GLOBAL LAND OUTLOOK
Thematic Report on Rangelands and Pastoralists

2nd Draft

Acknowledgements

The Global Land Outlook Thematic Report on Rangelands and Pastoralists was the product of a team effort led by the author and UNCCD secretariat, in collaboration with supporting and contributing partners, and in consultation with key stakeholders and experts. It was made possible through the generous financial support provided by the European Commission.

Author: Pedro Maria Herrera Calvo

Editors: Shannon Mouillesseaux and Sasha Alexander

Graphic Designer: Javier Acebal

Contributors: Nicholas Euan Sharpe (FAO, Angola), Phemo Karen Kgomotso (UNDP, Mongolia), Karim Musalem (WWF, Paraguay), Jara Febrer Santos (GOB Menorca, Spain), Assocle, Mahoussi Simone (IFAD, Tanzania and Tajikistan), Alexis Bonogofsky (WWF, USA), Nachilala Nkombo (WWF, Zambia), Oloumane Patrick Nino (University of Quebec, Algeria), Patrik Nino Oloumane (University of Quebec (Algeria), Nasser Eddin Obaid (ACSAD, Arabic countries), Almut Therburg (CONICET, Argentina), María Cristina Camardelli (National University of Salta (Argentina), Bibiana Vilá (VICAM / CONICET, Argentina), Edina Scherzer (Raumberg-Gumpenstein R&D, Austria), Ana Carolina Crisostomo (WWF, Brazil), Paola Agostini (The World Bank, Central Asia), Yongjun Li (National Forestry and Grassland Administration, China), Huxuan Dai (Shan Shui Conservation Centre, China), Moustafa S. El Hakeem (Desert Research Center, Egypt), Tsegazeab Embaye Tedla (Ministry of Agriculture, Eritrea), Ministry of Agriculture, Ethiopia), Nicola di Niro (CRAMM-Geaco / Fondazione Popoli e Territori, Europe), Dragan Angelovski (FAO, Georgia), Anshul Ojha (Desert Resource Centre, India), Vivekanandan Perumal (Sustainable Agriculture and Environmental Voluntary Action, India), Rishi Sharma (WWF, India), Pier Paolo Roggero (Desertification Research Centre University of Sassari, Italy), Marco Bindi (University of Florence, Italy), Mira Haddad (ICARDA, Jordan), Isaac Kofi Bimpong (IAEA, Kenya), Peter Ken Otieno (RECONCILE, Kenya), Fiona Flintan (ILRI ,Kenya, Tanzania, Ethiopia and IGAD Region), Talantbek Toktosunov (CAMP Alatoo, Kyrgyz Republic), Assocle, Mahoussi Simone (IFAD, Kyrgyz Republic), Elvira Maratova (ILC Ecosystem Restoration Platform, Kyrgyz Republic and Thailand), Gregorio Velasco Gil (FAO, Mali, Mauritania, Niger, Senegal), Elisabeth Huber-Sannwald and Natalia Martínez Tagüeña (Instituto Potosino de Investigación Científica y Tecnológica, A.C., Mexico), Miguel Angel Cruz Nieto (Organización Vida Silvestre, Mexico), Mario Rodrigo Chávez (Comisión Nacional de Áreas Naturales Protegidas, México), Zhyrgalbek Kozhomberdiev (CAMP Alatoo, Mongolia), Ykhanbai Hijaba (JASIL, Mongolia and Central Asia), Stefan Graf (Bern University of Applied Science, Morocco), Sanusi Abubakar (L-PRES, Nigeria), David Cobon (Centre for Applied Climate Sciences, Northern Australia), Mohammad Zaman (IAEA, Pakistan), Duarte Marques (Aguiarfloresta, Portugal), Quasim Al-Janabi (The Ministry of Environment, Republic of Iraq), Roxana Triboi (Ion Mincu University of Architecture and Urbanism, Romania), Kulik Konstantin Nikolaevich (Federal Scientific Centre of Agroecology, Complex Melioration and Protective Afforestation, Russia), Orou Djega Imorou (CILSS, Sahel), Serena Ferrari (CIRAD, Senegal), Andiswa Finca (Agricultural Research Council, South Africa), Jabier Ruiz-Mirazo, María Turiño, Yolanda Sampedro and Mireia Llorente (Entretantos Foundation, Spain), Sharini Somasiri (Rajarata University, Sri Lanka), Namayani Rapey Edward (Pastoral Women's Council, Tanzania), Pius Loupa (COPACSO, Uganda). Special thanks to the people that helped to mobilise and gather all case studies.

Reviewers: Cathrine Mutambirwa (UNCCD), Olga Andreeva (UNCCD), Sasha Alexander (UNCCD), Melissa Ho (WWF), Martha Kauffman (WWF), Chris Magero (IUCN), Bora

Masumbuko (IUCN), Jabier Ruiz-Mirazo (Entretantos) and UNCCD SPI members Dolors Armenteras, Nichole N. Barger, Helene Gichenje, Elisabeth F. Huber-Sannwald, Jeffrey E. Herrick, and Tungalag Ulambayar.

Citation: UNCCD. 2024. Global Land Outlook Thematic Report on Rangelands and Pastoralism. UNCCD, Bonn.

United Nations Convention to Combat Desertification (UNCCD)
Platz der Vereinten Nationen 1
D-53113 Bonn, Germany
www.unccd.int

Cover photo:

ISBN on-line:
ISBN print:

This publication is available for download at:

Preface

Ibrahim Thiaw, UNCCD Executive Secretary

Foreword

Maryam Niamir-Fuller, IYRP Co-Chair of the International Support Group

Executive summary

Rangelands encompass a wide variety of landscapes, including grasslands, shrublands, wetlands, tundra, and deserts. These important ecosystems are primarily covered by natural vegetation which provide grazing and forage for livestock and wildlife. Pastoralists, herders, farmers, and ranchers directly depend on the health of rangelands for their livelihoods which often form an important part of their cultural identity. Rangelands also provide critical environmental services at local and global levels, such as watersheds for rural and urban uses, biodiversity habitat, carbon capture and storage, recreational activities, and the potential for renewable energy.

Rangelands have rarely featured on international agendas. A key reason they have been neglected is the lack of definitive data capturing their size, condition, and value. Covering more than 50 per cent of the Earth's surface area, rangelands provide important economic, environmental, and cultural benefits that are often taken for granted. Many rangelands are experiencing the mounting pressures of land-use change, overgrazing, invasive species, wildfires, and drought which are accelerating land degradation and desertification around the world.

Livestock grazing is the most common economic use of rangelands as well as one of the most effective management tools. Maintaining forage production and soil health is key to achieving ecological and economic objectives under a changing climate and essential for sustaining extensive livestock production into the future. Sustainable rangeland management and restoration activities should aim to prevent land degradation and desertification resulting from human activities and, where feasible, to stabilize or improve the health and productivity of already degraded rangelands.

Key messages and recommendations

- Rangelands should be fully recognised and integrated in land, climate, agriculture, and nature conservation policies in a way that respects and leverages the opportunities created by their unique characteristics and dynamics.
- Tailored policy and legal frameworks, participatory and fair governance institutions and mechanisms, and multi-level coordination are necessary to halt current trends of conversion and degradation and develop enabling environments for sustainable rangeland management and restoration initiatives.
- Pastoralism, encompassing the wide diversity of extensive livestock models, should be considered as the core production system for maintaining rangeland health, compatible with and complementary to other sustainable land uses.
- The equitable and gender-sensitive participation of pastoralists and other rangeland communities in integrated land use planning, decision-making, and the governance of rangelands is the basis for improving their livelihoods and the provision of ecosystem services.
- Capacity development for the creation and application of knowledge and technologies, including the integration scientific research and traditional knowledge, is required to deploy context-specific extension services as well as to test and validate new implementation and monitoring approaches.
- Partnerships and coordinated action can help foster innovative financial mechanisms and a new generation of flexible investments that are adapted and responsive to the scales, dynamics, and conditions of rangelands, common natural resources, pastoralist communities, and decentralized governance arrangements.

Chapter 1: Overview

Rangelands play a central role in achieving Land Degradation Neutrality (LDN) and contributing to both local and global sustainability agendas. Rangelands operate as complex socioecological systems with critical values, processes, goods, and services.[1] Rangeland ecosystems have co-evolved with the communities whose sustenance and livelihoods depend on the resources and opportunities they provide.[2] Their capacity to support these communities largely depends on how rangelands are used and managed. The future of rangelands and their inhabitants are threatened by external and global drivers of change.

The United Nations (UN) has designated 2024 as the **International Year of Camelids** (e.g., camels, llamas, alpacas, vicuñas, guanacos) which are an important source of livelihood for millions of families - most of them pastoralists in dryland and mountainous rangeland ecosystems around the world. Furthermore, the UN has declared 2026 the **International Year of Rangelands and Pastoralists** (IYRP) to raise awareness and direct attention and investment to the sustainable management and restoration of rangelands, recognizing their significant contribution to achieving sustainable development.[3]

The IYRP underscores the importance of healthy rangelands and sustainable pastoralism, including for the implementation objectives of the United Nations Convention to Combat Desertification (UNCCD) and the LDN targets under Sustainable Development Goals (SDG) target 15.3. In this context, as part of the effort to combat desertification, land degradation and drought, and restore rangeland health and productivity, the UNCCD's Global Land Outlook (GLO) thematic report on rangelands and pastoralists ("the report") aims to provide a new conceptual framework for action to better manage and restore rangelands as well as establish the evidence base for sustained financing and cooperation at all levels and across all sectors.

The report focuses on the relationship between rangelands and their users, most notably pastoralists, linking people with the land that sustains their livelihoods and communities under a purposeful management and stewardship approach. The underlying premise is that this approach needs to be embraced and scaled up to protect rangelands and their functions, to combat land degradation and achieve LDN,[4] as well as make progress towards other goals and targets in the SDGs,[5] Global Biodiversity Framework (GBF)[6], United Nations Decade on Ecosystem Restoration 2021–2030 (UNDER)[7], and the Paris Agreement of the United Nations Framework Convention on Climate Change (UNFCCC).

1.1 Aim and scope

The report explores the links between rangelands and local communities through pastoralism. It highlights the role and untapped potential of extensive livestock management systems in reducing land degradation, contributing to just and equitable rural development, and

[1] Squires, V.R., Gaur, M. and Ariapour, A. (2022) 'Land Degradation Neutrality in the World's Rangelands: Contemporary Approaches to Old Problems Using New Solutions', Journal of Rangeland Science, 12(3), pp. 308–321. https://www.sid.ir/fileserver/je/1004020220308.
[2] Herrera, P.P.M., Davies, J. and Baena, P.P.M. (2014) The Governance of Rangelands. Edited by P.M. Herrera, J. Davies, and P. Manzano Baena. Routledge. https://doi.org/10.4324/9781315768014.
[3] https://documents-dds-ny.un.org/doc/UNDOC/LTD/N22/240/35/PDF/N2224035.pdf
[4] https://www.unccd.int/land-and-life/land-degradation-neutrality/overview#:~:text=We%20define%20LDN%20as%20%E2%80%9Ca,%E2%80%8B.
[5] https://sdgs.un.org/goals.
[6] https://www.cbd.int/gbf/.
[7] https://www.decadeonrestoration.org/.

protecting the global commons while improving the health of these critical landscapes and community livelihoods.

Drawing on case studies from around the world, the report offers insights and perspectives into how pastoralism is contributing to rangeland governance and stewardship in many regions and examines the potential for replicability and scalability. It draws on a diversity of initiatives, policies, investments, nature-based solutions, and tools, and provides an analysis of territorial and cultural approaches, including specific interventions that target the conservation and regeneration of rangeland ecosystems. It also reflects on lessons learned to improve the design, planning, implementation, and finance for future rangeland initiatives.

The report offers new entry points, possibilities, and recommendations for policymakers and other stakeholders that encourage greater attention and investment in rangeland management to secure stable livelihoods for the people that inhabit them. It concludes that local, multi-actor, transdisciplinary, and inclusive approaches are needed to sustain and improve the health and productivity of the rangelands and their caretakers.

1.2 Structure and contents

The report is structured around five chapters. The **first chapter** provides an overview of what the reader can expect. The **second chapter** looks at the reasons that many initiatives on rangelands and pastoralism are prone to fail and proposes guidance and recommendations to improve the efficiency and effectiveness of such initiatives. Drawing on case studies, scientific literature, and other knowledge sources, the **third chapter** presents a historical perspective and reflects on the lessons learned to improve the performance of rangelands and pastoralist projects and programmes. The **fourth chapter** includes regional snapshots for 10 areas of the world, illustrated with national and local case studies. The **fifth chapter** builds upon this regional analysis and offers a global approach to support rangelands and pastoralists around the world. The **sixth chapter** includes a set of conclusions, recommendations, and considerations to support stakeholders and policymakers in devising policies and programmes that better manage and nurture rangelands.

1.3 Definitions and explanations

The report uses terms and concepts that may engender differences in interpretation around the world and across disciplines and practitioners. This section introduces and explains the key terms and concepts used in the report which are referenced in literature.[8]

The report focuses on the use and management of rangelands, acknowledging the wide range of ecosystems and biomes that are generally used for grazing livestock. While the terms “land cover” and “land use” are often used interchangeably in the literature to reference this type of socioecological system, the report defines **land use** as the purposes and activities, primarily grazing, through which people interact with land and terrestrial ecosystems.[9] **Land cover** is defined by the character of the elements located on the surface of land, either biophysical (e.g., grasses, shrubs, trees) or artificial (e.g., fences, tracks, shelters). **Land use change** and **land cover change** remains a major environmental challenge which is currently driven by urbanisation,

[8] Allen, V.G., Batello, C., Berretta, E.J., Hodgson, J., Kothmann, M., Li, X., McIvor, J., Milne, J., Morris, C., Peeters, A. and Sanderson, M. (2011) ‘An international terminology for grazing lands and grazing animals’, Grass and Forage Science, 66(1), pp. 2–28. https://doi.org/10.1111/j.1365-2494.2010.00780.x.
[9] Ellis, E.C. (2021) ‘Land Use and Ecological Change: A 12,000-Year History’, Annual Review of Environment and Resources, 46, pp. 1–33. https://doi.org/10.1146/annurev-environ-012220-010822.

population growth, migration, agricultural expansion and intensification, or land conversion for human settlements, among other factors and processes.[10]

The report refers to **land management** as any process that allocates land resources to specified uses and goals, including all human activities that take place on land, specifically when the activity aims to produce positive social, environmental, or economic outcomes.[11] **Sustainable Land Management (SLM)** denotes the use of land resources to meet changing human needs while ensuring the long-term health and productive potential of these resources and the maintenance of their environmental functions.[12] SLM in the rangelands is referred to as **Sustainable Rangeland Management (SRLM)**, which can be framed as a knowledge-based process that integrates social, economic, environmental, and land use principles under various policies and practices.[13]

Explanatory Note: The report acknowledges that pastoralist activity always has human intelligence behind decision-making and planning for the use and preservation of available resources (whether it is a single shepherd deciding their daily itinerary or a community moving from winter to summer pastures). Accordingly, this report considers all pastoralist systems as land management systems. The decision to not allow grazing or restrict other land uses (whether temporarily or permanently) is also understood as a form of land management. Abandonment is considered a discontinuation of land management generally caused by the loss of function and services.[14]

Throughout the report, **integrated land-use planning** is defined as the systematic assessment of the ecological, economic, and social conditions in order to select, design, and implement the best land-use strategies and options.[15] The purpose of integrated land-use planning is to assign a set of compatible land uses for a given territory, in a way that is socially just and desirable and economically viable, while safeguarding its resources and the provision of ecosystem services. These are the preconditions required to implement SRLM practices. The report considers pastoralism a desirable default option for rangeland management that should be incorporated into land-use planning. The flexibility and capacity of planning instruments should allow the integration of pastoralism with other uses in the same areas under a multifunctional

[10] Nedd, R., Light, K., Owens, M., James, N., Johnson, E. and Anandhi, A. (2021) 'A Synthesis of Land Use/Land Cover Studies: Definitions, Classification Systems, Meta-Studies, Challenges and Knowledge Gaps on a Global Landscape', *Land*, 10(9), p. 994. https://doi.org/10.3390/land10090994.

[11] Foley, J.A., DeFries, R., Asner, G.P., Barford, C., Bonan, G., Carpenter, S.R., Chapin, F.S., Coe, M.T., Daily, G.C., Gibbs, H.K., Helkowski, J.H., Holloway, T., Howard, E.A., Kucharik, C.J., Monfreda, C., Patz, J.A., Prentice, I.C., Ramankutty, N. and Snyder, P.K. (2005) 'Global consequences of land use', Science, 309(5734), pp. 570–574. https://doi.org/10.1126/science.1111772.

[12] Alemu, M.M. (2016) 'Sustainable Land Management', Journal of Environmental Protection, 07(04), pp. 502–506. https://doi.org/10.4236/jep.2016.74045.

[13] Motavalli, P., Nelson, K., Udawatta, R., Jose, S. and Bardhan, S. (2013) 'Global achievements in sustainable land management', *International Soil and Water Conservation Research*, 1(1), pp. 1–10. https://doi.org/10.1016/S2095-6339(15)30044-7.

[14] Subedi, Y.R., Kristiansen, P. and Cacho, O. (2022) 'Drivers and consequences of agricultural land abandonment and its reutilisation pathways: A systematic review', *Environmental Development*, 42(November 2021), p. 100681. https://doi.org/10.1016/j.envdev.2021.100681.

[15] Metternicht, G. (2017) 'Global Outlook Working Paper on land use planning', pp. 1–67. https://knowledge.unccd.int/sites/default/files/2018-06/6. percent20Land+Use+Planning+ G Metternicht.pdf.

perspective, using an **adaptive land management** model[16] which can be reactive and resilient under changing conditions.

Explanatory Note: The report uses this adaptive land management model to improve rangeland planning and management, based on a systemic and iterative decision-making approach as well as long-term monitoring. This can be facilitated through transition scenarios that integrate strategic, tactical, operational, and monitoring protocols that account for feedback loops.[17] The report introduces a coherent logic framework to integrate the support of rangelands and pastoralist action at the different levels and scales of decision-making. To this end, both land-use planning and management need to recognize the main features displayed by pastoralist systems, including mobility, multifunctionality, diversity, and the non-exclusive use of variable resources.

Land degradation in the rangelands is a serious concern. It is defined as a negative trend in land condition caused by direct or indirect human-induced processes, including anthropogenic climate change. It can be expressed as long-term reduction or loss of ecosystem goods and services,[18] such as biological (soil) productivity, ecological integrity, or value to humans. Land degradation impacts both people and ecosystems, simultaneously affected by climate change and contributing to it.[19]

Land Degradation Neutrality (LDN) is defined as "a state whereby the amount and quality of land resources necessary to support ecosystem functions and services to enhance food security remain stable, or increase, within specified temporal and spatial scales and ecosystems".[20] LDN strives for a balance between land degradation and restoration, taking into account trade-offs and synergies with other sustainability goals. The UNCCD endorsed LDN as a primary vehicle to drive the implementation of the convention and which was subsequently embraced in the overall vision of its 2018-2030 Strategic Framework.[21]

Ecological and ecosystem restoration is defined as the process of assisting the recovery of a degraded, damaged, or destroyed ecosystems to reinstate ecological processes, functions, and services.[22] The UN is supporting the **Decade on Ecosystem Restoration** (2021-2030) in an

[16] Herrick, J.E., Duniway, M.C., Pyke, D.A., Bestelmeyer, B.T., Wills, S.A., Brown, J.R., Karl, J.W. and Havstad, K.M. (2012) 'A holistic strategy for adaptive land management', Journal of Soil and Water Conservation, 67(4), pp. 105–113. https://doi.org/10.2489/jswc.67.4.105A .

[17] Mitake, Y., Hiramitsu, K., Tsutsui, Y., Sholihah, M. and Shimomura, Y. (2020) 'A Strategic Planning Method to Guide Product—Service System Development and Implementation', *Sustainability*, 12(18), p. 7619. https://doi.org/10.3390/su12187619.

[18] Feng, S., Zhao, W., Zhan, T., Yan, Y. and Pereira, P. (2022) 'Land degradation neutrality: A review of progress and perspectives', *Ecological Indicators*, 144 (September), https://doi.org/10.1016/j.ecolind.2022.109530.

[19] Olsson, L. and Barbosa, H. (2016) 'Land degradation', in *IPCC special report on climate change and land*, pp. 182–206. https://www.ipcc.ch/site/assets/uploads/sites/4/2020/05/Chapter-4_FINAL-1.pdf.

[20] https://www.unccd.int/land-and-life/land-degradation-neutrality/overview

[21] https://www.unccd.int/resources/other/unccd-2018-2030-strategic-framework

[22] Crossman, N.D., Bernard, F., Egoh, B., Kalaba, F., Lee, N. and Moolenaar, S. (2016) *The role of ecological restoration and rehabilitation in production landscapes: An enhanced approach to sustainable development*, *Working paper for the UNCCD Global Land Outlook*. https://www.unccd.int/sites/default/files/2018-06/16. percent20Ecological percent2BRestoration__N_D_Crossmann.pdf

attempt to restore lost ecosystem services, mitigate and adapt to climate change, and halt the decline of biodiversity while creating livelihood opportunities.[23]

Explanatory Note: While the focus of land restoration has been primarily on forests, the report recognises the need and potential to restore rangeland ecosystems, such as grasslands, savannahs or shrublands. The interest in restoring these ecosystems is growing rapidly and has become a priority for the UN Decade.[24] The report applies the principles and standards of ecosystem restoration which strive to conserve or regenerate the full suite of rangeland functions and services.[25] However, several afforestation projects in the rangelands have raised concerns and intense debate.[26] The report argues that the transformation of rangelands into forests or tree plantations should be avoided unless scientifically justified by the historic, ecological, economic, and social characteristics of the targeted area.[27]

Differentiating between "rangelands" and "grasslands" can be controversial. Both terms are often used as synonyms,[28] although many nuances are subject to debate. The report defines **rangelands** as any areas which are used as a natural or semi-natural ecosystem for grazing by livestock and/or wild animals, and on which indigenous vegetation predominantly comprises grass, grass-like plants, forbs, or shrubs that are or can be grazed, including open forests and agroforestry systems. Rangelands are considered complex socioecological systems[29] that include a broad range of services, values and interests that should be considered in functional assessments.[30] Many rangelands fall within the classification of **drylands**, which are characterised by water scarcity typically with an Aridity Index below 0.65.[31]

[23] UNEP and FAO (2020) 'The UN Decade on Ecosystem Restoration 2021-2030', UNEP/FAO Factsheet, 2019(June 2020), p. 4. www.unep.org.

[24] Dudley, N., Eufemia, L., Fleckenstein, M., Periago, M.E., Petersen, I. and Timmers, J.F. (2020) 'Grasslands and savannahs in the UN Decade on Ecosystem Restoration', *Restoration Ecology*, 28(6), pp. 1313–1317. https://doi.org/10.1111/rec.13272.

[25] Gann, G.D., McDonald, T., Walder, B., Aronson, J., Nelson, C.R., Jonson, J., Hallett, J.G., Eisenberg, C., Guariguata, M.R., Liu, J., Hua, F., Echeverría, C., Gonzales, E., Shaw, N., Decleer, K. and Dixon, K.W. (2019) 'International principles and standards for the practice of ecological restoration. Second edition', Restoration Ecology, 27(S1), pp. S1–S46. https://doi.org/10.1111/rec.13035.

[26] Vetter, S. (2020) 'With Power Comes Responsibility – A Rangelands Perspective on Forest Landscape Restoration', *Frontiers in Sustainable Food Systems*, 4(November), pp. 1–10. https://doi.org/10.3389/fsufs.2020.549483.

[27] Jackson, R.B., Jobbágy, E.G., Avissar, R., Roy, S.B., Barrett, D.J., Cook, C.W., Farley, K.A., Le Maitre, D.C., McCarl, B.A. and Murray, B.C. (2005) 'Atmospheric science: Trading water for carbon with biological carbon sequestration', *Science*, 310(5756), pp. 1944–1947. https://doi.org/10.1126/science.1119282.

[28] Lund, G. (2007) 'Accounting for the World's Rangelands', *Rangelands*, 29(1), pp. 3–10. https://doi.org/: http://dx.doi.org/10.2111/1551-501X(2007)29[3:AFTWR]2.0.CO;2.

[29] Hruska, T., Huntsinger, L., Brunson, M., Li, W., Marshall, N., Oviedo, J.L., Whitcomb, H. and Briske, D.D.D. (2017) Rangeland as social-ecological systems, Rangeland systems. Edited by D.D. Briske. Cham: Springer International Publishing (Springer Series on Environmental Management). https://doi.org/10.1007/978-3-319-46709-2.

[30] FAO (2019) Trees, forests and land use in drylands: the first global assessment-Full report. FAO Forestry Paper No. 184. Rome, FAO Forestry Paper. https://www.fao.org/documents/card/es/c/ca7148en/

[31] Davies, J. (2017) The land in drylands: Thriving in uncertainty through diversity. UNCCD Working Paper. https://www.unccd.int/sites/default/files/2018-06/15.%20The%2BLand%2Bin%2BDrylands__J_Davies.pdf

Grasslands are defined not so much for their use as for being ecosystems dominated by grasses or grass-like plants,[32] but also ecosystems with woody vegetation – shrublands, woody grasslands, open forests or savannahs[33] – which also host trees and diverse organisms.[34] Besides natural grasslands, there are secondary grasslands that arise as a consequence of land use change or caused by other human activities.[35] Grasslands can be understood over a gradient, according to the degree of naturalness and human intervention (e.g., seeding, mowing, fertiliser use) that influence their characteristics. Old-growth or **ancient grasslands** tend to hold higher values of ecological integrity.[36] At the other extreme, monospecific seeded grasslands are the result of complete transformation of the previous vegetation, resembling cultivated land rather than a natural ecosystem. The true status of some natural or old-growth grasslands have been mischaracterised when successional vegetation, shrub encroachment, or afforestation are seen as a natural or desirable future trajectory instead of processes of land degradation.[37]

Explanatory Note: The report utilizes "grasslands" as an ecosystem-based concept primarily defined by vegetation cover, while "rangelands" is employed as a land-use and land management concept as displayed in the conceptual framework (Figure 1). Rangelands are primarily defined by their use for grazing or gathering of feed, whether potential or actual,[38] and can comprise a mosaic of different ecosystems such as grasslands and savannahs, as well as shrublands, deserts, steppes, tundra, alpine vegetation, open forests, etc.[39] In addition, rangelands may encompass mixed land uses, including grazed crops and agroforestry systems.

Rangelands are most often used to raise livestock upon their grazing and water resources. **Grazing systems** are livestock-based production and land management systems that integrate the use of grazing with land resources in a specific socio-economic context.[40] Among them,

[32] Dixon, A.P., Faber-Langendoen, D., Josse, C., Morrison, J. and Loucks, C.J. (2014) 'Distribution mapping of world grassland types', *Journal of Biogeography*, 41(11), pp. 2003–2019. https://doi.org/10.1111/jbi.12381.

[33] Solbrig, O.T., Medina, E. and Silva, J.F. (1996) Ecological Studies, Vol 121. Biodiversity and Savana Ecosystem Processes - A global perspective. http://catalog.hathitrust.org/api/volumes/oclc/32970031.html.

[34] Solbrig, O.T. (1996) 'The Diversity of the Savanna Ecosystem', 121(1983), pp. 1–27. https://doi.org/10.1007/978-3-642-78969-4_1.

[35] Squires, V.R. (2018) *Grasslands of the World*, *Grasslands of the World*. Edited by V.R. Squires, J. Dengler, L. Hua, and H. Feng. CRC Press. https://doi.org/10.1201/9781315156125.

[36] Veldman, J.W., Buisson, E., Durigan, G., Fernandes, G.W., Le Stradic, S., Mahy, G., Negreiros, D., Overbeck, G.E., Veldman, R.G., Zaloumis, N.P., Putz, F.E. and Bond, W.J. (2015) 'Toward an old-growth concept for grasslands, savannas, and woodlands', Frontiers in Ecology and the Environment, 13(3), pp. 154–162. https://doi.org/10.1890/140270.

[37] Nerlekar, A.N. and Veldman, J.W. (2020) 'High plant diversity and slow assembly of old-growth grasslands', Proceedings of the National Academy of Sciences, 117(31), pp. 18550–18556. https://doi.org/10.1073/pnas.1922266117.

[38] Briske, D.D.D. (2017) 'Rangeland Systems:for a Conceptual Framework', in D.D. Briske (ed.) *Rangeland systems*. Cham: Springer Open (Springer Series on Environmental Management), p. Chapter 1. https://doi.org/10.1007/978-3-319-46709-2.

[39] Dudley, N., Petersen, I., Campari, J., Periago, M., Miñarro, F., Siqueira, C., Rincón, S., Rendón, E., Kauffman, M., Burns, A. and Pereladova, O. (2020) *Grassland and savannah ecosystems - An urgent need for conservation and sustainable management*. https://www.wwf.de/fileadmin/fm-wwf/Publikationen-PDF/WWF-Study-Grasslands-and-Savannah-Ecosystems.pdf.

[40] Allen, V.G., Batello, C., Berretta, E.J., Hodgson, J., Kothmann, M., Li, X., McIvor, J., Milne, J., Morris, C., Peeters, A. and Sanderson, M. (2011) 'An international terminology for grazing lands and grazing animals', *Grass and Forage Science*, 66(1), pp. 2–28. https://doi.org/10.1111/j.1365-2494.2010.00780.x.

pastoralist systems are based on mobile grazing animals.[41] **Pastoralism** encompasses the extensive production of herbivorous livestock using pasture or browse.[42] This definition is expanded to include any extensive system that dynamically manages livestock and land for economic, social, and environmental benefits,[43] going beyond livestock production to provide an identity and a way of life for pastoral communities.[44] Pastoralism encompasses a great diversity of production systems, cultures, knowledge pools, institutions, and heritages.[45] Different terms are used to describe pastoral systems and their features around the world, such as transhumance, nomadism, and rotational or regenerative grazing.[46]

Explanatory Note: The report uses "pastoralism" as a comprehensive term, encompassing the whole range of extensive livestock production systems that use and steward rangelands, including those that use rangelands as part of agropastoralism or agroforestry systems. Where pastoralism is used under a more restrictive scope, this is clearly indicated in the text.

Pastoralists refer to the individuals, households. and communities that practice pastoralism. Pastoralists raise sheep, goats, cattle, horses, camels, yaks, llamas, alpacas, and semi-domesticated species, such as vicuña, bison, caribou, and reindeer, from the artic to the tropics. Livestock herds are often mixed, with pastoralists rearing different species and breeds in the same production unit. Pastoralist communities manage their land, water, and other natural resources in a sustainable, independent, and flexible way, often characterised by rights to common resources and traditional or customary values that ensure the provision of ecosystem services. Pastoral livelihoods are diverse and influenced by socioecological stress, risk and uncertainties due to changing conditions of a social, political, economic and ecological nature.[47] Traditionally, pastoralists have reduced and overcome these constraints with resilience strategies and adaptive capacities.[48]

---

[41] Ayantunde, A.A., de Leeuw, J., Turner, M.D. and Said, M. (2011) 'Challenges of assessing the sustainability of (agro)-pastoral systems', *Livestock Science*, 139(1–2), pp. 30–43. https://doi.org/10.1016/j.livsci.2011.03.019.

[42] Davies, J., Niamir-Fuller, M. and Kerven, C. (2010) 'Extensive livestock production in transition: The Future of Sustainable Pastoralism', in Livestock in a Changing Landscape. Volume 1: Drivers, Consequences, and Responses, pp. 285–308. https://www.researchgate.net/publication/285360020_Extensive_livestock_production_in_transition_the_future_of_sustainable_pastoralism.

[43] Ouedraogo, R. and Davies, J. (2016) 'Enabling sustainable pastoralism: policies and investments that optimise livestock production and rangeland stewardship', *Revue Scientifique et Technique de l'OIE*, 35(2), pp. 619–630. https://doi.org/10.20506/rst.35.2.2544.

[44] Jenet, A., Buono, N., Di Lello, S., Gomarasca, M., Heine, C., Mason, S., Nori, M., Saavedra, R. and Van Troos, K. (2016) 'The Path to Greener Pastures: Pastoralism, the Backbone of the World's Drylands', *SSRN Electronic Journal*. Edited by P. Mundy, p. 140. https://doi.org/10.2139/ssrn.3888381.

[45] Zinsstag, J., Schelling, E., Bonfoh, B., Crump, L. and Krätli, S. (2016) A vision of the future of pastoralism, Revue Scientifique et Technique de l'OIE. Edited by J. Zinsstag, E. Schelling, and B. Bonfoh. World Organisation for Animal Health. https://doi.org/10.20506/rst.issue.35.2.2521 .

[46] Dong, S., Kassam, K.A.S., Tourrand, J.F. and Boone, R.B. (2016) Building Resilience of Human-Natural Systems of Pastoralism in the Developing World: Interdisciplinary Perspectives. Edited by S. Dong, K.-A.S. Kassam, J.F. Tourrand, and R.B. Boone. Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-30732-9.

[47] Muhammad, K., Mohammad, N., Abdullah, K., Mehmet, S., Ashfaq, A.K. and Wajid, R. (2019) 'Socio-political and ecological stresses on traditional pastoral systems: A review', *Journal of Geographical Sciences*, 29(10), pp. 1758–1770. https://doi.org/10.1007/s11442-019-1656-4.

[48] Nori, M. and Scoones, I. (2019) 'Pastoralism, Uncertainty and Resilience: Global Lessons from the Margins', *Pastoralism*, 9(1). https://doi.org/10.1186/s13570-019-0146-8.

Explanatory Note: The term "pastoralist", broadly used in the report, is often not recognised by pastoralists themselves, who may prefer to self-identify using other terms such as herders, shepherds, ranchers, producers, farmers, or other terms used in their respective countries and cultures. The report acknowledges all these identities and the diversity that underpins them but adopts the use of pastoralist as a comprehensive term to facilitate a global perspective and approach.

Pastoralist systems (and their management practices) are the only mechanism to ensure sustainable production in many rangelands. However, they are often mixed with other primary production systems under **agroforestry** and **agropastoral** systems, including the agricultural use of trees,[49] such as trees on farms, farming in forests and along forest margins, tree-crop production, **silvopastoralism**, and **agrosilvopastoralism**.[50] Accordingly, the conceptual framework applied in the report encompasses soil, water, trees, pastures, and livestock under coherent land management systems.[51]

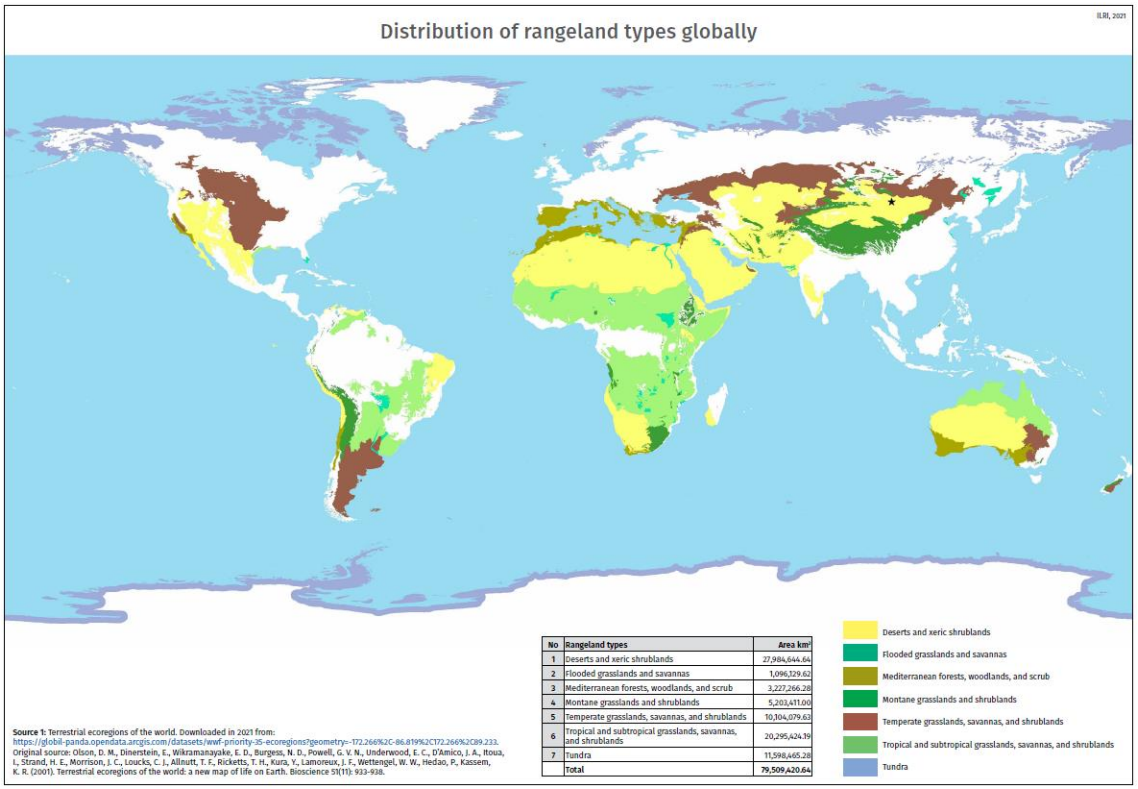
The complexity of management systems linked to rangelands demands a cautious approach to rangeland governance which refers to the result of relationships between formal and informal institutions, policies, rules, and practices that shape human and environmental interactions.[52] The report defines **land governance** as the outcome of factors and dynamics related to the interaction between people and land. The governance of rangelands is a pivotal issue that constitutes the foundation of many initiatives targeting rangelands and pastoralists.[53] The meaningful participation of all actors involved is necessary for sound rangeland governance, which must also foster the perception of tenure security, integration of traditional and scientific knowledge, inclusion of polycentric institutional arrangements, and application of adaptive management systems – all of which can improve the performance and sustainability of rangeland governance systems.[54]

[49] Nair, P.K.R., Kumar, B.M. and Nair, V.D. (2021) An Introduction to Agroforestry. Cham: Springer International Publishing. https://doi.org/10.1007/978-3-030-75358-0.
[50] Grebner, D.L. and Boston, K. (2022) *Introduction to Forestry and Natural Resources*, *(Second Edition), 2022*. Elsevier. https://doi.org/10.1016/C2018-0-05067-7.
[51] FAO (2022) *Grazing with trees*, *Grazing with trees*. FAO. https://doi.org/10.4060/cc2280en.
[52] Manzano, P., Burgas, D., Cadahía, L., Eronen, J.T., Fernández-Llamazares, Á., Bencherif, S., Holand, Ø., Seitsonen, O., Byambaa, B., Fortelius, M., Fernández-Giménez, M.E., Galvin, K.A., Cabeza, M. and Stenseth, N.C. (2021) 'Toward a holistic understanding of pastoralism', *One Earth*, 4(5), pp. 651–665. https://doi.org/10.1016/j.oneear.2021.04.012.
[53] Herrera, P.P.M., Davies, J. and Baena, P.P.M. (2014) The Governance of Rangelands. Routledge. https://doi.org/10.4324/9781315768014.
[54] Davies, J., Herrera, P.M., Ruiz-Mirazo, J., Mohamed-Katerere, J., Hannam, I. and Nuesiri, E. (2016) Improving governance of pastoral lands. FAO. https://www.fao.org/3/a-i5771e.pdf.

Chapter 2: Rangelands, pastoralism, and land degradation

Globally, rangelands cover 80 million square kilometres, over 54 per cent of the world's terrestrial surface, constituting the largest land-use type in the world. Of this, 78 per cent (around 62 million square kilometres) occur in the drylands, mainly in tropical and temperate latitudes. These are characterised by hyper-arid to sub-humid climates, indicating different degrees of water scarcity with aridity indices ranging from 0.05 to 0.65, respectively.[55] Many temperate rangelands, which also have water scarcity features, are often considered de facto drylands.[56]

Figure 1. Map of global rangelands according to ecoregions[57]



No	Rangeland types	Area km²
1	Deserts and xeric shrublands	27,984,644.64
2	Flooded grasslands and savannas	1,096,329.62
3	Mediterranean forests, woodlands, and scrub	3,227,266.28
4	Montane grasslands and shrublands	5,203,411.00
5	Temperate grasslands, savannas, and shrublands	10,104,079.63
6	Tropical and subtropical grasslands, savannas, and shrublands	20,295,424.39
7	Tundra	11,598,465.28
	Total	79,509,420.64

Source 1: Terrestrial ecoregions of the world. Downloaded in 2021 from: https://global-panda.opendata.arcgis.com/datasets/wwf-priority-25-ecoregions?geometry=-172.266%2C-86.819%2C172.266%2C89.233. Original source: Olson, D. M., Dinerstein, E., Wikramanayake, E. D., Burgess, N. D., Powell, G. V. N., Underwood, E. C., D'Amico, J. A., Itoua, I., Strand, H. E., Morrison, J. C., Loucks, C. J., Allnutt, T. F., Ricketts, T. H., Kura, Y., Lamoreux, J. F., Wettengel, W. W., Hedao, P., Kassem, K. R. (2001). Terrestrial ecoregions of the world: a new map of life on Earth. Bioscience 51(11): 933-938.

Rangelands are highly diverse -- biologically and culturally – and include a great range of biomes and ecosystems as presented in Table 1. They support the livelihoods of approximately 2 billion people[58] as the main source of forage for a wide range of livestock production systems based on grazing, browsing, and pasture management. According to the Rangelands Atlas, livestock production systems in rangelands cover 67 million square kilometres, 45 per cent of global terrestrial surface and 84 per cent of rangelands, almost half of which are in the drylands. Extensive livestock rearing is often the only sustainable type of land use in the rangelands.

[55] Nash, D.J., Middleton, N. and Thomas, D. (1999) 'World Atlas of Desertification', The Geographical Journal, 165(3), p. 325. https://doi.org/10.2307/3060449.

[56] FAO (2019) Trees, forests and land use in drylands: the first global assessment-Full report. FAO Forestry Paper No. 184. Rome, FAO Forestry Paper. https://www.fao.org/documents/card/es/c/ca7148en/

[57] ILRI, IUCN, FAO, WWF, UNEP and ILC (2021) *Rangelands Atlas*. Nairobi: ILRI. https://www.rangelandsdata.org/atlas/.

[58] Briske, D.D.D. (2017) *Rangeland systems*. Edited by D.D. Briske. Cham: Springer Open (Springer Series on Environmental Management). https://doi.org/10.1007/978-3-319-46709-2.

Rangelands are the source of 16 per cent of global food production and 70 per cent of feed for domestic herbivores, of greatest significance in Africa and South America.[59] Livestock provide food security and generate income for the majority of the 1.2 billion people living under the poverty threshold in developing countries. Moreover, pastoralism offers significant potential for poverty reduction and resilient livelihoods in rangeland areas.[60] Despite this potential, indigenous peoples and rural communities in developing countries, both pastoralists and agropastoralists, remain among the poorest and most marginalised in the world.[61]

Table 1: Rangeland extent according to biome[62]

Biome	*Rangeland cover (%)*
Deserts and xeric shrublands	35%
Tropical and subtropical grasslands, savannas and shrublands	26%
Temperate grasslands, savannas and shrublands	13%
Tundra	15%
Montane grasslands and shrublands	6%
Mediterranean forests, woodlands and scrub	4%
Flooded grasslands and savannas	1%

Rangelands are host to a multitude of economic, social, cultural and ecological values that are supported by ecosystem health and functionality.[63] This includes vital ecosystem services – locally and globally -- from provisioning and regulating to cultural and supporting services. Many scientific publications highlight the importance of pastoralist practices in preserving and managing those services.[64] Provisioning services, such food, feed, forage, and fibre, are widely acknowledged; however, rangelands are multifunctional and can produce a diversity of other goods and services.

