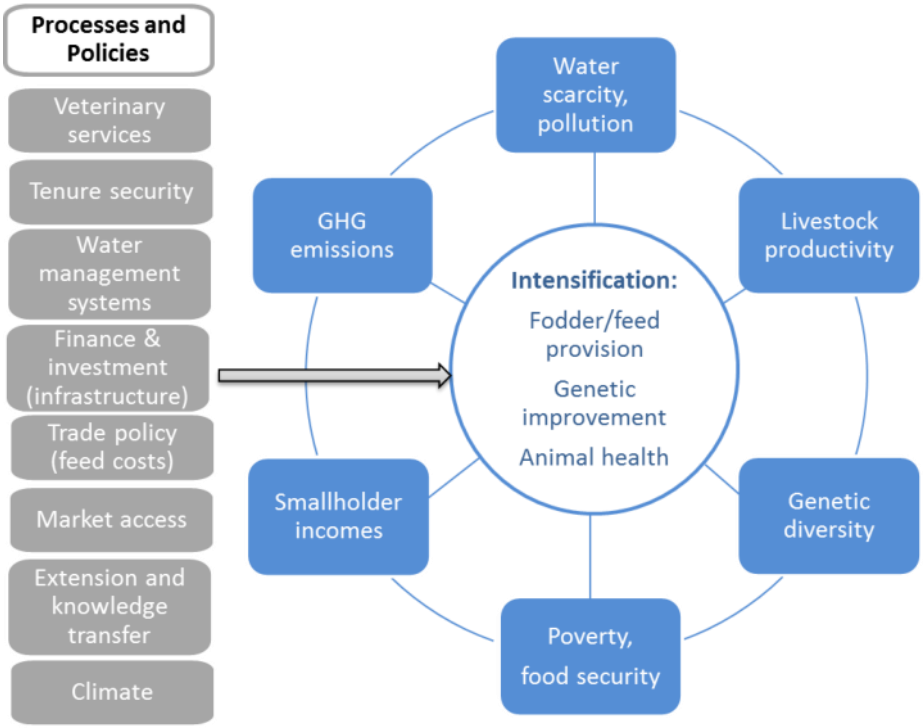
Kamp, J., R. Urazaliev, A. Balmford, P. F. Donald, R. E. Green, A. J. Lamb and B. Phalan. 2015. Agricultural development and the conservation of avian biodiversity on the Eurasian steppes: a comparison of land-sparing and land-sharing approaches. Journal of Applied Ecology 52: 1578-1587.

Unit 3. Intensification and livestock productivity

Trade-offs between poverty reduction zero hunger (1, 2) and water availability (6), life on land (15) & climate action (13).

Trade-offs between economic growth (8, 9) and water availability (6), life on land (15) & climate action (13).

Intensification of livestock production towards higher input - higher output systems is often associated with sector commercialisation. But there are a number of barriers to this process in Central Asia. The major determinants of individual livestock performance are climate, nutrition, genetic potential and animal health. In Central Asia winter fodder is a major limiting factor. In areas with access to arable land, crop residues or cheap fodder markets, improved feeding and winter housing combined with genetic improvement may be associated with gains in animal productivity, as well as a reduction in GHG emissions. But elsewhere, expanding farms often find it cheaper to migrate to winter pastures, relying on animal numbers rather than performance to increase product volume. Genetic improvement may still raise productivity but benefits depend on whether breeding programmes are appropriate to climatic conditions and farming systems. Some may result in loss of genetic diversity. Other trade-offs associated with intensification include water pollution and competition of fodder crops with food and cash crops for irrigated land - dependant on inefficient and environmentally damaging water management systems. Fodder costs, and access to cropland, water, winter pasture and high value markets all determine the extent of intensification and the significance of resulting trade-offs.



Unit 3. Livestock productivity depends on climate, feeding, genetic potential of animals and veterinary systems. Intensification may be influenced by factors such as land access, water management systems and markets (grey boxes) and in turn influences multiple SDGs (blue boxes).

Unit 3. Summary and references

Sub-Topic	Summary
Global patterns and trends	
Intensification: trends and determinants	▪ Determinants of livestock productivity ▪ Intensification and productivity gains ▪ Drivers of intensification
Trade-offs in intensification	▪ Environmental trade-offs and sustainable intensification ▪ Land use opportunity costs ▪ Social and economic trade-offs ▪ Genetic diversity
Irrigation and water use efficiency	▪ Principles of integrated water resource management ▪ World experience in irrigation management transfer
Central Asia	
Fodder availability in Central Asia	▪ The winter feed bottleneck ▪ Increasing fodder and feed availability ▪ Determinants of intensification of feeding
Irrigation water: demand and management	▪ Irrigation problems in Central Asia ▪ Institutions for water management
Genetic potential, animal health, zoonotic disease	▪ Breeds and improvement programmes. ▪ Animal health and impact on the livestock sector

Key References

Robinson, S. & M. Petrick (2021). Trade-offs among sustainability goals in the Central Asian livestock sector, SDG^{nexus} Network Working Paper No 1. Center for international Development and Environmental Research (ZEU), Justus Liebig University Giessen. Topics 3 & 4.