Among the supporting services, rangelands hold exceptional biodiversity values, including being the habitats of numerous mammals and endangered species, and representing one third of all global biodiversity hotspots.[65] Protected areas in rangelands currently cover 9.5 million square kilometres or 12 per cent of the global rangelands. With respect to regulating services,

[59] Holechek, J.L. (2013) 'Global trends in population, energy use and climate: Implications for policy development, rangeland management and rangeland users', Rangeland Journal, 35(2), pp. 117–129. https://doi.org/10.1071/RJ12077.
[60] FAO (2018) Transforming the livestock sector through the Sustainable Development Goals. http://www.fao.org/3/CA1201EN/ca1201en.pdf.
[61] Grace, D., Lindahl, J., Wanyoike, F., Bett, B., Randolph, T. and Rich, K.M. (2017) 'Poor livestock keepers: ecosystem–poverty–health interactions', Philosophical Transactions of the Royal Society B: Biological Sciences, 372(1725), p. 20160166. https://doi.org/10.1098/rstb.2016.0166.
[62] ILRI, IUCN, FAO, WWF, UNEP and ILC (2021) Rangelands Atlas. Nairobi: ILRI. https://www.rangelandsdata.org/atlas/.
[63] Sala, O.E., Yahdjian, L., Havstad, K. and Aguiar, M.R. (2017) 'Rangeland Ecosystem Services : Nature ' s Supply and Humans ' Demand', in D.D. Briske (ed.) Rangeland systems, pp. 467–489. https://doi.org/10.1007/978-3-319-46709-2.
[64] Seid, M.A., Kuhn, N.J. and Fikre, T.Z. (2016) 'The role of pastoralism in regulating ecosystem services', OIE Revue Scientifique et Technique, 35(2), pp. 435–444. https://doi.org/10.20506/rst.35.2.2534.
[65] Davies, J. (2017) The land in drylands: Thriving in uncertainty through diversity. https://www.unccd.int/sites/default/files/2018-06/15.%20The%2BLand%2Bin%2BDrylands__J_Davies.pdf

rangelands make up about 30 per cent of the global carbon pool,[66] [67] and account for most of the interannual variability in the global carbon sink.[68]

The value of cultural services and heritage within rangelands is noteworthy. Rangelands are home to 24 per cent of all languages and host numerous world heritage sites recognizing their unique landscapes and cultures with their store of traditional knowledge -- a critical source of information to replicate and scale SLM in the rangelands.[69] Rangelands continue to shape the culture, knowledge, world vision, and sense of purpose of pastoralists and other communities, contributing to their identity and value systems.

The effective governance of rangelands requires a better understanding of their dynamics, capacity, and the future supply and demand for their ecosystem services. There has been a recent shift from the unchecked demand for the goods that rangelands can provide to policies and regulations that recognize and value the wide range of services for communities and cultures.[70] The challenge is to ensure supply meets demand while addressing the synergies and trade-offs under transdisciplinary and multi-actor frameworks.

2.1 Rangeland degradation

Although there are different definitions and approaches to rangeland degradation,[71] they all point to the persistent deterioration of rangeland health which manifests in their reduced capacity to deliver ecosystem goods and services.

Land and livestock management, together with climate change and biodiversity loss, are the direct drivers of rangeland degradation. The consequences of human activities, namely overexploitation, often result in the loss and fragmentation of grass cover; declining soil fertility due to nutrient depletion as well as soil erosion, salinisation, alkalinisation, compaction, and crusting; water scarcity and moisture fluctuations; the loss of biodiversity above and below ground; or a combination of these.[72]

The indirect drivers fuelling rangeland degradation are population growth and the rapidly increasing demand for food, fibre, and fuel, along with land governance, policy and regulation,

---

[66] Parton, W.J., Scurlock, J.M.O., Ojima, D.S., Schimel, D.S. and Hall, D.O. (1995) 'Impact of climate change on grassland production and soil carbon worldwide', Global Change Biology, 1(1), pp. 13–22. https://doi.org/10.1111/j.1365-2486.1995.tb00002.x.

[67] MEA, (2015) Ecosystems and Human Well-being: Synthesis., ZooKeys. Washington DC: Island Press. https://www.millenniumassessment.org/documents/document.356.aspx.pdf. .

[68] Ahlström, A., Raupach, M.R., Schurgers, G., Smith, B., Arneth, A., Jung, M., Reichstein, M., Canadell, J.G., Friedlingstein, P., Jain, A.K., Kato, E., Poulter, B., Sitch, S., Stocker, B.D., Viovy, N., Wang, Y.P., Wiltshire, A., Zaehle, S. and Zeng, N. (2015) 'The dominant role of semi-arid ecosystems in the trend and variability of the land CO 2 sink', Science, 348(6237), pp. 895–899. https://doi.org/10.1126/science.aaa1668.

[69] Karl, J.W. (2011) 'Turning information into knowledge for rangeland management', *Rangelands*, 33(4), pp. 3–5. https://doi.org/10.2111/1551-501X-33.4.3.

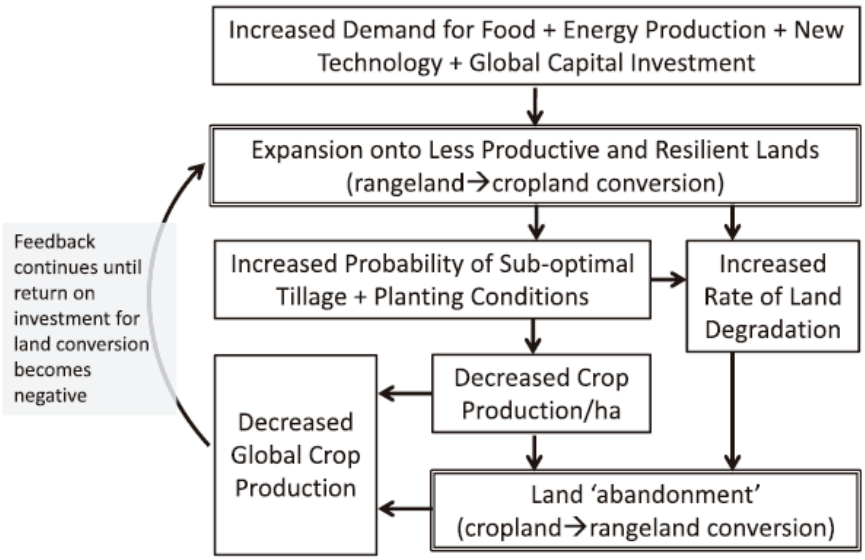
[70] Yahdjian, L., Sala, O.E. and Havstad, K.M. (2015) 'Rangeland ecosystem services: Shifting focus from supply to reconciling supply and demand', Frontiers in Ecology and the Environment, 13(1), pp. 44–51. https://doi.org/10.1890/140156.

[71] Bolo, P., Sommer, R., Kihara, J., Kinyua, M., Nyawira, S. and Notenbaert, A. (2019) 'Rangeland Degradation: Causes, Consequences, Monitoring Techniques and Remedies', CGIAR Working Paper, p. 23. https://hdl.handle.net/10568/102393.

[72] Angerer, J.P., Fox, W.E. and Wolfe, J.E. (2016) 'Land Degradation in Rangeland Ecosystems', in Biological and Environmental Hazards, Risks, and Disasters. Elsevier, pp. 277–311. https://doi.org/10.1016/B978-0-12-394847-2.00017-6.

new technologies, and the impact of capital and investment.[73] These are the same drivers causing global changes in land use across all biomes and ecosystems. The paradox is that efforts to increase food security and land productivity have converted millions of hectares of rangelands to crop production, triggering land degradation and resulting in decreasing yields as depicted in Figure 2.

Figure 2. Feedback cycle of rangeland degradation[74]



Globally, there are significant divergences in the assessments of land degradation, its extent and degree. The most reliable sources estimate that 25 per cent of global land is highly degraded, 36 per cent moderately degraded but stable, and 10 per cent showing improved land potential indicators.[75] Translating this data into economic terms, land degradation results in the loss of 10–17 per cent of global gross domestic product (GDP) every year.[76]

The estimates of rangeland degradation have changed over time as they reflect the progress made in the understanding of rangeland dynamics, definitions, indicators, assessment tools, management systems and land uses.[77] There are still critical gaps in the knowledge and

[73] Angerer, J.P., Fox, W.E., Wolfe, J.E., Tolleson, D.R. and Owen, T. (2023) Land degradation in rangeland ecosystems, Biological and Environmental Hazards, Risks, and Disasters. Angerer et al., 2023, "Land degradation in rangeland ecosystems", In Sivanpillai and Schroder (eds). "Biological and Environmental Hazards, Risks, and Disasters". https://doi.org/10.1016/b978-0-12-820509-9.00007-1.

[74] Herrick, J.E., Brown, J.R., Bestelmeyer, B.T., Andrews, S.S., Baldi, G., Davies, J., Duniway, M., Havstad, K.M., Karl, J.W., Karlen, D.L., Peters, D.P.C., Quinton, J.N., Riginos, C., Shaver, P.L., Steinaker, D. and Twomlow, S. (2012) 'Revolutionary land use change in the 21st century: Is (Rangeland) science relevant?', Rangeland Ecology and Management, 65(6), pp. 590–598. https://doi.org/10.2111/REM-D-11-00186.1.

[75] FAO (2011) The State of the World's Land and Water Resources for Food and Agriculture (SOLAW)–Managing Systems at Risk, http://www.fao.org/3/i1688e/i1688e.pdf. .

[76] ELD (2015) The value of land: Prosperous lands and positive rewards through sustainable land management, ELD Initiative. ELD Initiative. https://www.eld-initiative.org/fileadmin/ELD_Filter_Tool/Publication_The_Value_of_Land__Reviewed_/ELD-main-report_en_10_web_72dpi.pdf.

[77] Onyango, V., Davies, J., Sharpe, N., Maiga, S.I., Ogali, C., Perez-Rocha, J. and Isakov, A. (2021) *Land degradation neutrality:* A rationale for using participatory approaches to monitor and assess rangeland health. FAO and IUCN. https://doi.org/10.4060/cb6131en.

interpretation of rangeland dynamics (e.g., related to economic analysis, carbon pools, water cycle regulation, shrub encroachment).[78]

The first global rangeland assessment undertaken in the early 1990's found that 73 per cent of the world's rangeland "degraded".[79] This was widely contested due to a lack of field data to measure and verify rangeland degradation accurately. Moreover, in the last few decades there has been a strong push to adopt a more holistic approach which integrates the use of traditional knowledge.[80] More recently, estimates of rangeland degradation have declined,[81] with some indicating only about 20 per cent of rangelands experiencing negative trends. Many are now concerned that these assessments are too conservative and significantly underestimate the actual loss of rangeland health and productivity.[82]

Land degradation poses a significant global threat to rangelands and their communities,[83] taking a heavy toll on pastoralists by undermining their access to, and the provision of, the natural resources needed to sustain their lives and livelihoods. Rangeland degradation reduces income, productivity, and mobility which has negative implications for human and animal health with the potential of increasing conflict over increasingly scarce land and water resources. These impacts are differentiated across households, communities, and regions, disproportionately affecting marginalised or disenfranchised groups, such as women, youth, and indigenous communities. Rangeland degradation can also has far reaching impacts due to hydrological disturbances, becoming sources of sand and dust storms, and the loss of ecosystem services that disadvantage the wider landscape.

2.2 Monitoring rangeland health and degradation trends

Historical trends in land use, coupled with internal stress and external pressures keep rangelands in a continuous change mode making it difficult to assess their degradation status. In addition to political commitments and corresponding actions to halt further rangeland degradation, a global framework is required to assist countries and communities in designing a monitoring and implementation approach that is specific to local circumstances.

One way to address the worrying trends in rangeland health is to organize the key underlying factors of degradation into a conceptual framework that addresses socioecological processes in the rangelands. Like human health,[84] rangeland health is shaped by many causes, drivers,

78 missing

[79] Dregne, H.E., Kassas, M. and Rozanov, B. (1991) 'A new assessment of the world status of desertification', Desertification Control Bulletin, pp. 6–19. https://m-d.me/docs/dregne91_a%20new%20assessment%20of%20the%20world%20status%20of%20desertification.pdf .

[80] Behmanesh, B., Barani, H., Abedi Sarvestani, A., Reza Shahraki, M. and Sharafatmandrad, M. (2016) 'Rangeland degradation assessment: A new strategy based on the ecological knowledge of indigenous pastoralists', *Solid Earth*, 7(2), pp. 611–619. https://doi.org/10.5194/se-7-611-2016.

[81] Jamsranjav, C., Reid, R.S., Fernández-Giménez, M.E., Tsevlee, A., Yadamsuren, B. and Heiner, M. (2018) 'Applying a dryland degradation framework for rangelands: the case of Mongolia', Ecological Applications, 28(3), pp. 622–642. https://doi.org/10.1002/eap.1684.

[82] Mussa, M., Hashim, H. and Teha, M. (2016) 'Rangeland degradation: Extent, impacts, and alternative restoration techniques in the rangelands of Ethiopia', Tropical and Subtropical Agroecosystems, 19(3), pp. 305–318. https://www.revista.ccba.uady.mx/ojs/index.php/TSA/article/view/2234/1034.

83 missing

[84] Ludwig, J.A. and Bastin, G.N. (2008) 'Rangeland condition: its meaning and use', A Discussion Paper prepared for the Australian Collaborative Rangelands Information System (ACRIS) Management

and symptoms, highly variable in the different locations and contexts worldwide. Assessing landscape function is one way to monitor degradation and track subsequent recovery. This involves creating indices based on simple field indicators that reflect the key attributes of rangelands,[85] and which can be arranged in a comprehensive framework as displayed in Table 2.

Table 2: Three attributes and 17 indicators used by USDA to assess rangeland health[86]

<table>
<tr><th>Soil/site stability</th><th>Hydrologic function</th><th>Biotic integrity</th></tr>
<tr><td colspan="2">1. Rills</td><td>12. Functional/structural groups</td></tr>
<tr><td colspan="2">2. Waterflow patterns</td><td>13. Dead or dying plants or plant parts</td></tr>
<tr><td colspan="2">3. Pedestals and/or terracettes</td><td>15. Annual production</td></tr>
<tr><td colspan="2">4. Bare ground</td><td rowspan="2">16. Invasive plants</td></tr>
<tr><td colspan="2">5.Gullies</td></tr>
<tr><td>6. Wind-scoured and/or depositional areas</td><td colspan="2">14. Litter cover and depth</td></tr>
<tr><td>7. Litter movement</td><td>10. Effects of plant community composition and distribution on infiltration</td><td>17. Vigor with an emphasis on reproductive capability of perennial plants</td></tr>
<tr><td colspan="3">8. Soil surface resistance to erosion</td></tr>
<tr><td colspan="3">9. Soil surface loss and degradation</td></tr>
<tr><td colspan="3">11. Compaction layer</td></tr>
</table>

It is important to understand that no general assessment methodology of rangeland health is uniformly applicable to all situations. While this framework is somewhat flexible and can be tailored for differing contexts, it is focused exclusively on biophysical indicators and must be accompanied with an understanding of land governance and management practices to get a complete picture of rangeland health and to design effective solutions.

The rangeland health framework shown in Figure 3 constitutes a steppingstone in the process to build a conceptual framework for the report, by incorporating rangeland degradation and its possible solutions. The graphic follows the Drivers, Pressures, State, Impact, and Response (DPSIR) model[87] to improve its comprehension and allow for technical adjustments while the analogy to human health remains useful.

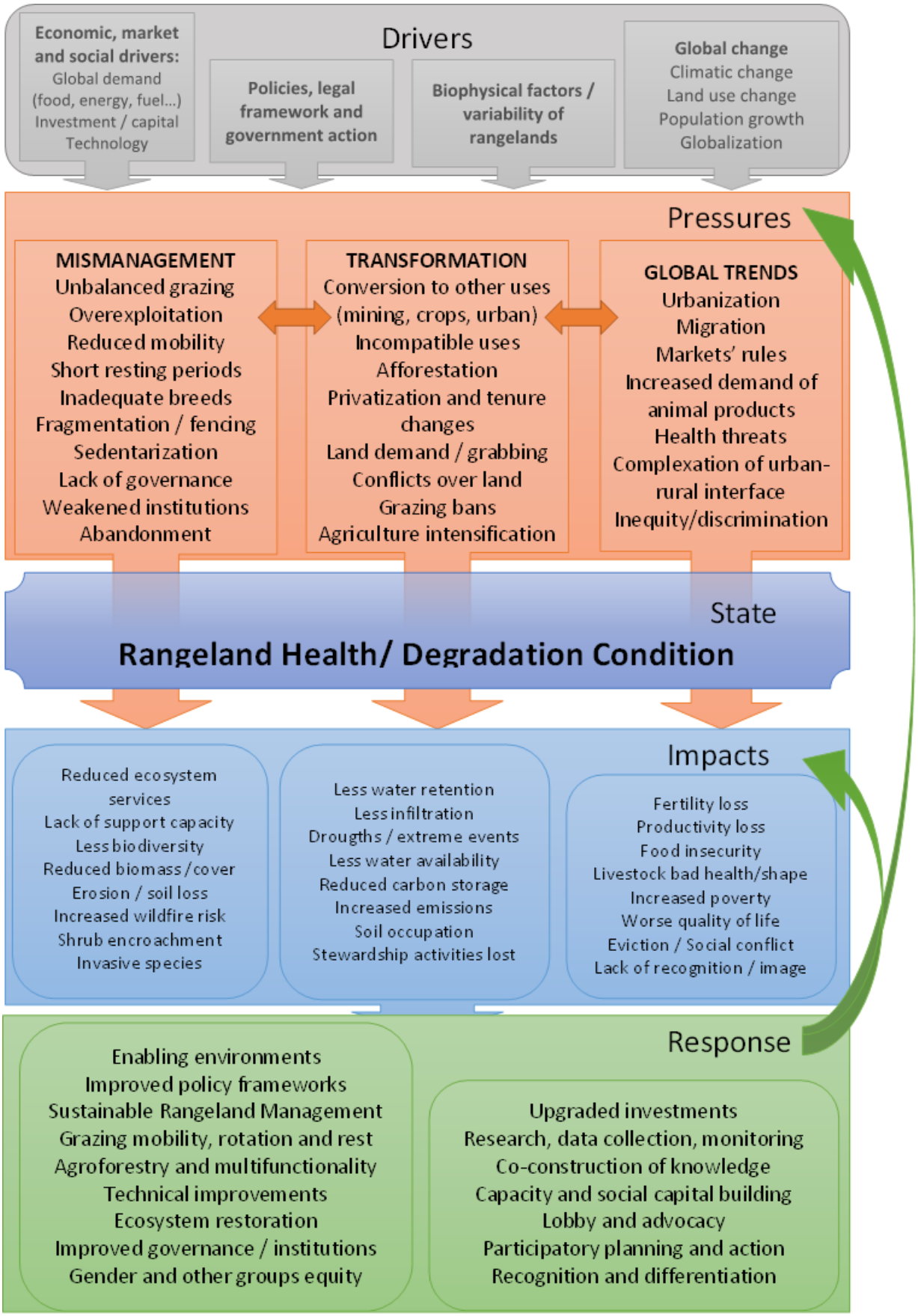
Figure 3: DPSIR model of rangeland health and degradation status

Committee, p. 87. https://www.dcceew.gov.au/sites/default/files/documents/rangeland-condition-meaning-use.pdf.

[85] Tongway, D. and Hindley, N. (2004) 'LANDSCAPE FUNCTION ANALYSIS : With special reference to Minesites and Rangelands', Cisro sustainable ecosystems, (January), pp. 2–80. https://www.researchgate.net/publication/238748160.

[86] Pellant, M., Shaver, P.L., Pyke, D.A., Herrick, J.E., Lepak, N., Riegel, G., Kachergis, E., Newingham, B.A., Toledo, D. and Busby, F.E. (2020) Interpreting Indicators of Rangeland Health. https://www.nrcs.usda.gov/sites/default/files/2022-06/Interpreting_Indicators_1734-6_ver5_08272020%20%281%29.pdf .

[87] Burkhard, B. and Müller, F. (2008) 'Driver–Pressure–State–Impact–Response', Ecological Indicators, 2, pp. 967–970. http://www.sciencedirect.com/science/article/pii/B9780080454054001294.


Drivers
Economic, market and social drivers:
Global demand (food, energy, fuel...)
Investment / capital
Technology
Policies, legal framework and government action
Biophysical factors / variability of rangelands
Global change
Climatic change
Land use change
Population growth
Globalization
Pressures
MISMANAGEMENT
Unbalanced grazing
Overexploitation
Reduced mobility
Short resting periods
Inadequate breeds
Fragmentation / fencing
Sedentarization
Lack of governance
Weakened institutions
Abandonment
TRANSFORMATION
Conversion to other uses (mining, crops, urban)
Incompatible uses
Afforestation
Privatization and tenure changes
Land demand / grabbing
Conflicts over land
Grazing bans
Agriculture intensification
GLOBAL TRENDS
Urbanization
Migration
Markets' rules
Increased demand of animal products
Health threats
Complexation of urban-rural interface
Inequity/discrimination
State
Rangeland Health/ Degradation Condition
Impacts
Reduced ecosystem services
Lack of support capacity
Less biodiversity
Reduced biomass / cover
Erosion / soil loss
Increased wildfire risk
Shrub encroachment
Invasive species
Less water retention
Less infiltration
Drougths / extreme events
Less water availability
Reduced carbon storage
Increased emissions
Soil occupation
Stewardship activities lost
Fertility loss
Productivity loss
Food insecurity
Livestock bad health/shape
Increased poverty
Worse quality of life
Eviction / Social conflict
Lack of recognition / image
Response
Enabling environments
Improved policy frameworks
Sustainable Rangeland Management
Grazing mobility, rotation and rest
Agroforestry and multifunctionality
Technical improvements
Ecosystem restoration
Improved governance / institutions
Gender and other groups equity
Upgraded investments
Research, data collection, monitoring
Co-construction of knowledge
Capacity and social capital building
Lobby and advocacy
Participatory planning and action
Recognition and differentiation

475

476

Technical interventions to address rangeland degradation through sustainable management and restoration activities are widely available and supported by evidence. However, there is a need to adjust the level and scale to effectively support pastoralists and other stakeholders. Participatory and multi-actor schemes help ensure the inclusion of all actors involved in planning, design, implementation, and monitoring. There are numerous manuals and guidelines which offer a range of technical measures to reverse degradation trends, such as revegetation; water management; soil treatment; rotational grazing; seasonal mobility; silvopastoral systems; enclosures; prescribed fire; etc.[88] These are highlighted in the case studies and have an important role in operationalising the framework, recognizing that their effective use is dependent on the soundness of the entire project or programme.

2.3 Towards a new conceptual framework for rangelands and pastoralism

Rangelands are associated with their actual or potential use for grazing and, thus, are mostly managed lands. Raising livestock is a critical but not exclusive activity in the rangelands, which can offer other productive, cultural and social benefits. The multifunctionality of rangelands is typical of complex socioecological systems which demand sound management mechanisms and commited people behind them.[89] The report emphasises the development of policy and implementation mechanisms under sustainable rangeland management and restoration approaches. This is supported by the design of a conceptual framework (Figure 4) where the elements and relationships shaping rangelands are organized in an interactive way, pointing to a multifunctional approach that links rangelands and their management systems.

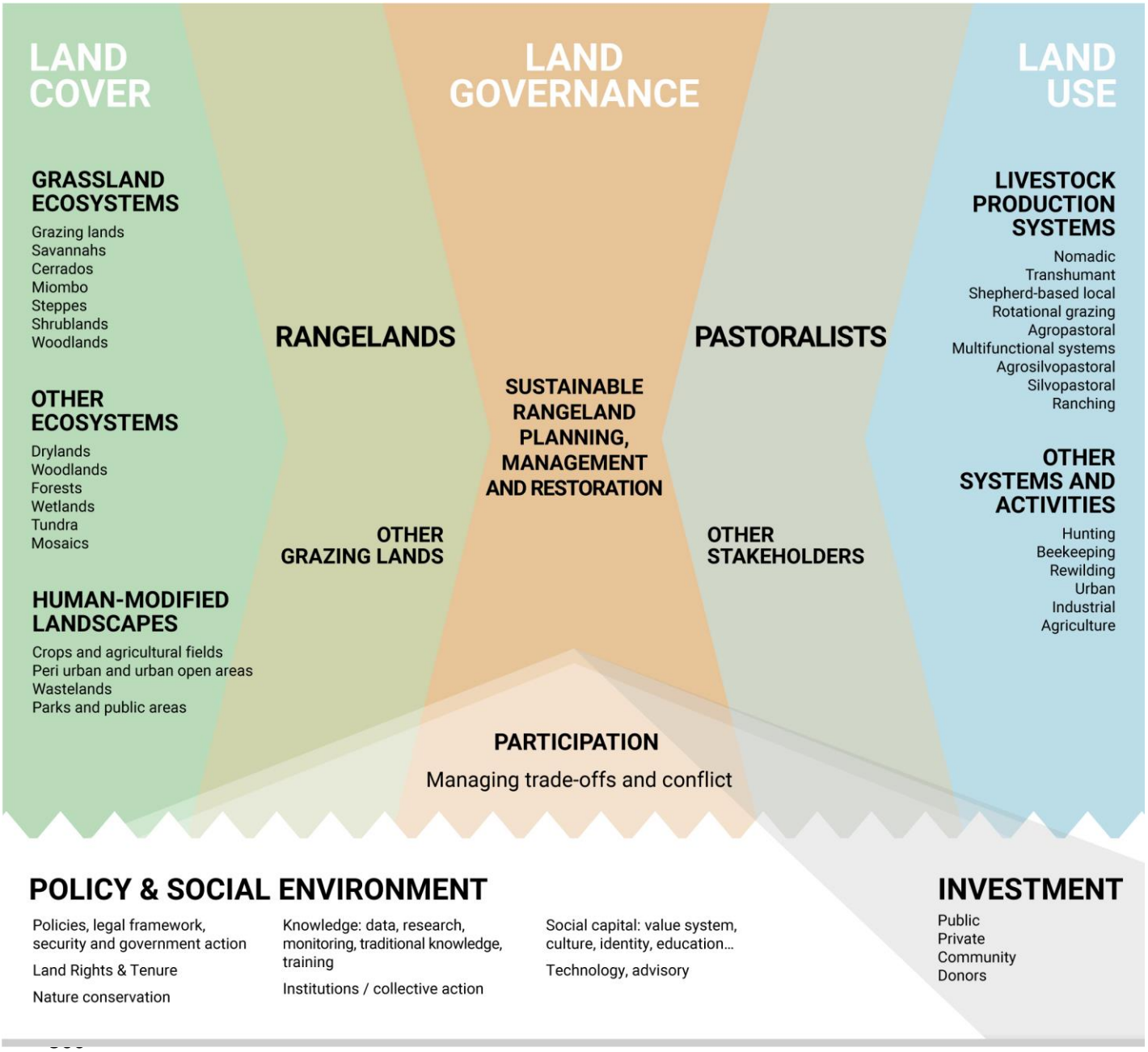
Although pastoralists and rangelands are separately arranged, the framework shows how they are intimately linked in the same socioecological system. Thus, a systemic approach is crucial to understand and sustainably manage rangelands under pastoralist systems. Beyond just land users, pastoralist communities have actually been, and still are, stewards of rangelands.[90] They often bear the ultimate responsibility for and consequences of their management. The participation of other users and stakeholders in rangeland governance is important, and can be quite beneficial, but pastoralists must be prioritised to sustinably manage and restore rangelands.

Figure 4. Socio-ecological conceptual framework in the context of rangeland management and restoration

[88] Bolo, P., Sommer, R., Kihara, J., Kinyua, M., Nyawira, S. and Notenbaert, A. (2019) 'Rangeland Degradation: Causes, Consequences, Monitoring Techniques and Remedies', CGIAR Working Paper, p. 23 https://hdl.handle.net/10568/102393.

[89] Ickowicz, A., Hubert, B., Blanchard, M., Blanfort, V., Cesaro, J.D., Diaw, A., Lasseur, J., Thi Thanh Huyen, L., Li, L., Mauricio, R.M., Cangussu, M., Müller, J.P., Quiroga Mendiola, M., Quiroga Roger, J., Vera, T.A., Ulambayar, T. and Wedderburn, L. (2022) 'Multifunctionality and diversity of livestock grazing systems for sustainable food systems throughout the world: Are there learning opportunities for Europe?', Grass and Forage Science, 77(4), pp. 282–294. https://doi.org/10.1111/gfs.12588.

[90] Lucatello, S., Huber-Sannwald, E., Espejel, I. and Martínez-Tagüeña, N. (2020) Stewardship of Future Drylands and Climate Change in the Global South. Edited by Simone Lucatello, Elisabeth Huber-Sannwald, Ileana Espejel, and Natalia Martínez-Tagüeña. Cham: Springer International Publishing (Springer Climate). https://doi.org/10.1007/978-3-030-22464-6.



507

508 The complex network of relationships between these elements in diverse political and social
509 environments shapes the use and management of rangelands. Addressing governance opens
510 the scope to the whole territory and to all stakeholders involved, a prerequisite for meeting
511 the global objectives addressed by the report.[91]

512 The conceptual framework designed in Figure 4, complemented with the rangeland health
513 framework depicted in Figure 3, also addresses the development of a global effort supporting
514 rangelands, at the same time contributing to organise the initiatives at national and local
515 scales. As most rangelands share several of the features shown, regional, national, and local
516 approaches and contexts can inform a global support framework. While there may be generic

[91] Davies, J., Herrera, P.M., Ruiz-Mirazo, J., Mohamed-Katerere, J., Hannam, I. and Nuesiri, E. (2016) Improving governance of pastoral lands. FAO. https://www.fao.org/3/a-i5771e.pdf

517 strategies, case studies can help elaborate the adjustments in and particularities of specific
518 response measures, management systems and governance approaches used by those
519 initiatives.

Chapter 3: Mobilising support for a new rangeland paradigm

Targeted and sustained investments can make a substantial contribution to improved rangeland health worldwide by financing projects and programmes that promote the conservation, sustainable management, and restoration of rangelands. Chapter 2 provided the conceptual framework that can be used to guide decision-makers in designing effective approaches and strategies that can be tailored to local circumstances.

Evidence shows that successful SRLM and restoration projects and programmes have several common elements. These include: 1) the meaningful participation of all relevant stakeholders in the planning, design, implementation, and monitoring stages; 2) the establishment of clear goals and measurable ecological and socioeconomic objectives;[92] 3) the space for innovation and adaptative management; and 4) the use of qualitative and quantitative data and information for monitoring, evaluation, and communications. With examples from all regions of the world, Chapter 4 conclusively demonstrates the untapped potential of rangeland projects and programmes to provide multiple co-benefits for people, nature, and the climate.

Even when these elements are incorporated in SRLM and restoration projects and programmes, the specific challenges and complexities of rangelands and pastoralism result in an alarmingly high rate of failure.[93] This is not unique to the rangelands, especially considering the unequal power dynamics associated with land and natural resources that often marginalise rural communities. As with nature conservation, project and programme managers must be proactive, undertake systematic analyses, and implement strategies that facilitate learning from these failures rather than seeking to mechanically replicate actions that were successful in very different contexts.[94]

[92] Petursdottir, T., Aradottir, A.L., Baker, S., Halldorsson, G. and Sonneveld, B. (2017) 'Successes and Failures in Rangeland Restoration: An Icelandic Case Study', Land Degradation and Development, 28(1), pp. 34–45. https://doi.org/10.1002/ldr.2579.

[93] IFAD (2018) *How to do Engaging with pastoralists* –. IFAD. https://www.ifad.org/en/web/knowledge/-/publication/toolkit-engaging-with-pastoralists-a-holistic-development-approach.

[94] Catalano, A.S., Lyons-White, J., Mills, M.M. and Knight, A.T. (2019) 'Learning from published project failures in conservation', Biological Conservation, 238(April), p. 108223. https://doi.org/10.1016/j.biocon.2019.108223.

The systematic analysis of pastoral projects and programmes was common during the 1990s and 2000s,[95] [96] [97] [98] but later diminished significantly with some notable exceptions.[99] [100] [101] As a result and despite efforts to support and guide new initiatives,[102] there is limited evidence of the main constraints that these projects and programmes encountered. While there is an increasing attention and literature devoted to the context and conceptual understandings, much less has been reported on the technical aspects of rangeland initiatives.

This chapter addresses both the conceptual underpinning and technical aspects of projects and programmes with the aim to analyse the key issues contained in the conceptual framework of the report (Figure 4), while providing a critical historical perspective and offering tools that can enhance the success of current and future rangeland projects and investments.

3.1 A historical perspective

History provides a first approach to learn about the evolution of rangeland and pastoralist projects and programmes. Although the perspectives on pastoralism, rangelands, and rural development have evolved considerably over the past 50 years, current initiatives tend to perpetuate misconceptions that persist in their approaches and strategies.

In the 1950s and the 1960s, livestock and rangeland projects and programmes were focused primarily on technical improvements in production systems (e.g., industrial breeds, forage production, groundwater extraction, veterinary advances) with the exclusive aim of modernisation that often overlooked the value of pastoral livelihoods and management systems.

In the 1970s, pastoralism began to gain recognition. However, the attention was still centred on how to transform pastoralist livelihoods through settlement and modernisation to eradicate traditional lifestyles. For newly born states, the priorities, much like those of their colonial predecessors, were focused on efforts to assert their authority, fix borders, and reduce conflict. Investments were directed towards infrastructure, technical assistance on

[95] Haan, C. de (1994) 'An overview of the World Bank's involvement in pastoral development', (December), pp. 1–23. https://cdn.odi.org/media/documents/5431.pdf.
[96] Hjort, A. (1976) 'Constraints on Pastoralism in Drylands. Oikos Editorial Office. Chapter 5 'Constraints on pastoralism in drylands', (24), pp. 71–82. http://www.jstor.org/stable/20112541 .
[97] Prior, J. (1994) Pastoral development planning, Paper Knowledge . Toward a Media History of Documents. Edited by Oxfam development guidelines. Oxfam. https://www.nzdl.org/cgi-bin/library?e=d-00000-00---off-0hdl--00-0----0-10-0---0---0direct-10---4-------0-0l--11-en-50---20-about---00-0-1-00-0--4----0-0-11-10-0utfZz-8-00&cl=CL1.14&d=HASH969c8b05beaa7fab629f6a.5.2&gt=1 .
[98] Hogg, R. (1992) 'NGOs, pastoralists and the myth of community: three case studies of pastoral development from East Africa', Nomadic Peoples, 30(30), pp. 122–146. http://www.jstor.org/stable/43123362.
[99] FAO and IFAD (2016) FAO's and IFAD's Engagement in Pastoral Development: Joint Evaluation Synthesis. https://ioe.ifad.org/documents/38714182/39720979/pastoral_dvp.pdf
[100] Wanyoike, F. and Baker, D. (2013) 'Pro-poor development performance of livestock projects: analysis and lessons from projects' documentation', Development in Practice, 23(7), pp. 889–907. https://doi.org/10.1080/09614524.2013.811470.
[101] Nori, M. (2009) 'Milking drylands: gender networks, pastoral markets and food security in stateless Somalia.', p. 229 pp. https://edepot.wur.nl/51717
[102] IFAD (2018) 'Lessons learned. Engaging with pastoralists – A holistic Development Approach'. https://www.ifad.org/documents/38714170/41028748/Pastoralism_LL.pdf.

animal health, production methods, and marketing under an overall strategy of intensification.[103]

In the last decades of the 20th century, rangeland management gradually shifted its approach with projects and programmes aiming to create grazing reserves, reduce herd sizes, promote group ranching, and improve land governance and tenure security. The scientific understanding of rangeland functioning has also improved, while many outdated colonial perceptions receded. This change in paradigm has important implications for SRLM and restoration which have yet to be fully realised, especially when targeting poverty or sustainability issues.

Since the 2010s, methodologies, analytical tools, and good practices have not matched the steady pace of improvement in conceptual frameworks. Managers involved in rangeland and pastoralist initiatives need practical applications that correspond with the new, updated frameworks.[104] While it is increasingly mainstream to promote community based SRLM and restoration projects and programmes under an adaptable non-equilibrium approach,[105] many historical flaws and concerns remain.[106]

States continue to try to control pastoral lands, especially in border or conflict areas, where pastoralists used to move freely. At the same time, the most substantial investments are aimed at projects and programmes that transform rangelands into large-scale irrigated agriculture, renewable energy projects, and even protected areas. Legal frameworks, development plans, and private investments are driving these transformations, while debates on land grabs or free, prior and informed consent around investment in pastoral areas are often ignored or given only token attention.[107] As a result, pastoralists and other rangeland stakeholders are often excluded from projects and programmes, distanced from their land and cultural identity, or forced to abandon their traditional livelihoods.

3.2 Learning from the past

The report emphasises two key means to address the shortcomings of the past. The first is that pastoralism and extensive livestock production needs to be fully considered in projects and programmes targeting the rangelands.[108] While pastoralism is not the only human activity on rangelands, it is a critical one to consider. Failure to do so will often reduce the efficiency and effectiveness of a wide range of rangeland initiatives that aim to boost their health and

[103] Scoones, I., Lind, J., Maru, N., Nori, M., Pappagallo, L., Shariff, T., Simula, G., Swift, J., Taye, M. and Tsering, P. (2020) 'Pastoralism and development: Fifty years of dynamic change', *IDS Bulletin*, 51(1), pp. 1–20. https://bulletin.ids.ac.uk/index.php/idsbo/issue/view/243

[104] Krätli, S., Kaufmann, B., Roba, H., Hiernaux, P. and ... (2015) *A house full of trap doors*, *Identifying barriers to resilient drylands in the toolbox of pastoral development …*. https://pubs.iied.org/pdfs/10112IIED.pdf.

[105] Scoones, I. (2021) 'Beyond the "balance of nature": Pastoralists' alternative perspectives on sustainability', *Nomadic Peoples*, 25(1), pp. 114–117. https://doi.org/10.3197/np.2021.250110.

[106] Coppock, D.L., Crowley, L., Durham, S.L., Groves, D., Jamison, J.C., Karlan, D., Norton, B.E. and Ramsey, R.D. (2022) 'Community-based rangeland management in Namibia improves resource governance but not environmental and economic outcomes', *Communications Earth and Environment*, 3(1). https://doi.org/10.1038/s43247-022-00361-5.

[107] Davies, J., Herrera, P.M., Ruiz-Mirazo, J., Mohamed-Katerere, J., Hannam, I. and Nuesiri, E. (2016) *Improving governance of pastoral lands*. FAO. https://www.fao.org/3/a-i5771e.pdf.

[108] Zerga, B. (2015) 'Rangeland degradation and restoration: A global perspective', Point Journal of Agriculture and Biotechnology Research, 1(2), pp. 037–054. http://www.pjournals.org/PJABR.

productivity,[109] such as those focused on rural development,[110] nature conservation,[111] or restoration.[112]

A siloed approach to rangeland management and restoration is often inefficient and even counterproductive, such as when a project targets biodiversity conservation applying methods that do not integrate livestock production.[113] Strategies that overlook the role of grazing and instead focus just on other good practices (e.g., exclosures, seeding, beekeeping) are often insufficient to address rangeland degradation.[114] [115] [116] It is important to recognize that pastoralism can directly and indirectly accelerate progress to land restoration targets, for example, by enhancing ecological connectivity through the preservation of traditional transhumance routes.

The second key means to learn from the past is to build bridges and address the tension between conservation perspectives (e.g., ecosystem-based approaches to large-scale restoration) and management-based approaches seeking to improve livelihoods and production systems in rangelands. These perspectives are not only compatible but complementary as they both draw on SRLM and restoration practices and necessitate the participation of local communities. With an appropriate and flexible management system, trade-offs can be minimised, returns on investment maximized, and socioeconomic goals achieved.

3.3 Addressing common failures in the design of rangeland initiatives

A first means to improve the way rangelands and pastoralism projects are formulated is to ensure that a proper conceptual background is used in project formulation. Table 3 lists common conceptual flaws in the design of projects and programmes involving rangelands and pastoral communities, many of which are linked to external or global pressures. The

[109] Barrow, E. (2022) Pastoralists — the solution to sustainable dry landscape management, yet undermined and seen as the " problem ". https://rightsandresources.org/wp-content/uploads/Pastoralists—the-solution-to-sustainable-dry-landscape-management-yet-undermined-and-seen-as-the-problem.pdf.

[110] Liniger, H. and Studer, R.M. (2019) Sustainable rangeland management in Sub-Saharan Africa, http://www.fao.org/agroecology/database/detail/en/c/1198899/.

[111] Toit, J.T., Cross, P.C. and Valeix, M. (2017) *Rangeland Systems*. Edited by D.D. Briske. Cham: Springer International Publishing (Springer Series on Environmental Management). https://doi.org/10.1007/978-3-319-46709-2.

[112] Matela, S. and McLeod, N. (2014) 'RANGELAND RESTORATION model summary + toolkit guide'. https://wedocs.unep.org/handle/20.500.11822/33292.

[113] Freese, C.H., Fuhlendorf, S.D. and Kunkel, K. (2014) 'A Management Framework for the Transition from Livestock Production toward Biodiversity Conservation on Great Plains Rangelands', *Ecological Restoration*, 32(4), pp. 358–368. https://doi.org/10.3368/er.32.4.358.

[114] Squires, V.R., Gaur, M. and Ariapour, A. (2022) 'Land Degradation Neutrality in the World's Rangelands: Contemporary Approaches to Old Problems Using New Solutions', *Journal of Rangeland Science*, 12(3), pp. 308–321. https://doi.org/10.30495/rs.2022.684639.

[115] Allen, C.R., Angeler, D.G., Fontaine, J.J., Garmestani, A.S., Hart, N.M., Pope, K.L. and Twidwell, D. (2017) 'Adaptive Management of Rangeland Systems Craig', in D.D. Briske (ed.)*, Rangeland Systems.* Springer International Publishing (Springer Series on Environmental Management), pp. 373–394. https://doi.org/10.1007/978-3-319-46709-2.

[116] Jenet, A., Buono, N., Di Lello, S., Gomarasca, M., Heine, C., Mason, S., Nori, M., Saavedra, R. and Van Troos, K. (2016) 'The Path to Greener Pastures: Pastoralism, the Backbone of the World's Drylands', *SSRN Electronic Journal*. Edited by P. Mundy, p. 140. https://doi.org/10.2139/ssrn.3888381.

consequent analysis signals some of the potential shortcomings emanating from a misguided approach.

Table 3: Conceptual causes of failure

Conceptual flaws	*Actions*	*Causes*	*Consequences*
Insufficient recognition of pastoralism	Misguided goals for pastoralism under a conventional perspective	Misconceptions on pastoralist systems and prejudices over pastoralists	Project failure, abandonment
	Promote changes regardless of their impact on basic needs	Misunderstanding of traditional pastoralism role in subsistence and risk prevention	Impoverishment conflict, vulnerability
	Destocking, resizing herds, promoting “alternatives”	Lack of recognition of the economic, social and cultural values of pastoralist culture	Vulnerability and marginalisation
	Actions focused on the role of adult men	Disregard for the roles of women, youth and other groups	Inequity, lack of replacement
	Poor baseline assessment	Undervaluation of traditional knowledge, insufficient knowledge available	Shortcomings
Underestimation of the complex interacting forces in pastoral environments	Transforming rangelands towards different uses	Transformation of rangelands, loss of critical assets for pastoralists	Loss of pastoral lands, increased stress
	Large stationary infrastructure, slaughterhouses, water...	Inadequacy of interventions for pastoralism, maladapted water infrastructure	Lack of water, uneven grazing
	Reducing pressure, destocking, misled grazing plans	Misguided interventions on grazing and mobility regimes	Uneven grazing, land degradation
	Overstock herd sizes, fenced ranching, private land rights	Misled rangeland management, lack of flexibility	Uneven grazing, land degradation
	Actions not flexible under changing conditions	Lack of awareness of change and variability, unexpected events harming project planning	Increased risk of failure
Oversized technological interventions	Industrial breeds, external inputs, feed supplementation…	Aim for intensification of pastoral production	Collapse of natural resources
	Encouraging settlement	Misguided technical assistance	Conflict, impoverishment
	Fencing, water points, centralised infrastructure	Misguided investments based on conventional approaches	Loss of mobility, economic failures
	Priority to technical action instead of social, cultural…	Overlooking social, economic and cultural issues and needs	Poor social outcomes, hidden constraints
Misunderstanding of pastoralists' decision-making	Participatory actions lacking key agents	Non-definition of the community involved, participants not well chosen	Inefficiency of participation
	Lack of specific actions securing rights	Land rights and security of tenure overlooked and insufficiently considered	Insecurity, conflict, misuse of resources
	Promoting "alternative" activities for pastoralists	Attempt to change pastoralist perception or behaviour; pastoralism is weakened	Conflicts, imbalanced power, abandonment
	State and promoters’ unilateral intervention	Weakened traditional governance institutions, lack of management capacity	Weak governance, conflicts, degradation
	Centralisation, homogenisation	Markets unaware of pastoralists' needs, lack of synchrony between markets and pastoralists	Bad access to markets for pastoral products
Misinterpretation of the role of commons	Privatisation, land-grabbing, state appropriation of common lands	Overlook and misconception about the importance of common lands	Weak governance, mismanagement
Lack of participation from the early stages	Project design lacking capacities	Loss of pastoralist experience, knowledge and skills, top-down approaches	Maladaptation of the project
Inadequate state action	Closing borders, assigning lands to the state, limiting land and movement rights	States consolidating their power over land, action of state weakening traditional systems	Loss of mobility, insecurity, conflict

The conceptual framework offers a good starting point for improving project and programme design through a holistic perspective on the relationship between rangelands and pastoralism. This generic approach needs to be adapted to local realities by ensuring inclusive and meaningful participation as well as the institutional arrangements that support collaboration and cooperation during all phases of the project cycle.

Each element of the framework (e.g., land uses, ecosystems, stakeholders, institutions, production systems, cultural norms) needs to be mapped and acknowledged within the local context, contributing to a carefully programmed baseline assessment.[117] Project design and funding proposals must also recognize the role of pastoralists and their rangeland management practices.

The FAO and International Fund for Agricultural Development (IFAD) have formulated three strategies[118] to overcome these shortcomings and create a minimum standard for sustainable pastoralism: 1) develop national development strategies and action plans that recognise and support pastoral systems; 2) avoid policies and investments that undermine pastoralism; and 3) improve land governance and tenure security to enfranchise pastoral communities, recognizing their diversity as a valuable asset.[119]

3.4 Improving technical interventions

In addition to misguided conceptual understandings, the poor quality of technical interventions is another leading cause of failures in rangeland initiatives. The analysis of common flaws has been arranged following the project life cycle, using the stages considered in the framework for upscaling SLRM and restoration activities:[120] 1) conducting baselines assessments; 2) considering strategic options; 3) planning and implementing measures; and 4) monitoring and evaluation. Accordingly, this section summarises the weaknesses identified in the each one of these stages of project or programme development, analysing the most common mistakes.

3.4.1 Baseline assessment

Insufficient knowledge of the reality and background of the territories targeted is a primary source of failure. A poor baseline analysis could be especially debilitating in rangeland and pastoralist projects when they are neither adapted to, nor devised to be adaptable to the realities on the ground. Too frequently, external drivers or pressures are identified as threats to the success of a project, rather than accommodating these threats within the project or programme design. Critical shortcomings, such as the lack of data and monitoring on the ground will be addressed repeatedly on the report, but table 3 signals some other avoidable mistakes that hinder many projects.

Table 4: Baseline analysis-related causes of failure

Threats	*Origin*	*Causes*	*Consequences*
	Lack of data and information	Insufficient information for decision-making, actions led by incomplete data	Unpredictability of results

[118] FAO and IFAD (2018) 'Engaging with pastoralists – a holistic development approach'. https://www.ifad.org/en/web/knowledge/-/publication/toolkit-engaging-with-pastoralists-a-holistic-development-approach.

[119] Fuhlendorf, S.D., Fynn, R.W.S. and Mcgranahan, D.A. (2017) 'Heterogeneity as the Basis for Rangeland Management', in D.D. Briske (ed.) *Rangeland systems*. Cham: Springer International Publishing (Springer Series on Environmental Management), pp. 169–196. https://doi.org/10.1007/978-3-319-46709-2.

[120] UNCCD (2017) Scaling up sustainable land management and restoration of degraded land, Global Land Outlook Working Paper. UNCCD. https://www.unccd.int/sites/default/files/2018-06/12.%20Scaling%2BUp%2BSLM_R_Thomas%2Bet%2Bal.pdf .

Threats	Origin	Causes	Consequences
Incomplete baseline analysis	Generalisations about pastoral development environment	Inadequate scale of work, projects developing conventional actions	Lack of compatibility between actions and local conditions
	Vagueness of key parameters: beneficiaries, work scales	Inadequate targets, actions pointing to misguided targets	Inefficiency
	Lack of risk assessment	Risks underestimated, not measured forecasted, lack of adaptation capacity	High vulnerability of projects to risk
	Lack of inputs from similar projects	Unawareness of potential mistakes and constraints, repeated errors of other projects	Avoidable mistakes: unrealistic options
	Lack of inputs from local stakeholders and pastoralists	Lack of contact with, or awareness of, the reality, actions not aligned with local interests	Ill-defined roles, responsibilities and processes

3.4.2 Strategic options and planning

A second set of potential failures come from bad choices at the start of the project design stage and a weak strategy. Table 5 lists and elaborates some of those mistakes. Being options, some of those shortcomings could often be prevented by alternative choices, although sometimes they could be forced by unavoidable situations that, either way, should be addressed and considered in the project. A clear example of these choices refers to partner selection. The lack of reliable partners (specifically government and the private sector) quite often undermines project success, for example, because of conflicts that arise due to a lack of inclusive consultation. The selection of partners and attribution of roles and responsibilities constitutes a critical component of project development. In addition, sustained funding, institution building, stakeholder engagement, and a solid evidence base are also essential factors associated with project success.[121]

The definition of key parameters, such as production, performance, and productivity, while important to guide the strategy and legitimate aspirations for producers and pastoralists, are often challenging to apply under a pastoralist lens and if misguided can easily contribute to failures at the stage of strategic planning. These shortcomings many hinder many well-intended projects by overestimating their capacities or choosing inappropriate strategies to achieve their goals.

The correct choice of scales and work levels is instrumental for technical success. Preventing scale mismatches, addressing resilience trade-offs across scales,[122] and adjusting scales to the operational level targeting socioecological processes could improve coherence between goals and actions. Information tools are increasingly available, offering more capacity for flexibility and adaptation.

Table 5: Causes of failure related to the development of strategic project options

Threats	Origin	Causes	Consequences
Unfavourable policy environments	Legal framework incompatible with project	Projects trying to succeed under restrictive legal environments, poor legal support	Weakness, lack of recognition, abuse
Unfavourable scenarios	Unplanned influence of external factors	Economic, social and environmental constraints, increasing barriers for actions	Poor results

[121] Wanyoike, F. and Baker, D. (2013) 'Pro-poor development performance of livestock projects: analysis and lessons from projects' documentation', *Development in Practice*, 23(7), pp. 889–907. https://doi.org/10.1080/09614524.2013.811470.

[122] Foley, J.A., DeFries, R., Asner, G.P., Barford, C., Bonan, G., Carpenter, S.R., Chapin, F.S., Coe, M.T., Daily, G.C., Gibbs, H.K., Helkowski, J.H., Holloway, T., Howard, E.A., Kucharik, C.J., Monfreda, C., Patz, J.A., Prentice, I.C., Ramankutty, N. and Snyder, P.K. (2005) 'Global consequences of land use', Science, 309(5734), pp. 570–574. https://doi.org/10.1126/science.1111772.

Unfavourable political relationships	Poor relationship with governments	Projects not integrated into larger programmes, isolated actions	Low impact
Hidden agendas	Intrusion of external goals and agendas	Priority given to external goals instead of project goals, actions unaligned with the project goals	Lack of trust and commitment
Political expediency	Intrusion of implicit politics and government interests	Priority given to political goals instead of project goals	Lack of trust towards states and policies
Bad partners election	Partners not suited for their role in project	Partners unable to fulfil their commitments, lack of capacity, influence, performance Prevalence of opportunity interests, actions not properly developed by responsible partners	Lack of efficiency
Poor strategic planning	Discontinuity between baseline and strategy	Inadequate solutions, use of conventional targets for pastoralist productions	incapacity to reach goals
	Poorly defined problem	Symptoms addressed rather than causes	Actions unable to introduce changes
	Lack of correlation between target and actions	Incoherent project, inadequate actions	Lack of results
	Lack of flexibility in specific objectives	Low capacity of reaction facing uncertainty, Pursuit of project goals, regardless of other circumstances	Project goals become unreachable or irrelevant
	Lack of contingency plans	Unforeseen difficulties that stress implementation, lack of flexibility	Lack of efficiency
	Lack of reactive capacity	No element(s) of responsiveness, actions insensitive to external conditions	Inability to respond to changing conditions
Lack of project ownership	Lack of participation/consulting	Lack of ownership, actions seen as not aligned with beneficiary interests or needs	Low impact/interest
Bad strategic choices and technical shortcomings	Lack of development-planning skills among project personnel	Weak project building process, actions uncoordinated	Loss of synergies
	Failure to involve pastoralists in the planning process	Insufficient mapping and incorporation of stakeholders	Unfit field action
	Neglect of institution building/ consolidation/updating	Lack of facilitation, lack of governance and access to resources	Actions not properly deployed in the field
	Omission of goals related to justice and sustainability	Actions not addressing critical sectors	Imbalance of results
	Faulty, unproven, or inappropriate technology	Inadequate tools to reach goals, limited effectiveness of actions	Goals not fulfilled

3.4.3 Action planning and implementation

The operational stages are critical in any project and the most common source of failure. The set of potential shortcomings listed in Table 6 focuses on implementation flaws that have been detected in many rangeland and pastoralist initiatives. Even well-designed projects and programmes can fail due to a lack of capacity, skills, supervision, or commitment to implement activities in a coherent way.

Table 6: Implementation-related causes of failure

Threats	*Origin*	*Causes*	*Consequences*
Shortcomings in project management	Poor integrity and coordination between actions	Unexpected interactions	Contradictory results
	Weak managerial skills and experience of personnel	Actions poorly managed, weak project implementation	Low impact
	Poor communication in project teams and stakeholders	Low level of coordination	Reduced impact

Threats	Origin	Causes	Consequences
	Over-management and bureaucracy	Teams more focused on paperwork than actions, inefficiency	Shortcomings in action implementation, burnout
	Weak structural or systemic capacity of project managers	Weak project implementation, underachieving actions	Low impact
Understaffing, low capacity	Weak economic capacity	Few personnel to implement actions and manage the project, low capacity	Work overload, underachievement
Low commitment from participants	Weak participation processes, lobbying and networking	Lack of support, actions underachieving goals	Lack of efficiency

692

693 ### 3.4.4 Monitoring and evaluation

694 The lack of capacity for evaluation, monitoring and reporting is often a challenge for many
695 project managers and implementers. Project evaluations frequently highlight deficiencies in
696 understanding the local context as well as the capacity and flexibility of local stakeholders to
697 implement off-the-shelf technical actions which often involves a delicate balancing between
698 risk taking and risk aversion. Finally, real time monitoring protocols are crucial but frequently
699 ad-hoc or completely lacking in rangeland and pastoralist projects, which underscores the
700 importance of research applications to improve information flows.

701 Project failures can also be linked to monitoring, evaluation, and learning, including the lack of
702 capacity for flexibility and adaptation, absence of contingency plans, and poor risk
703 management systems. Table 7 presents monitoring flaws that are most related to rangeland
704 and pastoralist projects.

705 *Table 7: Monitoring and evaluation-related causes of failure*

Threats	Origin	Causes	Consequences
Evaluation shortcoming	Poor monitoring system	Low feedback from the environment, actions unable to be redesigned	Lack of responsiveness and reactive capacity
		Low feedback from working teams, actions unable to be reprogrammed	Lack of responsiveness and reactive capacity
Lack of supervision / review		Low feedback from supervisors, actions unable to feed future projects	Lack of improvement capacity

706

707 There is an urgent need to improve the quality of projects and programmes targeting
708 rangelands and pastoralism. Many of the shortcoming could be easily corrected against a
709 checklist incorporating the tables above. Perhaps most urgent is the need for a coherent
710 conceptual framework to help guide the design and development of projects and programmes.

711 The next chapter provides insights into rangeland and pastoralist initiatives around the world.
712 They have been selected to show the different approaches and strategies utilized with respect
713 to the diversity of rangelands and pastoralist systems. Although they sometimes have flaws,
714 are often underfunded and underacknowledged, and must overcome many constraints, the
715 teams behind those projects have offered their designs, achievements, and reflections to
716 provide guidance for others to upscale pastoralist and rangeland sustainable management and
717 governance.

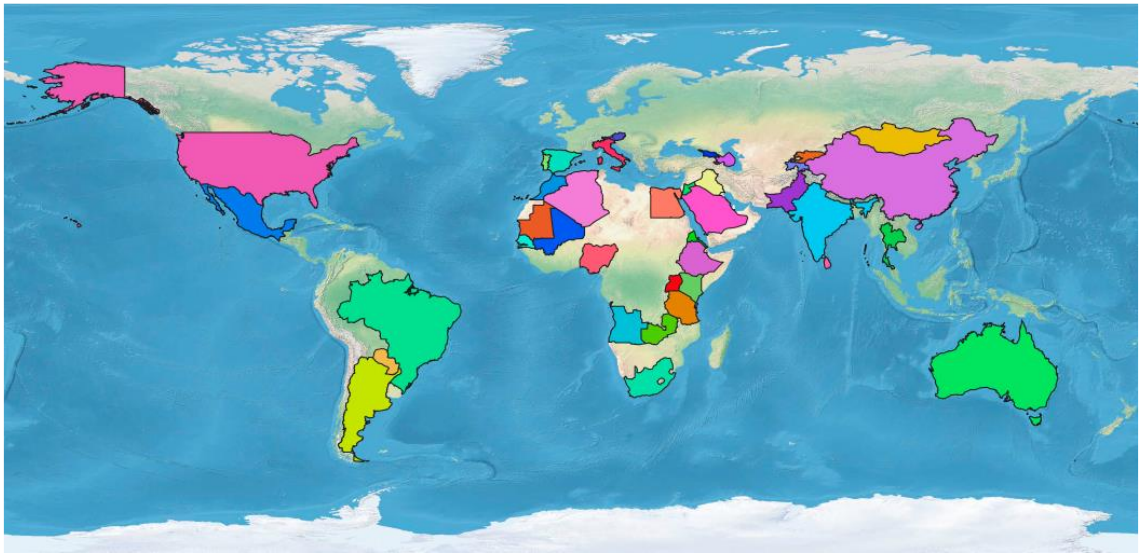
Chapter 4: Regional case studies and analysis

Many countries, organizations, and institutions are engaged in the implementation of SRLM and restoration activities, the recognition of the role of rangelands in LDN, the creation of enabling environments and participatory rangeland governance systems, and the financial and technical support of pastoralist initiatives and communities, and rangeland restoration. This chapter constitutes the backbone of the report. It contains initiatives submitted by organizations, countries, and other stakeholders responding to a broad call to provide their experiences and initiatives on rangelands and pastoralism.

These initiatives are summarised in the report as case studies with due respect given to the original content and style. The analysis is divided into ten sections in line with well-recognized regions of the world. While the analysis is by no means systematic or comprehensive, the case studies selected are extensive and offer a range of approaches and implementation strategies. They touch upon most of the drivers, pressures, impacts, challenges, and solutions discussed in the report. Their valuable lessons learned are synthesised in Chapter 6.

Each regional section starts with an introduction, which is followed by an analysis using case studies from more than one country, when available, and then national and local initiatives. Each regional section concludes with an overview of rangeland degradation trends and a discussion on the issues in the region that have attracted the most attention from policymakers and practitioners or are considered significant in advancing the SRLM and restoration agenda.

Figure 5: Map of case studies



4.1 East Africa

East Africa is characterised by expansive drylands, which occupy nearly 75 per cent of its surface, ranging from 20 per cent in South Sudan to 99 per cent in Eritrea. Pastoralism is the predominant land use, and pastoralists and agropastoralists constitute significant proportions of their populations. Pastoralism produces almost 90 per cent of the livestock and animal products consumed in the region, contributing 19 per cent, 13 per cent and 8 per cent of GDP in Ethiopia, Kenya and Uganda respectively[123] and, on average, 57 per cent of the agricultural GDP in countries under the Intergovernmental Authority on Development (IGAD) in Eastern Africa.[124] Nevertheless, poverty and migration in pastoralist communities are widespread and concerning.[125]

Pastoralist communities constitute a wide range of culturally and linguistically diverse groups, reflected in their varied production systems, livestock species and breeds raised, and the additional resources used. Nonetheless, they share a common strategy: mobile pastoralism relies on vast common lands, decentralised decision-making that accounts for diverse voices and interests, and opportunistic strategies.[126] Accordingly, traditional tenure systems favour communal access and priority of passage to move herds between key resource areas.

East African rangelands are widely acknowledged for their biodiversity and natural values. Pastoralists and their livestock have played a critical role in shaping the ecology of rangeland landscapes through grazing, mobility, and fire.[127][128] Their actions influence the vegetation and tree cover, controlling shrub encroachment and keeping habitats favourable for wildlife. Since pastoralism emerged as a land-use system in sub-Saharan Africa, more than 5,000 years ago, pastoral natural resource management and herding strategies have modified ecosystems to such an extent that the removal of pastoralism would be detrimental to biodiversity. The consolidated positive interrelations between biodiversity and pastoralism call for an integrated conservation strategy.[129] However, wildlife populations in the area are experiencing drastic declines driven by land degradation and global change.[130]

---

[123] Nyariki, D.M. and Amwata, D.A. (2019) 'The value of pastoralism in Kenya: Application of total economic value approach', Pastoralism, 9(1). https://doi.org/10.1186/s13570-019-0144-x.

[124] Odhiambo, M.O. (2021) 'Priority Areas for Action and Research on Pastoralism and Rangelands in Eastern Africa'. https://uknowledge.uky.edu/igc/24/6/15/

[125] Homewood, K., Rowcliffe, M., De Leeuw, J., Said, M.Y. and Keane, A. (2019) 'Pastoralism, conservation and resilience: Causes and consequences of pastoralist household decision-making', Agricultural Resilience: Perspectives from Ecology and Economics, (March 2014), pp. 180–207. https://doi.org/10.1017/9781107705555.010.

[126] Lind, J., Okenwa, D. and Scoones, I. (2020) Land, investment and politics: Reconfiguring Eastern Africa's pastoral drylands. https://core.ac.uk/download/pdf/326497421.pdf.

[127] Marshall, F., Reid, R.E.B., Goldstein, S., Storozum, M., Wreschnig, A., Hu, L., Kiura, P., Shahack-Gross, R. and Ambrose, S.H. (2018) 'Ancient herders enriched and restructured African grasslands', Nature, 561(7723), pp. 387–390. https://doi.org/10.1038/s41586-018-0456-9.

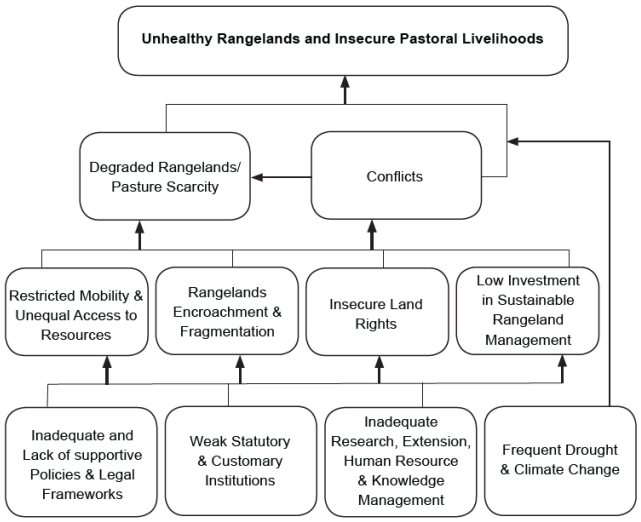
[128] Little, P.D. (1996) 'Pastoralism, biodiversity, and the shaping of savanna landscapes in East Africa', Africa, 66(1), pp. 37–51. https://doi.org/10.2307/1161510.

[129] Notenbaert, A.M.O.O., Davies, J., De Leeuw, J., Said, M., Herrero, M., Manzano, P., Waithaka, M., Aboud, A., Omondi, S., Leeuw, J. De, Said, M., Herrero, M., Manzano, P., Waithaka, M., Aboud, A. and Omondi, S. (2012) 'Policies in support of pastoralism and biodiversity in the heterogeneous drylands of East Africa', Pastoralism, 2(1), pp. 1–17. https://doi.org/10.1186/2041-7136-2-14.

[130] Lankester, F. and Davis, A. (2016) 'Pastoralism and wildlife: Historical and current perspectives in the East African rangelands of Kenya and Tanzania', OIE Revue Scientifique et Technique, 35(2), pp. 473–484. https://doi.org/10.20506/rst.35.2.2536.

East African rangelands are experiencing a shift towards better recognition of their value, unleashing a rush to acquire, control and invest in these lands.[131] This movement is turning upside-down decades of underinvestment and marginalisation.[132] Policies, governments and investors now see these areas as frontiers with abundant land and resources,[133] with major actors investing in the construction of ports, pipelines, roads, wind farms and plantations. Such large-scale investments are often portrayed as part of wider commercial and development strategies, and as an opportunity to increase the resilience of pastoralist communities. Yet, they often impact the delicate intricacies of traditional rangeland management practices, ignoring the ancestral rights and promoting rangeland conversion and land-grabbing.

Figure 6: Cause-effect framework of challenges in the rangelands of the IGAD region[134]



Pastoralist representation exists in places, such as Ethiopia, Kenya, and Uganda, where parliamentary bodies for pastoralists have been established with different levels of formalisation. However, there is no universal recognition of the value of pastoralist representation. Policies at national levels rarely support traditional pastoral livelihoods, advocating instead for modernisation and leaving advocacy for traditional pastoral interests to civil society organizations (CSOs).[135]

Addressing these challenges (Figure 6) requires coordinated action to develop SRLM at regional, national, and local levels. Productivity and economic diversification could be addressed by developing the linkages within the socioecological systems, integrating locally

[131] Lind, J., Sabates-Wheeler, R., Caravani, M., Kuol, L.B.D. and Nightingale, D.M. (2020) 'Newly evolving pastoral and post-pastoral rangelands of Eastern Africa', Pastoralism, 10(1), p. 24. https://doi.org/10.1186/s13570-020-00179-w

[132] Lind, J., Okenwa, D. and Scoones, I. (2020) Land, investment and politics: Reconfiguring Eastern Africa's pastoral drylands. https://core.ac.uk/download/pdf/326497421.pdf

[133] Greiner, C. (2016) 'Land-use change, territorial restructuring, and economies of anticipation in dryland Kenya', Journal of Eastern African Studies, 10(3), pp. 530–547. https://doi.org/10.1080/17531055.2016.1266197.

[134] ICPALD, I./ (2020) Regional Strategic Framework 2019/2020. https://icpald.org/wp-content/uploads/2021/02/Rangeland-Strategic-Framework-Rangeland-Management-for-ASALs-of-the-IGAD-Region.pdf.

[135] Nori, M. (2022) 'Assessing the Policy Frame in Pastoral Areas of Sub-Saharan Africa (SSA)', SSRN Electronic Journal [Preprint]. https://doi.org/10.2139/ssrn.4071572.

adapted management practices, agricultural technologies and state services. Joint regional action could target sustainable rangeland systems and livelihood security.[136]

There have been efforts to formulate both regional and national policies (Table 9), although cross-country coordination and synergies among countries, are generally lacking, even among those with shared borders. The harmonisation of existing policies and practices has been identified as a key step to ensure effective and sustainable management of rangeland resources in the region.

Table 9: Rangeland-related national policies and strategies in the IGAD region[137]

Country	Policy/Strategy/Plan	Status
Uganda	Rangeland Management and Pastoralism Policy, 2017	Draft
Sudan	The Rangelands and Forages Resources Development, 2015	Operational
	Pastoral Strategic Action Plan for Semi Desert Savanna Sudan, 2014–2024	Operational
South Sudan	National Livestock Development Policy	Operational
	MARF, Policy Framework and Strategic Plans, 2012–2016	Operational
Ethiopia	Pastoralist Development Policy and Strategy, 2018	Draft
	National Strategy on *Prosopis Juliflora* Management, 2017	Finalised
	The Federal Rural Land Administration / Use Proclamation 456/2005	Operational
Kenya	Rangelands and Pastoralism Strategic Plan, 2018–2028	Draft
	Vision 2030 Development Strategy for Northern Kenya and Other Arid Lands, 2012	Operational
	National Policy for the Sustainable Development of Arid and Semi-Arid Lands, 2017	Operational
	Agricultural Sector Transformation and Growth Strategy (ASTGS), 2019–2029	Operational
	Community Land Act, 2016	Operational

Silvopastoral and agrosilvopastoral systems are also widespread in East Africa. Pastoralism has proven invaluable in agroforestry approaches by combining mobility with multifunctional community management.[138] Silvopastoralism can be quite effective to restore East African rangelands and savannahs,[139] aiming to increase the number of trees and shrubs and the services they provide, not only as fodder but also to harvest fruits, fuelwood, gums and resins. As the framework depicted in Figure 7 shows, the main goal of these processes is to ensure sustainable and equitable access to, and management of, rangelands and their resources.

Figure 7: Objective tree to achieve sustainable rangelands in East Africa via harmonisation of policies and practices[140]

[136] Wynants, M., Kelly, C., Roberts, N., Gilvear, D., Rabinovich, A., Nasseri, M., Patrick, A., Munishi, L., Mtei, K., Wilson, G., Ndakidemi, P. and Blake, W.H. (2018) 'Land degradation in East- Africa's agro - pastoral systems: changing interactions between the social, economic and natural domains', (December). https://doi.org/http://dx.doi.org/10.13140/RG.2.2.36615.14244.

[137] ICPALD, I./ (2020) Regional Strategic Framework: Rangeland management in arid and semi-arid lands of the IGAD region (RRMSF). https://icpald.org/wp-content/uploads/2021/02/Rangeland-Strategic-Framework-Rangeland-Management-for-ASALs-of-the-IGAD-Region.pdf.

[138] FAO (2022) Grazing with trees, Grazing with trees. FAO. https://doi.org/10.4060/cc2280en.

[139] Chris Reij, Nick Pasiecznik, Salima Mahamoudou, Habtemariam Kassa, Robert Winterbottom and John Livingstone (2020) 'Dryland restoration successes in the Sahel and Greater Horn of Africa show how to inrease scale and impact', ETFRN News, 60, pp. 1–24. https://www.cifor.org/knowledge/publication/7907.

[140] ICPALD, I./ (2020) Regional Strategic Framework: Rangeland management in arid and semi-arid lands of the IGAD region (RRMSF). https://icpald.org/wp-content/uploads/2021/02/Rangeland-Strategic-Framework-Rangeland-Management-for-ASALs-of-the-IGAD-Region.pdf.

Regional approaches

The rangeland and pastoralism agenda in East Africa has benefitted from regional processes like the African Union's Policy Framework for Pastoralism[141] and the IGAD transhumance protocol,[142] which provide strong foundations for improved policy and programming. The Pretoria Declaration on Economic, Social and Cultural Rights in Africa,[143] adopted by the African Commission on Human and Peoples' Rights in 2004, recognised the importance of respecting tenure rights and access to land, while the Framework and Guidelines on Land Policy in Africa[144] and other African covenants should support the key role land policy plays in achieving LDN in the region.

There have been regional approaches to LDN too. In 2020, UNCCD published the East Africa Thematic GLO Report,[145] presenting several case studies on LDN in the region and addressing tenure risks in financial investments. The report has also collected regional participatory governance initiatives in East Africa. There is a need for advances and successful experiences in innovative financing tools for rangelands and pastoralism.

Participatory land use planning (PLUP) in pastoral areas[146]

[141] African Union (2010) 'Policy Framework for Pastoralism in Africa ': https://au.int/sites/default/files/documents/30240-doc-policy_framework_for_pastoralism.pdf .
[142] IGAD. Intergovernmental Authority on Development (2020) IGAD Protocol on Transhumance. https://icpald.org/wp-content/uploads/2021/06/IGAD-PROTOCOL-ON-TRANSHUMANCE-Final-Endorsed-Version.pdf.
[143] https://www.ohchr.org/en/resources/educators/human-rights-education-training/13-pretoria-declaration-economic-social-and-cultural-rights-africa-2004
[144] https://www.un.org/en/land-natural-resources-conflict/pdfs/35-EN- percent20Land percent20Policy percent20Report_ENG percent20181010pdf.pdf
[145] UNCCD. (2019) East Africa Thematic Report. Responsible Land Governance to Achieve Land Degradation Neutrality, United Nations Convention to Combat Desertification. https://www.unccd.int/resources/global-land-outlook/east-africa-responsible-land-governance-achieve-land-degradation
[146] https://cgspace.cgiar.org/handle/10568/125373

While pastoral rangelands tend to be collectively managed by customary institutions, land use often falls across administrative boundaries. Pastoral areas may be remote and large, often vacant for long periods. PLUP initiative is designed to face cross-boundary planning challenges, keeping rangelands under appropriate management schemes.

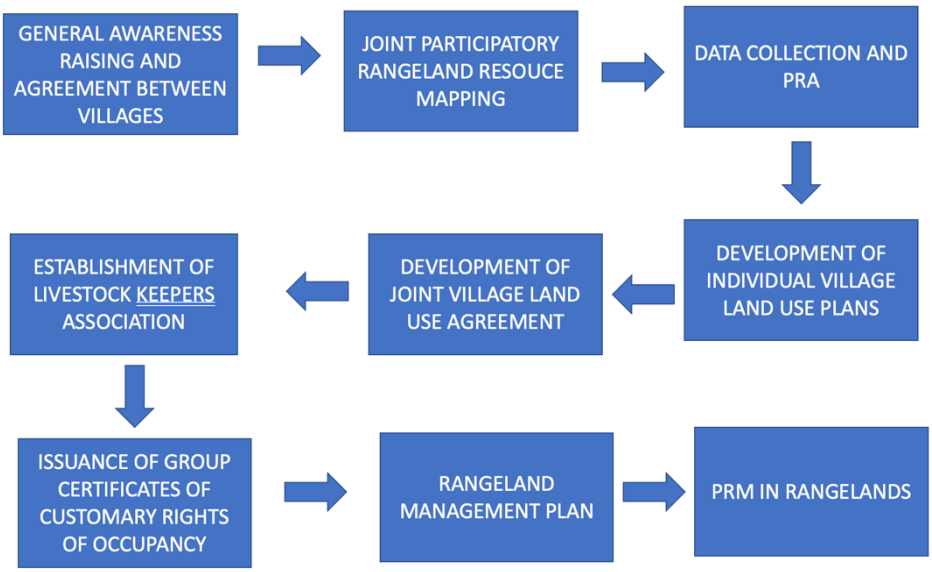
PLUP agreements strengthen reciprocal relations, collective tenure and good governance, helping prevent and resolve conflicts between land users at different scales – across villages, districts, counties and even countries. PLUP has developed joint village participatory planning in Tanzania,[147] Ethiopia's Woreda district,[148] and pastoral counties in Kenya.[149]

The PLUP processes demand significant resources, capacities, technical support, time and expertise for analysis and assessment of options. A village-level plan is likely to need detailed soil and vegetation studies (often mandatory, as in Tanzania).

PLUP provides skilled facilitators and advanced representation mechanisms, often through grassroots and other social organizations, engaging users at the core of decision-making. PLUP typically starts with participatory mapping of rangeland resources, land use, management and governance. PLUP should be designed in a flexible way to accommodate complexities of collective land use (tenure, shared resources, movement across boundaries and response to drought or other climatic crises). All pastoralists, men and women, young and old, are included in PLUP processes, building capacities as needed.

East African PLUP has been developed under favourable legal frameworks and facilitated policies, such as in Tanzania. PLUP has also been co-designed with governments. This is easily applicable to pastoralist areas, particularly in complex situations where conventional land-use planning may block mobility and traditional access to resources. The benefits are notable: local pastoral communities experience increased security on their land, and governments are confronted by fewer land-use conflicts.

Figure 8: Steps in the joint village land-use planning in Tanzania



[147] https://cgspace.cgiar.org/handle/10568/116994
[148] https://cgspace.cgiar.org/handle/10568/99262 and https://cgspace.cgiar.org/handle/10568/99457
[149] https://cgspace.cgiar.org/handle/10568/106344 and https://cgspace.cgiar.org/handle/10568/106345

A final example of a regional approach is provided by the East Africa Rangelands Assessment,[150] which evaluates rangeland programmes with a focus on community-based rangeland management. The project is the result of a collaboration between the United States Forest Service International Programs and the Northern Rangelands Trust in Kenya.

National approaches

Ethiopia

Ethiopian rangelands comprise about 62 per cent (767, 000 square kilometres) of the country's land area, The central highland mass shapes the country, rising from 1,000 metres to 1,700 metres and above.[151] Almost 75 per cent of the landmass is categorised as drylands. Low rangelands have sparse vegetation but host 26 per cent of the total livestock, producing over 90 per cent of legal exports of live animals.[152] Pastoralism supports an estimated 20 million people and produces 80 per cent of the total annual milk supply in Ethiopia.[153]

Rangeland livestock production is affected by shrub encroachment, uneven grazing and drought.[154] Feed shortage is compensated by standing hay, haymaking and crop residues, but rangeland degradation is reducing feed and water availability and increasing livestock disease and loss.[155] Borana households are adapting to this situation by keeping more goats, sheep and camels instead of cattle, but coordinated state interventions are needed to face those challenges.

Ethiopia is a pioneer in using traditional enclosures as a tool to improve rangeland conditions[156] and showing successful approaches to investment in rangelands and implementation of SRLM and restoration initiatives,[157] as with the Pastoralist Livelihoods Initiative.[158]

---

[150] Reid, R.S., Rowland, M.M., Bruno, J. and Galvin, K.A. (2021) East Africa Rangelands Assessment: Community-based Rangeland Management Programs. Phase I Scoping Report. https://doi.org/10.13140/RG.2.2.35049.42081.

[151] Mengistu, A., Kebede, G. and Feyissa, F. (2018) 'Status of Ethiopian Rangelands: with Special Reference to Southern Rangelands', International Journal of Agriculture and Biosciences, 7(3), pp. 175–181. https://www.researchgate.net/publication/328687140_Status_of_Ethiopian_Rangelands_with_Special_Reference_to_Southern_Rangelands.

[152] Ministry of Agriculture, and PENHA (2022) Ethiopian National Drylands Restoration Strategy. Ministry of Agriculture, Federal Democratic Republic of Ethiopia, and the Pastoral / Environmental Network in the Horn of Africa. https://www.decadeonrestoration.org/publications/ethiopian-national-drylands-restoration-strategy.

[153] Nyariki, D.M. and Amwata, D.A. (2019) 'The value of pastoralism in Kenya: Application of total economic value approach', Pastoralism, 9(1). https://doi.org/10.1186/s13570-019-0144-x.

[154] Abate, T., Ebro, A. and Nigatu, L. (2012) 'Evaluation of rangeland in arid and semi-arid grazing land of South East Ethiopia', *International Journal of Agricultural Sciences*, 2(7), pp. 221–234. https://www.internationalscholarsjournals.com/articles/evaluation-of-rangeland-in-arid-and-semiarid-grazing-land-of-south-east-ethiopia.pdf.

[155] A.A. Ayantunde, S. Fernández-Rivera and G. McCrabb. (2005) Coping with feed scarcity in smallholder livestock systems in developing countries. Journal of Chemical Information and Modeling. https://www.livestock-emergency.net/userfiles/file/feed-supply/Ayantunde-et-al-2005.pdf.

[156] Napier, A. and Desta, S. (2011) Review of Pastoral Rangeland Enclosures in Ethiopia. https://fic.tufts.edu/assets/Tufts-Range-Enclosure-Review-PLI.pdf.

[157] Semplici, G. and Campbell, T. (2023) 'The revival of the drylands: re-learning resilience to climate change from pastoral livelihoods in East Africa', Climate and Development, pp. 1–14. https://doi.org/10.1080/17565529.2022.2160197.

[158] https://fic.tufts.edu/research-item/policy-support-to-the-pastoralist-livelihoods-initiative-ethiopia/

The Government of Ethiopia Ministry of Agriculture and the Pastoral and Environmental Network in the Horn of Africa (PENHA)[159] have promoted a **National Drylands Restoration Strategy** for the country to guide development and conservation efforts in the drylands. The scope of the strategy extends beyond the agricultural sector (land, crop, livestock, forest management) to cover other sectors, notably water and mines, with the aim to diversify livelihood options and off-farm income-generating activities for the growing population in the drylands. Other organizations, such as the Northern Rangelands Trust,[160] are also developing rangeland strategies in their conservancies.[161] The long-term vision of these strategies is to stabilise and improve the productivity of rangelands that underpin the pastoralist economy, reduce competition and conflict for water and grazing resources, and improve forage for livestock and wildlife.

Kenya

Pastoralism is the main source of livelihood for millions of people residing in Kenya drylands, which occupy 80 per cent of the country. Kenya's pastoral sector has an economic value of USD 1.13 billion.[162] The national annual meat consumption was estimated at 553,200 tonnes, of which pastoral meat contributed 28 per cent.[163]

Kenya has been active, with ambitious government commitments to restore rangelands among many other landscapes. The government and national and international organizations have implemented diverse initiatives and processes to respond to challenges facing rangelands.

The **Kenya Rangelands Restoration and Conservation Action Group** was formed following the Kenya National Landscape Restoration Scaling Conference 2021, in recognition of the need for special attention on rangeland restoration. One of its key tasks is to bring together actors in the protection and restoration of rangelands in Kenya. This group promoted a seminar, "Restoring Kenya's Rangelands: the way forward",[164] after which an action group was created to identify key issues, support rangeland conservation and restoration, and compile and share experiences, practices, and solutions. The group will assess and monitor rangeland health for multiple targets and commitments (LDN; UN Decade on Ecosystem Restoration) and action on resilience, policy support, diversification and financing.[165]

Kenya has also been actively involved in developing Participatory Rangeland Management initiatives, following the path described in the regional approaches section.

Participatory Rangelands Management (PRM)

[159] https://www.penhanetwork.org/
[160] https://www.nrt-kenya.org/
[161] Northern Rangelands Trust (2019) 'The Northern Rangelands Trust: Rangelands Strategy 2019-2022', p. 25. https://static1.squarespace.com/static/5af1629f12b13f5ce97ca0b5/t/5dcbd1c49b612d4aef7c5dbb/1573638639987/NRT_Rangelands_Strategy_D2_HR.pdf.
[162] Nyariki, D.M. and Amwata, D.A. (2019) 'The value of pastoralism in Kenya: Application of total economic value approach', Pastoralism, 9(1). https://doi.org/10.1186/s13570-019-0144-x.
[163] Amwata, D.A., Nyariki, D.M. and Musimba, N.R.K. (2016) 'Factors Influencing Pastoral and Agropastoral Household Vulnerability to Food Insecurity in the Drylands of Kenya: A Case Study of Kajiado and Makueni Counties', Journal of International Development, 28(5), pp. 771–787. https://doi.org/10.1002/jid.3123.
[164] https://regreeningafrica.org/uncategorized/restoring-kenyas-rangelands-the-way-forward/
[165] https://regreeningafrica.org/wp-content/uploads/2023/02/RESTORING-KENYAS-RANGELANDS-THE-WAY-FORWARD.pdf

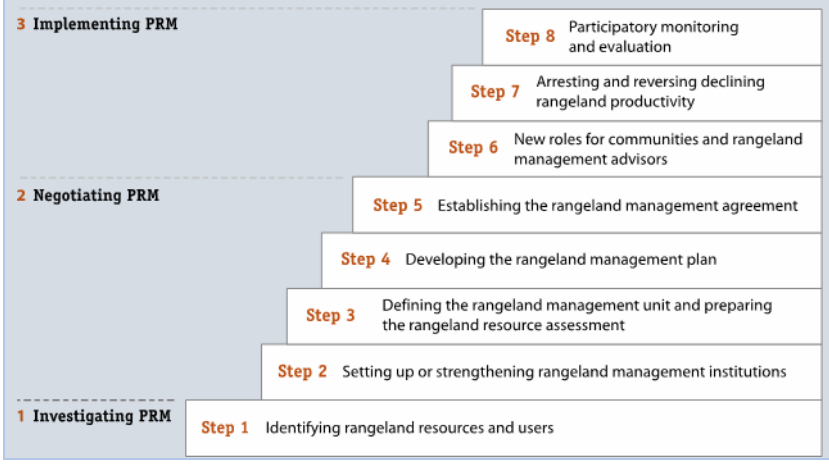
Participatory Rangelands Management (PRM) is underpinned by two ideals: participation and planning. The first ensures that all stakeholders are involved in decision-making, the second uses this engagement to generate and process information to shape land use and management. This way, rangelands, pastoralists and their land rights can be protected through a deliberate planning process that involves all categories of community members. PRM aims to improve the condition of rangelands and simultaneously engage communities in their governance.

Mapping, whereby a visual picture is devised of resources, users and management systems, is a key step in the process.[166] The process empowers and inspires community members by understanding the different uses, people and interests in the same resource base.[167]

Before starting a PRM process, it is important to align it with policy and legal frameworks, closely working with local and national governments. Afterwards, the same work allows for development of the tools, guidelines and strategies that will lead the process. The participatory stages follow a logical framework (as shown in the figure below) that can be adapted to country and local levels.

PRM targets multiple stakeholders, prioritising the integration of pastoralists, equality and the full integration of women and youth (e.g., by increasing women's leadership positions).[168] PRM is also adopting the One Health approach,[169] which can be reproduced in other African countries, as explained by their promoters in two documentaries.[170] [171]

Figure 9: Methodological steps to develop Participatory Rangeland Management instruments



The collection of rangeland initiatives also includes a technological approach, led by the International Atomic Energy Agency (IAEA), that brings to light the need to continue investing in research and innovation to mobilise additional resources for the recovery of rangelands.

A project led by **International Atomic Energy Agency (IAEA)** is assessing the impact of mutated forages on the performance of smallholder dairy cows in drought prone areas in Kenya. Using nuclear techniques, they produced two *Brachiaria* mutant varieties with higher productivity and tolerance to drought. This could ensure a better supply of forage for livestock, especially in drier periods while its high

[166] https://cgspace.cgiar.org/handle/10568/118298
[167] Irwin, B., Cullis, A. and Flintan, F. (2015) Mapping Guidelines for Participatory Rangeland Management in Pastoral and Agro-Pastoral Areas Mapping Guidelines for Participatory Rangeland Management in Pastoral and Agro-Pastoral Areas. https://cgspace.cgiar.org/handle/10568/105665.
[168] https://cgspace.cgiar.org/handle/10568/117286
[169] https://cgspace.cgiar.org/handle/10568/106514
[170] https://www.youtube.com/watch?v=Q5mFM2rpREQ
[171] https://www.youtube.com/watch?v=lSiCq-8jYgI

nutritive content and digestibility would improve livestock productivity and health. Findings from the assessment could be shared with other East African countries prone to drought conditions.

Tanzania

Tanzanian rangelands cover one third of the country's surface, about 61 million hectares, and are extensively used under pastoralist or agropastoralist systems. Three per cent of the 3.7 million households in Tanzania are pastoralists, and seven per cent are agropastoralist. This amounts to approximately 370,000 households and 2.2 million people. Rangelands in Tanzania are an important resource for the country's economy, supporting approximately 16 million cattle, 12 million goats and 3.5 million sheep -- producing an estimated 335,000 tonnes of meat for the domestic market.

Additionally, Tanzanian rangelands hold significant cultural and heritage value. They are also widely known for their high biodiversity, unique ecosystems and habitat for a significant number of endemic, rare and endangered species. These values generate important economic activity through tourism and conservation investments.[172]

There is widespread concern about the loss and degradation of Tanzanian rangelands.[173] Wildlife numbers are falling, and degradation is a key contributor to this scenario. The alienation of pastoral lands by state and private interests has also been reported.[174] The government, development organizations and grassroots organizations are helping Tanzania face these challenges through diverse initiatives.

Tanzania is also active in developing gender responsive initiatives. A baseline assessment on the subject has been provided by local activists, as shown in the box below.

Livestock and gender in Tanzania

Livestock production systems in Tanzania are generally shared between men and women, although specific tasks and responsibilities vary across communities. Generally, men are in charge of cattle and goats, while women assume responsibility for reproduction, milking and small livestock, in addition to domestic responsibilities.

This division of responsibilities is typical in the Kilwa Masoko district. In contrast, Bukoba, men are responsible for stall feeding and milking, while women watch the calves and fertilise crops. In Kilimanjaro, Chagga women and girls assume responsibility for milking and fodder harvesting, and care for sheltered animals. In Maasai communities, women care for calves and sick animals, milk cattle, distribute milk, and process skins, while men manage herds. In the Tanga and Morogoro regions, women are responsible for agriculture, small livestock, and dairy activities. In the Mvomero, Kongwa, and Lushoto districts, widows can own large livestock, while married women own poultry and smaller livestock.

[172] United Republic of Tanzania-VPO (2014) 'Guidelines for sustainable management of rangelands in Tanzania', *Iea* [Preprint]. http://www.iea.org/statistics/statisticssearch/.

[173] Wiethase, J.H., Critchlow, R., Foley, C., Foley, L., Kinsey, E.J., Bergman, B.G., Osujaki, B., Mbwambo, Z., Kirway, P.B., Redeker, K.R., Hartley, S.E. and Beale, C.M. (2023) 'Pathways of degradation in rangelands in Northern Tanzania show their loss of resistance, but potential for recovery', Scientific Reports, 13(1), pp. 1–15. https://doi.org/10.1038/s41598-023-29358-6.

[174] Kipury, N. and Sørensen, C. (2008) 'Poverty, pastoralism and policy in Ngorongoro : lessons learned from the Ereto I Ngorongoro Pastoralist Project with implications for pastoral development and the policy debate'. https://www.jstor.org/stable/resrep18061.5.

These gender divisions impact wealth and vulnerability. Male income from livestock and crops in Sukuma societies exceeds female income obtained from selling milk, chickens, ghee, hides, eggs, fertiliser, and cultural items. As livestock is a common wedding gift, it is often perceived as a bride price, which harms women's and girls' rights. Male-headed households often hold more wealth than female-headed ones in Tarangire-Manyara.