Smith, A., S. Snapp, R. Chikowo, P. Thorne, M. Bekunda and J. Glover. 2016. Measuring sustainable intensification in smallholder agroecosystems: A review. Global Food Security 12: 127-138.

Herrero, M., S. Wirsenius, B. H. C. Rigolot, P. Thornton, P. Havlík, I. d. Boer and P. J. Gerber. 2015. Livestock and the environment: What have we learned in the past decade? Annual Review of Environmental and Resources 40: 177-202.

Garces-Restrepo, C., G. Muñoz and D. Vermillion. 2007. Irrigation Management Transfer Worldwide Efforts and Results. FAO Land and Water Division.

FAO. 2013. Irrigation in Central Asia in Figures. AQUASTAT Survey-2012. Rome.

Additional reading

Sedik, D. 2010. The Feed-Livestock Nexus in Tajikistan: Livestock Development Policy in Transition. FAO Regional Office for Europe and Central Asia.

Mukhamedova, N. and K. Wegerich. 2017. The rising challenge of multiple water resource use at the urban fringes - evidence from Ferghana District of Uzbekistan. Central Asian Journal of Water Research 3: 41-53.

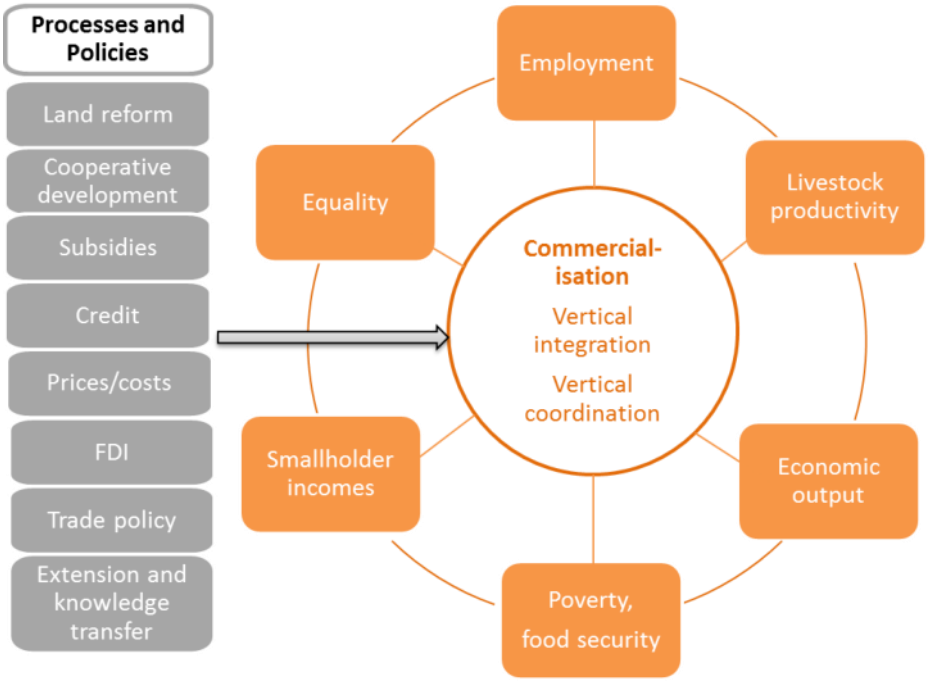
Bekchanov, M., A. Karimov and J. P. A. Lamers. 2010. Impact of Water Availability on Land and Water Productivity: A Temporal and Spatial Analysis of the Case Study Region Khorezm, Uzbekistan. Water 2: 668-684.

Broka, S., Å. Giertz, G. Christensen, C. Hanif, D. Rasmussen and R. Rubaiza. 2016. Kyrgyz Republic Agricultural Sector Risk Assessment. 103076-KZ. World Bank, Washington DC.

Unit 4. Commercialisation: value chains, trade and agricultural policy

Trade-offs between poverty reduction and zero hunger (1, 2) and decent work and economic growth (8, 9).

Sales of livestock products and development of associated processing industries supply domestic markets, generate income and taxes and provide export revenue. But participation in formal value chains with high quality and food safety standards may be out of reach for smallholders, who mostly sell through informal markets. Policy makers and firms often prefer large farming units with capacity to supply quality and quantity of product to support processing and export industries. But if commercialisation of agriculture is achieved to the detriment of small farmers then trade-offs may arise between growth in the agricultural sector and poverty reduction. The ability of small farmers to grow, commercialise and specialise is strongly influenced by the economic and policy environment – which also affects the willingness of private firms to work with small suppliers. Government policies in trade, land reform, subsidies, infrastructure, credit and agricultural service provision all affect agricultural incentives and commercialisation. In particular investment in public goods such as infrastructure, extension and veterinary services, combined with development of cooperatives and contract farming have potential to improve smallholder participation in value chains, but this potential is as yet largely unrealised in Central Asia.



Unit 4. Future patterns of commercialisation could include vertical integration or vertical coordination and may integrate smallholders to greater or lesser extents. These factors will be determined by social, political and economic processes (grey boxes) whilst the outcomes on interlinked SDGs are symbolised by the orange boxes.

Unit 4. Summary and references

Sub-Topic	Summary
Global patterns and trends	
Global value chains	▪ Growth and trends in global value chains ▪ Winners and losers of value chain development ▪ Impact of trade and investment policy on agricultural incentives and rural living standards.
Value chain structures and smallholder integration	▪ Vertical integration ▪ Contract farming and technology transfer ▪ Cooperatives
Central Asia	
Value chains in Central Asia	▪ Milk value chains ▪ Beef value chains ▪ Contracts and cooperatives
Trade arrangements and export barriers	▪ Trading arrangements in Central Asia ▪ Import and export of livestock products ▪ Trade control instruments
Government support to agriculture	▪ Budgetary support for agriculture ▪ Finance and subsidies ▪ Extension and technology transfer
Economy wide impacts of policies	▪ Total government support indictors ▪ Distortions to agricultural incentives

Key References

Robinson, S. & M. Petrick (2021). Trade-offs among sustainability goals in the Central Asian livestock sector, SDG^{nexus} Network Working Paper No 1. Center for international Development and Environmental Research (ZEU), Justus Liebig University Giessen. Topics 5 & 8.

Swinnen, J. F. M. and M. Maertens. 2006. Globalization, privatization, and vertical coordination in food value chains in developing and transition countries. *in* International Association of Agricultural Economists Conference, Gold Coast, Australia, August 12 -18, 2006.

Catelo, M. A. O. and A. C. Costales. 2008. Contract farming and other market institutions as mechanisms for integrating smallholder livestock producers in the growth and development of the livestock sector in developing countries. Pro-Poor Livestock Policy Initiative & FAO.

Anderson, K. and J. Swinnen. 2008. Introduction and Summary. Pages 4-50 in K. Anderson and J. Swinnen, editors. Distortions to Agricultural Incentives In Europe's Transition Economies. World Bank, Washington DC.

Additional reading

FAO. 2018. Review of Agricultural Trade Policies in the Post-Soviet Countries 2016-17. FAO, Rome.

OECD. 2020. Kazakhstan. *in* Agricultural Policy Monitoring and Evaluation. OECD Publishing, Paris.

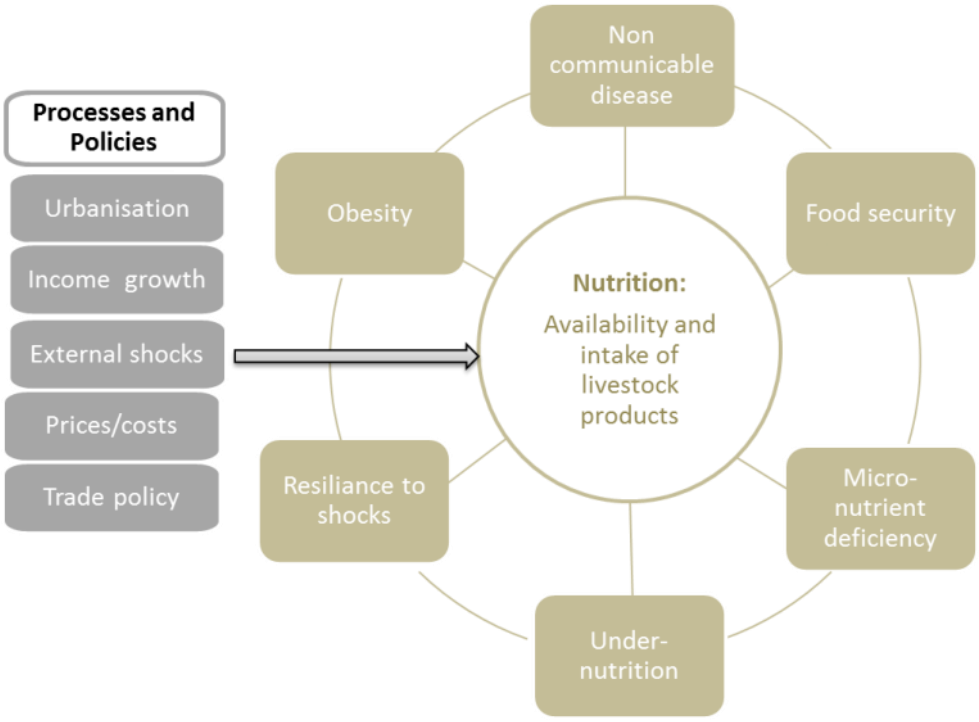
FAO Investment Centre. 2010. Highlights on four livestock sub-sectors in Kazakhstan: Dairy subsector. FAO, Rome