Women in most pastoral societies are denied the rights to keep livestock, reducing their income and rendering them economically independent. Despite discrimination in wedding and inheritance rights, the perception of gender livestock ownership and related arrangements vary widely by community.

Women are often assigned additional tasks and responsibilities (e.g., seeking water or pasture in situations of scarcity). Limited access to education and to animal health training, information and extension services also impact women more than men in Pwani and other regions. Widespread inequalities in household labour division, resource ownership and decision-making often render women highly vulnerable and disempowered.

The Pastoral Women's Council[175] (PWC), a non-profit membership organization based in northern Tanzania, focuses on gender equality and community development through the empowerment of Maasai women and girls. With over 6,500 members, at least 75 per cent of whom are women and youth, PWC is highly inclusive of minority and underprivileged groups (single mothers, orphans, widows, and people living with disabilities). PWC is an active member of FAO's WeCaN community of practice and leads interesting projects with the aim to empower pastoralist women and girls in favour of their rights and voices, economic empowerment and access to quality social services.

Land restoration and climate adaptation[176]

Rural pastoralists in the Arusha region of Tanzania depend on rangelands and clean water to sustain their semi-nomadic cattle-herding way of life. Women often provide supplementary income by selling milk, firewood, food commodities and handicrafts. As a result of significant livestock losses and food insecurity, communities are faced with difficult choices; men are forced to migrate in search of livelihoods, while women are left behind with no means of support. This scenario increases women's already vulnerable situation and places greater burden on them with respect to production and food security, in addition to their existing responsibilities.

This PWC initiative addresses this situation through **land restoration** and **climate action plans at the village level**. The plans target the policy framework and support direct action at the district and village level, fully engaging both the community and local government in the process starting with awareness-raising campaigns. Following training, selected women groups assume responsibility for the supervision and implementation of the primary activities (e.g., creating grass banks, improving the grazing schedule, providing food aid during droughts, building dispensaries, fencing water sources, rehabilitating water systems, and protecting and building water points and irrigation systems to reduce the effort required of women to provide water and food).

At present, 27 pastoralist villages in Ngorongoro, Monduli and Longido districts of the Arusha Region have submitted plans to the district government and have begun to implement them.

[175] http://www.pastoralwomenscouncil.org/
[176] https://www.youtube.com/watch?v=_ekQRMsGTjo

Following implementation, communities monitor the work and provide feedback. A Climate Action Committee monitors and holds accountable relevant actors for implementation progress.

PWC builds social capital, facilitating women's groups and other key stakeholders to engage in rangeland restoration. PWC members also collaborate with the Tanzania Metrological Agency to gauge the potential timing and location of rainfall. Over **USD 900,000** has been provided in support of these plans, and communities have enacted local by-laws for them.

The Sustainable Rangeland Management Project[177]

This project supported sustainable rangeland management by developing participatory village land-use plans and participatory land-use management teams at the district level, drawing on guidelines from the National Land Use Planning Commissions.

The SRLM approach used in the project enabled the community to develop joint land use and management plans. The planning process followed the same steps depicted in the previous cases, starting with participatory mapping,[178] with a leading role of women, who often have in-depth spatial knowledge on resources and their use. Participatory maps are quick to produce, easy to use and documentable. They display historical-cultural items and are comparable to official maps and, thus, providing legitimacy. Participatory maps drive village negotiations on resource-sharing and can contribute to agreements on the use of forest, water and rangelands and be incorporated into joint village land- use plans. The planning is completed with the establishment of land users' institutions and the issuance of certificates of customary rights of occupancy to secure land rights. A commitment of time and investment are necessary to formalise the documents as legally binding by-laws, approved by the District Council and registered by the Government.

Land conflict resolution often accompanies participatory planning, especially in villages experiencing unsolved conflicts.[179] Facilitation is key to balance power and prevent abuse and other risks while providing guidance, empowerment, and compensation.

This project was built upon wide collaboration between public and private bodies, with funds primarily provided by IFAD and international bodies. SRLM planning on four sites of four villages has secured 162,880 hectares for 1,083 households and the wider population.

Additionally, the Government of Tanzania developed guidelines for sustainable management and utilization of rangelands.[180] International initiatives, such as The Restoration Initiative,[181] have launched restoration projects that apply a management approach that considers human action part of the ecosystem.

Uganda

Rangelands cover 44 per cent of Uganda's total land area, sustaining 80 per cent of the national livestock herd and 90 per cent of the cattle. Pastoralism is the dominant activity in

[177] The Sustainable Rangeland Management Project
[178] http://cgspace.cgiar.org/handle/10568/90495
[179] http://cgspace.cgiar.org/handle/10568/79796
[180] United Republic of Tanzania-VPO (2014) 'Guidelines for sustainable management of rangelands in Tanzania', *Iea* [Preprint]. http://www.iea.org/statistics/statisticssearch/.
[181] https://iucn.org/news/202209/restoration-initiative-2021-year-review

Uganda's rangelands, accounting for 4.5 per cent of GDP and contributing substantially to the 70 per cent of employment generated by the agricultural sector.[182] Pastoralists represent 35 per cent of the total population, with 64 per cent of them categorised as poor.

The current scenario, shared with the other countries, is worrisome. Many of its challenges can be traced back to land and economic policies originating from the colonial era, which focused more on performance than on ecosystem services. It is urgent to halt policies and practices that are harming rangelands, specifically sedentarisation, conversion, privatisation and fire exclusion, while providing locally-led SRLM alternatives. New supporting policies should start by generating a national dialogue and roadmap for implementing land reforms. The project below, developed by COPACSO, adopts a local participatory framework to address this issue.

The Right to Food: The Pasture Seed Model[183] [184]

This initiative aimed to build the capacity of pastoralists and stakeholders to expand pastures while advocating for pastoralism and land rights.

Action at the local level focused on increasing pasture seed production and promoting restoration through community pasture seed banks. In collaboration with communal land associations, it established demonstration sites on common lands as well as Pasture Growing Groups to cultivate pasture gardens, harvest and store seeds, and build seed banks.

This initiative strengthened communal land associations at the state level to advocate for pastoralist rights and rangeland corridors serving both wildlife and livestock, supported implementation of the rangeland management and pastoralism policy, and established the Uganda rangeland policy working group and a platform for community pasture seed conservation and preservation in the Karamoja sub-region.

The pasture seed model was strengthened by considering livestock an entire food system, therefore targeting both resilience and income diversification for improving livelihoods. Beneficiaries began changing their attitudes and acknowledging the income from selling pasture seeds and improved feed production, starting their own personal pasture gardens.

The primary targets of the project were both mobile pastoralists (kraal leaders, youth) and sedentary farmers (mainly women), but it also reached other interested stakeholders. COPACSO built capacities in monitoring, follow-up and mentorship, in synergy with local, sub-national and national experts. The initiative also involved research institutions, like the National Agricultural Research Organisation, for technical expertise. Oxfam-Uganda provided most of the funding.[185] This initiative can be adapted to other drought-prone areas of Karamoja.

Eritrea

Eritrea's landscape is characterised by a south-to-north chain of high mountains crossing the country separating the central highlands from the eastern and western lowlands. Pastoral and agropastoral production systems are the major land uses in the country, although the

[182] Beyeza-mutambukah, B. (2015) *The Contribution of Rangelands to the Economy of Uganda*. https://www.celep.info/wp-content/uploads/2016/08/COPASCO-poster-IRC2016.pdf.
[183] https://copacsodotorg.wordpress.com/2020/11/02/healthy-weeknight-meals/
[184] https://copacsodotorg.wordpress.com/
[185] https://cng-cdn.oxfam.org/uganda.oxfam.org/s3fs-public/file_attachments/Oxfam percent20in percent20Uganda percent202016-2017 percent20Annual percent20Report_0.pdf

highlands host mixed irrigation and rain-fed crops.[186] Rangelands, encompassing bush and grasslands, together account for over 60 per cent of the land surface.[187]

Eritrean people living in the lowlands depend on livestock, which hold cultural importance as a sign of wealth and social prestige. The country hosts 1.9 million cattle, 6.8 million sheep and goats, 319,000 camels, 518,000 equine, and some 1.1 million poultry. Livestock production is based on natural pasture predominantly found in the semi-arid rangelands.

Eritrea has benefited from considerable investment in pastoral projects since the late 20th century but with limited success. Recently, pastoralist production has gained recognition, increasing the understanding of rangelands, mobility, and flexible and decentralised decision-making. The case below shows how the Government of Eritrea is updating these systems.

Rangeland and pastoralism development initiative

This initiative promotes a bottom-up approach to livestock and to the management and restoration of grazing land in Eritrea. It recognises and encompasses community knowledge and priorities, ensuring planned actions are endorsed by the community, including nomadic and mobile pastoralists and small farmers. The project applies a participatory approach alongside influential people, administrative officers, religious leaders and grassroots organizations (with a mandatory 30 per cent women).

Pastoralists are carefully integrated into the project with respect to seasonal movements, household divisions, heterogeneity of pastoral groups, and the need for firsthand representation. Thus, their involvement in planning, implementation and monitoring is difficult, despite the considerable benefits expected. Accordingly, strengthening pastoral organizations and interaction with other groups is a project priority.

Crop farmers and pastoralists have made progress, with little or no external support. The provision of support could speed up the process and avoid critical errors. Ensuring that communities are at the centre of the implementation of solutions creates a sense of ownership and supports the development of local institutions to carry on after external support ceases.

In practical terms, actions target households as basic operational and decision-making units. The facilitation of informal arrangements to negotiate resource access and movement among those units prevents conflict and promotes flexible, multifunctional land-use strategies. Funded and supported by the Government of Eritrea, this initiative is considered critical to Eritrea's sustainable development.

Land degradation in East Africa

Land degradation in East Africa is a critical threat to people's livelihoods, severely affecting 51, 41, 23, and 22 per cent of Tanzania, Malawi, Ethiopia, and Kenya's terrestrial areas, respectively.[188] Poor, rural communities, who depend on agriculture and natural resources, are

[186] IUCN (2006) *THE STATE OF ERITREA Pastoralism as a Conservation Strategy and Contributing Towards Livelihood Security and Improvement in Eritrea*. https://www.iucn.org/sites/default/files/import/downloads/eritrea_country_study.pdf.

[187] Kahsaye, W. (2002) the Cultural Ecology of Pastoralism in Eritrea: a Geogrpahical Inquiry. Louisiana State University and Agricultural and Mechanical College. https://digitalcommons.lsu.edu/cgi/viewcontent.cgi?referer=&httpsredir=1&article=3744&context=gradschool_dissertations.

[188] UNCCD (2019) East Africa Thematic Report. Responsible Land Governance to Achieve Land Degradation Neutrality. https://www.unccd.int/resources/global-land-outlook/northeast-asia-partnerships-achieve-land-degradation-neutrality

disproportionately affected. The costs of land degradation are high; in Kenya, the IMF estimates that it represents around 3 per cent of the country's GDP.

The main causes for land degradation in the region point to the introduction of centralised agricultural growth policies that are mismatched with the complex dynamics of East African ecosystems, contributing to soil exhaustion, decreased fertility and increased erosion. Additional causes relate to deforestation, uneven grazing, and unsustainable agricultural practices (e.g., land clearing or firewood extraction). This degradation is rooted in political misunderstanding of pastoral and agropastoral systems, driven by coercive policies of land use, privatisation, sedentarisation, and exclusion and marginalisation from state and public services. Many communities find it increasingly difficult to adapt to changing internal and external shocks and pressures, impacting local production systems and furthering degradation.[189]

Discussion

The case studies in East Africa demonstrate the important role of participation, the need for improved policy frameworks, and the knowledge gap represented by the lack of actual data and information on rangelands.

First, participatory, bottom-up approaches are central to SRLM. Participation is central to the conceptual framework of this report (Figure 4) and has been demonstrated in the varied case studies presented in this report. Participation necessitates the actual integration of all stakeholders involved, and specifically the different pastoralist communities, in decision-making. Accordingly, effective participation schemes must first be promoted, conveniently arranged, resourced and allowed within an appropriate time frame. Skilled facilitation, by providing guidance, safe environments, conflict management and technical support, is vital to plan and effectively implement rangeland action.

Second, East African countries demonstrate the vital role of policy frameworks to develop enabling environments to manage and restore rangelands. Effective projects and initiatives cannot be implemented without sufficient legal support. Several East Africa countries are already engaged in revising policies and supporting effective legal frameworks, to ensure impactful pastoral initiatives. As pastoralism is often transboundary, however, it is important to ensure political borders and disputes do not obstruct project success. Countries can generate profit from synergies and transboundary agreements on rangelands and pastoralism.

Data on pastoralism represents another critical area to improve rangeland management in East Africa. This knowledge gap has resulted in initiatives that lack baseline analysis and, thus, are developed on the basis of generic solutions that are not fit for, or responsive to, such complex environments. Case studies show a critical need to improve the knowledge pool on rangelands, including data on how and when they are used. By incorporating the wide knowledge and expertise of the many and diverse pastoralist communities, initiatives in East Africa can effectively develop the knowledge base between researchers and practitioners. This is a meaningful strategy to upgrade management and restoration tools, merging the long-term

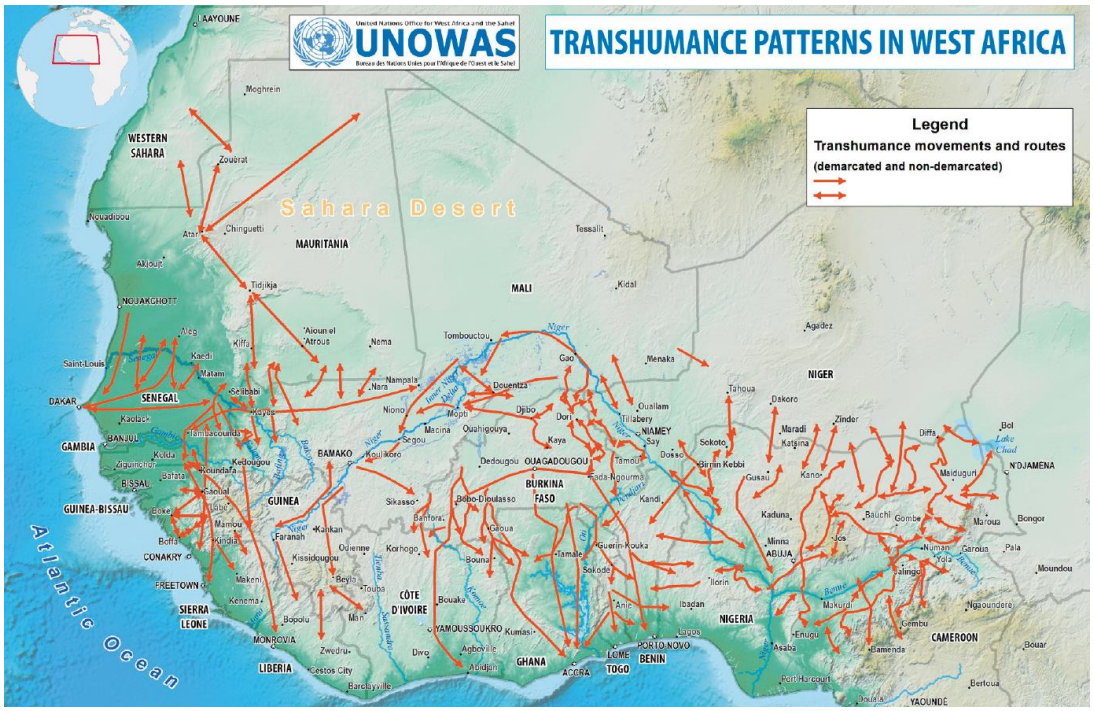
[189] Wynants, M., Kelly, C., Roberts, N., Gilvear, D., Rabinovich, A., Nasseri, M., Patrick, A., Munishi, L., Mtei, K., Wilson, G., Ndakidemi, P. and Blake, W.H. (2018) 'Land degradation in East- Africa ' s agro - pastoral systems : changing interactions between the social , economic and natural domains', (December). https://doi.org/http://dx.doi.org/10.13140/RG.2.2.36615.14244.

adaption capacity of producers with the need to acknowledge the drivers and trends of global change and technology advances.

4.2 West Africa

The most relevant climate feature of West Africa is the latitudinal rainfall gradient, with the hyper-arid areas of the north Sahel barely receiving 100 millimetres each year while the humid south coast experiences over 5000 millimetres in precipitation each year. Between these zones, arid, semi-arid and sub-humid grasslands and savannahs represent the diversity of West African rangelands,[190] [191] coarsely classified into four groups: desert; Sahelian savanna; Sudanian savanna; and forest-savanna mosaic.[192] Rainfall is highly variable, especially in the drier areas of the Sahel with short and irregular rainy season and prolonged droughts. Conversely, temperatures tend to be uniformly high. West Africa rangelands (desert excluded) occupy around 2.9 million square kilometres, 56 per cent of them in the Sahel zone.[193]

Figure 10: Transhumance routes in West Africa[194]



[190] Timpong-Jones, E.C., Samuels, I., Sarkwa, F.O., Oppong-Anane, K. and Majekodumni, A.O. (2023) 'Transhumance pastoralism in West Africa–its importance, policies and challenges', African Journal of Range and Forage Science, 40(1), pp. 114–128. https://doi.org/10.2989/10220119.2022.2160012.

[191] Olson, D.M., Dinerstein, E., Wikramanayake, E.D., Burgess, N.D., Powell, G.V.N., Underwood, E.C., D'Amico, J.A., Itoua, I., Strand, H.E., Morrison, J.C., Loucks, C.J., Allnutt, T.F., Ricketts, T.H., Kura, Y., Lamoreux, J.F., Wettengel, W.W., Hedao, P. and Kassem, K.R. (2001) 'Terrestrial ecoregions of the world: A new map of life on Earth', BioScience, 51(11), pp. 933–938. https://doi.org/10.1641/0006-3568(2001)051[0933:TEOTWA]2.0.CO;2.

[192] Bocksberger, G., Schnitzler, J., Chatelain, C., Daget, P., Janssen, T., Schmidt, M., Thiombiano, A. and Zizka, G. (2016) 'Climate and the distribution of grasses in West Africa', Journal of Vegetation Science, 27(2), pp. 306–317. https://doi.org/10.1111/jvs.12360.

[193] Lipper, L., Dutilly-Diane, C. and McCarthy, N. (2010) 'Supplying Carbon Sequestration From West African Rangelands: Opportunities and Barriers', Rangeland Ecology & Management, 63(1), pp. 155–166. https://doi.org/10.2111/REM-D-09-00009.1.

[194] UNOWAS (2018) Pastoralism and Security in West Africa and the Sahel: Towards Peaceful Coexistence. https://unowas.unmissions.org/sites/default/files/rapport_pastoralisme_eng-april_2019_-_online.pdf.

Pastoralism is widespread in West Africa. Mobile pastoralists follow long mobility routes, crossing multiple countries from the edge of the Sahara to the coast. Nomadic and transhumant pastoralists account for approximately 13 per cent of the West African population, including the Tuareg, Fulani, Peuls, Maures and other ethnic groups.[195] FAO estimates in 2016 suggest approximately 73 million cattle, 4.6 million camels, 110 million sheep and 157 million goats across the Economic Community of West African States (ECOWAS) and Mauritania.[196] The region hosts a great diversity of pastoralist systems, encompassing the whole spectrum of pastoral mobility and agroforestry integration. Livestock production accounts for at least 25 per cent of the GDP of Burkina Faso, Mali, Mauritania, Niger and Chad, is critical to food systems which provide employment for 80 per cent of the population.

Rangelands are of great concern in the region, as West Africa is particularly vulnerable to climate and global change.[197] Governments and investors are increasingly interested in rangelands, fuelled by discoveries of oil and minerals and the growing demand for land-based commodities. Large-scale land acquisitions still target pastoral areas, especially those with greater accessibility due to new infrastructure.[198] This situation is generating insecurity across the region, generating violent conflicts in which pastoralists communities become inadvertently trapped.

Table 10: Causes and effects underpinning rangeland and pastoralism conflicts in West Africa[199]

Causes	Effects
Indiscriminate grazing and movement of cattle at night	Trespassing by transhumant cattle; food crop yield losses; cattle rustling
Scarcity of land	Cropping on designated grazing areas
Abusive prices of feed for transhumant herders	Herders resort to reserves for forage in times of scarcity
Discrimination against pastoralism on land rights	Promotes social division and enmity between herders and farmers
Decentralisation and transfer of natural resource management to rural communities	Privatisation and conversion reduces the extent of grazing lands
Blocking of transhumant tracks and corridors	Ignoring blockades and grazing on former grazing areas
Insurgency and political instability	Pastoralists seen as threats irrespective of borders
Transhumance corridors passing through protected areas where grazing is forbidden	Grazed animals stray into protected areas
Unregulated common use of water sources	Depletion of community water wells and degradation around them
Effects of climate change	Inadequate forage and water for pastoral livestock
Spraying of farms with herbicides and insecticides	Poisoned animals
Rape of women and girls on farms	Violence inflicted on communities and violation of culture and taboos
Language barriers	No dialogue and negotiations
Incompatibility between farms and cattle mobility paths	Crop damage; some farmers shoot cattle that stray onto their farms
Armed herders groups	Intimidation, tension and mistrust; extreme violence, cattle rustling

[195] https://www.fao.org/pastoralist-knowledge-hub/pastoralist-networks/regional-networks/west-and-central-africa/en/

[196] UNOWAS (2018) Pastoralism and Security in West Africa and the Sahel: Towards Peaceful Coexistence. https://unowas.unmissions.org/sites/default/files/rapport_pastoralisme_eng-april_2019_-_online.pdf.

[197] Zampaligré, N. and Schlecht, E. (2018) 'Livestock foraging behaviour on different land use classes along the semi-arid to sub-humid agro-ecological gradient in West Africa', Environment, Development and Sustainability, 20(2), pp. 731–748. https://doi.org/10.1007/s10668-017-9907-y.

[198] Flintan, F.E., Robinson, L.W. and Allen, M. (2021) 'A review of tenure and governance in the pastoral lands of East and West Africa', (December). https://hdl.handle.net/10568/117697.

[199] Timpong-Jones, E.C., Samuels, I., Sarkwa, F.O., Oppong-Anane, K. and Majekodumni, A.O. (2023) 'Transhumance pastoralism in West Africa – its importance, policies and challenges', African Journal of Range & Forage Science, 40(1), pp. 114–128. https://doi.org/10.2989/10220119.2022.2160012.

Causes	Effects
Uncontrolled burning and wildfires	Wildfires destroy food-crop farms
Cattle rustling and banditry	Fear, tension and mistrust, vigilante groups

The violence exerted by jihadists, accusations of collaboration and collateral damages have caused herders to retreat into refugee camps. Conflict between herders and farmers related to land use have intensified in some countries, especially Nigeria. The COVID-19 pandemic and the consequent closure of borders in transhumance areas exacerbated conflict and worsened tensions.[200] The intersecting pastoral and security crises have greatly impacted pastoralism in the past 50 years,[201] directly and persistently impacting food, water and energy security.[202]

Regional approaches

A positive future for rangelands coupled with the legitimate aspirations of producers demands a sound regional approach. Organizations that support pastoralism, such as the Réseau Billital Maroobé,[203] have proposed recommendations, including to ensure protection from Defense and Security Forces and to regulate and control self-defense and violent groups.

ECOWAS[204] and the *Comité Permanent Inter-Etats de Lutte contre la Sécheresse dans le Sahel*[205] have supported pastoralists and rangelands at the regional level, such as with the 2019 Nouakchott Declaration.[206] Mauritania, Mali, Burkina Faso and Niger are developing Pastoral Codes to regulate resource access and mobility. Representatives from regional civil society networks have also participated in global policy processes, such as the Global Agenda for Sustainable Livestock.[207] Several regional networks, such as the *Association pour la Promotion de l'Elévage au Sahel et en Savane*,[208] *Réseau Billital Maroobe*,[209] Confederation of Traditional Stock Breeders Organizations in Africa,[210] etc., are actively promoting support initiatives and facilitating peaceful transhumance between the Sahel and coastal countries. FAO, through the Pastoralist Knowledge Hub (PKH), also actively supports pastoralism in the area.[211]

[200] Pellerin, M. (2021) Listening to herders in west Africa and the Sahel : what future for pastoralism in the face of insecurity and its impacts ? https://www.inter-reseaux.org/wp-content/uploads/Edited-Report-Patoralism-and-Insecurity-in-the-Sahel-and-West-Africa-RBM.pdf.

[201] UNOWAS (2018) Pastoralism and Security in West Africa and the Sahel: Towards Peaceful Coexistence. https://unowas.unmissions.org/sites/default/files/rapport_pastoralisme_eng-april_2019_-_online.pdf.

[202] UNCCD (2019) The Global Land Outlook: West Africa Thematic Report: Land Degradation Neutrality: Benefits for Human Security, The Global Land Outlook West Africa Thematic Report. https://www.unccd.int/resources/publications/global-land-outlook-west-africa-thematic-report-land-degradation-neutrality.

[203] https://www.maroobe.com/

[204] https://ecowas.int/

[205] https://www.cilss.int/

[206] https://rr-africa.woah.org/wp-content/uploads/2000/11/nouakchott-1.pdf

[207] https://www.livestockdialogue.org/

[208] https://www.apess.org/

[209] https://www.maroobe.com/

[210] https://coretherders.org/

[211] FAO (2020) 'FAO support of multi-stakeholder platforms on land tenure governance Innovative practices from the field and building on experience FAO support of multi-stakeholder platforms on land tenure governance'. https://www.fao.org/3/cb2425en/CB2425EN.pdf.

Improving governance of pastoral lands

This initiative is based on the use of the Voluntary Guidelines on the Responsible Governance of Tenure,[212] approved by the Committee on World Food Security, and its technical guide n°6 "Improving governance of pastoral lands".[213] These guidelines provide different lines of action, linked to accountable decision-making, effective representation, inclusive participation, knowledge recognition, strengthening customary systems and their synergies with statutory systems, capacity- and social capital-building, conflict management and collaborative learning. The initiative promotes better governance in the pastoral lands of Niger[214] and Mali[215] and guides stakeholders in other countries, such as Chad, Guinea, and Mauritania.

This initiative has promoted several multi-stakeholder platforms, facilitating their development and training members on the Voluntary Guidelines and land rights.[216] The National Transhumance Committees and signed agreements with specific ministries are instrumental at the country level. Additionally, two transboundary agreements between Niger and Nigeria have been signed, providing reinforced protection of cross-border transhumant pastoralists from livestock theft and insecurity, joint investment programmes, and coordination between the two states.

Another interesting regional project, taking place in different Sahel countries, is singularly focused on radio journalism and communications around rangeland issues.

"**Capacity building of community radio journalists in West Africa and the Sahel on conflict sensitive journalism**"[217] 218

This initiative aims to promote the role of radio and journalism in raising knowledge and understanding of the agropastoral sector among key actors. By publicly recognising pastoralism and agropastoralism as a key sector, this initiative aims to change the perception and language of community radio journalists on pastoral issues.

The project includes theoretical and practical training on the production of radio programmes (interviews, production, broadcasting, etc.), with each journalism student subsequently planning and producing six radio programmes to be uploaded onto Radio Agropastorale,[219] a platform previously established by the initiative. The initiative familiarises journalists and other participants with different aspects of pastoralism as well as dissemination and communication techniques. Two expert consultants in journalism and pastoralism oversaw this training, which included a week of practical application in the field. An average of 25–30 students (community radio journalists and farmer and herder leaders) participated in each edition, providing positive feedback afterwards.

[212] https://www.fao.org/tenure/voluntary-guidelines/en/
[213] Davies, J., Herrera, P.M., Ruiz-Mirazo, J., Mohamed-Katerere, J., Hannam, I. and Nuesiri, E. (2016) Improving governance of pastoral lands. FAO. https://www.fao.org/policy-support/tools-and-publications/resources-details/en/c/1151757/ .
[214] https://www.fao.org/documents/card/en/c/ca7290en
[215] https://www.fao.org/documents/card/fr/c/cb5295fr
[216] https://www.fao.org/documents/card/en/c/cb6532en
[217] https://www.cilss.int/
[218] https://www.cilss.int/index.php/projet-pepisao/
[219] https://soundcloud.com/user-445095840

National approaches

Nigeria

Nigeria, Africa's most populous country, has one of the largest livestock populations on the continent, contributing 9 per cent to the agricultural GDP of the country. The best available data on livestock numbers dates back to 2016, when it was estimated that, there would have been 20.5 million cattle, 42 million sheep, 74 million goats, and 280,000 camels in Nigeria. The pastoral production system plays a key role in the livestock sector, which comprises over 20 million cattle and involves close to 15 million people.[220]

Most Nigerian pastoralists are Fulani by ethnicity but are not a homogenous group. There are several Fulani clans, sub-clans, local cultures and dialects, and variations in herding practices.

Nigeria's rangelands are influenced by conflicts. The general pressures described above coincide with ethno-religious and political tensions, state failure, land-grabbing by agri-business and elites, displacement, interruption of livestock routes, as well as the presence of Boko Haram and other sources of conflict. Thus, land-related conflicts have often generated extreme violence, to different degrees around the country. Large-scale conflict management and improved security are essential to stop the violence, restore rule of law and improve the relationship between pastoralists and farmers, with a view to restore the governance of rangeland resources and water. The case study on Nigeria, below, shows how improved livestock performance can be supported alongside conflict management.

"Livestock Productivity and Resilience Support project"[221]

This project introduces policy and economic instruments to generate interest in adaptive herd management and improve their production and commercialisation, while achieving three objectives: 1) strengthen national livestock institutions to develop an enabling environment; 2) enhance livestock value chain performance; and 3) prevent and manage crises, reduce conflict and build peace.

The project has involved preparatory work on stakeholder mobilisation and advocacy and recently kick-started its implementation, targeting policy reforms, better services, a productive alliance on value chain enhancement, improved access to credit and better natural resources management.
As part of this initiative, a collaborative framework includes pastoralists, small- and medium-scale farmers, and other stakeholders, which is funded by a collaborative investment scheme between the Government, institutions and private actors.

Senegal

The majority (58 per cent) of the Senegalese population are engaged in agriculture and 36 per cent in livestock keeping. Livestock production has been more stable than crop production in recent decades, due to droughts and locust outbreaks. Livestock generates about 36 per cent of agricultural GDP and 3.7 per cent of total GDP (1994–2000), and 68 per cent of Senegalese households, 90 per cent in rural areas, have herds. Small ruminants dominate the livestock sector, as sheep culture is particularly important, with most remaining under a traditional extensive or mixed farming system (either pastoralist or agropastoralist).[222]

[220] https://www.preventionweb.net/news/nigerias-pastoralists-face-triple-burden-disease-outbreaks-conflict-and-climate-change
[221] https://fmard.gov.ng/
[222] D'Alessandro, S., Fall, A.A., Grey, G., Simpkin, S. and Wane, A. (2015) *Senegal: Agricultural Sector Risk Assessment*. https://openknowledge.worldbank.org/server/api/core/bitstreams/4dc23c60-96d8-5347-b217-244cf1e0706a/content.

The already high value of rangelands and livestock to the economy, livelihoods, nutrition, and ecosystem services is likely to continue to increase in the coming decades. As such, grazing may become a significant adaptation tool. Projected trends in rangeland productivity and agricultural and livestock systems can help formulate SRLM strategies assisting the agricultural sector affected by climate change.[223]

Senegal is leading adaptation initiatives based on agroforestry approaches that simultaneously provide for both mobile pastoralism and settled agropastoralism, tailoring specific adaptation tools from participatory processes in Fatick and other Ferlo locations.[224] The initiative presented below is linked to the Great Green Wall in Senegal.[225]

"Dundi Ferlo"[226] [227] [228] [229] [230]

This initiative aims to carry out a large-scale reforestation (starting with 1,000 hectares and eventually encompassing over 10,000 hectares) over a 10-year period in the Senegalese Ferlo region around the route of the Great Green Wall. The project targets a pastoral area with a high level of livestock movement and strong pressure on the forest cover on which the herders depend. The project's innovation lies in the engagement of pastoral communities in the restoration process, drawing profit from the economic outcomes of forest resources. The project is supported by research, identifying effective reforestation techniques for the Sahelian context.

This initiative provides an opportunity to analyse reforestation operations in the past 15 years in the Sahel. The mixed results and local conflicts arising from restoration operations require reorientation of these practices towards integration with rangelands. The top-down approach is constrained by pitfalls that reduce their outcomes. Ecological restoration should not oppose pastoralism for conservation reasons; conversely, selected trees can be useful for breeders as complementary feed or shade, while rangelands are instrumental as host to valuable habitats and species and a provider of services for the community. Prior consultation and participation are essential to integrate the interests of all stakeholders in the governance of restoration.

Land Degradation Neutrality in West Africa

According to the GLO thematic report on West Africa,[231] the region holds significant potential to achieve LDN. The Sahel, in particular, has advanced knowledge and skilled practice at a local level, drawn from diverse rangeland production systems, which could help to scale up SRLM and adapt pastoralist systems to climate change. Rangeland, water caption and sustainable development of renewable energies, can provide additional support to agroforestry and

[223] Sircely, J. (2022) Climate outlook for rangelands in Senegal. https://cgspace.cgiar.org/bitstream/handle/10568/127765/ClimateOutlookforRangelands_Senegal.pdf?sequence=1&isAllowed=y.
[224] FAO (2022) Grazing with trees, Grazing with trees. FAO. https://doi.org/10.4060/cc2280en.
[225] https://www.unccd.int/our-work/ggwi
[226] https://www.avsf.org/fr/posts/2843/full/senegal-assurer-une-reforestation-utile-et-perenne-grace-au-projet-dundi-ferlo
[227] https://www.weforest.org/
[228] https://isra.sn/
[229] https://www.cirad.fr/
[230] https://www.unccd.int/our-work/ggwi/great-green-wall-accelerator
[231] UNCCD (2019) The Global Land Outlook: West Africa Thematic Report: Land Degradation Neutrality: Benefits for Human Security, The Global Land Outlook West Africa Thematic Report. https://www.unccd.int/resources/publications/global-land-outlook-west-africa-thematic-report-land-degradation-neutrality.

pastoralist initiatives. West African countries have set realistic and achievable targets for LDN by 2030. Their success will depend on the mobilisation of innovative financing resources, promotion of SRLM, development of an inclusive economy based on the sustainable use of land resources and securing and strengthening the land rights of vulnerable groups.

Discussion

Cases in West Africa have areas of overlap: the remarkable diversity among pastoralist cultures, strategies and production systems; responsibilities assigned to pastoralists; and conflict management.

The diversity of pastoral systems is at the core of sustainable rangeland management, and West Africa offers a strong example, showing pastoralist and agropastoral systems coping with starkly different socioecological conditions. Diversity is part of the identity of pastoralist communities and, thus, also should be part of the solutions implemented. This diversity is an inherent characteristic of the complex socioecological systems of rangelands. West Africa is a region where the combination of a large variety of ecosystems and the multiple interests and production systems generates the most diverse outcomes and strategies to address rangeland issues (e.g., how to manage open access lands or coexist with croplands).

The fair designation of responsibilities and capacities also needs to be considered. Land degradation is often linked to human causes (overpopulation, overgrazing, fuel collection…), placing the responsibility on local communities. However, local communities have been contending with changing scenarios for generations, drawing their survival and well-being from variable resources and managing lands under extreme pressure. Further, causality of land degradation in West Africa is not fully understood, and often baseline assessments lack a systematic and empirical foundation, lending to results that are not aligned to the reality of West African rangelands. Concern over land degradation has often overlooked physical factors, modern developments, and external interventions. Consequently, restoration initiatives have failed, lacking the knowledge and adaptation strategies employed by local producers.[232] This is related to the knowledge gap, the application of conventional solutions to insufficiently analysed situations, and a lack of understanding of the role and capacity of local communities.

As the conceptual framework shows, conflict is another transversal issue affecting rangeland management and governance. Although the situation in West Africa is often viewed as simply herder-farmer conflicts, there are more complex social and land-related issues, which make it difficult to apply a single lens. Some territories are more successful than others at addressing conflict by combining participation and governance tools with local/state authority action, as demonstrated by case studies. Accordingly, it is important to create opportunities for dialogue and agreements between pastoralists and other rangeland users to reduce conflicts and support SRLM, based on multifunctionality, adaptation, and resilience.

[232] Kiage, L.M. (2013) 'Perspectives on the assumed causes of land degradation in the rangelands of Sub-Saharan Africa', Progress in Physical Geography, 37(5), pp. 664–684. https://doi.org/10.1177/0309133313492543.

4.3 Middle East and North Africa

The Middle East and North Africa (MENA) Region is a vast area with nearly 9 million square kilometres, hosting 420 million people from 20 countries across two continents along the Mediterranean Sea, the Red Sea and the Persian Gulf. Rangelands occupy at least 303 million hectares (deserts excluded) ranging from the Dead Sea depression (417 metres below sea level) to Mount Damavand (5,610 metres) in Iran. Topography of the region is variable with important mountain ranges. The whole region can be considered dryland, hosting Mediterranean arid and semi-arid climates, low and erratic rainfall, and wide arid and desert zones.[233] This results in water scarcity, and one of the most water-scarce areas in the world, overly exposed to droughts and climate change impacts.

Dry forests, rangelands and deserts are the dominant vegetation reflecting a long history of human activities and ecological conditions. Agricultural land is scarce and occupies only five per cent of the region. Conversely, rangelands occupy wide areas in most of the countries in the region.

Livestock economies are strategic in the region,[234] representing the main form of rural savings for households and communities, helping increase resilience and reduce vulnerability to external shocks[235] while providing income for women and rural communities.[236] Sheep and goats are the most numerous, with over 150 million sheep and around 60 million goats in 2014. There are also an estimated 21.7 million cattle, 24 million camels, 4 million buffaloes, 6.3 million mules and donkeys, and about 633,000 horses. Algeria and Iran hold the most sheep (31.4 and 27.8 million, respectively), Iran and Yemen have the most goats (20 and 9 million, respectively), and Egypt and Iran have the most cattle. Small ruminants and camels graze large arid and semi-arid rangelands, while cattle are usually in settlements in irrigated areas.[237]

Rangelands are communally or state-owned, often freely grazed under enduring religious and cultural traditions. Their access and tenure rights are not clearly assigned to village communities or tribes. However, the situation varies across countries, combining state, customary and religious law, and private, public and communal ownership. Historically, property rights have coupled Islamic principles and customary laws with government demands to secure rights, but a high degree of uncertainty and insecurity remains. Nonetheless, traditional governance mechanisms (Aqdal in Morocco and Tunisia, Qoroq in Iran, or Hima in

[233] Naghizadeh, N., Badripour, H., Louhaichi, M., Gamoun, M. and Niamir-Fuller, M. (2021) 'Rangelands and Pastoralism of the Middle-East and North Africa , from Reality to Dream', in National Organizing Committee of 2021 IGC/IRC Congress (ed.) *The XXIV International Grassland Congress / XI International Rangeland Congress*. UKnowledge / University of Kentucky, pp. 1–4. https://uknowledge.uky.edu/igc/24/6/19.

[234] Nori, M. (2022) 'Assessing the policy frame in pastoral areas of West Asia and North Africa (WANA)'. https://hdl.handle.net/1814/74315.

[235] Ates, S. and Louhaichi, M. (2012) 'Reflexions on agro-pastoralists in the WANA region: Challenges and future priorities', *Options Méditerranéennes. Séries A: Mediterranean Seminars*, 102(October), pp. 511–516. http://om.ciheam.org/om/pdf/a102/00007007.pdf.

[236] Zuccotti, C.V., Geddes, A.P., Bacchi, A., Nori, M. and Stojanov, R. (2018) Drivers and patterns of rural youth migration and its impact. FAO. https://www.fao.org/documents/card/en/c/I9193EN.

[237] Mohamed, A.H., Hawy, A.S. El, Sawalhah, M.N. and Squires, V.R. (2019) 'Middle East and North Africa Livestock Systems', in V. Squires (ed.) Livestock: Production, Management Strategies and Challenges. Nova. https://www.researchgate.net/publication/350837428_Middle_East_and_North_Africa_Livestock_Systems.

Syria, Jordan and the Arabian Peninsula) remain in the region, regulating access to grazing lands and supporting the resting and recovery periods with seasonal bans. They represent the most ancient indigenous institutions related the management and conservation of rangelands.

Rangelands and pastoralism in the MENA region require wide, coordinated action. The challenge is to fit interventions into the socioeconomic setting of each production system, management pattern and community while keeping an integrated perspective, as reflected in Table 11.

Table 11: Problems and strategies to improve pastoralism in the MENA region

Problems		
Policy, institutions and tenure	**Socioecological**	**Technical and knowledge**
Unfair and misguided allocation of land tenure and access rights	Weakening of pastoralists' identity and sense of ownership	Lack of supporting research, extension and technical support
Inappropriate rangeland management units	Limited investment and inequitable access to credit	Lack of reliable data on rangeland and pastoralism
Absence of state action	Inadequate markets, facilities and information	Low productivity and seasonal feed availability
Weakening and disintegration of traditional institutions	Conflict over lands	Lack of integration of indigenous knowledge
Lack of recognition of customary governance and land rights	Absentee livestock owners	Lack of impact assessment of policies and plans on rangelands
Forced and induced sedentarisation	Improper delivery of services to mobile people	Lack of economic research on pastoralism, food security, etc.
Nationalisation of natural resources	Conversion, fragmentation and degradation of rangelands	Loss of local livestock breeds adapted to climatic hazards/risk
Limited participation of pastoral communities	Harsh climatic conditions, climate change and drought	Disease outbreaks
Strategies		
Policy, institutions and tenure	**Socioecological**	**Technical and knowledge**
Generate a supportive legal framework	Improve financial and insurance tools	Increase research, extension and technical support
Secure land tenure and access rights allocation	Adapt markets and value chains	Enhance information and monitoring in the field
Strengthen traditional institutions and governance systems	Solving existing conflicts	Co-construct integrated knowledge and training
Coordinate state action and bodies	Support participation of communities and stakeholders	Promote best management practices
Provide adapted services	Build social capital	Prevent and address outbreaks and disease
Stop conversion of rangelands	Support adaptation to climate change	Promote the role of local livestock breeds

Currently, the region lacks coordinated action to address these challenges. However, the region has significant influence in international initiatives, such as the Great Green Wall and WeCAN community. Several MENA states have promoted policies and state measures to overcome these challenges, implementing pastoralist and rangeland laws, and updating and promoting governance institutions as well as participatory and multi-stakeholder platforms.

The MENA region is leading the recovery of traditional management systems, such as Hima and Agdals, implementing silvopastoral and agroforestry schemes, promoting diversification

and multifunctionality, and revisiting other pastoralist management tools (mobility, multi-species herd, improved value chains, etc.).[238]

National approaches

Morocco

Morocco has 53 million hectares of pastoral land, of which nine million hectares are located in forests.[239] The country hosts a variety of terrestrial ecosystems, making the country one of the most diverse in the Mediterranean region.[240] Rangelands, largely in arid or semi-arid zones, are the main source of income for pastoralists. However, they have been increasingly affected by urban expansion, cultivation, desertification, climate change and pollution. In the south-east of the Great Atlas and the Anti-Atlas, rangeland degradation has generated tensions and conflicts.[241]

The Government is trying to address this situation through an evolving legal framework. The silvopastoral sector benefits from the existence of this framework, as well as from a wide experience in forestry development projects and pastoral improvement. Morocco's silvopastoral strategy establishes principles and general rules that govern forest and pastoral areas and the mobility and management of grazing livestock.[242]

A national consensus on the silvopastoral sector is reflected in the state-led coordination and stakeholder consultations, which led to the development of the silvopastoral strategy. The practical application of the strategy and legal framework is, however, subject to social and ecological constraints. Access to forests, which is only permitted to pastoralists under certain circumstances, is a key constraint. "Use-rights holders" living near forest domains enjoy special entitlements, including the right to graze their domestic livestock; however, such rights require improved security.[243] The case below shows the difficulty and coinciding necessity of coordination between state and customary institutions to improve rangeland management.

Collaboration of the Jmaâ (tribal council) with the Douar association as a contact with the local authority and foresters[244] [245]

The Jmaâ, the traditional institution that organizes a douar or village of mobile pastoralists, traditionally set limits on pastoralist use of local rangelands for grazing, with different limits for local pastoralists and other douars. Although the authority of the Jmaâ is acknowledged by the douar, lack of state recognition has often led to abuse and degradation.

[238] Sivakumar, M.V.K., Lal, R., Selvaraju, R. and Hamdan, I. (2013) *Climate Change and Food Security in West Asia and North Africa*, *Climate Change and Food Security in West Asia and North Africa*. Edited by M.V.K. Sivakumar, R. Lal, R. Selvaraju, and I. Hamdan. Dordrecht: Springer Netherlands. https://doi.org/10.1007/978-94-007-6751-5.