Lerman, Z. and D. Sedik. 2014. Cooperatives in the CIS and Georgia: Overview of Legislation. Policy Studies on Rural Transition No. 2014-2. FAO, Rome.

Unit 5. Human nutrition and the livestock sector

Trade offs between decent work and economic growth (8, 9) and overnutrition (2), resulting in obesity and rising human health burden.

The nutrition transition describes the trend in developing countries from widespread malnutrition, characterised by calorie deficiencies, to overnutrition and rising prevalence of obesity and non-communicable diseases such as diabetes and heart disease. These changes are associated with increased consumption of sugar, processed foods, and animal products – strong increases in demand for the last of these has been called 'the livestock revolution'. In Central Asia, undernutrition and micro-nutrient deficiency are still significant but some areas are starting to experience a triple nutritional burden, as these deficiencies co-exist with rising overnutrition. Thus, amongst low income households, access to livestock products may be associated with positive health outcomes, whilst the relationship is likely to switch at higher incomes as animal product intake increases. At the same time, the nutritional status of Central Asian populations is vulnerable to shocks. Dependence on remittances and food imports makes the region sensitive to geo-political upheavals and commodity prices - with potentially rapid dietary and health implications.



Unit 5. Availability and intake of livestock products are influenced by increasing incomes, urbanisation and trade policies, and external shocks (grey boxes). The outcomes on interlinked SDGs include different dimensions of nutritional status, health and resilience, of which livestock raising is one aspect (beige boxes).

Unit 5. Summary and references

Sub-Topic	Summary
Global trends and patterns	
Global consumption of livestock products	■ The nutrition transition ■ The livestock revolution ■ Positive contribution of livestock to diet, health and food security ■ Negative contribution of livestock: obesity and disease ■ The role of trade in the nutrition transition
Central Asia	
Human health Central Asia	■ Food security and undernourishment ■ Obesity and the nutrition transition ■ Trends and prevalence of non-communicable diseases ■ Determinants of malnutrition
The role of livestock in diet and health	■ Overall dietary composition and trends ■ Trends in livestock product availability and intake ■ Contribution of livestock sector to health outcomes

Key references

Robinson, S. & M. Petrick (2021). Trade-offs among sustainability goals in the Central Asian livestock sector, SDG^{nexus} Network Working Paper No 1. Center for international Development and Environmental Research (ZEU), Justus Liebig University Giessen. Topic 6.

Neumann, C. G., M. W. Demment, A. Maretzki, N. Drorbaugh and K. A. Galvin. 2010. The Livestock revolution and animal source food consumption: benefits, risks and challenges in urban and rural setting of developing countries. *in* H. Steinfeld, H. A. Mooney, F. Schneider and L. Neville, editors. Livestock in a Changing Landscape: Drivers, Consequences and Responses. Island Press.

Popkin, B. 2006. Global nutrition dynamics: the world is shifting rapidly toward a diet linked with non-communicable diseases. American Journal of Clinical Nutrition 84: 289-298.

Roth, G. A., C. Johnson, A. Abajobir, F. Abd-Allah and e. al. 2017. Global, Regional, and National Burden of Cardiovascular Diseases for 10 Causes, 1990 to 2015. Journal of the American College of Cardiology 70: 1-25.

FAO. 2019. Regional Overview of Food Security and Nutrition in Europe and Central Asia 2019. Structural Transformations of Agriculture for Improved Food Security, Nutrition and Environment. Budapest.

Additional reading

Aringazina, A., T. Kuandikov and V. Arkhipov. 2018. Burden of the Cardiovascular Diseases in Central Asia. Central Asian Journal of Global Health 7.

WHO. 2017. FEEDcities project. The food environment description in cities in Eastern Europe and Central Asia - Kyrgyzstan. WHO.

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