[239] Chebli, Y., El Otmani, S., Elame, F., Moula, N., Chentouf, M., Hornick, J.-L. and Cabaraux, J.-F. (2021) 'Silvopastoral System in Morocco: Focus on Their Importance, Strategic Functions, and Recent Changes in the Mediterranean Side', Sustainability, 13(19), p. 10744. https://doi.org/10.3390/su131910744.

[240] FAO (2022) *Grazing with trees*, *Grazing with trees*. FAO. https://doi.org/10.4060/cc2280en.

[241] https://fnh.ma/article/actualite-economique/espaces-pastoraux-les-parcours-naturels-menaces

[242] Naggar, M. (2018) 'Stratégie sylvopastorale et renouveau des pratiques pastorales en forêt au Maroc', *Revue Forestière Française*, 70(5), p. 487. https://doi.org/10.4267/2042/70133.

[243] FAO (2022) *Grazing with trees*, *Grazing with trees*. FAO. https://doi.org/10.4060/cc2280en.

[244] https://qcat.wocat.net/en/wocat/approaches/view/approaches_5144/

[245] https://qcat.wocat.net/en/wocat/

Legally, natural resource management and conflict resolution at the douar level is directly linked to the competency of the douar association, which rules and manages local forest resources, holds exclusive grazing and resource rights, and takes disciplinary action for malpractice.

This initiative has promoted close collaboration between the Jmaâ and the Douar association while also strengthening their legal status and, thus, the capacity of both the Jmaâ and the Douar association. The douar association acts as an interface between the Jmaâ, the local authority, and the foresters, keeping forest management at the local level. The Jmaâ assembly limits the number of outsiders and absent owners grazing, thereby regulating their forest grazing rights. The Jmaâ can issue additional rules, such as banning the chopping of branches to feed livestock. The association is legally qualified to communicate with foresters and the local authority and has been deputised to issue fines for trespassers or wrongdoers with support from the forestry department.

The collaboration between the Jmaâ, the Douar association, the local government and the foresters helps ensure the health of the forests which, in turn, encourages the community to respect and enforce respect for the rules, to the benefit of all, incentivising the entire Douar to prevent degradation at minimal cost.

This agreement is also flexible. If snow cover prevents grazing, the Jmaâ can authorise herders to lightly trim the holm oaks for one day. However, they are obligated to chop in a group to minimise the amount that is cut. Closure of pastures can also be applied as in the Agdals.[246]

Jordan

Jordan is an arid country with 90 per cent of its 90,000 square kilometres covered by rangelands. The country is divided into three geographic zones: the Jordan Valley; the Highlands; and the Badia. The Badia receives less than 200 millimetres in annual precipitation and is almost fully rangelands.

Livestock contributes about 55 per cent to agricultural production, with sheep and goats the predominant livestock species. The animals are mostly fed by a mix of crop by-products, planted fodder and barley with the contribution of rangelands generally low and severely reduced in degraded areas and during extended droughts.[247] Pastoralism is the most common activity in the rangelands, traditionally practiced by the Bedouins. Camel production was dominant until the 1940s, shifting later to sheep and goats. Bedouin tribes practiced a traditional land management system (Dirah) covering the area throughout which a group migrated, as well as a grazing system (Hima), which regulated grazing and resting periods.[248]

The Government of Jordan started to promote the sedentarisation of Bedouin herders in the 1960s, declaring rangelands state-owned and permitting open-grazing. Border consolidation,

[246] https://qcat.wocat.net/en/wocat/technologies/view/technologies_5166/

[247] Ministry of Agriculture and IUCN (2013) Updated Rangeland Strategy for Jordan. Jordan: Ministry of Agriculture Directorate of Rangelands and Badia Development. https://faolex.fao.org/docs/pdf/jor165720.pdf

[248] IUCN (2015) 'Sustainably Investing in Rangelands: Jordan', pp. 1–6. http://cmsdata.iucn.org/downloads/mapping_20rangeland_20in_20jordan_20gis_2015.pdf.

diminishing rights, new land uses and climate hazards have contributed to land degradation, to the extent that producers now greatly depend on barley and external fodder.[249]

The Government has been active in the sustainability and restoration of rangelands. The National Rangeland Strategy (2013) was developed in cooperation with the International Union for Conservation of Nature (IUCN) and with stakeholders, targeting the underlying causes of degradation and promoting SRLM and improved plant cover, water management, restoration and mobility. Secured rights facilitated cooperatives and helped reinstate the concept of Hima. Later, the Aligned National Action Plan to Combat Desertification[250] initiated restoration projects in degraded Badia areas, with a success that still needs to be assessed.

The restoration of degraded rangelands in Jordan has become key to enhance and maintain the productivity and resilience of fragile ecosystems. Following this lead, the next case study presents advances in water catchment and restoration of a watershed.

Watershed rehabilitation initiative to restore degraded rangelands in the Jordanian Badia[251] [252]

This project presents an integrated watershed approach to the restoration in Jordanian drylands. The design includes integrated interventions to separate the degradation cycle into different steps and rebuilding the provision of ecosystem services. Key measures include controlling gully erosion, supporting revegetating gully plugs[253] and creating micro-catchments for water harvesting in the upstream Vallerani System[254] and the floodplain Marabs system.[255] Marabs is an advanced technology that creates compartments for flood-irrigated agriculture from local gully-filling, transforming eroded gullies into agricultural patches.

The project is generating economic improvements with agricultural interventions in the watershed, while decreasing degradation processes and the pressure on the dryland ecosystem. It shows the potential of a more sustainable model for vulnerable uplands, which are less fertile and prone to runoff. Upstream microcatchments increase biodiversity regeneration through the emergence of dormant seed, complemented by adapted seedlings.

The survival rate and success of the rehabilitation approach are high. The vegetation patches created reduce erosion and trap sediments, including organic carbon. Water harvesting reduces surface runoff, mitigating downstream flooding and increasing local soil moisture, production and biodiversity, which increase carbon. Sediments are trapped in the gully plugs and fertilise the crops. Smoothed watershed hydrology is beneficial to downstream Marabs protecting crops and infrastructure. Increased water infiltration conserves water and deepens percolation. Water is harvested and runoff is minimised, preventing erosion.

[249] Haddad, M., Strohmeier, S.M., Nouwakpo, K., Rimawi, O., Weltz, M. and Sterk, G. (2022) 'Rangeland restoration in Jordan: Restoring vegetation cover by water harvesting measures', *International Soil and Water Conservation Research*, 10(4), pp. 610–622. https://doi.org/10.1016/j.iswcr.2022.03.001.
[250] Ministry of Environment (2015) The Aligned Action Plan National to Combat Desertification in Jordan. Jordan. https://www.unccd.int/sites/default/files/naps/Jordan%2520-%2520eng%25202015-2020.pdf.
[251] https://mel.cgiar.org/projects/watershed-restoration-in-badia-areas-of-jordan---technology-packages-for-controlling-and-monitoring-gully-erosion
[252] https://www.icarda.org/
[253] https://qcat.wocat.net/en/wocat/technologies/view/technologies_5862/
[254] https://qcat.wocat.net/en/wocat/technologies/view/technologies_5860/
[255] https://qcat.wocat.net/en/wocat/technologies/view/technologies_5770/

Egypt

Egypt encompasses one million square kilometres of mostly arid and desert land. Its 80 million inhabitants live and work in only 4 per cent of the country, concentrated along the Nile River, which also hosts agricultural lands. Agriculture is irrigated, with agropastoralism practiced by both small and large farmers along the banks and delta of the Nile.

Rangelands are at the margins of these lands and in desert environments and are used by semi-nomadic and nomadic pastoralists. Egypt raises 8.6 million large ruminants, cattle and buffalo. Goats and sheep, of which there are 3 million each, are raised mainly in Upper Egypt, the Nile Delta and the desert rangelands. Nomadic pastoralists also keep camels (1.2 million) under extensive management for milk, meat and transport.[256]

Currently, there are no policies that directly support pastoralism or specific strategies or action plans for sustainable rangeland management. However, some pioneer initiatives have been developed and continue to deliver positive outcomes.

"**Matrouh Resource Management Project (MRMP)**",[257] led by the Desert Research Center (DRC)[258] and the World Bank, (1994–) and presented by Moustafa S. El Hakeem

This initiative promoted participatory planning and management of rangeland resources in the Matrouh Governorate of Egypt, particularly pilot Grazing Management Units to manage rangelands, improve practices, reduce tillage, lower stocks, and fertilise with manure and bio-fertilisers at seeding. The Grazing Management Units engage mobile herders, agropastoralists, and rural communities to provide firsthand knowledge to improve rehabilitation efforts.

Led by the DRC, the initiative benefited from the support of the Egyptian Government through five-year programmes administered by the Matrouh Governorate with funds from the Global Environment Facility (GEF) and the World Bank. Local Project Coordination Units implemented the project, supporting indigenous organizations, after identifying 38 local communities whose livelihoods were based on land resources. A preliminary household survey led to the participatory drafting of community action plans, prepared with technical support from project staff. Agreements were signed with local communities for three-year implementation of each community action plan.

The project resulted in considerable economic impact. Crop (oil, vegetables and barley) productivity was substantially increased. Water harvesting also increased, improving the benefits to the farms. Fodder and shrub plantations significantly reduced concentrate use and feed expenses on about 40 per cent of the beneficiaries. Women implementing small income-generating projects for poultry production generated net benefits of USD 80 per production cycle of 20 chickens. MRMP continues working in the Marsa Matrouh under guidance of DRC and the Center of Matrouh for sustainable development.

[256] Jimat DevelopmentConsultants (2022) *Profil pays sur le pastoralisme et l ' agriculture à petite échelle - Égypte*. https://nelga.org/wp-content/uploads/2023/01/Egypte-Profil-du-pays-Pastoralisme-et-agriculture-a-petite-echelle.pdf.

[257] https://projects.worldbank.org/en/projects-operations/project-detail/P005153

[258] https://drc.gov.eg/

Iraq

Iraq has a surface of 430,000 square kilometres, 90 per cent of which correspond to rangelands, which are government-owned and usually controlled under customary rules supported by communities. In 2011, Iraq had 7.7 million sheep, 1.4 million goats and 58,000 camels.[259] Pastoralists typically own small flocks (fewer than 100 sheep and goats), which are commonly moved upland in the wet season, although wealthier individuals may own larger flocks.

Rangeland degradation is extensive in the country. The Government of Iraq initiated action for SRLM within the Agriculture Reconstruction and Development Program for Iraq, with USDA support. The rangeland programme aimed to balance the diverse economic, cultural and social needs with the preservation of Iraq's rangelands,[260] as shown in the case below. However, these restoration programmes also need to assess improvements.

Building capacities and developing Iraqi skills in the field of sustainable management of natural pastures

This joint initiative between the government of Muthanna in the Samawah Desert, educational institutions and other stakeholders aims to promote capacity-building and develop Arab skills in rangeland management and rotational grazing.

The initiative seeks to restore pastoral ecosystems, provide fodder, improve livelihoods and protect dryland habitats. Acting at different levels, the initiative introduces guiding legislation for the protection and development of natural pastures, implements monitoring systems to provide data and information on the status of natural pastures, facilitates research on pastoral production and genetic resources, promotes stakeholder platforms and raises awareness.

With a total of USD 10 million, the project provides the means to carry out direct actions (e.g., nurseries to propagate plants and produce seeds or agricultural machinery, when needed), targeting Bedouins, mobile herders, small farmers, consumers, decision makers, politicians and donors with over 35 per cent representation of women.

Other countries in the MENA region have also promoted different strategies and programmes to protect and restore rangelands and promote pastoralism and extensive livestock farming as a sustainable production system for managing those lands. The case below shows how the integrated vision of pastoralism has slowly infiltrated agricultural and environmental policies.

The Arab Centre for Studies of Arid Zones and Dry Lands (ACSAD)[261] coordinates an initiative on rangeland management that aims to balance grazing animals and the productivity of pastures, aiming for the sustainable management of rangelands.

ACSAD has promoted rangeland restoration through a scientific approach, including field measurements and monitoring, suitable technologies, plant species, and suitable locations for

[259] Mohammed, S.K. (2015) 'Economic analysis of rangeland rehabilitation in Iraq compared with the experience of Jordan', *European Journal of Agriculture and Forestry Research*, 3(1), pp. 1–27. http://www.eajournals.org/wp-content/uploads/ECONOMIC-ANALYSIS-OF-RANGELAND-REHABILITATION-IN-IRAQ-1.pdf.

[260] Al Pierson (2006) *Assessment of Rangelands in Iraq Preliminary Report*. https://pdf.usaid.gov/pdf_docs/PNADI053.pdf.

[261] http://www.acsad.org/

plantation and rangeland improvement. Relevant information is being collected and published.[262] The initiative aims to restore rangelands and improve the livelihoods of nomads and mobile pastoralists, as well as other stakeholders. ACSAD could be scaled up to other Arab countries.

Land Degradation Neutrality in the MENA region

More than one half of all land and one quarter of arable land in MENA is degraded, with estimates rising from 40 per cent to 70 per cent between 1999 and 2012. In 2012, an estimated 20 per cent of the population lived on these degraded lands, which are mostly in marginal areas, with poverty rates climbing up to 50 per cent.[263]

Although interrelated factors are contributing to this degradation, hyperaridity, water scarcity, intense climate change and extreme events (wildfires, landslides, sand and dust storms), which are typical in the region, are exacerbating it. Nonetheless, land degradation in MENA is primarily linked to unsustainable agricultural uses and the failure of natural resource management policies. Weak land tenure, ineffective governance, and violent conflicts have increased degradation and migration. Millions of refugees and displaced people have been pushed to abandon their lands, which has reduced production, destroyed physical capital, and pushed labour out, thus deteriorating both land and economy.

Countries in MENA have successfully rehabilitated large areas and promoted supportive legislation. Concerted efforts can stop and even reverse degradation; however, long-term success depends on how well limited water resources are managed. In the past two decades, initiatives and projects, including multi-country and long-term initiatives (e.g., the Great Green Wall) and smaller initiatives (e.g., Acacias for All[264] in Tunisia), have addressed land degradation.

Discussion

North Africa and the Middle East, one of the most vulnerable regions to land degradation, also offers initiatives and proposals from states and civil society. Their projects focus on key issues for rangelands, starting with climate change adaptation policies, the impact of migration and social trends, partnering with traditional institutions, the value of livestock, uneven grazing, and improving water cycle management.

The region is one of the most affected by climate change and pressures that trigger rangeland degradation. However, the policy efforts of some countries in the region are at the forefront of state-led action in the global south.

Social trends, specifically migration, are critical in the area and are putting unprecedent pressure on rangelands and pastoral communities. Men leave in search of better opportunities, while women and the youth stay behind, in charge of the household, often without the rights and legal tools to enforce this additional responsibility. Vulnerability

[262] https://bit.ly/42PpR1n

[263] World Bank (2019) *Sustainable Land Management and Restoration in the Middle East and North Africa Region—Issues, Challenges, and Recommendations*. Washington, D.C. https://www.profor.info/sites/profor.info/files/Sustainable-Land-Management-and-Restoration-in-the-Middle-East-and-North-Africa-Region-Issues-Challenges-and-Recommendations.pdf.

[264] https://arab.org/directory/acacias-for-all/

increases among those left behind as decision-making rests in the hands of absent people, and poverty and marginalisation spread. Rights and equal opportunities must be secured for women and youth to build appropriate approaches to better manage the MENA's rangelands.

The region also hosts working examples of traditional institutions sustainably governing rangelands, a remarkable contribution to SRLM (included in the conceptual framework in Figure 4). Those institutions include the Hima system or the Agdals,[265] which offer guidance for other pastoralist regions, despite still requiring better recognition, support and security.

The economic and cultural value of livestock is often overlooked in MENA. The conceptual framework recognises that cultural and identity issues are influential but underacknowledged issues shaping the interest of pastoralists. For instance, projects tend to overlook that pastoralists will invest their savings in livestock, as they consider livestock more valuable than cash. It is important to take this into account in rangeland projects, as pastoralists likely would transform increased project income into livestock. If this is not anticipated in the project development, it could destabilise the whole project. At the same time, measures should not be put in place to limit pastoralist assets without suitable alternatives, as this would jeopardise their income and well-being and increase poverty and insecurity.

Overgrazing is a major concern in pastoralist projects as it is seen a main driver of degradation in the region. However, uneven grazing remains misunderstood and often development projects still apply measures that are negligent and even counterproductive. For instance, complementary feed is often provided to alleviate scarcity assuming that hungry animals will cause overgrazing; however, this leads to overstocking, concentration, and immobility, increasing and deepening degradation. Overgrazing is typically caused by animals confined to small patches of land, rather than by mobile grazing animals, even if the latter are more numerous. If external inputs (fodder, barley, etc.) are subsidised but the animals still graze freely, rangelands will degrade, and pastoralist productions will shrink. On the other hand, well managed rangelands under rotational grazing can support higher densities of livestock while improving their ecological conditions.[266] Carefully planned investments and financial tools can be used to improve the mobile, rotational approach used in locally adapted, multifunctional systems, and simultaneously increase both production and land management.

Finally, water management is a critical tool for sustainable rangeland management. The region has promoted notable projects targeting water harvesting and use, which should be upscaled in other countries and regions and should trigger a pastoralist-friendly approach to water harvesting, retention, and management.

[265] Herrera, P.P.M., Davies, J. and Baena, P.P.M. (2014) The Governance of Rangelands. Edited by P.M. Herrera, J. Davies, and P. Manzano Baena. Routledge. https://doi.org/10.4324/9781315768014. .

[266] di Virgilio, A., Lambertucci, S.A. and Morales, J.M. (2019) 'Sustainable grazing management in rangelands: Over a century searching for a silver bullet', *Agriculture, Ecosystems & Environment*, 283(November 2018), p. 106561. https://doi.org/10.1016/j.agee.2019.05.020.

4.4 Central Asia and Mongolia

The Central Asia and Mongolia (CAM) region hosts some of the most interesting and diverse rangelands in the world, ranging from great deserts, such as Gobi, Karakum and Kyzylkum, to the high mountain ranges of Altai, Tien Shan, or the Pamirs, and to wide steppes, foothill plains and temperate grasslands, thriving under harsh continental conditions and deserts.

As grazing rangelands account for 60 per cent of the total area, pastoralism is a fundamental economic activity in the region. Livestock herding accounts for 10–45 per cent of national GDPs in CAM countries and supports the livelihoods of nearly one third of the region's population.[267] Over 171 million herds graze the rangelands, their high temporal and spatial variability of resources imposing the seasonal livestock mobility as the main adaptation strategy. Mobile pastoralism is the only viable agricultural activity in the arid lands,[268] complemented with agropastoral systems where conditions allow it. Both farming systems are historically governed by customary property rights, or collectivised state-managed systems. Long-distance mobility and seasonal transhumance are primarily viable to large livestock owners, while poorer pastoralists have been trying to adapt by pooling community labour, adopting agropastoralism or diversifying their income through off-farm work.[269]

The Soviet period changed these approaches. The collectivisation process, linked to Socialist economies, challenged the institutional frameworks of pastoralists, promoting sedentarisation. Still, some pastoralist communities continue to herd in traditional ways, their knowledge and skills more effective in those rangelands. The fall of the Soviet Union launched a series of national de-collectivisation processes, transferring livestock ownership and control to families and private owners with the pastoral economy of each country transitioning towards global markets. This transition is still dynamic in most countries, as socioeconomic and cultural patterns change and new opportunities emerge.

Building on the growing global interest in rangelands and pastoralism, several countries in Central Asia have been shifting their approach, raising awareness and targeting pastoralism as a key social and economic activity for managing and restoring rangelands. At the same time, demand for pastoral products is growing and relatively good domestic prices for meat and dairy products allow rangeland dwellers to generate income while the food provided by their animals guarantees security and nutrition for their families.[270]

In parallel, land tenure has been a key issue in the region. Traditional common ownership regimes with semi-governed open access seem more suitable and environmentally and socially appropriate for the region. Increasing degradation of rangelands has made policy makers focus on the application of formal legislation to grazing lands, and decision makers, donors and international partners tend to prioritise private rights over collective institutions. As a

[267] Ulambayar, T. (2021) 'Rangelands and Pastoralism in Central Asia and Mongolia: Challenges and Perspectives', in Joint XXIV International Grassland & XI International Rangeland Virtual Congress, pp. 1–4. https://uknowledge.uky.edu/igc/24/6/16/

[268] Robinson, S., Jamsranjav, C. and Gillin, K. (2017) 'Pastoral property rights in Central Asia', Études rurales, 200(200), pp. 220–253. https://doi.org/10.4000/etudesrurales.11774.

[269] Mirzabaev, A., Ahmed, M., Werner, J., Pender, J. and Louhaichi, M. (2016) 'Rangelands of Central Asia: challenges and opportunities', Journal of Arid Land, 8(1), pp. 93–108. https://doi.org/10.1007/s40333-015-0057-5.

[270] Nori, M. (2022) Assessing the policy frame in pastoral areas of Asia RSC Policy Paper 2022/04. https://cadmus.eui.eu/bitstream/handle/1814/74314/RSC_PP_2022_03_FINAL.pdf?

consequence, there is tension between the different approaches to land tenure that each country has followed to organize their rangelands, as shown in Table 12.

Table 12: Summary of legislation regulating pasture access in case-study countries[271]

Country	*Land legislation*		*Subsequent pasture-specific legislation*	
	Law	Provision	Law	Provision
Kazakhstan	Land Code 2003	Leasing for 49 years or purchase	Law on Pastures 2017	Unclear, while bylaws remain undeveloped
Kyrgyzstan	Government Resolution 360 (4 June 2003)	Leasing for up to 49 years by public auction	Law on Pastures 2009	Common property regime
Tajikistan	Land Code 1996 & Law on Dekhan Farms 2009 National Development Strategy (NDS) 2006–2015 Poverty Reduction Strategy 2010–2012 (PRS III)	Leasing or permanent heritable use	Law on Pastures 2013	Common management, individual leasing and privatisation all possible
Uzbekistan			Law on Pastures 2019	
Turkmenistan	Presidential decree June 1995; Land Code 2004	Pasture managed by state enterprises, often unregulated in practice	Law on Pastures 2015	Regulated leasing by individuals or groups
Mongolia	Land Law (1994, 2003) Law on Environment Protection (2006) Green State Policy on Forests (2015) Development Policy (2014) Sustainable Development Vision to 2030 (2016)	Camp sites leased, pasture open access	Law on Grazing Fees 2021	Long-term lease by herding groups

In the 21st century, there has been policy changes and several countries in the region are progressively adopting more understanding rangelands strategies that are more supportive of pastoralism. The most promising example, Mongolia, is championing the International Year of Rangelands and Pastoralists (IYRP) initiative and has made significant advances in the recognition of herder communities and the allocation of communal management contracts. Other countries in the region have supported pastoralism, appealing to international institutions and promoters of local, national, and international projects focused on rangelands.[272] With policies and interventions already supporting pastoralism, rangeland initiatives are increasingly put in place in the whole CAM region.

Regional approaches

The call for initiatives received a considerable number of initiatives from CAM countries. The boxes below describe some regional projects on land degradation neutrality, SRLM and the restoration of Central Asian Rangelands, which promote collaborative approaches in the region. The first one focuses on sustainable rangeland management and improved land tenure.

Regional innovations for diverse tenure systems of rangelands in Central Asia[273] [274] [275] [276]

[271] Adapted (with additions from case studies) from Robinson, S., Jamsranjav, C. and Gillin, K. (2017) 'Pastoral property rights in Central Asia', Études rurales, 200(200), pp. 220–253. https://doi.org/10.4000/etudesrurales.11774.

[272] https://iyrp.info/central-asia-mongolia

[273] https://www.oicrf.org/-/regional-innovations-for-diverse-tenure-systems-of-pasture-land-in-central-asia

[274] https://www.landcoalition.org/es/explore/our-network/jasil-environment-and-development-association/

[275] https://asia.landcoalition.org/es/newsroom/central-asia-pastoral-alliance-moves-forward-new-work-plan/

[276] https://asia.landcoalition.org/en/explore/our-work/asia-rangelands-initiative/

This initiative collects, tests, implements and promotes community-based co-management arrangements between pastoralist communities and local governments in the CAM region.

Changes in the Mongolia political framework in the early 2000s opened the door to recognition and registration of rangeland communities (*nukhurlu*), legally supporting community-based management. From 2000 to 2008, 54 local herder communities in three Mongolian ecosystems implemented and tested community-based rangeland management (CBRM) arrangements, with support from Canada's International Development Research Centre[277], and then upscaled it to the national level, with support from the JASIL association and the ILC, from 2012 onward. From 2014 to 2020, the initiative expanded to other countries in the region. The Central Asia Pastoral Alliance developed adapted tenure systems for rangeland projects, all of them included in the ILC Asia Rangeland Initiative[278] and in the Indigenous and Community Conserved Areas (ICCA) Territories of Life.[279] These arrangements are based on traditional governance, established upon kinship relationships and combined with common land sharing through evolving community-based rules.[280] Communities are also invested in diversification and expansion of their economic capacity in such areas, promoting activities linked to transformation and processing of meat and dairy, marketing and enhanced value chains, local breeds, ecotourism, forest products, etc.[281]

Key results include improved co-managed rangeland arrangements, supported by pastoralists and other stakeholders and endorsed by local governments. The project has improved land tenure security, engaging a large number of pastoralists. In addition, 1,065 Rangeland Agreements have been signed by Pasture User Groups (PUGs) and 60 million hectares of rangelands secured. Project activities have reached 1,509 PUGs involving 80,000 herders and 90 cooperatives in the 18 provinces (aimags) of Mongolia.[282] In Kyrgyzstan, all 454 pastoral communities and 9.0 million hectares were involved. In Kazakhstan, herders from 22 areas received recognition from the government on collective use, lease and ownership of their pastoral lands. In Tajikistan, over 28 Pasture User Unions (PUUs) developed pasture use plans. In Uzbekistan, over 20 PUGs and associations participated in the project.

In the second case study, Resilient Landscapes in Central Asia (RESILAND CA+) applies a transboundary perspective and promotes key economic and financial instruments to increase landscape resilience.

[277] https://idrc-crdi.ca/en
[278] https://d3o3cb4w253x5q.cloudfront.net/media/documents/case_studies_leaflet_10_mongolia.pdf
[279] https://report.territoriesoflife.org/national-and-regional-analysis/west-central-asia/
[280] Ykhanbai, H. (2011) 'Community-Based Co-management of Pastureland and other Natural Resources in Mongolia', in Sustaining Commons: Sustaining Our Future, the Thirteenth Biennial Conference of the International Association for the Study of the Commons, pp. 1–8. https://hdl.handle.net/10535/7152.
[281] Ickowicz, A., Hubert, B., Blanchard, M., Blanfort, V., Cesaro, J.D., Diaw, A., Lasseur, J., Thi Thanh Huyen, L., Li, L., Mauricio, R.M., Cangussu, M., Müller, J.P., Quiroga Mendiola, M., Quiroga Roger, J., Vera, T.A., Ulambayar, T. and Wedderburn, L. (2022) 'Multifunctionality and diversity of livestock grazing systems for sustainable food systems throughout the world: Are there learning opportunities for Europe?', (Mongolia case study). Grass and Forage Science, 77(4), pp. 282–294. https://doi.org/10.1111/gfs.12588.
[282] https://www.aramis.admin.ch/Default?DocumentID=68639&Load=true

Resilient Landscapes in Central Asia (RESILAND CA+)[283]

RESILAND CA+ focuses on investments and economic activities that target landscape restoration and resilience, especially through green wages, jobs, diversified activities and ecosystem restoration investments, with a Central Asian transboundary perspective on border and transnational areas.

The project development includes the creation of a regional framework that could finance development initiatives, including analyses, technical support and investment for landscape-level project implementation. This framework is complemented by a Regional Exchange Platform for high-level dialogue and a regional online database. Together, the framework, platform and database support the harmonisation of policies on transboundary landscape restoration. Geographically, RESILAND CA+ targets cross-border landscapes, infrastructure and features of five Central Asian countries: Uzbekistan; Kyrgyz Republic; Tajikistan; Kazakhstan; and Turkmenistan.

RESILAND CA+ is implemented with a two-pronged approach: 1) technical assistance provided by the World Bank with support from GEF, Central Asia Water and Energy Program (CAWEP), The Global Partnership for Sustainable and Resilient Landscapes (PROGREEN), and WAVES; and 2) the Program on Forests (PROFOR) multi-donor trust funds. This is the first regional and operational programme in Central Asia targeting climate change adaptation and resilience.

These initiatives offer insight into rangeland and pastoralism work in Central Asia that frame national and sub-national level action described below.

National approaches

Tajikistan

The Republic of Tajikistan is a mountainous country that hosts 3.3 million square kilometres of mountain pastures (87 per cent of all the country's pastureland).[284] Summer pastures are in the uplands and are used between June and August, while winter pastures are in the valleys. Villages also host pastures that are used throughout the year.

Agriculture is the main source of livelihood, supporting 50 per cent of the country's population. Livestock production shifted from an intensive, state-supported system based on winter feed distributed from centralised sources to rely only on land-based resources after the Soviet Union collapsed in 1991. The latter remains a critical production strategy for poor rural households. This shift reduced performance, income and production, triggering feed demand and disturbing management.[285] Poverty is widespread, with 50 per cent of the population living below the poverty line, including 78 per cent in the Khatlon region alone. The IFAD case study below shows an approach used to manage these conditions.

[283] https://www.worldbank.org/en/topic/environment/brief/climate-and-environment-program-in-central-asia#Pillar percent201

[284] Kerven, C., Steimann, B., Ashley, L. and Dear, C. (2011) Pastoralism and Farming in Central Asia's Mountains: A Research Review, MSRC Background Paper. https://doi.org/https://doi.org/10.5167/uzh-52730.

[285] Cavatassi, R. and Mallia, P. (2019) 'IFAD Impact Assessment – Livestock and Pasture Development Project (LPDP): Tajikistan', SSRN Electronic Journal [Preprint]. https://doi.org/10.2139/ssrn.3389336.

Livestock and Pasture Development Project (LPDP-II)[286] [287]

The Livestock and Pasture Development Project (LPDP-II) is financed jointly by IFAD and the Government of the Republic of Tajikistan. The overall goal is to reduce poverty in the Khatlon region, by increasing the nutritional status, revenue, and productive capacity of pastures and livestock managed by poor rural households. The project is based on institutional development through the establishment of PUUs at the local level, Pasture User Associations (PUAs) at the district level and a Pasture Management Trust at the central level. The pasture law represents the main legal framework for these institutions. PUUs comprise an executive body (Pasture Committee with a minimum 30 per cent female representation), and an Assembly whose decisions require the participation of 80 per cent of the households involved. Each PUU also develops the Community Livestock and Pasture Management Plans, securing land rights and facilitating common pasture management and rehabilitation. The 197 new PUUs have proven to be a cost-effective way to implement SRLM. Other groups, such as Common Interest Groups and Women Income Generating Groups, were also established to facilitate additional economic activities.

Project implementation started in October 2016 following completion of the IFAD guidelines. Women and vulnerable female-headed households were prioritised through the provision of training and livestock packages, and 261 Women Income Generating Groups targeted the most vulnerable women, promoting beekeeping, turkey breeding, milk processing and complementary activities.

Training has included the introduction of windbreaks composed of pistachio trees and other species, the use of Groasis waterboxx,[288] and rotational grazing.[289] The Steering Committee supported implementation through the provision of policy guidance, collaboration, and a Management Unit, run by the Ministry of Agriculture, and a Food Security Committee. Community Facilitators oversaw the capacity-building of community organizations. Around USD 24 million (IFAD loan of USD 8.7 million and grant of USD 8.7 million, Asian Species Action Partnership grant of USD 5.0 million, Government contribution of USD 0.5 million, and co-financing by beneficiaries of USD 1.4 million) were invested in the project. Additional information on the project is provided in the project's impact assessment.

Kyrgyzstan

Agriculture in Kyrgyzstan employs 29 per cent of all labour in the country, mostly in small-scale production. Over 400,000 business units and over 700,000 rural households produce more than 95 per cent of the total agricultural production in the country.[290] The traditional practice of nomadic pastoralism remains. There are 375,000 small family farms in Kyrgyzstan of which about 80 per cent keep animals in small farmsteads, one half directly or indirectly related to nomadic pastoralism. The Nomadic Livestock Keepers' Development Fund represents small livestock keepers. The approach applied in the Kyrgyz case studies is similar to other experiences in Central Asia, focusing on local institutions to improve rangeland governance, as shown by the the Central Asian Mountain Partnership (CAMP) Alatoo in Bazar-Korgon and other districts.

[286] https://www.ifad.org/en/web/operations/-/project/2000000977
[287] https://www.ifad.org/en/
[288] https://www.groasis.com/en/products/stop-using-drip-irrigation-and-use-the-waterboxx-to-plant-trees-vegetables-and-bushes-with-less-water
[289] Norton, B.E. (2022) Management of livestock using rotational grazing. IFAD. https://www.ifad.org/documents/38714170/46450319/management-livestock-using-rotational-grazing.pdf.
[290] FAO (2020) Smallholders and family farms in Kyrgyzstan. FAO. https://doi.org/10.4060/ca9826en.

District Pasture Commission[291]

District Pasture Commissions (DPCs) are established under the District State Administration of the Kyrgyz Republic to conduct participatory management, promote natural resources at the water basin level, and decide on rangeland management issues. These decisions are mandatory under state authority and executed by Pasture Committees (PC) at the local level. DPC coordinates and monitors plans from different PCs. Rangeland users also benefit from the mobilisation of resources for the construction of infrastructure (e.g., bridges built for cattle drives). Annually, the DPC develops a participatory common action plan that establishes the start and end dates of the grazing season, and the equitable access and distribution of pasture areas. DPC also help solve conflicts and play an important role as stakeholder platforms, distributing information, coordinating actions and mobilising financial resources.

Inequities in the allocation of pasture areas can lead to acute feed shortage forcing affected local governments to lease additional pastures at expensive prices, which causes conflicts, exacerbated by growing animal stocks. DPCs manage these conflicts and balance trade-offs and the supply and demand of pastures, under a sustainability lens. CAMP-Alatoo accompanies and facilitates DPC work until they become self-sustainable (2–3 years).

This approach was piloted under the project, "Biodiversity conservation and poverty reduction through community-based management of walnut forests and pastures in southern Kyrgyzstan", supported by GIZ.[292] CAMP Alatoo, as the implementing partner, provides human resources, experience and knowledge to support the mapping of pastures,[293] and other technical issues.

CAMP Alatoo has also shared other significant initiatives for this report, including the development of a Mobile application "Monitoring of pasture",[294] which provides effective pasture monitoring that can help to ensure that rangeland resources are managed in a sustainable and equitable manner, benefiting both the environment and local communities. Data are collected on key indicators to help inform management decisions and plans, and the app helps identify degraded pastureland and allocate restoration interventions.

Another case from Kyrgyzstan illustrates the silvopastoral approach and the role that forests and woody areas can play supporting pastoralists in forested lands.

Empowering Vulnerable Communities Living Near Forests to Improve Their Food Security in the Kyrgyz Republic[295]

This project develops participatory forest management initiatives, transferring management functions to local communities. Capacity transference and CBRM institutions facilitate pastoralist and near-forest communities to improve rangeland management and increase their access to resources, while providing monitoring and feedback for rangelands.

The project started with a baseline assessment, analysing access to forest resources, food and nutrition needs and the potential of agroforestry models. The planning stage includes the design of joint forest action plans and preliminary business plans for community forestry.

[291] https://www.camp.kg/
[292] https://www.giz.de/en/html/index.html
[293] https://www.ifad.org/en/web/knowledge/-/pasture-condition-maps-in-kyrgyzstan
[294] https://camp.kg/mobilnye-prilozheniya?lang=en
[295] https://en.rdf.kg/tpost/rmjpoabbe1-empowering-vulnerable-communities-living

Pastoralists are engaged in the development of grazing plans and reserves, each managed by local communities. Nomads, mobile pastoralists, and small farmers are the primary beneficiaries. Financial resources and technical expertise come from government budgets, international organizations, and private donors. This initiative approaches community forestry and agroforestry as viable options for food security and poverty reduction, addressing the root causes of malnutrition.

The last case, under the same project cited in the case study for Tajikistan, is shown in the next box.

Livestock and Market Development Programme II[296] [297]

This programme aims to improve livestock productivity and climate resilience, promote equitable returns, reduce poverty and enhance economies of pasture communities. The project targets CBRM planning[298] and vulnerability reduction, improved animal health services, market and value chain diversification and improvement, and develops geospatial tools, pastoral resilience,[299] and policy recommendations.[300]

IFAD programmes in Kyrgyzstan channel support through government programmes working with PUUs and other stakeholders. Every municipality has a PUU, engaging all livestock owners. PUUs legally hold tenure rights so they can develop land and build infrastructure and water points, generate income from user fees and leases, and ensure its sustainable use by scheduling grazing, regulating stocks and establishing reserves.

The project benefits households in 190 PUU areas. About 304,000 households benefit directly and indirectly. The largest part of the investment goes directly to the beneficiaries in the form of matching grants, training and technical assistance. This project has invested over USD 39 million.
Kyrgyzstan has one of the best governance models for CBRM as a result of the 2009 Pasture Law. The PUU model is also supported by IFAD in Tajikistan and Georgia, in collaboration with other partners.

Mongolia

Mongolia spans 1.56 million square kilometres, about 85 per cent of which is over 1,000 metres altitude. A total of 72 per cent of the land is categorised as rangeland, distributed across different ecological zones, ranging from high-mountains to steppes and deserts.[301]

Pastoralism is a key activity in the country. The traditional pastoral livestock sector employs one third of the national labour force and produces almost 83 per cent of total agricultural production, which remains the main component of the Mongolian economy, both in terms of GDP (14.5 per cent) and employment (29.8 per cent).[302] Livestock assets account for 66.5

[296] https://www.ifad.org/en/web/operations/-/project/1100001709
[297] https://www.ifad.org/en/
[298] https://www.ifad.org/en/web/knowledge/-/introduction-to-community-pasture-management-plans-in-kyrgyzstan?
[299] https://www.ifad.org/documents/38714170/44188440/cop26-catalogue-geospatial-tools-and-applications-for-climate-investments.pdf/03cedef3-9397-bd41-bcea-6f2280571d8b?
[300] https://www.ifad.org/en/web/knowledge/-/low-carbon-and-resilient-livestock-development-in-kyrgyzstan?
[301] Jamsranjav, C., Reid, R.S., Fernández-Giménez, M.E., Tsevlee, A., Yadamsuren, B. and Heiner, M. (2018) 'Applying a dryland degradation framework for rangelands: the case of Mongolia', *Ecological Applications*, 28(3), pp. 622–642. https://doi.org/10.1002/eap.1684.
[302] https://www.scribd.com/document/360142950/Mongolia-Yearbook-2015 .

million herds. Mongolian nomadic and mobile pastoralism has evolved in a context of risks and uncertainty smartly using scarce resources to produce food, manure, hides and fibres. Pastoralists have adapted to shock-prone environments and overcome crises related to climate, market, and disease. Mobility is practiced between regular seasonal camps and other more sporadic resources. Rangelands are formally state-owned but mostly managed as common property, with more exclusive rights pertaining to winter and spring camps.[303]

The following case study for the country relies on existing community-based organizations (CBOs), in this case to promote one of the top-quality pastoralist products such as cashmere fibres.

Ensuring Sustainability and Resilience of Green Landscapes in Mongolia[304]

This project aims to improve rangeland management by building systemic capacity at the community level and promoting best practices. It seeks to reduce degradation threats in at least 300,000 hectares of rangeland and generate social and environmental benefits in over 2,426,646 hectares of mountains (Sayan and Khangai) and across southern Gobi landscapes, by working with 25,600 stakeholders (50 per cent women) in the four target *Aimags* (provinces). The project supports existing CBOs, such as Forest and Pasture User Groups (FUGs and PUGs), to integrate best management practices into their plans and agreements. The initiative promotes sustainable livelihoods and conservation strategies implemented by PUGs and Forest User Groups, removing barriers, restoring rangelands and forests, enhancing protected area effectiveness, and recovering key endangered species, such as snow leopards (*Panthera uncia)* and Argali sheep (*Ovis darwini*).

Implementation is based on participatory planning to support SRLM practices and the continuity of the nomadic way of life. The initiative has been funded with USD 8 million grant financing from GEF and raised an additional USD 39 million from the Government and co-financing partner.
A key achievement of the project is the establishment of the Mongolian Sustainable Cashmere Platform,[305] a multi-stakeholder and nationwide initiative to improve cashmere production under collaborative leadership. This platform also works alongside the Government to ensure a strong, coherent legal and institutional framework supporting sustainable cashmere production and positioning Mongolia as a global leader in the field. The Mongolian Sustainable Cashmere Platform has been piloting cashmere value chain initiatives to explore and improve practices around the sustainable cashmere traceability and certification process. The project has generated materials, such as "The call of the forest: Protecting biodiversity by promoting the sustainability and resilience of green landscapes in Mongolia".[306]

Additional initiatives from Central Asia countries illustrate some of the challenges of rangeland management and restoration in the region: the Central Asia Desert Initiative, implemented by the University of Greifswald (Germany), the Michael Succow Foundation (Greifswald, Germany) and FAO in Uzbekistan was used by FAO to demonstrate the potential of the silvopastoral approach to tackle rangeland challenges in CAM countries.[307]

[303] FAO (2021) Pastoralism in Mongolia, a needed balance between production and sustainable use of natural resources. https://www.fao.org/documents/card/es/c/CB5066EN.
[304] http://mn.ensure.mn/
[305] https://www.undp.org/mongolia/projects/mongolian-sustainable-cashmere-platform
[306] https://undp-biodiversity.exposure.co/the-call-of-the-forest
[307] FAO (2022) Grazing with trees, Grazing with trees. FAO. https://doi.org/10.4060/cc2280en.

Land degradation Neutrality in CAM region

The processes of land degradation in this region are complex and have not yet been appropriately assessed.[308] Some of the main drivers are related to de-collectivisation and agricultural intensification processes: weakened land rights; conversion of rangelands; expansion of crop production and irrigation schemes (also as fodder providers for increasing livestock numbers); and uneven grazing, especially near settlements. Water management is a frequently overlooked factor, with issues, such as water overuse to increase land productivity, water infrastructure degradation, a lack of water-use monitoring, and low technical capacity among water users.[309] Recent interest in rangelands often disregard pastoral communities and their economies in favour of implementing mining and intensive farming schemes. In Kazakhstan and Turkmenistan, the recent exploitation of oil and gas reserves is reconfiguring national economies and institutional agendas. In Tajikistan, Kyrgyzstan, and Uzbekistan, large-scale cotton, wheat, and horticultural projects have attracted investments in irrigation and rural settlements.[310] These developments are increasing water scarcity, soil erosion and land salinisation while converting and fragmenting rangelands, thus deeply impacting pastoralist communities.[311]

Kazakhstan, Uzbekistan and Mongolia are the most committed countries of the region with LDN targets according to FAO[312] and the UNCCD Knowledge Hub.[313] In 2018, under the framework of the Bonn Challenge, Kazakhstan, Kyrgyz Republic, Tajikistan and Uzbekistan pledged to bring over 2.5 million hectares into restoration by 2030 and adopted the Astana Resolution to reinforce cooperation in land degradation.

Table 13: Global Restoration Commitments per country in 2020 in the Central Asia and Mongolia[314]

Country	LDN	Bonn Challenge	Restoration commitment Low	Restoration commitment Medium	Restoration commitment High
Armenia	73,500	500,000	500,000	536,000	573,000
Kazakhstan	571,429	1,800,000	1,800,000	2,371,429	2,371,429
Kyrgyzstan	120,000	323,200	323,200	463,200	473,200
Tajikistan	-	70,000	70,000	70,000	70,000
Uzbekistan	-	1,000,000	1,000,000	1,000,000	1,000,000
Mongolia	1,825,370	600,000	1,825,370	3,254,410	3,854,410

[308] Kerven, C., Steimann, B., Ashley, L. and Dear, C. (2011) Pastoralism and Farming in Central Asia ' s Mountains : A Research Review, MSRC Background Paper. https://doi.org/https://doi.org/10.5167/uzh-52730.

[309] Strikeleva, E., Abdullaev, I. and Reznikova, T. (2018) 'Influence of land and water rights on land degradation in Central Asia', Water (Switzerland), 10(9). https://doi.org/10.3390/w10091242.

[310] Nori, M. (2022) Assessing the policy frame in pastoral areas of Asia RSC Policy Paper 2022/04. https://cadmus.eui.eu/bitstream/handle/1814/74314/RSC_PP_2022_03_FINAL.pdf?

[311] Mirzabaev, A., Goedecke, J., Dubovyk, O., Djanibekov, U., Le, Q.B. and Aw-Hassan, A. (2016) *Economics of Land Degradation and Improvement – A Global Assessment for Sustainable Development*, Edited by E. Nkonya, A. Mirzabaev, and J. von Braun. Springer International Publishing. https://doi.org/10.1007/978-3-319-19168-3. .

[312] FAO (2022) Overview of land degradation neutrality (LDN) in Europe and Central Asia, Overview of land degradation neutrality (LDN) in Europe and Central Asia. FAO. https://doi.org/10.4060/cb7986en.

[313] https://www.unccd.int/data-knowledge

[314] Based on Sewell, A., van der Esch, S., Löwenhardt, H., Annelies Sewell, A., Löwenhardt Supervisor Bram Bregman, H., Schoolenberg, M., Verhagen, W., Kok, M., Doelman, J., Vragovic, A., Guler, E., Naqvi, M., Jauffret, S., Lara Almuedo, P., Mutambirwa, C., Augustinus, C., Orr, B. and Alexander, S. (2020) Technical Note on Methodology for the Global Restoration Commitments Database. www.pbl.nl/en.

Discussion

Currently, Central Asia and Mongolia is one of the hotspot regions for SRLM. The effects of global change drivers in the region were exacerbated by the fall of the Soviet Union in 1991, which deeply affected rural economies and livestock production systems generating serious impacts and accelerating rangeland degradation. CAM case studies show key strategic approaches to address this situation, in line with the SDGs, LDN and the conceptual framework, starting by improving land rights and tenure systems, using locally adapted breeds, synchronising between grazing and the rangelands cycle, and recognising the role of mobility and the critical need for rangeland-tailored investments that could shift the current degradation trends.

A crucial first action is to secure land rights and tenure so the long-term measures can be implemented by their managers and their outcomes secured. Projects should aim to strengthen both capacity and subsequent participation of local and traditional institutions in SRLM. Then, their decisions would be endorsed and secured by supportive state authorities, devising, for participants, a clear path from planning to implementation. Thereafter, implementation of the plans through collaborative and multi-actor platforms should integrate the different interests to coordinate execution and monitor the actions. This way, as shown by the conceptual framework, the projects gear participatory action towards improved management.

However, there are some concerns in the design and application of rangeland initiatives. Addressing unsustainable grazing and rangeland degradation with complementary fodder may increase the conversion of rangelands to produce fodder crops and the overuse of scarce water resources, while lands around feeding points degrade. Similarly, promoting improved breeds without a deep analysis of their adaptability, rusticity or mobility aptitude, overlooks the need for specific action to protect and improve local and adapted pastoralist breeds. Conversely, the path planned by Cashmere Platform targets local breeds as vital assets to improve production.

Regarding rangeland production systems, and their influence on SRLM, synchronising grazing stocks with the needs for rangeland grazing and resting at each moment of their cycle is determinant. Interventions promote this synchronisation mostly through rotational grazing, which is a clear improvement from past practice. However, mobile pastoralism and seasonal movements a more comprehensive approach that better preservesthe health of rangelands, as considered by the Mongolian initiative. Accordingly, nomads and transhumant people need to be recognised and acknowledged, e.g. habilitating flexible corridors, open access rangelands, seasonal pastures, water access and other infrastructure to enhance livestock mobility. Devising a strong plan, based on participatory mapping, and allocating clear land uses, offer more security and better project outcomes. However, it is easy to fail in offering the flexibility needed for pastoral mobility, which may be a result of pastoralist communities being underrepresented or their livelihoods being sidelined in favor of alternatives which are not necessarily viable or sufficiently tested. This approach often harms pastoralists way of life and reduces the capacity of rangelands without viable alternatives for either.

There also appears to be a lack of rangeland-adapted economic tools and investments. The report has shown interesting cases that promote bold changes in the value chains and market demands of rangeland products. These initiatives need to be encouraged and upscaled, in search for better investments in rangelands, which also need to be accessible to local communities. Innovative approaches for community investment or land stewardship need to

be mainstreamed to consolidate further resources and options when projects end. Nevertheless, some of the projects have already acknowledged the need for early economic benefits for pastoralist households and communities to keep them engaged.

5.5 Europe

European rangelands, as in other parts of the world, are the result of very long co-evolution between human communities and natural ecosystems and continue to be part of complex land management systems. They can be embedded in mosaic landscapes of grasslands, croplands, woodlands, and settlements, which are closely interlinked and managed as socioecological systems to support the provision of key ecosystem services.[315] Historically, traditional management has planned grazing calendars and stocking ratesand controlled shrub encroachment using fire, mowing and grazing, and they have stored hay, planted trees and hedges, built infrastructure, etc. Today, critical natural values of European rangelands and habitats of interest for conservation strongly depend on these management practices.[316]

Conversely, European landscapes are immersed in a deep pattern of change, compatible with the conceptual framework used in this report, simultaneously reflecting global trends and regional processes.[317] The main drivers of change impacting European landscapes include urbanisation, land abandonment, shrub encroachment, intensification, globalisation, land sparing for nature conservation, and development of renewable energy uses,[318] each of which is pushing land, specifically rangelands, towards degradation.[319] These pressures have different impacts on each area, reflecting their own socioecological conditions: land abandonment is intense in Eastern Europe, the Mediterranean and the mountains while agricultural intensification is most expressed in lowlands.[320] Traditional livestock production is declining, driven by global change, low market accessibility, labour shortage, lack of renewal, unfair regulations, and other factors.

Preventing the conversion of rangelands and keeping SRLM systems active, based on grazing and multifunctionality, is of utmost importance for European natural values. Therefore, a wide-scale plan to recognise, upgrade and mainstream extensive livestock systems is a necessary step forward that will help secure multiple benefits from Europe's rangelands.[321]

---

[315] Hartel, T., Fagerholm, N., Torralba, M., Balázsi, Á. and Plieninger, T. (2018) 'Forum: Social-Ecological System Archetypes for European Rangelands', Rangeland Ecology and Management, 71(5), pp. 536–544. https://doi.org/10.1016/j.rama.2018.03.006.

[316] Halada, L., Evans, D., Romão, C. and Petersen, J.E. (2011) 'Which habitats of European importance depend on agricultural practices?', *Biodiversity and Conservation*, 20(11), pp. 2365–2378. https://doi.org/10.1007/s10531-011-9989-z.

[317] Pinto-Correia, T. and Kristensen, L. (2013) 'Linking research to practice: The landscape as the basis for integrating social and ecological perspectives of the rural', *Landscape and Urban Planning*, 120, pp. 248–256. https://doi.org/10.1016/j.landurbplan.2013.07.005.

[318] Plieninger, T., Draux, H., Fagerholm, N., Bieling, C., Bürgi, M., Kizos, T., Kuemmerle, T., Primdahl, J. and Verburg, P.H. (2016) 'The driving forces of landscape change in Europe: A systematic review of the evidence', *Land Use Policy*, 57, pp. 204–214. https://doi.org/10.1016/j.landusepol.2016.04.040.

[319] Plieninger, T., Hartel, T., Martín-López, B., Beaufoy, G., Bergmeier, E., Kirby, K., Montero, M.J., Moreno, G., Oteros-Rozas, E. and Van Uytvanck, J. (2015) 'Wood-pastures of Europe: Geographic coverage, social–ecological values, conservation management, and policy implications', Biological Conservation, 190, pp. 70–79. https://doi.org/10.1016/j.biocon.2015.05.014.

[320] van Vliet, J., de Groot, H.L.F., Rietveld, P. and Verburg, P.H. (2015) 'Manifestations and underlying drivers of agricultural land use change in Europe', *Landscape and Urban Planning*, 133, pp. 24–36. https://doi.org/10.1016/j.landurbplan.2014.09.001.

[321] Schils, R.L.M., Bufe, C., Rhymer, C.M., Francksen, R.M., Klaus, V.H., Abdalla, M., Milazzo, F., Lellei-Kovács, E., Berge, H. ten, Bertora, C., Chodkiewicz, A., Dămătîrcă, C., Feigenwinter, I., Fernández-Rebollo, P., Ghiasi, S., Hejduk, S., Hiron, M., Janicka, M., Pellaton, R., Smith, K.E., Thorman, R., Vanwalleghem, T., Williams, J., Zavattaro, L., Kampen, J., Derkx, R., Smith, P., Whittingham, M.J., Buchmann, N. and Price, J.P.N. (2022) 'Permanent grasslands in Europe: Land use change and intensification decrease their

There are hardly any data on livestock kept under extensive or pastoralist regimes in Europe. Neither censuses nor statistics disaggregate livestock by production system, presenting a major knowledge gap, along with the lack of monitoring of grazing uses. These gaps result in a lack of recognition and legal differentiation. Market evidence shows that animal products in Europe are increasingly provided through intensive systems, whereby with very large shares of crop production are being devoted to animal feed.[322]

Regional approaches

The European Union (EU) countries used around 157 million hectares of land for agricultural production in 2020, 38 per cent of the EU's total land area.[323] Around 34 per cent of agricultural land is permanent pasture, formally including all rangelands categorised as farmland and 19 per cent of woody pastures, found in the region, with many others not being accounted for due to the presence of trees or shrubs, even if they are used as part of extensive livestock production systems.

The Common Agricultural Policy (CAP) is the legal framework supporting agricultural production and regulating agricultural markets in the EU. The financial support from the CAP also reaches extensive livestock farming and pastoralism, but without providing a level of support in proportion with their social and environmental benefits. As a result, pastoralism fails to compete favorably with other farming systems, and the abandonment of extensive farming continues.[324] All in all, the CAP does not recognize pastoralism as a priority activity for production, rural development and SLM.

On the other hand, EU environmental policies have nominally expressed their support for extensive livestock systems, by explicitly recognising their role in nature conservation. The European Green Deal and the 2020 EU "Farm to Fork" strategy show ambition in reorienting food production towards environmentally and climate-friendly practices, raising expectations for increased support of pastoralism. Despite the expectations raised, farm economies continue to be driven by markets and the CAP, which keep pushing agriculture towards industrialization.[325]

Consequently, EU policies require commitment and change to create an enabling environment for pastoralism. There is an urgent need for a supportive framework that recognises the economic, social, cultural and ecological roles of grazing in European rangelands, legally defining and differentiating pastoralism from intensive farming, supporting research and innovation in the sector and developing participatory governance systems, with effective representation of pastoralists and integration of their expertise and perspectives.

---

multifunctionality', *Agriculture, Ecosystems and Environment*, 330(January). https://doi.org/10.1016/j.agee.2022.107891.

[322] Nori, M. (2022) *Assessing the policy frame in pastoral areas of Europe*, *SSRN Electronic Journal*. https://hdl.handle.net/1814/73811.

[323] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Farms_and_farmland_in_the_European_Union_-_statistics

[324] Kuemmerle, T., Levers, C., Erb, K., Estel, S., Jepsen, M.R., Müller, D., Plutzar, C., Stürck, J., Verkerk, P.J., Verburg, P.H. and Reenberg, A. (2016) 'Hotspots of land use change in Europe', *Environmental Research Letters*, 11(6), p. 064020. https://doi.org/10.1088/1748-9326/11/6/064020.

[325] Nori, M. (2022) *Assessing the policy frame in pastoral areas of Europe*, *SSRN Electronic Journal*. https://hdl.handle.net/1814/73811.

Figure 11: Livestock census in the EU27 and the United Kingdom[326]

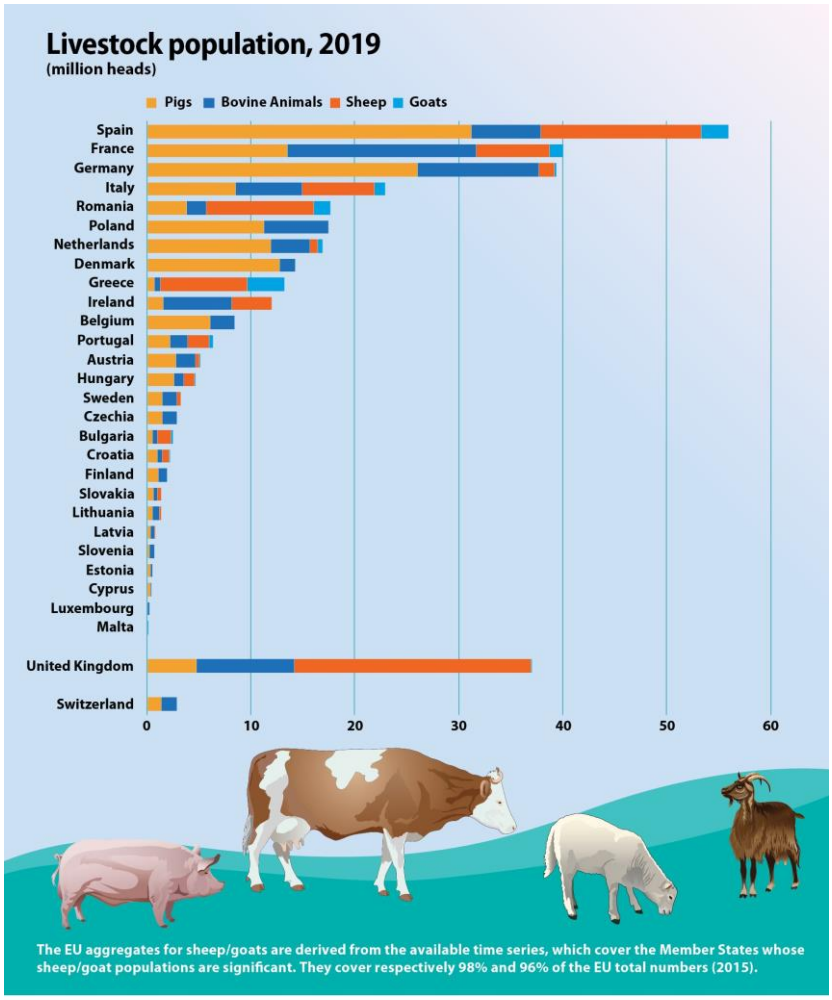


Figure 12: Evolution of livestock in EU countries[327]

Pastoralism support has increased in recent years in Europe. Although some national organizations support pastoralism from a multi-actor perspective, regional coordination is

[326] https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20200923-1

[327] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Agricultural_production_-_livestock_and_meat

lacking. Initiatives, such as the European Forum on Nature Conservation and Pastoralism[328] and the European Shepherds' Network[329], have cleared the path, while EU programmes that finance key pastoralism projects, such as Burren Life (seeding Burren Programme[330]), Life Regen-Farming[331], Life Live-ADAPT[332], Life Viva Grass[333], H2020 funded (HNV)-Link[334], Partnership for Research and Innovation in the Mediterranean Area (PRIMA) financing Pastinnova[335] and Sustainable Approaches to LAnd and water Management in funded Drylands (SALAM-MED), presented below. In 2021, a conference on pastoralism held by the European Committee of the Regions,[336] acknowledged the need for coordinated advocacy work in support of extensive livestock at the EU level. The Declaration of Transhumance as World Immaterial Heritage and the upcoming IYRP with its European Support Group mark advances in the European regional approach.

Although some European countries, which do not belong to the EU, have their own policies on livestock production, the EU position has a critical influence throughout Europe and its neighbours and sets an example for other countries to develop their own policies and interventions. The research project below, which highlights Mediterranean countries, provides a case study of the relationships between the EU and neighbouring countries.

Sustainable Approaches to LAnd and water Management in MEditerranean Drylands (SALAM-MED)[337] [338]

SALAM-MED is a project testing innovative technologies to improve grazing management and preserve ecosystem services in degraded grazed areas in the Mediterranean. SALAM-MED assesses the effectiveness and sustainability of applying rotational grazing schemes in degraded silvopastoral systems by using innovative global positioning system (GPS) collars and virtual fencing technology, coupled with remote sensing-based modelling, to balance grazing and prevent degradation. Implementation of the rotational approach aims to improve grazing efficiency, abate management costs, and ensure flexibility in managing stocks to quickly respond to environmental changes.

The project has enabled an open dialogue between stakeholders to address sustainability and scalability challenges, define priorities and promote consensual solutions. The SALAM-MED Integrated approach combines a top-down process based on scientific knowledge and water management tools and a bottom-up process building capacity through social learning.
Funded by PRIMA[339] with a total budget of almost EUR 3 million, this project includes a dissemination programme supported in partnership with the FAO.

[328] https://www.efncp.org/
[329] https://shepherdnet.eu/
[330] http://burrenprogramme.com/
[331] https://webgate.ec.europa.eu/life/publicWebsite/index.cfm?fuseaction=search.dspPage&n_proj_id=4623
[332] https://liveadapt.eu/en/home-2/
[333] https://vivagrass.eu/
[334] http://hnvlink.eu/
[335] https://pastinnova.eu/
[336] https://cor.europa.eu/en/events/pages/pastoralism-a-crucial-way-to-tackle-sustainability-challenges.aspx
[337] https://www.salam-med.org/
[338] https://en.uniss.it/nrd
[339] https://prima-med.org/

National approaches

Italy

Italy's forest surface encompasses one third of its total 29 million hectares of land. Forestland includes open forests and woody rangelands in mountains and steep slopes. Agricultural land occupies approximately 47.1 per cent of the country and lost around 5 million hectares between 1961 and 2006. Permanent pastures cover around 28.2 per cent, in a growing trend primarily caused by crop abandonment. Grasslands cover about 6.2 per cent, one half of which includes different typologies of dry grasslands on the islands and along the Alpine and Apennine ranges. Woody pastures occur in the central Appennines, and other areas where traditional silvopastoralism used chopping as complementary feed.

Pastoralism and extensive livestock production remain common in many parts of Italy, including transhumance patterns, with seasonal vertical mobility between the lowland pastures and the Alps or the Apennines. Sheep and, secondarily, goats are raised mostly in dry grasslands, while cattle is more abundant in the northern and central regions. Production has greatly changed in recent years, drastically reducing livestock movements. Local short vertical transhumance is now more common, with the livestock stabled in the winter and moved to mountains in the summer. Truck-based cross-regional sheep transhumance is still practiced to a limited extent in the northern Alpine regions and in the Abruzzo, Molise and Apulia.[340]

Italy has increased social and academic support of pastoralism and extensive livestock farming in recent years, with remarkable efforts to recognise transhumance. The case below shows collaboration between producers, academics and support organizations in this regard.

Pastures vulnerability and adaptation strategies to climate change impacts in the Alps (PASTORALP)[341]

Built upon a multidisciplinary, participatory science-based approach, this initiative tested innovative methodologies to map pastoral resources, assess the impacts of climate change, and identify adaptation strategies. Policy recommendations and technical measures were developed to increase resilience and reduce vulnerability. The participatory processes engaged local farmers, shepherds, and other stakeholders. Funded by the LIFE EU programme, it had a total budget of EUR 2,314,400.

The project was implemented in two sites, Gran Paradiso National Park and Parc des Ecrins. Around 100 breeders and shepherds from those areas were interviewed on the management and criticalities of mountain livestock farming. In parallel, consultation workshops collected and discussed current pastoral practices and suggestions from stakeholders. Feasible adaptation strategies were identified targeting feed production, water resources, management practices and structural adjustments. These strategies were tested, implemented in pilot areas under participatory approaches, and validated in subsequent workshops.

The project developed policy measures to guide decision-making at different policy levels and succeeded in its innovative approach to pastoral management, impacts and social perceptions. It strengthened the relationship and cooperation between beneficiaries and public institutions. Further information is available on the PASTORALP Platform[342] and final conference[343] website.

[340] Pardini, A. and Nori, M. (2011) 'Agro-silvo-pastoral systems in Italy: integration and diversification', *Pastoralism*, 1(1), pp. 1–10. https://doi.org/10.1186/2041-7136-1-26.
[341] https://www.pastoralp.eu/homepage/
[342] https://www.pastoralp.eu/tools/
[343] https://www.pastoralp.eu/final-conference/

Spain

The Iberian Peninsula, shared by Spain and Portugal, is a hotspot for European pastoralism. Spain is one of the most biodiverse countries in Europe. Spanish rangelands reflect this diversity, displaying a wide range of grasslands, woody pastures, open forests, and other potentially grazed landscapes. A huge portion of its territory (around 440 million hectares) has the potential to be grazed at some time of the year. However, the dry season in the Mediterranean coupled with cold temperatures in the winter in the centre and north lead to seasonal scarcity, shaping traditional pastoral strategies.[344] The Iberian Peninsula is also famous for its agrosilvopastoral systems, the Dehesa in Spain[345] and the Montado in Portugal,[346] as well as other examples in both countries.[347,]

Extensive livestock systems in Spain address the multiple social, economic and ecological challenges through long and short transhumance, shepherded grazing, agropastoral systems, diversification and local breeds (146 native livestock breeds, including 46 cattle, 51 sheep, 22 goats, 21 horses, and 6 donkeys, many at risk of extinction), a complex pool of land rights (individual, different commons, public-dominion, state properties) and a rich cultural heritage. Characterisation of Spanish extensive livestock systems is ongoing, but initial results offer a wide range of approaches to SRLM.[348]

In 2016, final livestock production in Spain reached a value of EUR 16,377 million, approximately 35 per cent of Total Agricultural Production and 1.69 per cent of total GDP. Livestock production has shown an overall pattern of growth in Spain since 1961. While cattle, pigs and poultry show a constant upward trend, accentuated in recent years, small ruminants have been much more volatile, with a loss of numbers in recent years. Sheep and goats, which represent the main species raised under pastoralist systems, have declined significantly, showing a pattern of progressive abandonment of extensive livestock farming. However, there are no official records of extensive livestock farmers or specific data on pastoralism in Spain.[349]

Transhumance is still practiced in Spain, mostly by traditional pastoralists in different areas and driven through different routes. There is no official data on transhumance, although it has

[344] Pasetti, F., Serrano, R., Manzano, P. and Herrera, P.M. (2022) Accounting for pastoralists in Spain. Ober-Ramstadt, Germany. http://www.pastoralpeoples.org/wp-content/uploads/2023/03/Accounting4pastoralists-ES.pdf.

[345] Moreno, G. and Pulido, F. (2012) 'Silvopastoralism in Mediterranean Basin: Extension, practices, products, threats and challenges', *Options Méditerranéennes : Série A. Séminaires Méditerranéens;*, 102. http://om.ciheam.org/om/pdf/a102/00007008.pdf .

[346] Pinto-Correia, T., Ribeiro, N. and Sá-Sousa, P. (2011) 'Introducing the montado, the cork and holm oak agroforestry system of Southern Portugal', Agroforestry Systems, 82(2), pp. 99–104. https://doi.org/10.1007/s10457-011-9388-1.

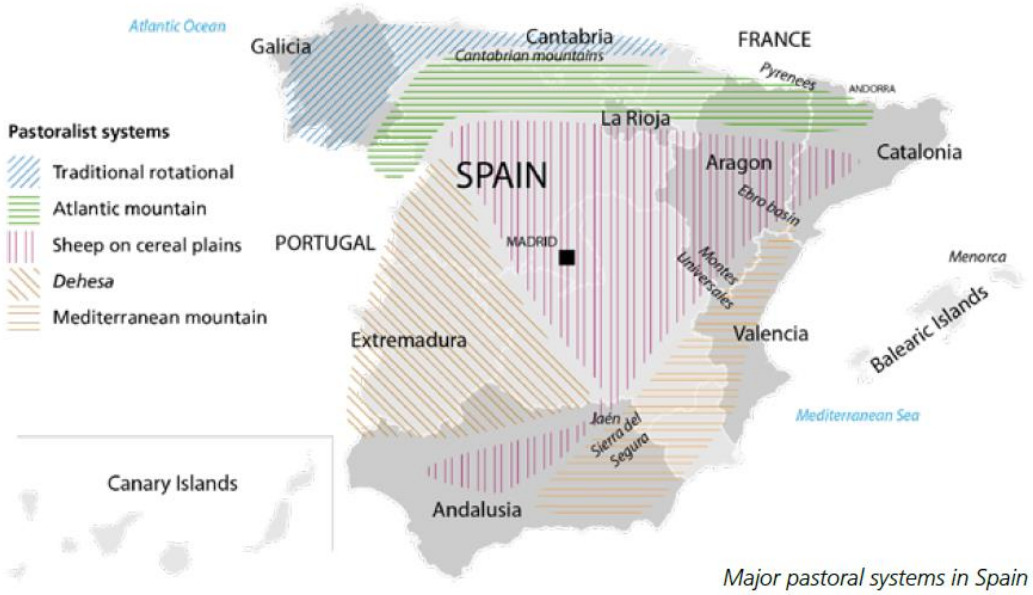
[347] Herrera Calvo, P.M. (2016) 'El uso pastoral como alternativa de gestión de los hábitats vinculados a los rebollares ibéricos', *Pastos*, 46(2), pp. 6–23. http://polired.upm.es/index.php/pastos/article/view/3615.

[348] Ruiz, J., Herrera, P.M., Barba, R. and Busqué, J. (2017) *Definición y caracterización de la ganadería extensiva en España*. Madrid. https://www.mapa.gob.es/es/ganaderia/temas/produccion-y-mercados-ganaderos/informesobreganaderiaextensivaenespanaoctubre2017nipo_tcm30-428264.pdf.

[349] Herrera, P.M., Majadas, J., Ramírez, N., Rico, L. and Esteban, A. (2018) *Huella ecológica, económica, social y sanitaria de la Ganadería en España*, *Fundación Entretantos, Cyclos S. Coop. y Garúa S. Coop para Greenpeace España*. https://www.entretantos.org/wp-content/uploads/2018/05/InformeHuella_2018.pdf.

been the subject of wide research. The Transhumance in Spain: White Book[350] estimated around 30,000 cattle and 50,000 sheep and goat annually performing long transhumance between regions in 2012, and numbers are significantly higher when considering short movements. The Feast of Transhumance has been celebrated annually in Madrid for 30 years, and a consolidated support movement has accompanied transhumant farmers. The role of transhumance in the Spanish landscapes and culture has been promoted and highlighted,[351] and Spain is part of the candidature presented to the United Nations Educational, Scientific and Cultural Organization (UNESCO).

Figure 13: Map of the main pastoral systems currently active in Spain



However, the policy framework devised by White Book of Transhumance in Spainis not yet complete, lacking coordination and political support. The main asset for transhumance is the 125,000 kilometres of drove roads, occupying 450,000 hectares and legally protected since 1995.[352] Old transnational agreements and routes still link Spanish pastures with those in Portugal, France, and Andorra. However, the legal framework needs to recognise and differentiate extensive systems and provide for specific support schemes. The rising movement supporting pastoralism has already produced the foundation to develop a national strategy,[353] and is working to develop a trademark for extensive livestock products.

[350] Red Rural Nacional, R. (2012) *Libro Blanco de la Trashumancia*. Ministerio de Agricultura, Alimentación y Medio Ambiente. https://www.mapa.gob.es/es/desarrollo-rural/publicaciones/publicaciones-de-desarrollo-rural/LIBRO percent20BLANCO percent202013_tcm30-131212.pdf.

[351] Manzano-Baena, P., Salguero-Herrera, C. and Zogib, L. (2018) 'Mobile pastoralism in the Mediterranean ':, (February). https://www.roads-less-travelled.org/wp-content/uploads/2019/04/MobilePastoralismMotherDocument_29January2017_ForWeb.pdf.

[352] https://www.boe.es/buscar/act.php?id=BOE-A-1995-7241#:~:text=Art percentC3 percentADculo percent204.&text=Las percent20v percentC3 percentADas percent20pecuarias percent20se percent20denominan,superior percent20a percent20los percent2020 percent20metros.

[353] Zabalza, S., Linares, A., Navarro, A., Urivelarrea, P. and Astrain, C. (2021) *Propuesta de Bases Técnicas para una Estrategia Estatal de Ganadería Extensiva*. WWF/SEP/PGEP/GAN-NIK/ATN/MAVA.

Spanish Platform on Extensive Livestock Farming and Pastoralism[354] [355]

Pastoralism, agrosilvopastoralism and other extensive livestock-based systems are deeply rooted in Spanish culture and history, providing numerous benefits in economic, ecological, and social terms.

The Spanish Platform for Extensive Livestock Systems and Pastoralism is helping fill this gap through dialogue, exchange, lobbying and collaboration. The platform gathers over 500 individuals and organizations, including farmers, conservationists, researchers, and other stakeholders and uses meetings, workshops and online communication tools to connect extensive farmers and supporters to exchange information and collaborate under a participatory, open governance scheme. The platform produces documents,[356] advocates for pastoral policies, supports pastoralist organizations, exchanges information, and facilitates networking and pastoralist representation in international fora.

The platform was created in late 2013 with support from Entretantos[357], a non-profit which established the secretariat and continues to facilitate the activities of the network. Other stakeholders provide support in worktime, additional resources and collaboration. Governance of the platform[358] is open and participatory (e.g. in annual meetings) and adheres to participatory protocols.

Spanish support to extensive livestock farming has established different multi-actor alliances between stakeholders. One of the most interesting is Land Stewardship, which brings together farmers and conservationists to implement measures to support biodiversity and ecosystem services in agricultural lands and rangelands, under agreed contracts. As such, conservationists not only support the efforts of shepherds to steward the territory, the gap between them is also bridged, as shown in the case below.

Custòdia Agrària[359] (Agrarian Land Stewardship)[360]

This initiative applies the Land Stewardship approach, making food production compatible with biodiversity conservation. It promotes regenerative pastoralist practices, monitoring the positive outcomes in carbon capture and biodiversity levels and engages small farmers, landowners, consumers and citizens, on a voluntary basis.

Land Stewardship usually starts with participatory mapping of land management systems and farmers' actions on the site area, and value assigned to and challenges encountered on the site area, with specific respect to their effects on biodiversity. Thereafter, an individual agreement, built collaboratively with the farmer and adapted to the conditions, is signed between the stewardship organization and the farmer. At the implementation stage, the organization raises funds and technical support while the farmers develop their portion of the agreement. Farms are also engaged in a network that monitors the implementation, exchanges experience and meets annually to identify needs, assigns resources and plans for subsequent year actions, upon available budget.

https://wwfes.awsassets.panda.org/downloads/propuestas_de_bases_tecnicas_para_una_una_estrategia_estatal_de_ganaderia_extensiva_octubre_2022.pdf.

[354] http://www.ganaderiaextensiva.org/

[355] https://www.entretantos.org/

[356] http://www.ganaderiaextensiva.org/documentos/

[357] https://www.entretantos.org/

[358] http://www.ganaderiaextensiva.org/gobernanza-de-la-plataforma/

[359] https://www.gobmenorca.com/custodia-agraria

[360] https://english.gobmenorca.com/

Farmers engaged in the programme demonstrate improved economic performance, higher added value and fairer prices for their products. Land Stewardship is appealing for local and small economic systems. Resources are invested locally in training and consultancies, improved production, and implementation of farm features (restoring infrastructure, water points, mobile handlers, etc.). Most people engaged are volunteers.

The case below presents a key structure for pastoralist support in Spain, Ganaderas en Red (GER),[361] which is a women pastoralist network facilitated by a professional team.

Ganaderas en Red (GER),[362] [363]

GER is a network of female extensive farmers, a first in Spain and in Europe. The network strengthens the links between pastoralists and rangelands, acknowledging that the territory that sustains these women is also sustained by them. Most GER women come from small family farms in rural territories. As the loneliness faced by pastoralist women is evident and sometimes cruel, this network aims to establish a mutual support group where pastoralist women can share feelings, needs, veterinary issues, natural remedies, or market concerns. Its main success is to give a voice to herder women in a secure space where they feel heard. Together, the women manage an operative that has already achieved great advances, such as the convening of meetings with several ministries, high media visibility,[364] collaboration offers, etc.

Their motto – "Invisible alone, invincible together" – has led to a participatory network based on social capital, flexible online tools, shared governance, continuous training and an effective communication and advocacy plan. Annually, this network receives a budget of EUR 40,000.
This initiative could be replicated to empower pastoralist women, making their work visible, or to develop a network of networks linking together territories and pastoralist women.

Finally, the application of new technologies has been widely tested in Spain. New projects promote pastoralism as a way to control vegetation under power lines[365] and renewable energy production sites. Numerous initiatives in Europe focus on pastoralism-driven wildfire prevention[366], nature conservation, HNV farming[367], habitat management[368], and territorialised food systems.[369] The implementation of GPS to monitor livestock[370] has been the subject of

[361] http://www.ganaderasenred.org/
[362] http://www.ganaderasenred.org/
[363] https://www.entretantos.org/
[364] https://www.youtube.com/@ganaderasenred115
[365] https://www.ree.es/es/sostenibilidad/proyectos-destacados/innovacion-social/pastoreo-en-red
[366] Varela, E., Górriz-Mifsud, E., Ruiz-Mirazo, J. and López-i-Gelats, F. (2018) 'Payment for Targeted Grazing: Integrating Local Shepherds into Wildfire Prevention', *Forests*, 9(8), p. 464. https://doi.org/10.3390/f9080464.
[367] http://hnvlink.eu
[368] Halada, L., Evans, D., Romão, C. and Petersen, J.E. (2011) 'Which habitats of European importance depend on agricultural practices?', *Biodiversity and Conservation*, 20(11), pp. 2365–2378. https://doi.org/10.1007/s10531-011-9989-z.
[369] Leroy, F., Hite, A.H. and Gregorini, P. (2020) 'Livestock in Evolving Foodscapes and Thoughtscapes', *Frontiers in Sustainable Food Systems*, 4(July), pp. 1–15. https://doi.org/10.3389/fsufs.2020.00105.
[370] Llaria, A., Terrasson, G., Arregui, H. and Hacala, A. (2015) 'Geolocation and monitoring platform for extensive farming in mountain pastures', *Proceedings of the IEEE International Conference on Industrial Technology*, 2015-June(June), pp. 2420–2425. https://doi.org/10.1109/ICIT.2015.7125454.

research, e.g., on behaviour analysis to detect predators,[371] daily grazing patterns,[372] disease-driven movement alteration[373], and virtual fencing.[374]

Portugal

Portugal has a surface of 89,000 square kilometres at the southwest of the Iberian Peninsula. The country has high bioclimatic variability, with a Mediterranean climate that is influenced by both the Atlantic and the continental mainland. Almost 40 per cent of its land is agricultural land (20 per cent of pastures), and another 38 per cent is forest land, including montados and silvopastoral areas.[375] Portuguese and Spanish Rangelands share conditions, but cultural differences lend to greater diversity in the Iberian rangelands.

Portugal has 2.2 million sheep across 52,000 farms, with approximately 80 per cent focused on meat and 20 per cent on dairy. There are around 423,000 goats across 32,000 farms, many of which are part of very small flocks.[376] In 2011, cattle reached 1.5 million. There are two main Portuguese extensive cattle systems that still use indigenous breeds and grazing, one based on very small herds of suckler cows in small farms in the north and centre, the other based in Montados and bigger farms in the South.[377]

In the 20th century, the state-run afforestation of common rangelands, persecution of pastoral fires, and agricultural abandonment resulted in a sharp regression of mountain grazing and hay meadows, invaded by woody vegetation. Simultaneously, rangeland forage productivity declined as perennial grasses faded. A false assumption that rangelands were unproductive and should be afforested propelled pastoralists into poverty and placed local breeds at risk, while wildfire risk increased dramatically. Today, the Portuguese mountains are in a steady state with a low level of ecosystem service provision. The case study below shows a new approach to restore rangelands and improve traditional production systems.

---

[371] Blecha, K.A. and Alldredge, M.W. (2015) 'Improvements on GPS location cluster analysis for the prediction of large carnivore feeding activities: Ground-truth detection probability and inclusion of activity sensor measures', *PLoS ONE*, 10(9), pp. 1–19. https://doi.org/10.1371/journal.pone.0138915.

[372] Rivero, M.J., Grau-Campanario, P., Mullan, S., Held, S.D.E., Stokes, J.E., Lee, M.R.F. and Cardenas, L.M. (2021) 'Factors affecting site use preference of grazing cattle studied from 2000 to 2020 through GPS tracking: A review', *Sensors*, 21(8). https://doi.org/10.3390/s21082696.

[373] Riaboff, L., Relun, A., Petiot, C.E., Feuilloy, M., Couvreur, S. and Madouasse, A. (2021) 'Identification of discriminating behavioural and movement variables in lameness scores of dairy cows at pasture from accelerometer and GPS sensors using a Partial Least Squares Discriminant Analysis', *Preventive Veterinary Medicine*, 193(November 2020), p. 105383. https://doi.org/10.1016/j.prevetmed.2021.105383.

[374] Muminov, A., Na, D., Lee, C., Kang, H.K. and Jeon, H.S. (2019) 'Modern virtual fencing application: Monitoring and controlling behavior of goats using GPS collars and warning signals', *Sensors (Switzerland)*, 19(7). https://doi.org/10.3390/s19071598.

[375] Castro, M. (2008) 'Silvopastoral Systems in Portugal: Current Status and Future Prospects', *Agroforestry in Europe*, (April), pp. 111–126. https://doi.org/10.1007/978-1-4020-8272-6_6.

[376] Tiberio, M.L. and Diniz, F. (2014) 'Sheep and Goat Production in Portugal: A Dynamic View', *Modern Economy*, 05(06), pp. 703–722. https://doi.org/10.4236/me.2014.56066.

[377] Araújo, J.P., Cerqueira, J., Vaz, P.S., Pinto de Andrade, L., Várzea Rodrigues, J. and Rodrigues, A.M. (2014) 'Extensive beef cattle production in Portugal', *Proceedings of International Worskshop "New Updates in Animal Nutrition, Natural Feeding Sources and Environmental Sustainability" Arzachena, Sardinia (Italy) 5th- 6th of May;*, pp. 31–44. https://repositorio.ipcb.pt/bitstream/10400.11/2360/1/Proceedings_International percent20Workshop_SArdenha percent205 percent206 percent20maio percent202014.pdf .

LIFE Maronesa[378]

The LIFE Maronesa project aims to restore the productivity and biodiversity of private hay-meadows and communal rangelands in the mountains. The project aims to improve plant nutrient cycling, management parameters, and herder income, while, secondarily, also reducing wildfire risk. Technically, improvements consist of acidity correction of hay-meadows, restoration of shrub encroached rangelands, and the use of prescribed fire, new water points, mobile mangers and cattle handling systems, GPS collars to reduce wolf predation, electric fencing and rotational grazing among other measures. The project, which is named after the Maronesa breed, an endangered local cattle breed, is managed by a local rural development association (AguiarFloresta) with three direct beneficiaries and several indirect ones including producers and common landowning communities. The LIFE programme funds one half of the total budget of EUR 2 million, while partners co-finance the rest.

The combination of prescribed fire and herbivory pressure increases plant cover and favours perennial grasses, explaining why the mountains sustained more domestic herbivores in the past.[379] Grass residues produce stable forms of soil organic carbon and are fundamental to recover soil organic carbon stocks. The mountain is becoming more productive and can sustain more cattle for a longer period of time with fewer inputs, increasing family's resilience to market fluctuations.

The project is designed with respect to science-based technical proposals validated by herders. The area baseline has been carefully analysed, and the project updates traditional technologies with the adoption of critical innovations (Temple Grandin cattle handling, GPS trackers, soil improvers, organic production, etc.). Pastoralists are empowered to manage their landscapes, balancing traditional practices and local knowledge with innovations that they authorise. The project has a tuned visitation system[380] that allows stakeholders, government and producers to visit the site.

Austria

Austria is comprised of 84,000 square kilometres, located at the foot of the Alps. Forests cover 42 per cent of the country surface area already increasing reaching more than 90 per cent in certain areas, leading to landscape homogenisation[381]. Farmland amounts to 3.19 million hectares, of which 1.39 are arable land and 1.73 are permanent grassland. Cropland in Austria has decreased in the last 50 years by 860,000 hectares while one third of alpine grassland has

[378] https://www.lifemaronesa.eu/

[379] A. Rego (2022) Restauração da produtividade e do stock de carbono das montanhas do norte de Portugal através da pastorícia extensiva. Libro de abstracts, III Congresso Hispano-Luso de Ganaderia Extensiva y Desarrollo Rural. Sostenibilidade Garantizada. Cáceres, 1-2 diciembre 2022. https://congresoganaderia.com/wp-content/uploads/2023/01/Libro-de-abstracts-III-Congreso-Hispano-luso-Ganaderia-Exrtensiva-3-enero-2023.pdf

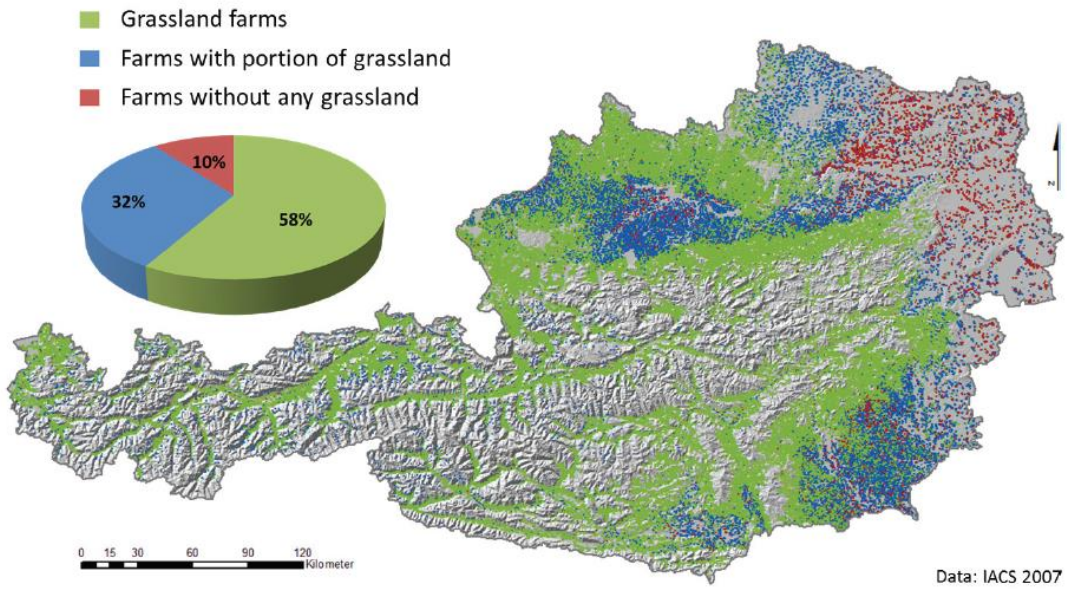
[380] https://www.lifemaronesa.eu/documentos/visita-virtual/?fbclid=IwAR1BfRTNYOd2JoFv4vQQAntnVD617_lYSO9WGmeay-wWYjdunNI3tAgxFQw

[381] BMLFUW (2007) *The Austrian Forest Programme*. Austria. https://info.bml.gv.at/dam/jcr:e8e49622-bff5-4ccf-b948-ee6cecfd0902/Waldprogramm_20englisch.pdf.

become forested or residential areas.[382] About 50 per cent of the total permanent grassland is used extensively, with low stocking rates, and is cut or grazed once or twice each year.[383]

Since almost 60 per cent of Austria's utilized agricultural area is grassland, cattle farming and milk production are very important agricultural productions. There are 1.9 million cattle raised by 55,000 farmers in Austria, with production amounted at EUR 765 million in 2020, 21 per cent of the animal production.[384] There are two main cattle farming systems: industrialised beef production, with fattening feedlots in the lowland agricultural regions; and small dairy cattle farming in mountain grasslands. Austria's alpine regions host about 70 per cent of the 40,600 dairy farms, most of them depending exclusively on the use of permanent grassland, some under very difficult and extreme conditions.

Figure 14: Map of grassland farms of Austria



Sheep and goat farming in Austria has become increasingly important due to the extensive farming of grasslands and pastures. Currently, there are around 378,000 sheep and 82,700 goats kept on a total of 23,688 farms, mostly by part-time farmers. This sector is an important source of complementary income for small-sized alpine farms.[385] Forest grazing has also been an important, but controversial, activity. While grazing in public forests was a common traditional use, it has been banned in certain areas to boost tree regeneration instead,, to the

[382] Buchgraber, K., Schaumberger, A. and Pötsch, E.M. (2011) 'Grassland Farming in Austria - status quo and future prospective', *16th Symposium of the European Grassland Federation 'Grassland Farming and Land Management Systems in Mountainous Regions'*, 16, pp. 13–24. https://raumberg-gumpenstein.at/jdownloads/FODOK/2011/fodok_2_9920_egf_buchgraber_13_24.pdf.

[383] Pötsch, E.M., Graiss, W., Resch, R. and Krautzer, B. (2013) 'Grassland renovation by natural self-seeding', *17th EGF Symposium "The role of grasslands in a green future – threats and perspectives in less favoured areas"*, 18(September 2017), pp. 490–492. https://www.researchgate.net/profile/Erich-Poetsch/publication/320099787_Grassland_renovation_by_natural_self-seeding/links/59cddb160f7e9b225636507e/Grassland-renovation-by-natural-self-seeding.pdf.

[384] https://info.bml.gv.at/en/topics/agriculture/agriculture-in-austria/animal-production-in-austria/cattle-farming-in-austria.html

[385] https://info.bml.gv.at/en/topics/agriculture/agriculture-in-austria/animal-production-in-austria/sheep-and-goat-farming-in-austria.html

extent that forest grazing is now declining. The case study below shows the effort to overcome these difficulties and promote the sustainable management of alpine grasslands.

EIP-Operational Group[386] "**Pasture-Innovations**"[387]

This Operational Group is dedicated to finding solutions to improve adapted pasture management. The former interest in grazing in Austria has recently reappeared, with pastoralist models of site adapted SRLM reinvigorated. These models are targeted by the "Pasture Innovation" project, specially focusing on rangelands with difficult operating conditions. The project also addresses animal management, health and welfare in mountain conditions, especially for small grazing ruminants during outdoor periods with higher incidence of grass-born parasites.

The Operational Group is comprised of diverse stakeholders who bring to the project different knowledge, generating the exchange of knowledge and experience. Collaboration with farms was financially compensated for the additional expenses and working hours. Partners also supported the technical needs of the project and provided additional equipment and technical assistance. The European Innovation Partnership (EIP-AGRI) provided funds and support.

The project was developed upon a baseline assessment of the existing challenges, experiments were performed based on these findings, interim results were presented and tested with stakeholders, and recommendations for pasture management were devised, resulting in the dissemination of findings and training. Key results include special seed mixtures and the establishment of methods in marginal rangelands, implementation and monitoring of site-adapted grazing, and grazing-based antiparasitic operations. The socioeconomic results have helped increase the acceptance of small ruminants and enhanced production.

Georgia

Natural pastures cover 1.9 million hectares or around 25 per cent the surface area of Georgia. The pastoral system remains nomadic in some regions, with migrating pastoralists using high summer pastures and lowlands in the winter.[388] Georgian pastures are mostly owned by the state and used under a regime of free access. Privatisation has mostly affected arable land, while rangelands were less affected. In fact, mountain and dry pastures have remained largely untouched by land tenure reforms. However, those tenure reforms have the potential to unleash investments in rangelands promoted by pasture users, communities, the state or donors.[389] Diverse sustainable rangeland management systems have been proposed for different areas of the country, as shown in the case below.

Achieving Land Degradation Neutrality Targets of Georgia through Restoration and Sustainable Management of Degraded Pasturelands[390]

[386] https://ec.europa.eu/eip/agriculture/en/about/operational-groups.html
[387] https://raumberg-gumpenstein.at/forschung/forschung-aktuelles/eip-projekt-zur-weidehaltung-gestartet.html
[388] Westerberg, V., Robinson, S., Stebbings, E., Costa, L., Visetti, P. (2021) The economics of pasture management in Georgia. Economics of Land Degradation Initiative. GIZ. https://www.eld-initiative.org/fileadmin/ELD_CaseStudies/Georgia_reports/giz_ELD_study_GEORGIA_v211208_.pdf.
[389] Raaflaub, M. and Dobry, L.M. (2015) Pasture Management in Georgia. Current Situation, Frame Conditions, Potentials of Development. Swiss Agency for Development and Cooperation SDC. http://environment.cenn.org/app/uploads/2016/08/Pasture-Management-in-Georgia.pdf.
[390] https://www.thegef.org/projects-operations/projects/10151

This project aims to restore and sustainably manage degraded pasturelands in three municipalities in Georgia. Implemented with funding from GEF for a total budget of USD 1.8 million, the project has established PUUs, which represent small farmers and mobile pastoralists, especially women, and supports both Municipal Pastureland Management Plans and sustainable land-use practices. The project has also produced knowledge materials, such as publicly accessible maps.[391]

The project follows the "Scientific Conceptual Framework for Land Degradation Neutrality" GEF guidelines and their components: policy and legal frameworks; a multi-stakeholder platform; and land-use planning.[392] The National Pasturelands Management Policy Document was used to draft new legislation with a focus on LDN, and an Inter-Sectoral Coordination Working Group was established to guide the project. Multi-stakeholder pasture management working groups conducted three operational Pasture Restoration Plans for the three Priority Pilot Areas of Village Pastures, helping ensure Georgia achieves its National LDN targets.

Russian Federation

The challenge of combatting desertification remains relevant in the arid zone of the Russian Federation:[393] Kalmykia, Stavropol Territory, Astrakhan, Volgograd and Rostov regions, etc. The Volgograd region, one of the most affected, requires the adoption of agroforestry measures in an area of 200,000 hectares, including: anti–erosion measures (61,896 hectares); protection of sands (58,227 hectares); protection of arid pastures (69,642 hectares); and intervention on small riverbanks (7,816 hectares).[394]

The Russian Federation has a long history of field interventions to protect agricultural lands, including ambitious projects implemented since the 1940s:

- PROJECT 1. Plan of protective forest plantations (1948–1953);
- PROJECT 2. Black Lands and Kizlyar Pastures desertification combat (1986–1996)[395];
- PROJECT 3. Activities to combat desertification in the Commonwealth of Independent States (1995–2000);
- PROJECT 4. "Prevention of agricultural lands retirement from agricultural turnover through agroforestry, phytomeliorative and cultural measures" (2014–2020);
- PROJECT 5. "Support for the implementation of state programmes in the field of land reclamation" (2021–2030); and
- PROJECT 6. "Protection and conservation of agricultural lands from wind erosion and desertification and chemical reclamation".

As there has been a sharp increase in land degradation in arid regions and climate change, scientists, production workers, the public and deputies have shifted their perspective, prompting the Government of the Russian Federation to establish a Centre for Combat

[391] https://www.arcgis.com/apps/View/index.html?appid=2a85f972895948638bf09869c0e3410c
[392] GEF (2019) Guidelines for the application of the "scientific conceptual framework for land degradation neutrality". https://www.thegef.org/sites/default/files/council-meeting-documents/EN_GEF.STAP_.C.57.Inf_.03_Guidelines percent20for percent20the percent20application percent20of percent20the percent20Scientific percent20Conceptual percent20Framework percent20for percent20LDN.pdf .
[393] https://doi.org/10.52479/978-5-6047604-3-7
[394] https://doi.org/10.52479/978-5-6045103-9-1
[395] https://link.springer.com/article/10.1134/S2079096118010067

Desertification based on the Federal Research Centre for Agroecology of the Russian Academy of Sciences (Volgograd). This centre leads the initiative presented in the box below.

Strategy for the development of protective afforestation in the Russian Federation for the period up to 2025[396]

Science and the long-term practice of agriculture and animal husbandry in forest-steppe, steppe and semi-desert areas have demonstrated how the negative phenomena of land degradation can be addressed. This strategy sets out biological and reclamation measures through the development of protective forest plantation (PFP) systems at all state levels. By implementing new agroforestry landscapes with a high degree of self-regulation and multifunctional influence, the ecological situation is stabilised, and sustainable production systems are generated. The positive impact of protective afforestation becomes central to the state strategy for environmental conservation, improving food security and the quality of the environment.

PFPs also includes effective assessment, management, technical guidance, deadlines, resource allocation and organization, and regulations to support their development. PFP are promoted on ravines, gullies, sands and riverbanks to prevent erosion and implemented along and inside agricultural lands and other territories as additional landscape features. However, the most important part is PFP implementation on steppes and arid pastures to increase forage productivity and protect rangelands and livestock shelters from drifts by snow or dust storms, as well as sheltering. PFP are implemented under a silvopastoral approach as protective canopy, additional feed, shelter places, etc. In the arid zone, pasture-protective strips occupy up to 5 per cent of natural forage lands and tree umbrellas around 0.2 per cent. On rangelands with highly degraded vegetation cover, PFP plant up to 10 per cent of the land with reclamation and feed shrubs designed for periodic grazing and improved regeneration.

The project is implemented with the support of a stakeholder platform, created after assessing the potential of local agroforestry to reach socioecologic targets. A long-term plan is drafted to operationalise the measures, creating a legitimate forest management system supported by the current policy and legal framework and involving state and regional support and funding. The project has recorded improvement in the microclimatic situation in forest pasture ecosystems, an increase of 2–3 times in biodiversity and yields increased by three times. The costs of forming forest pasture ecosystems pay off in 2.5–3.5 years. Productive longevity is 15–30 years, and the cadastral value of restored rangelands increases by 30–50 per cent.

In addition to the case studies presented, most European countries have a long history and culture of pastoralism, transhumance, extensive livestock farming, alpine grasslands and extensive farming. France, for instance has had a pastoral act in place since 1972, and pastoral

[396] https://vfanc.ru

systems are particularly diverse in Germany[397], Greece and all Mediterranean countries with silvopastoralist culture.[398]

Land Degradation Neutrality in Europe

Europe is increasingly affected by desertification. In 2017, 25 per cent of European land (411,000 square kilometres), was declared at high or very high risk of degradation, a 14 per cent increase since 2008. The risk of desertification is most serious in the Mediterranean (notably southern Portugal, Spain and Italy, and south-eastern Greece, Malta, and Cyprus), and in the areas bordering the Black Sea in Bulgaria and Romania. The main threats are related to erosion, declining organic matter and biodiversity, contamination, sealing, compaction, landslides and salinisation. Climate change trends are exacerbating this situation.[399]

In 2015, the EU and Member States committed to achieve LDN in the EU by 2030.[400] On 02 May 2022, the 8th Environment Action Programme entered into force, as the EU's legally agreed common agenda for environmental policy until 2030. Building on the European Green Deal[401], and the Biodiversity Strategy for 2030[402], this programme provides the current framework to address LDN. However, it is the EU soil strategy for 2030[403] that sets out a framework and concrete measures to protect and restore soils and ensure they are used sustainably. The EU Soil Strategy aims to achieve healthy soils by 2050, with concrete actions taken by 2030 and it is supported by a Soil Monitoring Law proposal. Additionally, "A Soil Deal for Europe"[404], establishes 100 living labs and lighthouses to lead the transition towards healthy soils by 2030.[405]

Other non-EU countries have already developed their commitment towards LDN. South-eastern and Balkan countries have assessed their status and commitments in the context of FAO's regional action.[406] Research in Russia has shown how the concept of LDN has evolved in

[397] Czerkus, G., Mathias, E. and Schenk, A. (2020) *Accounting for pastoralists in Germany*. Ober-Ramstadt, Germany. http://www.pastoralpeoples.org/wp-content/uploads/2020/09/Accounting4pastoralists-in-Germany.pdf.

[398] Rigueiro-Rodríguez, A., McAdam, J. and Mosquera-Losada, M.R. (2009) *Agroforestry in Europe*. Edited by A. Rigueiro-Rodróguez, J. McAdam, and Maróa Rosa Mosquera-Losada. Dordrecht: Springer Netherlands (Advances in Agroforestry). https://doi.org/10.1007/978-1-4020-8272-6.

[399] Ferreira, C.S.S., Seifollahi-Aghmiuni, S., Destouni, G., Ghajarnia, N. and Kalantari, Z. (2022) 'Soil degradation in the European Mediterranean region: Processes, status and consequences', *Science of the Total Environment*, 805, p. 150106. https://doi.org/10.1016/j.scitotenv.2021.150106 .

[400] ECA (2018) *Combating desertification in the EU: a growing thread in need for more action*, *European Court of Auditors*. https://op.europa.eu/webpub/eca/special-reports/desertification-33-2018/en/.

[401] https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en

[402] https://environment.ec.europa.eu/strategy/biodiversity-strategy-2030_en

[403] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX percent3A52021DC0699

[404] https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/eu-missions-horizon-europe/soil-health-and-food_en

[405] Panagos, P., Montanarella, L., Barbero, M., Schneegans, A., Aguglia, L. and Jones, A. (2022) 'Soil priorities in the European Union', *Geoderma Regional*, 29(April), p. e00510. https://doi.org/10.1016/j.geodrs.2022.e00510.

[406] FAO (2022) *Overview of land degradation neutrality (LDN) in Europe and Central Asia*, *Overview of land degradation neutrality (LDN) in Europe and Central Asia*. FAO. https://doi.org/10.4060/cb7986en.

the country to embrace the concepts of effective land use and management, in addition to their approach to sustainability and efficiency.[407]

Discussion

The European cases show how pastoralism remains important in many developed countries, as part of their heritage, their production and the preservation of their natural and cultural values. The cases that illustrate European pastoralism raise other important questions, including the status of pastoralists, shared issues with developing countries, co-construction of knowledge, engagement of the whole society through initiatives (e.g., land stewardship), and the potential role of developed countries in supporting a global effort towards SRLM.

European cultural heritage and traditional knowledge constitute valuable assets to combat land degradation. They have developed multifunctional and multi-stakeholder approaches, combining pastoralist systems with complex land-use schemes that offer a range of agroforestry solutions. The challenge is to recognise and upscale these approaches to policies and strategic instruments. Research and co-construction of knowledge are unravelling innovation trends that could present new development paths. For instance, urban and peri-urban grazing is attracting new attention as both a local food production system and a land management system to control the vegetation of public lands, parks and industrial sites.[408]

However, the perception and image of pastoralists in European societies have deteriorated and there is a clear need for their role in land management, sustainability and nature conservation to be recognised. Policies should support this approach, promoting fair conditions, accurate incentives and social support to keep healthy rangelands fully functional and delivering essential ecosystem services.

Several drivers, pressures and impacts are shared with rangelands and pastoralists in developing countries and worldwide. The most influential are rangeland conversion by urbanization, afforestation and renewable energy production, shrub encroachment, declining institutions governing common lands, unfit access rights to pastures, market pressures, generational renewal, etc.

Innovative approaches to promote SRLM by linking rangeland producers with others have been experimented in Europe. Following this reasoning, Land Stewardship has been proposed to engage consumers and urban communities. It has delivered positive outcomes in many countries, although there is great potential to develop and scale it further. Innovation has been also behind the application of new technologies to improve rangeland and livestock management, including geolocalization, virtual fencing, early alerts and a wide range of social innovation deployed by case studies.

Increasing wildfire risk is an additional concern, often associated with the abandonment of grazing and other traditional agroforestry activities and fuelled by climate change. This is a warning signal of emerging degradation patterns, as shown in Figure 2. Grazing management, often viewed as responsible for igniting those fires, provides critical tools to manage

[407] Kust, G., Andreeva, O., Lobkovskiy, V. and Annagylyjova, J. (2023) 'Experience in application and adaptation of the land degradation neutrality concept in the Russian Federation', *Land Degradation & Development*, 34(3), pp. 573–590. https://doi.org/10.1002/ldr.4484.

[408] Grădinaru, S.R., Triboi, R., Iojă, C.I. and Artmann, M. (2018) 'Contribution of agricultural activities to urban sustainability: Insights from pastoral practices in Bucharest and its peri-urban area', *Habitat International*, 82(September), pp. 62–71. https://doi.org/10.1016/j.habitatint.2018.09.005.

vegetation, reduce fuel and prevent the most disturbing wildfire impacts. In addition, wildfire prevention offers an opportunity to recover and promote extensive livestock farming in high-risk areas, returning the investment with interesting outcomes.

Lastly, the EU has the capacity and potential to support other countries addressing SRLM through research projects, financial support, investments, etc. This capacity is highlighted in some of the initiatives cited in this section. However, there is concern that the EU's legal and conceptual framework on rangelands is not fully developed, and it still bears some conceptual flaws identified in Chapter 3. It is vital that European countries fully incorporate rangelands into agricultural and environmental policies, with a LDN and restoration lens.

4.6 Indian sub-continent

The Indian sub-continent ranges from humid tropical to semi-arid and from temperate to alpine climate types, distributed across 15 agroecological regions. Indian rangelands occupy about 121 million hectares from the Thar Desert and semi-arid and arid tropics to temperate pastures and alpine meadows in the Himalaya Mountains. Rangelands occupy around 70 per cent of the temperate region, while the proportion is minor in the tropical region. The area used for grazing is estimated at around 40 per cent of the total land surface of India, including grasslands (17 per cent), and part of the forests (23 per cent. However, a large share of this (around 100 million hectares) is considered underutilized rangelands, including degraded forest lands, agricultural lands unsuitable for crop production, ravines and wastelands.[409]

Pastoralists are present in all parts of India, although there are no official data. Estimates suggest that there are 13 million people belonging to 46 communities,[410] over 30 million more than estimated by other sources.[411] Taking into consideration landless, small and marginal farmers who rear livestock, the number could be up to 577 million. Mobile pastoralists remain important in the country, from mountains to lowlands and deserts, practicing both horizontal movement patterns in the dryland regions and vertical movement patterns in the mountains, generating significant diversity in production systems.[412] There are examples of nomadic and semi-nomadic communities, transhumants, agropastoral and agroforestry systems. Pastoralists often rely on common lands to graze yaks, buffaloes, cattle, sheep, goats, camels and pigs. They also use forests, fallow land, stubble and other harvested fields, and treasure a great cultural heritage and a great sense of responsibility over their animals.

Pastoralists have been neglected in public policies, which have failed to secure the tenure and rights of access to their pool of resources. The communal rangelands (Common Property Resources) have decreased from 70 million hectares in 1947 to 38 million hectares in 1997 and continue rapidly shrinking under privatisation, conversion or misappropriation. Pastoralists have been banned from forests and protected areas, and mining and energy projects are also restricting their movements, losing access to critical resources. The Forest Rights Act is allowing pastoralist communities to secure their land rights, ushering in change.

Grazing Rights in the Forest Rights Act 2006 and its implementation[413]

This case shows implementation of the "Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006" (Forest Rights Act 2006[414]).

The development of this law is a major success for lobbyists in India, who created a self-financed platform to lobby the government in favour of this act between 1999 and 2005. Nomads and

[409] Malaviya D.R., Roy A.R. and Kaushal P. (2018) Rangelands/Grasslands of India Current Status and Future Prospects in Squires, V.R. (2018) Grasslands of the World, Grasslands of the World. Edited by V.R. Squires, J. Dengler, L. Hua, and H. Feng. CRC Press. https://doi.org/10.1201/9781315156125.
[410] Kishore, K. and Kohler-Rollefson, I. (2020) Accounting for pastoralists in India. http://www.pastoralpeoples.org/wp-content/uploads/2020/09/Accounting4pastoralists-IN.pdf.
[411] https://www.landcoalition.org/fr/newsroom/the-pastoralist-parliament-in-india-amplifying-community-voices/
[412] Sharma, V.P., Köhler-Rollefson, I. and Morton, J. (2003) Pastoralism in India: A scoping study, Department for …. http://r4d.dfid.gov.uk/PDF/outputs/ZC0181b.pdf.
[413] http://sevango.in/
[414] https://tribal.nic.in/fra.aspx#:~:text=The percent20Forest percent20Rights percent20Act percent20(FRA,and percent20other percent20socio percent2Dcultural percent20needs.

mobile pastoralists have already benefited from the long-term advocacy carried out by SEVA and other non-governmental organizations (NGOs), CSOs, and pastoralists.

Implementation of the Forest Rights Act 2006 remains slow, although it has already resulted in a cascade of community action of pastoralists successfully claiming their rights.[415] Through the project, communities have been offered guidelines[416] and technical assistance to help claim their forest rights, showing them how to exercise their representation and engage local institutions.

As an example of the value of this law, Van Gujjars in Rajaji National Park claimed grazing rights and titles for 43 families to graze their buffaloes, rights which have been granted following a High Court Judgement. They also promote the planting of indigenous species of trees with fodder and medicinal value. Migratory routes and grazing zones have been delimited for pastoral communities including 2,000 square kilometres in Lolab [Kupwara] and 6,000 in Pulwama alongside different areas in Jammu and Kashmir for the benefit of local Gujjar and Bakkarwal communities). Another positive result of the project is the possible granting of access to rangeland resources, as has already occurred in Banni grazing lands for Maldharis, in Kutch, Gujarat and Virudhunagar, or in Theni districts in Tamil Nadu benefiting "Malai madu" cattle herders. These developments have opened new economic opportunities for pastoralists, such as using cattle dung to prepare fertilisers for organic farming (*Amirtha karaisal, Panchagavya, Jeevamurutham*).

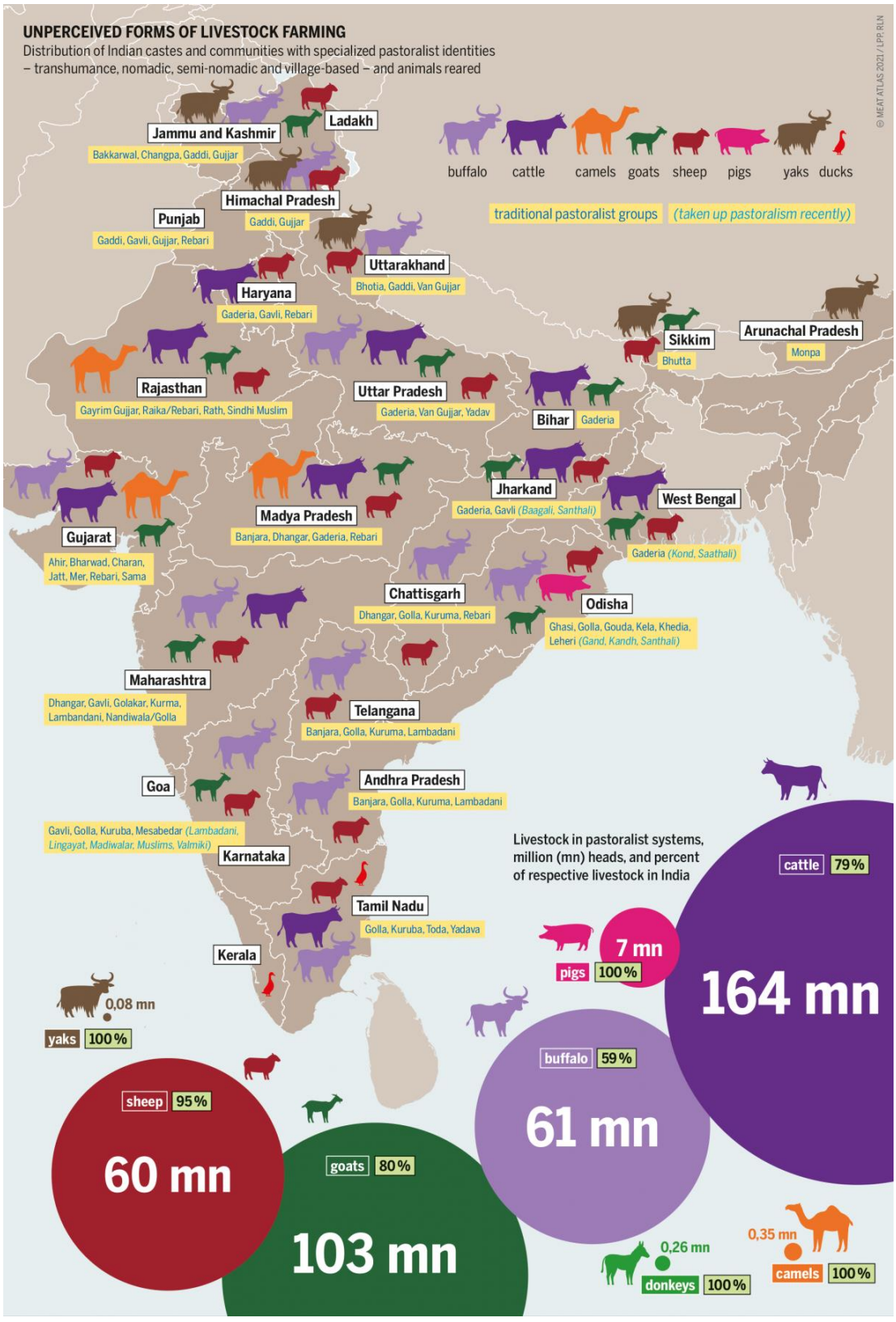
A national consultation on Pastoralism and the Forest Rights Act 2006[417] was held in Dehli in 2022, involving CSOs and pastoral community representatives from 11 states. It was organized by the Centre for Pastoralism with the participation of IYRP supporting NGOs and volunteers.[418]

Livestock is a very important sub-sector of the Indian food production economy, supporting rural livelihoods and contributing 4 per cent of the national GDP and 26 per cent of the agricultural GDP. India hosts 20 per cent of the world's livestock including 193 million cattle, 149 million goats, 110 million buffaloes, 74 million sheep, 9 million pigs, 300,000 camels and 58,000 yaks. Around 77 per cent of these animals are kept in extensive systems, producing about 53 per cent of India's milk and 74 per cent of its meat. Pastoralists have developed 73 out of 200 officially recognised livestock breeds in India, supporting opportunities to improve rangeland management, local production and soil fertility.[419]

The future for Indian pastoralists relies in the recognition of their land and tenure rights and the improvement of their markets. Camel herders are in particularly difficult situation, as demand for draft animals has fallen and there are no other marketing options for their products.

Figure 15: Livestock in pastoralist systems in India[420]

[415] http://www.fra.org.in/
[416] https://centreforpastoralism.org/wp-content/uploads/2022/01/FRA-Facilitator-Guide-1.pdf
[417] https://stsc.odisha.gov.in/sites/default/files/2022-08/Proceedings_National percent20Consultation percent20on percent20FRA percent20held percent207th-8th percent20July percent2C2022.pdf
[418] https://www.downtoearth.org.in/news/agriculture/ensure-pastoralists-covered-under-government-schemes-centre-to-states-84775
[419] Heinrich Boll Foundation (2021) 'Meat Atlas', p. 74. https://eu.boell.org/sites/default/files/2021-09/MeatAtlas2021_final_web.pdf
[420] Heinrich Boll Foundation (2021) 'Meat Atlas', p. 74. https://eu.boell.org/sites/default/files/2021-09/MeatAtlas2021_final_web.pdf



Despite the absence of policy support, pastoralism has shown itself to be remarkably resilient in many parts of the country. The movement in support of pastoralists has greatly increased throughout the sub-continent, taking credit for interesting political advances and a notable international presence. Indian support organizations, such as SEVA[421], the Centre for

[421] http://sevango.in/

Pastoralism[422], and the Desert Resource Center[423] are also developing work on recognition and advocacy. The Centre for Pastoralism is currently producing an atlas on Indian pastoralism to map traditional grazing routes.[424] The case below is presented by the Desert Resource Center, an organization based in Rajasthan.

Reviving traditional pastoral routes in the desert bioregion in Rajasthan (India)[425]

The desert bioregion of India, including Rajasthan, parts of Gujarat and Haryana, comprises a significant number and diversity of animals and pastoralists. The Madhari desert-herders are mostly traditional breeders, each group specialized on one species (camel, sheep, goat, cattle). In recent decades, the availability of water for irrigated agriculture has marginalised pastoralists in certain desert areas and critically reduced this practice. This initiative aims to reverse this trend and support the ambitions, accountability and sense of ownership of Madharis to their lands and routes, against state appropriation and marginalisation.

This Desert Resource Centre functions with respect to: communities; markets and policies; and the engagement of all stakeholders. For communities, grassroots and pastoral communities are organized around production (camel, goat, sheep, indigenous cattle herders, small agri-pastoralists, etc.) and are core producers of the value chain and, thus, the main agents of change on the ground. Over 70 per cent of community participants are women, lending to a gender-sensitive approach. With respect to markets, all stakeholders are involved in value chains. The policy component encompasses different levels of government, decision makers, extension, research and policy.

Public and private partners mobilised over USD 250,000 every year for the last six years, primarily supporting infrastructure and green technologies for value chains and mentoring micro-entrepreneurs from within the community.

Key successes of the programme include the pastoral "product and derivative" value chains managed by two social enterprises supported by the project. They have launched and positioned in markets two lines of pastoral products: dairy from camel, goat, and indigenous cattle; and animal fibre products for insulation and ambience sound applications in the built environment industry. Community pastoralists, especially smaller, marginalised ones, have begun increasing their herd, hoping to improve their income through milk and fibre sales and as a way to reclaim their lost lands and pastoral routes.

The programme is centred on the belief that pastoralism is a resilient livelihood model for deserts, especially with camelids husbandry. Replication has been initiated in collaboration with the Government of Ethiopia, which aims to translate the model of non-bovine dairy, with technical assistance from the Desert Resource Centre.

International conservation organizations, such as IUCN and the World Wildlife Fund (WWF), have supported extensive livestock production in India. The concern about grasslands, savannahs and drylands has boosted interest in preserving and restoring these ecosystems actively managed. Besides a claim to change the perspective towards a scientific management-

[422] https://centreforpastoralism.org/
[423] https://ourdeserts.org/
[424] https://www.downtoearth.org.in/news/agriculture/return-of-pastoralism-how-villagers-fought-a-long-battle-to-regenerate-grazing-lands-assist-herders-88620
[425] https://ourdeserts.org/

based approach to restore grasslands,[426] organizations have endorsed the efforts of pastoralist communities to stop marginalisation and ensure that their leadership and traditional knowledge are recognised and adopted in SRLM. Their initiatives point to a synergic approach between pastoralism and biodiversity conservation, as illustrated in the case below.

"Reviving Trans-Himalayan Rangelands: A community-led vision for people and nature"[427]

This initiative, currently in its early stages, addresses degradation of high-altitude rangelands, and associated biodiversity and livelihood impacts. It intends to develop a community-led, shared vision of stewardship and co-management of high-altitude rangelands.

Trans-Himalayan high-altitude rangelands have sustained agropastoralist communities and a rich assemblage of wildlife for centuries. The Changpa people of the Changthang and Brokpas of the Mago-Chu Valley live alongside an array of biodiversity, including wild carnivores and herbivores, while rearing pashmina goats, yaks, and sheep. These regions historically had livestock-based economies, strong traditional management practices and high social tolerance for wildlife. However, the situation has changed dramatically. Herds have increased and become more specialized, with Pashmina goats, intensifying conflicts and reducing tolerance for wildlife. Livestock predation causes significant losses (retaliatory killing of wolves and snow leopards, declining wild ungulates).

The project recognises the Changpa and Brokpa communities as primary stakeholders and stewards of rangelands and addresses multiple actors (government departments, district administration and paramilitary forces stationed along the international border) with a stake and interest in rangelands. Institutions (e.g., Centre for Pastoralism) and social enterprises (e.g. All Changthang Pashmina Grower Cooperative, Looms of Ladakh, "Its All Folk"), are also involved. The project plans to establish Rangeland Councils in each project region to develop a joint vision for the rangelands, improving human-wildlife coexistence and increasing women's income from rangeland-friendly products. Around USD 300,000 have been committed and an additional USD 725,000 are expected.

The project is bringing marginalised pastoral communities to the centre of the discourse on rangeland conservation, to ensure long-term SRLM. A genuinely participatory approach, supporting traditional wisdom is demonstrating that biodiversity conservation and pastoral livelihoods can be simultaneously achieved.

Pastoralist movement has garnered regional attention in the Indian sub-continent. The development of the South Asian Pastoral Alliance[428] has been critical, with support from FAO and the World Alliance of Mobile Indigenous Peoples (WAMIP), active representatives from India, Afghanistan and Nepal, and collaborators in Bangladesh and Bhutan. The alliance is mapping the rangeland and pastoral organizations and will use those maps to mobilise and connect pastoralist communities, and CSOs, with the aim to influence policies and decision-making. The box below, from Sri Lanka, shows the regional coverage of this movement.

Exploration of extensive dairy cattle management system in the Murunkan region in Mannar District, Sri Lanka

[426] https://india.mongabay.com/2022/08/commentary-restoring-indian-grasslands-does-not-require-disturbing-soil-and-planting-grasses-but-more-science/
[427] https://www.wwfindia.org/
[428] http://www.marag.org/south-asia-pastoralist-alliance/

Pastoral cattle farmers feed their cows in rice fields during the off-season and move to marginal forest lands during the rice cultivation season. Mismanaged, this system can hurt forests, reduce income, and increase risk during the crop season. To explore this situation, a survey was performed with 72 livestock/pastoral farmers during visits to them in the Murunkan region. The project analysed feed and water, monitored animal behaviour and tested alternatives. Later, a multi-stakeholder platform was established to ensure local farmer and pastoralist participation.
The platform helped to identify the local knowledge available in this unique dairy cattle farming system, performed a SWOT analysis, and devised conclusions and areas of work needed. The objective was to make the most of the opportunities to increase the farmers' income while protecting marginal forest lands. Resources and commitment of the research team were critical in the initial stages, but additional funding and support are required to adopt robust methodologies. This initiative targets farmers from the Tamil community, building on their culture and traditions, although the approach is transferable and is being applied within the Jaffna local sheep management system.

Land Degradation Neutrality in the Indian sub-continent

According to the National Academy of Agricultural Sciences[429], India hosts 120.4 million hectares of degraded land, driven by water erosion (82.6 million hectares), wind erosion (12.0 million hectares), chemical degradation (24.8 million hectares) and physical degradation (1.0 million hectares). Most degraded land is considered arable (104.2 million hectares). India loses crop output valued at 3,5 billion dollars due to water erosion alone. Such a huge loss has serious consequences for food, livelihoods and environmental security.

India is deeply committed to LDN and ecosystem restoration. The Government has launched several LDN programmes, including a National Afforestation Program, Green India Mission, and Watershed Development Component.[430] Jointly the plans will help restore 26 million hectares and support the LDN target.[431] In addition, the Government has launched the "Desertification and Land Degradation Atlas of India",[432] which reflects these measures.

Grasslands are threatened ecosystems in India; yet, they have been neglected in conservation and restoration policies.[433] Less than 5 per cent of India's grasslands fall within protected areas, and grassland area declined from 18 to 12.3 million hectares between 2005 and 2015.[434] Further, grasslands are not sufficiently considered in restoration policies, and there is a clear bias towards forest-based interventions.[435]

Indeed, rangelands are nearly absent from these measures and current restoration programmes favour afforestation, including converting natural grasslands into plantation forests or other uses . Fortunately, there is an evident shift towards recognition of the socioecological role of rangelands and pastoralism, and India has recently taken a more

[429] http://naas.org.in/News/NN21022021.pdf
[430] https://wdcpmksy.dolr.gov.in/
[431] https://landportal.org/news/2023/02/g20-india- percentE2 percent80 percent98arrest-land-degradation-restore-ecosystem percentE2 percent80 percent99-discussed-1st-working-group
[432] https://vedas.sac.gov.in/static/atlas/dsm/DLD_Atlas_SAC_2021.pdf
[433] Lahiri, S., Roy, A. and Fleischman, F. (2023) 'Grassland conservation and restoration in India: a governance crisis', Restoration Ecology, 31(4). https://doi.org/10.1111/rec.13858.
[434] https://www.downtoearth.org.in/news/agriculture/india-lost-31-of-grasslands-in-a-decade-66643
[435] Lahiri, S., Roy, A. and Fleischman, F. (2023) 'Grassland conservation and restoration in India: a governance crisis', Restoration Ecology, 31(4). https://doi.org/10.1111/rec.13858.

supportive approach.[436] In 2022, the Department of Animal Husbandry and Dairying and the Department of Fisheries requested that 12 states with sizeable pastoral populations focus government schemes on the welfare of pastoral communities, and provide assistance to pastoralists under the National Livestock Mission, Animal Husbandry Infrastructure Development Fund, and Rashtriya Gokul Mission (focused on sustainable dairy production).

Discussion

Indian cases present interesting ways to improve rangeland management, notably: the role of livestock in the community value system; and multifunctionality of rangelands.

First, regarding value systems, the sense of care and responsibility demonstrated by pastoralists around the world for their animals, is particularly pronounced in Indian pastoralist cultures. Animal health and welfare and the need to provide livestock with a life worth living are priorities that are deeply embedded in the cultural heritage of most Indian pastoralist cultures setting an example for other animal production systems that needs to encompass these priorities to survive increasing social criticism. The One Health approach is a critical step in this direction, with its roots digging deeply in pastoralist cultural legacy of land, animal and community management.

With respect to multifunctionality, , the need for certified fertilizers in organic farming is increasing the value of dung, a natural sub-product that could offer additional income for extensive farmers. This is a circular, holistic approach to agricultural land management that clearly shows the key role of mobile livestock in the transfer of fertility between lands to improve production and services.

[436] https://www.downtoearth.org.in/news/agriculture/return-of-pastoralism-how-villagers-fought-a-long-battle-to-regenerate-grazing-lands-assist-herders-88620

4.7 China and Southeast Asia

As China hosts one of the largest pastoralist areas worldwide, this chapter is mostly devoted to this country. However, a case study from Thailand is also included to show that pastoralism extends well beyond the northern rangelands into the warmest areas of the region too.

China has 400 million hectares of pastoral land, which are mostly situated in the drier and higher regions of North and Northwest China and are mostly inhabited by peoples of various ethnic minorities. Pastoral lands cover approximately 40 per cent of the country, and pastoralists occupy around 190 million hectares of rangeland in areas mostly located in the six pastoral provinces. Agropastoral lands occupy around 210 million hectares in the transition zone between traditional cropping regions and pastoral regions.

China's livestock population tripled between 1980 and 2010, from 142 to 441 million livestock units. Production systems have strongly intensified, partially replacing traditional pastoralist and mixed crop-livestock systems by landless systems, with monogastric animals, the proportion of which shifted from 2.6 per cent in the 1980s to 56 per cent in 2010 and are increasingly dominant.[437] At the end of 2021, China's sheep and goat inventory amounted to around 326 million heads in 2022.[438]

The country has been suffering from serious land degradation since the mid-20th century. The degraded area has increased by 15 per cent each decade from the 1960s to the 2000s. A survey completed in 2006 revealed that 90 per cent of the temperate typical steppe and the temperate desert steppe were degraded. In addition, cold alpine meadows and steppes and lowland meadows were severely or moderately degraded. Rangeland degradation impacts both grassland ecosystems and rural communities, which has led to conflict and instability in the country.[439]

Three major rangeland policies have been developed in China, challenging social, economic, and ecological processes in pastoral regions in the past 30 years: the Rangeland Household Contract Policy; Rangeland Ecological Construction Projects; and the Nomad Settlement Policy. Research has found that these policies have caused negative impacts due to the lack of acknowledgement of the interactions and trade-offs between pastoralist production systems and rangelands. Nonetheless, some success in rangeland restoration and rural livelihoods has been noted. Accordingly, researchers have proposed a land tenure policy that recognises local institutional arrangements. Nevertheless, voluntary choice in nomad pastoralism should be promoted, alongside innovative approaches to provide social services and support for mobility.[440]

China has made clear progress in the sustainability of the rural land use system through its national restoration programs. Nevertheless, centralized programs are often criticized for

[437] Bai, Z., Ma, W., Ma, L., Velthof, G.L., Wei, Z., Havlík, P., Oenema, O., Lee, M.R.F. and Zhang, F. (2018) 'China's livestock transition: Driving forces, impacts, and consequences', *Science Advances*, 4(7), pp. 1–12. https://doi.org/10.1126/sciadv.aar8534.

[438] https://www.ceicdata.com/en/china/number-of-livestock-sheep-and-goats/cn-livestock-number-sheep--goats

[439] Hua, L. and Squires, V.R. (2015) 'Managing China's pastoral lands: Current problems and future prospects', *Land Use Policy*, 43, pp. 129–137. https://doi.org/10.1016/j.landusepol.2014.11.004.

[440] Gongbuzeren, Li, Y. and Li, W. (2015) 'China's Rangeland Management Policy Debates: What Have We Learned?', *Rangeland Ecology and Management*, 68(4), pp. 305–314. https://doi.org/10.1016/j.rama.2015.05.007.

compromising as compromising socioeconomic benefits, lacking integration and generating uneven solutions. The state approach should promote proactive investments and global support, drawn on scientific insights and the engagement of non-state actors.[441]

"**Practices of grassland restoration and women's handicraft cooperation in community reserve on the Qinghai-Tibetan Plateau**"[442]

This initiative recognises the awareness and preoccupation of herders with rangeland degradation, facilitating collective action. The aim of the initiative was to set up a co-managed community reserve to jointly explore pathways of adaptation, restoration and alternative livelihood as pioneering solutions. Restoration is performed by reseeding and fertilising the land.

In the past two years, 500 herders in four pastoral communities participated in this action, restoring nearly 85 hectares of degraded lands. Elected herders formed the management team responsible for allocating and scheduling the restoration and mobilising the villagers. Herding families contributed with yak dung for fertilisation and labour work for reseeding. The project also helps develop women's cooperation through handicrafts: 12 female herders were engaged in making handicrafts from yak hair and wool, generating a total revenue of approximately USD 5,435. They learned handicraft techniques and are eager to learn cooperation skills. The local government is a key supporter of the project, providing venues for work and thereby encouraging the village's adaptation. The Shan Shui Conservation Centre provided start-up funding, technical support, training and communication among multiple stakeholders.

Financial and material support were provided to purchase materials, while skilled experts taught restoration and handicraft techniques, helping with product design and marketing strategy. The project reached consensus through open village assemblies, which approved the project specifics and a multi-stakeholder platform, which developed the workplan.

Subsidy and Reward Policy for Grassland Ecological Protection

The Government of China put forth a five-year plan, which commenced in 2011 and is currently in its third period (2021–2025), to balance grassland protection and use.

The central government has invested over USD 21 billion to implement the policy, covering a grassland area of 253 million hectares in 13 provinces. Pastoralists are encouraged to reduce grazing intensity by subsidising grazing exclusion in heavily degraded grasslands (with USD 16 per hectare per year) and stock reduction in lightly degraded grasslands (with 5 USD per hectare per year), providing an average of USD 210 per family per year.

The central government formulates the policy and project scope and supplies funds, while local governments and departments of grassland are responsible for subsidy allocation and supervision. This policy is applied in the main pastoral areas of China.

Finally, a case from Thailand complements the regional approach with insights from other country of the Region.

[441] Bai, Z., Ma, W., Ma, L., Velthof, G.L., Wei, Z., Havlík, P., Oenema, O., Lee, M.R.F. and Zhang, F. (2018) 'China's livestock transition: Driving forces, impacts, and consequences', *Science Advances*, 4(7), pp. 1–22. https://doi.org/10.1126/sciadv.aar8534.

[442] http://en.shanshui.org/project/1017/

"**Recognizing the Rights of Lua and Karen in Thailand and their Knowledge on Seed-Banking**"

This initiative is focused on promoting sustainable agriculture practices among the Lua and Karen communities, who are predominantly small-scale farmers. This initiative also recognises and protects the rights of indigenous communities to access and manage their natural resources, including pastures. By supporting seed banks and other community-based initiatives, the initiative also preserves traditional crop varieties.[443] Local pastoralists are also involved, as they face significant challenges in relation to their access to land and natural resources, including land-grabbing, land-use changes, and land-based conflicts.

Pastoralists in Thailand are involved through the promotion of policies and programmes that support their land and resource rights, including demarcation and registration of pastoral lands, recognition of customary tenure systems, and the provision of legal support and advocacy services.

The process of implementation includes legal recognition of the rights of the Lua and Karen communities to their traditional knowledge and land. A multi-stakeholder platform, including Lua and Karen communities and other stakeholders, was established to provide a safe space for dialogue and collaboration. At the same time, communities are engaged in capacity-building and training on sustainable agriculture practices, seed banks and indigenous breeds, built on community knowledge and skills, drawing on modern research and promoting exchange with other communities.

The initiative applies a gender-sensitive approach. A key success consists of placing the traditional knowledge of the Lua and Karen communities at the centre of the initiative and securing their rights to access and use their land. This has helped to promote the rights of indigenous communities and sustainable and equitable agricultural practices in the region. The success of this initiative highlights the importance of taking a holistic approach to promoting sustainable agriculture and protecting the rights of indigenous communities.

Discussion

The China cases bring an essential issue to this report's theory of change: the overarching role of states and administrations in promoting, developing, upscaling and defending the sustainable management of rangelands. As displayed in the conceptual framework (Figure 4), policies, legal framework and government action are influential factors in rangeland governance. States, with their different levels, departments and institutions, are vital to provide investment, financial tools and security, both legal and physical, to rangeland initiatives. In addition, state action should also contribute to coordinate and give support and legitimacy to pastoral initiatives. However, the implementation of mandatory top-down measures that lack participation on state-owned or state-managed lands has often proven ineffective when targeting restoration and SRLM. As case studies show, direct intervention should be local, and local communities and individual pastoralists directly engaged and committed to deliver results. Initiatives will not be successful without their engagement and the assimilation of initiatives under their own value system and culture and their own benefit.

Accordingly, rather than convergence between top-down and bottom-up approaches, the main challenge is achieving a clear and fair distribution of responsibilities between the

[443] https://aippnet.org/aipp-documentary-seeds-and-indigenous-peoples/

different levels of planning and decision-making processes involving rangelands and pastoral and extensive production. As already stated, participation is vital to implement measures at the local level if rangeland projects aim to improve multifunctionality and sustainability. Nevertheless, local communities cannot do it on their own, at the scales needed to produce real change. States need to be present, doing their part, collaborating with other states and international actors, offering a coordinated and unified action, bringing together all the interests involved and providing an equitable, secure framework and other support needed. Coordination among state departments and bodies is critical to influence positive action at local levels.

4.8 South America

Rangelands cover 33 per cent of the total total land area of South America and are distributed across different regions with quite variable conditions. Climatically, they range from arid to sub-humid, with mean annual precipitation ranging from approximately 150 to 1,500 millimetres.[444] Local soil conditions, temperature, elevation, and topography introduce more variability in their conditions, shaping their vegetation.

Figure 16: Map of the main South American Rangelands[445]

Woody plants, important in these rangelands, range from scattered dwarf shrubs to an open but almost continuous canopy of small trees. The result is a mix of different ecosystems, including grasslands, shrublands, savannas, dry open forests and hot and cold deserts. Distribution of these ecosystems results from the complex interplay of ecological conditions, land use, and disturbance regimes.[446] South American Rangelands include 605 million hectares

[444] Yahdjian, L. and Sala, O.E. (2008) 'Climate change impacts on South American rangelands', Rangelands, 30(3), pp. 34–39. https://doi.org/10.2111/1551-501X(2008)30[34:CCIOSA]2.0.CO;2.
[445] ILRI, IUCN, FAO, WWF, UNEP and ILC (2021) Rangelands Atlas. Nairobi: ILRI. https://www.rangelandsdata.org/atlas/.
[446] Bernardi, R.E., Buddeberg, M., Arim, M. and Holmgren, M. (2019) 'Forests expand as livestock pressure declines in subtropical South America', Ecology and Society, 24(2). https://doi.org/10.5751/ES-10688-240219.

of tropical, temperate, montane and flooded grasslands, savannas and shrublands.[447] The deserts of the Pacific coast stretch from southern Ecuador across the entire Peruvian shoreline to northern Chile. Further inland, at altitudes of 3,000–4,500 metres, the high plains of the Andean mountains cover large areas of Peru, Bolivia, Chile, and Argentina, home to the Puna biome. East of the Andes, an arid landscape, dominated by rangelands extends from Chaco's northern reaches in Paraguay to Patagonia in southern Argentina through part of Rio Grande do Sul in Brazil, the Campos in Uruguay and the Pampas of Argentina. Grasslands occupy an area of nearly 70 million hectares and have been identified as one of the regions with the greatest diversity of grasses on Earth: around 3,000 vascular plants, of which 450 grasses and 150 legumes are considered forage for domestic grazing animals. This area also provides feed for 43 million cattle and 14 million sheep.[448] Brazilian rangelands to the north-west include the Cerrado and Caatinga biomes, covering 35 per cent of the Brazilian territory (2.8 million square kilometres).

South American rangelands sustain many diverse grazing-based livestock systems. Mobile pastoralism is actively practiced in four countries: Argentina; Bolivia; Chile; and Peru.[449] In Argentina and Chile, it occupies marginal areas, and its economic relevance lies in pastoralists' capacity to exploit economic niches. Conversely, pastoralism is quite important in Bolivia and Peru with a relevant impact on the economies of both countries. Ranching systems also contribute substantially to the rural economies of many countries (e.g., Brazil, Argentina, Uruguay) and South America is also leading the development of modern silvopastoral systems.[450] [451]

Historically, South American consumption of animal products (meat and dairy) has been greater than other developing countries and it is predicted to increase further. The region's meat consumption is already high – at nearly 61 kilogramme per year in Latin America – almost doubling the average level globally.[452] Demand is almost as high as supply and this is also true for milk. The Latin American Livestock Industry has experienced a production growth of over 30 per cent during the last two decades in milk and beef production. There are approximately 570 million animal units of livestock on the subcontinent, and over 80 per cent graze on rangelands. The region plays an essential role in the global cattle industry since it contributes

[447] Morales C. (2018) Grasslands in South America, in Squires, V.R. (2018) Grasslands of the World, Grasslands of the World. Edited by V.R. Squires, J. Dengler, L. Hua, and H. Feng. CRC Press. https://doi.org/10.1201/9781315156125.

[448] https://doi.org/10.18174/462555

[449] Grünwaldt, J.M., Castellaro, G., Flores, E.R., Morales-Nieto, C.R., Valdez-Cepeda, R.D., Guevara, J.C. and Grünwaldt, E.G. (2016) 'Pastoralismo en zonas áridas de Latinoamérica: Argentina, Chile, México y Perú', Revue Scientifique et Technique de l'OIE, 35(2), pp. 543–560. https://doi.org/10.20506/rst.35.2.2526.

[450] Westreicher, C.A., Mérega, J.L. and Palmili, G. (2007) 'The economics of pastoralism: study on current practices in South America', Nomadic peoples, 11(2), pp. 87–105. http://www.jstor.org/stable/43123802.

[451] Chará, J., Reyes, E., Peri, P., Otte, J., Arce, E. and Schneider, F. (2019) *Silvopastoral Systems and their Contribution to Improved Resource Use and Sustainable Development Goals: Evidence from Latin America*. https://www.fao.org/publications/card/es/c/CA2792EN/.

[452] OECD_FAO (2022) OECD-FAO Agricultural Outlook 2022-2031. OECD (OECD-FAO Agricultural Outlook). https://doi.org/10.1787/f1b0b29c-en.

over 25 per cent of the global beef supply and 10 per cent of the global milk supply.[453] Most meat export production is developed on ranches.

There are some issues with grazing livestock in South America. The first is its relationship with the complex patterns of deforestation reported in the region which have been very acute in recent decades. As much as 40 per cent of the South American landmass is estimated to have been deforested, in a historical process that continues to date. A very intense period of conversion of dry and wet forests occurred from 2000 to 2010 (oscillating according to different sources between 1 and 4 million hectares per year of net loss of forests).[454] 80 per cent of the deforestation has resulted from land-use conversion into cropland for soybeans and pastures for extensive cattle production.[455]

Cropland expansion from 2001 to 2013 was lower (44.27 million hectares) than from pastureland (96.9 million hectares), but higher regional expansion rates of row crop agriculture have been reported.[456]

Since 1985, the area of natural tree cover decreased by 16%, transformed to pasture (23%), cropland (160%) and plantation (288%).[457] In addition, conversion of forests into pastures has been increasingly severe in the arid and semi-arid zones of Brazil, Argentina, Paraguay, Bolivia and Chile. A similar trend is detected in Central America.[458] Accordingly, the environmental impact of deforestation in South America in terms of, for instance, the reduction of carbon storage[459] or biodiversity loss, is alarming.[460] However, few countries monitor deforestation and land degradation drivers in a systematic manner and coordinated action has been scarce across the region. Socially, this situation is also complicated with small livestock producers

[453] Ding, L. and Kinnucan, H.W. (2011) 'The Latin American Livestock Industry: Growth and Challenges', Journal of Gender, Agriculture and Food Security, 1(3), pp. 1–22. https://doi.org/10.22004/ag.econ.302483.

[454] Armenteras, D., Espelta, J.M., Rodríguez, N. and Retana, J. (2017) 'Deforestation dynamics and drivers in different forest types in Latin America: Three decades of studies (1980–2010)', Global Environmental Change, 46(November 2016), pp. 139–147. https://doi.org/10.1016/j.gloenvcha.2017.09.002.

[455] Thornton, P.K. (2010) 'Livestock production: Recent trends, future prospects', *Philosophical Transactions of the Royal Society B: Biological Sciences*, 365(1554), pp. 2853–2867. https://doi.org/10.1098/rstb.2010.0134.

[456] Graesser, J., Aide, T.M., Grau, H.R. and Ramankutty, N. (2015) 'Cropland/pastureland dynamics and the slowdown of deforestation in Latin America', Environmental Research Letters, 10(3). https://doi.org/10.1088/1748-9326/10/3/034017.

[457] Zalles, V., Hansen, M.C., Potapov, P. V., Parker, D., Stehman, S. V., Pickens, A.H., Parente, L.L., Ferreira, L.G., Song, X.P., Hernandez-Serna, A. and Kommareddy, I. (2021) 'Rapid expansion of human impact on natural land in South America since 1985', Science Advances, 7(14), pp. 1–12. https://doi.org/10.1126/sciadv.abg1620.

[458] Ding, L. and Kinnucan, H.W. (2011) 'The Latin American Livestock Industry: Growth and Challenges', Journal of Gender, Agriculture and Food Security, 1(3), pp. 1–22. https://doi.org/10.22004/ag.econ.302483.

[459] De Sy, V., Herold, M., Achard, F., Beuchle, R., Clevers, J.G.P.W., Lindquist, E. and Verchot, L. (2015) 'Land use patterns and related carbon losses following deforestation in South America', Environmental Research Letters, 10(12). https://doi.org/10.1088/1748-9326/10/12/124004.

[460] IPCC (2013) Climate Change 2013 – The Physical Science Basis, IPCC Climate change. Edited by 2013: Climate Change 2013 Intergovernmental Panel on Climate Change IPCC. Cham: Cambridge University Press. https://doi.org/10.1017/CBO9781107415324.

often displaced and depending on abandoned agricultural crops with exhausted soils, a few years after the original forests were cleared.[461]

Most of the support for pastoralists has been driven by the communities themselves with some engagement of universities and research institutions. The Red Pastoramericas[462] builds on these community initiatives bringing together small livestock producers from different countries This network participates in the FAO Pastoralist Knowledge Hub and leads the Regional Support Group of the IYRP. There are other initiatives at the regional level, often led by academic institutions. Conservation organizations have also adopted a multi-country approach, as described in the case below, which shows the emerging path towards cross-border coordination.

Restoring a Free-Flowing Pantanal to boost climate action and biodiversity: Updated Pantanal Ecoregional Action Strategy 2022–2030[463]

Pantanal comprises a set of flood-prone savannah and wetland areas located in the Upper Paraguay River Basin. Bolivia, Paraguay and Brazil headwaters, draining from the ecoregions of Chaco, Cerrado, and Chiquitania, provide the water needed to sustain the whole area.

The Pantanal initiative comprises a large ecoregional plan, supported by actions at the national, subnational and local levels, including work with local communities. Grasslands and savannahs are the targeted ecosystems, especially to halt deforestation and conversion. The main conservation work is aimed at freshwater tropical wetlands with savannah vegetation, and including relevant connections upstream and downstream, targeting the health of many other landscapes that are hydrologically connected.

The Pantanal initiative aims to deliver significant conservation impacts through an integrated landscape approach. The current strategy has four pillars: 1) **Free Flowing Pantanal** with a focus on sustainable basin-scale energy planning to keep the rivers flowing; 2) **Deforestation and Conversion Free Pantanal** aiming to implement sustainable agriculture and cattle ranching and promote deforestation and conversion free commitments; 3) **Climate Resilient Pantanal**, focused on connectivity, protected areas, indigenous management, resilience and nature-based solutions; and 4) **Engaging, Mobilising and Influencing for a sustainable Pantanal**.

WWF has supported dialogue processes and technical capacity-building at the national and sub-national levels of the three countries to drive investment towards a common, long-term conservation agenda with the participation of local communities. A major milestone was reached with the 2018 trilateral signing of the Pantanal Declaration for Conservation and Sustainable Development.[464] The organization has been supporting the strengthening of the Zicosur Platform[465] to improve trade, logistics and ecosystem services on a subnational level.

Methodologically, work is undertaken at different levels, including the basin-wide Transboundary Diagnostic (conducted with a GEF project) and Strategic Action Plan to be agreed with the three governments while, at the local level, building capacity of local partners. The engagement of the

[461] FAO (2007) 'Ganadería y deforestación', *Revista Politicas Pecuarias*, 3, pp. 1–8. https://www.fao.org/publications/card/en/c/882b975b-9e71-5e5a-854e-0db8e51c3fb2/.
[462] https://www.facebook.com/pastoramericas/
[463] https://www.worldwildlife.org/places/pantanal
[464] https://www.wwf.org.br/?64342/An-Unprecedented-Agreement-for-the-Pantanal-is-Signed
[465] https://zicosur.co/

three governments in tri-national basin planning and governance should provide an enabling framework for the completion of the process.

This initiative has been the result of coordinated work of three country WWF offices, along with financial support from other WWF country offices and third agencies (GEF, International Climate Initiative [IKI], EU, United States Agency for International Development [USAID], etc.).

National approaches

Argentina

Rangelands account for two thirds of Argentina's land area and contribute uniquely to its agricultural production, biodiversity, and cultural identity. The effect of mountain ranges and regional air mass movements create varied climates and a diverse array of rangeland and forest biomes, with arid drylands occupying around 39 per cent of the country, as shown in Table 14.

Table 14: Rangeland types in Argentina[466]

Rangeland type	Location and description	Area (Mha)	Mean rainfall (mm/yr)	Plant communities
Arid and semi-arid grasslands, shrublands, and woodlands*	Patagonia (cold deserts and semi-deserts)	60	300	Shrub steppes, grass steppes and meadows
	Monte (Hot and cold deserts and semi-deserts	46	80–300	Shrub steppes
	Caldenal (semi-arid woodlands)	2.3	300–350	Woodlands
	Western Chaco (dry woodlands and savannas)	65	320–800	Mid- to low forests and savannas
	Puna (cold deserts and semi-deserts)	9	200	Shrub steppes
Subtropical humid forests and savannas*	Eastern Chaco (subhumid forests and savannas)‡	25	800	Forests and savannas
	Espinal (forests, woodlands, savannas)	3	1,000–1,200	Forests and savannas
Temperate humid grasslands	Pampas (temperate grasslands and steppes)	50	700–900	Grasslands
Sub-Antarctic forests	Nothofagus temperate semideciduous forests	2	≥1,000	Forests and savannas

Figure 17: Rangelands in Argentina

[466] Anderson, D.L., Bonvissuto, G.L., Brizuela, M.A., Chiossone, G., Cibils, A.F., Cid, M.S., Feldman, I., Fernández Grecco, R.C., Kunst, C., Oesterheld, M., Oliva, G.E., Paruelo, J.M., Peinetti, H.R. and Villagra, E.S. (2011) 'Perspectives on Rangeland Management Education and Research in Argentina', *Rangelands*, 33(1), pp. 2–12. https://doi.org/10.2111/RANGELANDS-D-10-00016.1.

Pastoralism in Argentina was developed out of traditional practices by indigenous groups, which settlers from Europe also later adopted. It is now largely practiced by indigenous communities and Criollo people of mixed descent. They keep llamas, sheep, goats, cattle and horses to produce meat, dairy, wool, cashmere, and handicrafts. According to the Red Chaco Network, based on the 2018 national census, 30,000–35,000 of the indigenous and Criollo people are pastoralists, mainly in the regions of the Puna altiplano, Gran Chaco, and Northern Patagonia. Pastoralists play a significant role in Argentinian agriculture and society,[467] contributing up to 16–20 per cent of agricultural GDP (1.2 per cent of global GDP) although the trade is mostly informal. Pastoralism in Argentina represents an important economic activity, critical to the livelihoods and food security of a significant number of small households.[468]

Argentina has historically received significant interest from academics and researchers focused on its rangelands and pastoralist activities, which still needs to be matched by policies and government support. New initiatives, such as the rangeland alliance (*Alianza del pastizal*),[469] are exploring new, collaborative ways to advance the preservation of these landscapes.

The cases from Argentina show current efforts to protect rangelands with innovative approaches, the first one targeting indigenous technologies.

Grasses cultivation in *deschampado* understory patches: participative construction of an appropriate technology

This initiative uses native resources to improve the forage supply while protecting the Chaco Forest ecosystem services. Together, researchers and Creole peasants have designed and implemented a

[467] Lanari, M.R., Centeno, M.P., Pereda, G., Ejarque, M., Lammel, S., Moronta, M., Quiroga, M., Quiroga, J., Losardo, P. and Frere, P. (2020) Accounting for Pastoralist in Argentina. http://www.pastoralpeoples.org/wp-content/uploads/2020/09/Accounting4pastoralists-AR.pdf

[468] Wane, A., Cesaro, J., Duteurtre, G., Touré, I., Ndiaye, A., Alary, V., Juanès, X., Ickowicz, A., Ferrari, S. and Velasco, G. (2020) The economics of pastoralism in Argentina, Chad and Mongolia, The Economics of Pastoralism. FAO. https://doi.org/10.4060/cb1271en.

[469] https://www.avesargentinas.org.ar/alianza-del-pastizal

technological alternative to pasture implantation. The *Deschampado* technique entails lightly pruning the low branches that hinder the circulation of animals and removing non-forage shrubs and sick trees. Afterwards, shade pastures are sown to prevent bush encroachment, which constitutes the greatest post-clearing threat. This silvopastoral approach does not negatively impact the regeneration of trees and it promotes higher biodiversity, lending to the increased provision of ecosystem services. The design and approach are based on the Creole Technological Space, devised during a participatory process following a logic framework that includes monitoring through a participatory indicator system. A workshop[470] carried out in 2022 assessed and validated the adoption of the *deschampado* technology.[471]

This alternative technique is meant to replace mechanical clearing of patches by commercial livestock farming in the region. Mechanical clearing periodically uses heavy machinery to clear the overgrowth of thorny woody shrubs, obstructing tree regeneration and heavily compacting the soil.

This collective action has been led by Creole communities who practice extensive cattle-raising in open forest, providing peasant knowledge, work and property infrastructure while a National University of Salta research team helped integrate empirical and scientific knowledge and gathered financial support. The process has developed an effective local technology to integrate pasture culture within forests, generating benefits highly valued by the local population.

The initiative below, from the National Observatory of Land Degradation and Desertification (ONDTyD), shows increasing interest in rangelands and LDN in Argentina.

Argentine Observatory of Land Degradation and Desertification,[472] [473]

The National Observatory of Land Degradation and Desertification (ONDTyD) was funded in 2012 by a conglomerate of academic and government institutions to establish a national network for permanent biophysical and socioeconomic monitoring and assessment of land degradation. Currently, 23 pilot sites and almost 200 experts are monitoring land degradation, implementing participatory practices of Sustainable Land Management, publishing the results and making recommendations for policymakers.[474] The observatory is currently supported by specific projects and a partnership of political and scientific-technological sectors. It aims to build understanding of the link between producers, livestock and the land, addressing land tenure and promoting sustainable practices among local producers, small nomadic herders and larger companies. Through participatory processes, co-construction of knowledge and joint work with local stakeholders the initiative adjust their research to the local context and addresses critical questions on gender, farm size power relations.

The last case study in Argentina is centred on the Puna and with innovative marketing of pastoralist products developed by Andean indigenous communities.

[470] https://ibigeo.conicet.gov.ar/taller-el-cultivo-de-pasturas-bajo-el-bosque-deschampado-taller-para-la-evaluacion-de-la-adopcion-del-deschampado-en-la-implantacion-de-pasturas-en-el-chaco-salteno/
[471] https://vimeo.com/325255990; https://www.youtube.com/watch?v=SvSdDBQN37Q; https://www.youtube.com/watch?v=0_bpJUqz_j4; https://www.youtube.com/watch?v=6QTNKj5htt0; https://www.youtube.com/watch?v=3Qv4Q6DKB7s
[472] http://www.desertificacion.gob.ar
[473] https://www.conicet.gov.ar/?lan=en
[474] http://www.desertificacion.gob.ar/wp-content/uploads/2018/03/ONDTyD_inf-preliminar12-17-1.pdf

The Puna pastoralist landscape in Santa Catalina, Jujuy, Central Andes[475] [476]

The Puna ecosystem supports one of the most long-lived and culturally distinct socioecological systems in the world: Andean pastoralism. Like any pastoral system, it is undergoing challenges, including migration. External threats, linked to marketing difficulties, also devalue their products and crafts and erode pastoral knowledge.

This project has developed a framework to gain insight into the Puna pastoral systems and to plan – together with local communities – for a sustainable future. The VICAM research team, in addition to carrying out basic studies and analysing trends, dedicates much of its energy to support community demands via a "bottom-up" approach. Together, researchers and communities have built a participatory environmental calendar, programming dialogues on critical issues (carrying capacity, sustainable markets for llama fibre, crafts, vicuña chaku, etc.). Additionally, action is taken to support community claims concerning land rights and conflicted lands. An annual spinning contest, the Pushka Runakuna[477], engages young people and empowers girls and women, demonstrating the importance of a gender equality approach that targets young people.

The initiative has brought together local stakeholders in Santa Catalina, including the Cooperative of Santa Catalina Livestock Producers, Community Council (including the indigenous communities of Aucapiña Chambi, Atu Saphis and Peña Colorada), local schools and authorities, and producers from scientific institutions (VICAM research group, CONICET, National Universities of Jujuy and Lujan), as well as donors (Midori Prize, Satoyama Initiative, and Williams Foundation).

The concept of "nature's contribution to people" and its indicators have helped analyse pastoralism and disseminate the project's outcomes. Scientific articles have also been produced on the project, such as the Puna pastoralist system[478], the management of vicuñas' wild populations[479]and other camelids, pastoral productions[480] and ecology of the Puna system[481].

Brazil

Pasture areas are the main land use type in Brazil. Grassy ecosystems, including savannas and grasslands, are widely found in all Brazilian biomes.[482] They are the dominant vegetation type in the Cerrado, Pampa and Pantanal, and occur as enclaves in the Caatinga, Atlantic Forest and Amazon. Overall, grassy ecosystems cover approximately 27 per cent of the Brazilian territory. Brazil's major grassy ecosystems are shown on the map in Figure 18, including the Savannas in the Cerrado and Caatinga and the grasslands in the Pantanal. They host an enormous

[475] www.vicam.org.ar
[476] https://www.conicet.gov.ar/?lan=en
[477] Vilá B., Arzamendia Y., Bejerano F., Farfán M., Dominguez G. 2022. Pushka Warmi: Concurso de hilado en Santa Catalina, Jujuy, Argentina. Revista Etnobiología. Vol 20, Num. pp: 29-50. ISSNe 2448-8151; ISSN 1665-2703. https://www.revistaetnobiologia.mx/index.php/etno/article/view/485.
[478] Arzamendia Y., Rojo V. Gonzalez N.M., Baldo J.L, Zamar M.I., Lamas H.E y Vilá B.L. 2021. The Puna pastoralist system: a coproduced landscape in the central Andes. Mountain Research & Development, Mountain 41(4) https://doi.org/10.1659/MRD-JOURNAL-D-21-00023.1
[479] Vilá, B. and Arzamendia, Y. (2022) 'South American Camelids: their values and contributions to people', Sustainability Science, 17(3), pp. 707–724. https://doi.org/10.1007/s11625-020-00874-y.
[480] Vilá B., Arzamendia Y. 2022. Weaving a vicuña shawl. Pastoralism: Research, Policy and Practice. 12:46. https://doi.org/10.1186/s13570-022-00260-6.
[481] Rojo V., Arzamendia Y., Perez C., Baldo J. y Vilá B. 2019. Spatial and temporal variation of the vegetation of the semiarid Puna in a pastoral system in the Pozuelos Biosphere Reserve. Environmental Monitoring and Assessment, 191: 635. https://doi.org/10.1007/s10661-019-7803-7.
[482] https://www.ibge.gov.br/en/access-to-information/institutional/the-ibge.html

biodiversity and natural value and are considered among the most endangered eco-regions on Earth due to high rates of conversion and the few protected areas declared.[483] These, grassy ecosystems receive little public attention and are undervalued by conservation initiatives.[484]

In the last 35 years, around 45 million hectares of new pastures were added to Brazilian agricultural lands. During this time, 64 million hectares were deforested, while 18 million hectares of original pastures were replaced by agriculture, forestry and dams. Currently, 70 per cent (37 million hectares) of total pastureland in the Amazon can be attributed to this deforestation.[485] One third of existing pastures in the Cerrado and Atlantic forest biomes are related to deforestation processes. Unfortunately, the expansion of the agricultural frontier at the expense of natural vegetation is ongoing. Since 2010, 10 million hectares of new pastures and 4 million hectares of new croplands have replaced the natural vegetation and there have been claims of cattle ranching invading indigenous territories and protected areas.[486]

Livestock management is often viewed as a negative factor for these ecosystems. However, a large body of evidence points to its importance for maintaining high levels of biodiversity and other ecosystem services. Research is currently assessing how SRLM approaches, which consider both grazing and fire as valuable management tools can boost key services, such as carbon storage.[487]

Figure 18: Map of the main grasslands and savannas in Brazil[488]

[483] Beuchle, R., Grecchi, R.C., Shimabukuro, Y.E., Seliger, R., Eva, H.D., Sano, E. and Achard, F. (2015) 'Land cover changes in the Brazilian Cerrado and Caatinga biomes from 1990 to 2010 based on a systematic remote sensing sampling approach', Applied Geography, 58, pp. 116–127. https://doi.org/10.1016/j.apgeog.2015.01.017.

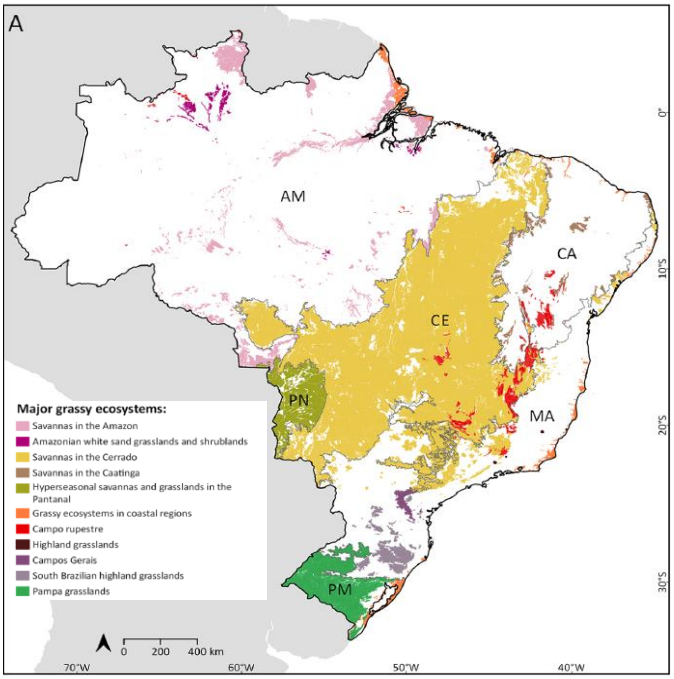
[484] Overbeck, G.E., Vélez-Martin, E., Menezes, L. da S., Anand, M., Baeza, S., Carlucci, M.B., Dechoum, M.S., Durigan, G., Fidelis, A., Guido, A., Moro, M.F., Munhoz, C.B.R., Reginato, M., Rodrigues, R.S., Rosenfield, M.F., Sampaio, A.B., Barbosa da Silva, F.H., Silveira, F.A.O., Sosinski, Ê.E., Staude, I.R., Temperton, V.M., Turchetto, C., Veldman, J.W., Viana, P.L., Zappi, D.C. and Müller, S.C. (2022) 'Placing Brazil's grasslands and savannas on the map of science and conservation', Perspectives in Plant Ecology, Evolution and Systematics, 56(June). https://doi.org/10.1016/j.ppees.2022.125687.

[485] https://plataforma.amazonia.mapbiomas.org/

[486] https://www.amnesty.org/en/latest/news/2019/11/brazil-facts-and-figures-behind-illegal-cattle-farms-fuelling-amazon-rainforest-destruction/

[487] Baggio, R., Overbeck, G.E., Durigan, G. and Pillar, V.D. (2021) 'To graze or not to graze: A core question for conservation and sustainable use of grassy ecosystems in Brazil', *Perspectives in Ecology and Conservation*, 19(3), pp. 256–266. https://doi.org/10.1016/j.pecon.2021.06.002.

[488] Overbeck, G.E., Vélez-Martin, E., Menezes, L. da S., Anand, M., Baeza, S., Carlucci, M.B., Dechoum, M.S., Durigan, G., Fidelis, A., Guido, A., Moro, M.F., Munhoz, C.B.R., Reginato, M., Rodrigues, R.S., Rosenfield, M.F., Sampaio, A.B., Barbosa da Silva, F.H., Silveira, F.A.O., Sosinski, Ê.E., Staude, I.R., Temperton, V.M., Turchetto, C., Veldman, J.W., Viana, P.L., Zappi, D.C. and Müller, S.C. (2022) 'Placing Brazil's grasslands and savannas on the map of science and conservation', Perspectives in Plant Ecology, Evolution and Systematics, 56(June). https://doi.org/10.1016/j.ppees.2022.125687.



Brazil produces 16 per cent of the world's beef (around USD 7.6 billion in 2019). One third of the Brazilian agribusiness GDP (USD 81 billion), is generated by cattle livestock, a sector that employs 3 million people in rural areas.[489] There are a total of 264 million cattle in Brazil, as well as 17.4 million sheep, accounting for 1.4 per cent of world production.[490] There are an increasing number of silvopastoral initiatives in Brazil, including the case study presented below.

Cerrado Alive Initiative[491]

The Cerrado is the second largest biome in South America, with over 2 million square kilometres (24 per cent of Brazil's territory), encompassing lands from 11 States. The traditional communities of the Cerrado retain significant knowledge of their landscape, including the nutritional, medicinal and commercial values of non-timber forest products. Over 150 species of edible fruit, nuts and seeds are currently being collected and marketed under community-based productive chains, adding value to the local economy. This initiative builds local capacity through small agro-extractive activity, SLM and equitable governance led by local or traditional communities.

Cerrado Alive is a 10-year strategy with USD 6.6 million committed and developed by influencing policy, shifting finance, engaging markets, and strengthening governance, while also enhancing research, knowledge, management, and communication.

The project supports CBOs of small farmers engaged in the harvesting *baru, pequi* and *buriti* fruits, as well as the golden-grass production chains. Other stakeholders and traditional communities, such as the *babassu* coconut breakers, are also engaged. Using a rights-based approach, it includes public attorneys and the Brazilian legal system. A key result of the initiative is the the Statement of

[489] Feltran-Barbieri, R. and Féres, J.G. (2021) 'Degraded pastures in Brazil: improving livestock production and forest restoration', Royal Society Open Science, 8(7), p. 201854. https://doi.org/10.1098/rsos.201854.

[490] Costa, J.A.A. da and Gonzalez, C.I.M. (2014) 'Sheep farming in Brazil', Integrated Crop-Livestock-Forestry SystemsEdition: firstChapter: 15Publisher: Embrapa 2014 [Preprint], (October). https://www.researchgate.net/publication/267028031_Sheep_farming_in_Brazil.

[491] https://www.wwf.org.br/?74943/Cerrado-Alive

Support of the Cerrado Manifesto [492] developed by WWF and signed by 175 organizations, calling on international market stakeholders to act in defense of the Cerrado. Other relevant actions include the Salmon Deforestation and Conversion Free benchmark for soy and the partnership with the "Central do Cerrado Cooperative", comprising 35 associations and over 12,000 families promoting value chains of native products.

Other partnerships have been formed to provide technical support, mobilisation, structuring, and markets to the 38 community enterprises that process 1,885 tonnes of native fruits collected by 2,600 families. A programme for improved access to credit has released credits with a value of USD 230,000 to six enterprises and helped mobilise USD 1 billion for rural credit under the Low Carbon Agriculture Program. The project has also helped form the Araticum Network and the Cerrado Knowledge Platform,[493] undertaken studies, and collaborated with other regions (e.g. WWF in the Pantanal).

Brazil's Nationally Determined Contribution (NDC) recognises that restoring forests and recovering degraded pasturelands are core strategies for reducing deforestation pressures. Accordingly, NDC has committed to recover 15 million hectares of degraded pasturelands, restore 12 million hectares of native vegetation, and create 5 million hectares of integrated agrosilvopastoral systems by 2030.[494]

Land Degradation Neutrality in South America

There are similarities in the ways that land degradation occurs across South American countries. The degraded area constitutes a significant percentage of each country's territories with deforestation a main driver, and low organic soil carbon content and declining productivity are also seen in each country.[495]

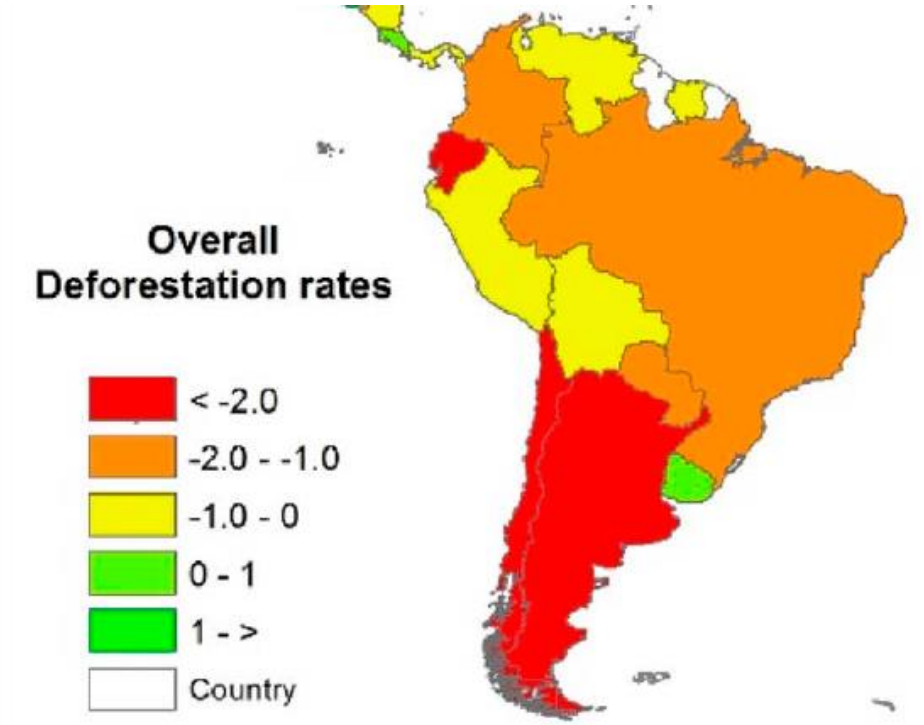
Table 15: Extension of land degradation in South American countries[496]

Country	Total area (km²)	Degradation estimates (% of land)			Main degradation factors
		PRAIS	WAD data	Other sources	
Brazil	8,515,770	26	36	61	Deforestation, productivity loss, low soil carbon content
Argentina	2,780,400	38	40	87	Productivity loss, aridity, low soil carbon content, vegetation cover change
Paraguay	406,752	52	62	30	Deforestation, productivity loss, land cover change, aridity
Peru	1,285,220		58	54	Deforestation, aridity, water stress, low soil carbon content
Ecuador	25,637	29	50		Deforestation, low soil carbon content, vegetation cover change

[492] https://www.wwf.org.br/natureza_brasileira/areas_prioritarias/cerrado/manifestodocerrado/
[493] https://cepf.lapig.iesa.ufg.br/#/
[494] Feltran-Barbieri, R. and Féres, J.G. (2021) 'Degraded pastures in Brazil: improving livestock production and forest restoration', Royal Society Open Science, 8(7), p. 201854. https://doi.org/10.1098/rsos.201854.
[495] UNCCD, (2019) The Global Land Outlook: Latin America and the Caribbean Thematic Report: Sustainable Land Management and Climate Change Adaptation. https://www.unccd.int/sites/default/files/2022-04/GLO LAC ENGLISH_WEB.pdf.
[496] UNCCD (2019) The Global Land Outlook: Latin America and the Caribbean Thematic Report: Sustainable Land Management and Climate Change Adaptation. United Nations Convention to Combat Desertification. https://www.unccd.int/sites/default/files/2022-04/GLO%20LAC%20ENGLISH_WEB.pdf .

Deforestation is a key driver of land degradation in the region. Indeed, the expansion of agriculture and pastures remains a primary cause of forest loss across South America with drylands experiencing higher deforestation rates than other lands. The direct drivers include infrastructure, agricultural expansion, cattle-grazing, forestry, aquaculture, natural disasters, fire and mining. The indirect drivers include social and population pressure, economic pressures (demand, markets, prices) and policies. The results are shown in the map in Figure 19.

Figure 19: Map of deforestation in South America[497]



Rangeland degradation is also widespread threat in South America. With high conversion rates over the last decades, it was estimated in 2008 that around 15 per cent of the grasslands were already lost or fragmented.[498] Livestock systems have been intensifying via two main strategies: increased use of fodder in feedlots; and increased stocking rates. Land-use change is also driving the intensification of livestock systems, thereby degrading grasslands. This affects most South American rangelands, which have experienced increasing anthropic pressure for many years, with Brazil's Cerrado and Caatinga and the Rio de la Plata basin most affected.[499]

Countries have promoted action to address this challenge via national and sub-regional projects. International cooperation is key to the development of these projects, with organizations, such as GEF, the EU (under the *Zona de Integración del Centro Oeste de América*

[497] Armenteras, D., Espelta, J.M., Rodríguez, N. and Retana, J. (2017) 'Deforestation dynamics and drivers in different forest types in Latin America: Three decades of studies (1980–2010)', Global Environmental Change, 46(November 2016), pp. 139–147. https://doi.org/10.1016/j.gloenvcha.2017.09.002.
[498] Modernel, P., Rossing, W.A.H., Corbeels, M., Dogliotti, S., Picasso, V. and Tittonell, P. (2016) 'Land use change and ecosystem service provision in Pampas and Campos grasslands of southern South America', Environmental Research Letters, 11(11), p. 113002. https://doi.org/10.1088/1748-9326/11/11/113002.
[499] https://www.wwf.org.br/?84401/Deforestation-in-the-Brazilian-Cerrado-increases-by-25-in-2022-and-registers-the-highest-rate-in-seven-years

del Sur [ZICOSUR]), the World Resources Institute and IUCN, contributing to implement initiatives (e.g., Ecosystem-based Adaptation, Bonn Challenge Initiative 20x20). Most of these initiatives have focused on forests and deforestation, but rangelands need to be actively incorporated into LDN targets.

Discussion

Land degradation is significantly impacting South American rangelands. Several critical issues arise in this context, as shown by the previous case studies, including the relationship between pastoralism and deforestation, the interference between ranching and mobile pastoralism, and the potential of agroforestry and silvopastoral approaches.

With respect to the relationship between pastoralism and deforestation, forest loss resulting from land conversion to agriculture is significant in the region,[500] but the role of grazing demands a deeper analysis. There are direct drivers related to livestock production, such as cattle-ranching for export, and also indirect ones, such as new soya crops, which displace livestock towards forest land,[501] lending to increased complexity and variability of local scenarios. For instance, livestock producers are occupying abandoned soya crops that had been deforested before their cultivation, and silvopastoral systems are recovering rangelands. All in all, a nuanced approach is leaving behind the consideration of all livestock a main source of land degradation while pastoralism is positively assessed as a critical strategy for SRLM. Moreover, both mobile and rotational grazing and prescribed fire are increasingly considered relevant rangeland management tools that can balance trade-offs and boost key services (e.g., carbon storage).

With respect to the interference between ranching and mobile pastoralism, the latter is often perceived to generate conflicts, as livestock on the move sometimes can damage crops, seedlings, infrastructure, restoration areas, etc. At the same time, pastoralism suffers the most when their routes, grazing reserves, tracks and infrastructure are invaded, destroyed or diminished, frequently by those same interventions that they seem to jeopardize.

The design of initiatives aiming to improve the condition on rangelands should address these complex relationships and ensure coexistence between legitimate activities. Participatory governance, democratic institutions, and a fair designation of land rights must be both flexible and operational to guarantee critical rangeland issues (e.g., rangeland resting periods or mobility). Pastoral mobility should always be considered a critical feature of most rangelands. The modulation of stock rates over time, critical for SRLM, can only be achieved this way. Accordingly, both livestock and wildlife movements should be facilitated across rangelands to ensure balanced grazing pressures at each moment of the cycle. Mobility also guarantees that the resting periods can be enforced, and the rangeland allowed to recover, clearing paths to move out livestock if local conditions require quick action (e.g. under extreme climate events, wildfires or rotation turnover). Mobile pastoralism, ranching, agropastoralism and agroforestry schemes can coexist, share resources and be mutually synergic if rights, planning and

[500] Bernardi, R.E., Buddeberg, M., Arim, M. and Holmgren, M. (2019) 'Forests expand as livestock pressure declines in subtropical South America', Ecology and Society, 24(2). https://doi.org/10.5751/ES-10688-240219.

[501] Richards, P.D., Myers, R.J., Swinton, S.M. and Walker, R.T. (2012) 'Exchange rates, soybean supply response, and deforestation in South America', Global Environmental Change, 22(2), pp. 454–462. https://doi.org/10.1016/j.gloenvcha.2012.01.004.

governance structures are effectively supported by the state and stakeholders are engaged in relevant rangeland governance institutions.

A last consideration, and an additional task that should be supported by South American countries and institutions, is the design and implementation of policy frameworks and pastoral strategies targeting small producers, rural communities and rangelands. By ensuring food security, securing land rights and promoting SRLM, these strategies should also facilitate the participation and improve the livelihoods of pastoralist and indigenous communities, often the weakest and most important link in rangeland governance. In addition, legal support would enhance collaboration between the different stakeholders and land-based livestock production systems, to deal with specific problems effectively.

Several South American initiatives, led by academics and experts and supported by international institutions, are expanding agroforestry schemes by restoring indigenous and traditional systems or designing and implementing modern ones, specifically silvopastoral systems.[502] This is helping improve management, production, adaptation and provision of ecosystem services of rangelands and open forests, setting an example for other regions to follow.

[502] Rogerio-Martins, M., Sandin-Ribeiro, R., Campos-Paciullo, D.S., Alves-Cangussú, M., Murgueitio, E., Chará, J. and Flores-Estrada, M.X. (2019) 'Silvopastoral Systems in Latin America for Biodiversity, Environmental, and Socioeconomic Improvements', in Agroecosystem Diversity. Elsevier, pp. 287–297. https://doi.org/10.1016/B978-0-12-811050-8.00018-2.

4.9 North America

Rangelands are a recognisable feature of the North American landscape. Open landscapes, from polar areas in Alaska and Canada to the grasslands of the central United States to the arid deserts of Mexico, dominate vast regions of the continent. This lends to different grassland ecosystems: tundra in the North; shortgrass, mixed-grass, and tallgrass prairies in the West; saltbrush communities in the Great Basin and communities dominated by cacti, and dry shrublands in the driest areas in the southwestern United States and Mexico deserts, with extreme temperature ranges and chronically low precipitation. This diversity in North American rangelands results in highly variable conditions and capacity to support livestock and wildlife.[503]

Canada hosts around 13.2 million hectares of grazed lands, including grazing forests. The Canadian prairies stretch about 1,800 kilometres from southeastern Manitoba to northwestern Alberta. Currently, around 11.4 million hectares are grasslands (with 9.9 million hectares considered natural grasslands). They have been constrained to 20 per cent of the originally covered area of 61 million hectares, as many have been converted to oilseed and grain crops that profit from their high soil fertility. These grasslands can generally be managed by extensive grazing systems, although they are confronted by challenges, such as shrub encroachment, uneven grazing, and occupation by mining and infrastructure.[504]

In the United States, rangelands comprise about 308 million hectares, a 31 per cent of the total land area, being dominant in the West. A total of 53 per cent of the 19 states west of the Mississippi are rangelands. These lands offer a variety of goods and services, with food and fibre production dominating the 20th century.[505] The conversion of grasslands into croplands is a primary threat to the central grasslands of the United States, along with undesirable shrub encroachment. Approximately 730,000 hectares of rangelands were transformed into crops in 2020 in the Great Plains area.[506]

Grasslands and shrubs of the arid and semi-arid zones of central and northern Mexico comprise approximately 25 per cent of the national territory, with rangelands in other parts of the country covering another 25 percent.[507] Mexican grasslands are distributed in a strip from the North to the South-east, with semi-arid grasslands extending from Sonora and Chihuahua to Guanajuato, and arid shrublands from Baja California to Oaxaca. Mexican rangelands have undergone major transformations in the last 50 years, mainly due to land use and climate

[503] https://wrangle.org/continent/north-america

[504] Bailey, A.W., McCartney, D. and Schellenberg, M.P. (2010) *Management of Canadian Prairie Rangeland*, *Agriculture and Agri-Food Canada*. Agriculture and Agri-Food Canada. https://www.beefresearch.ca/files/pdf/fact-sheets/991_2010_02_TB_RangeMgmnt_E_WEB_2_.pdf.

[505] Havstad, K.M., Peters, D.P.C., Skaggs, R., Brown, J., Bestelmeyer, B., Fredrickson, E., Herrick, J. and Wright, J. (2007) 'Ecological services to and from rangelands of the United States', Ecological Economics, 64(2), pp. 261–268. https://doi.org/10.1016/j.ecolecon.2007.08.005.

[506] R. Joshi, D., E. Clay, D., Smart, A., A. Clay, S., P. Kharel, T. and Mishra, U. (2020) 'Soil and Land-Use Change Sustainability in the Northern Great Plains of the USA', in Land Use Change and Sustainability. IntechOpen. https://doi.org/10.5772/intechopen.84781.

[507] Huber-Sanwald, E. (2021) 'Action Plan for the International Year of Rangelands and Pastoralists (IYRP): The Case for Mexico'. https://iyrp.info/sites/iyrp.org/files/2021 IGC-IRC IYRP Huber-Sannwald Mexico paper.pdf.

change, and uneven grazing.[508] Their surface has shrunk by 14 per cent in grasslands and 26 per cent in shrublands as a result of their conversion to agriculture.

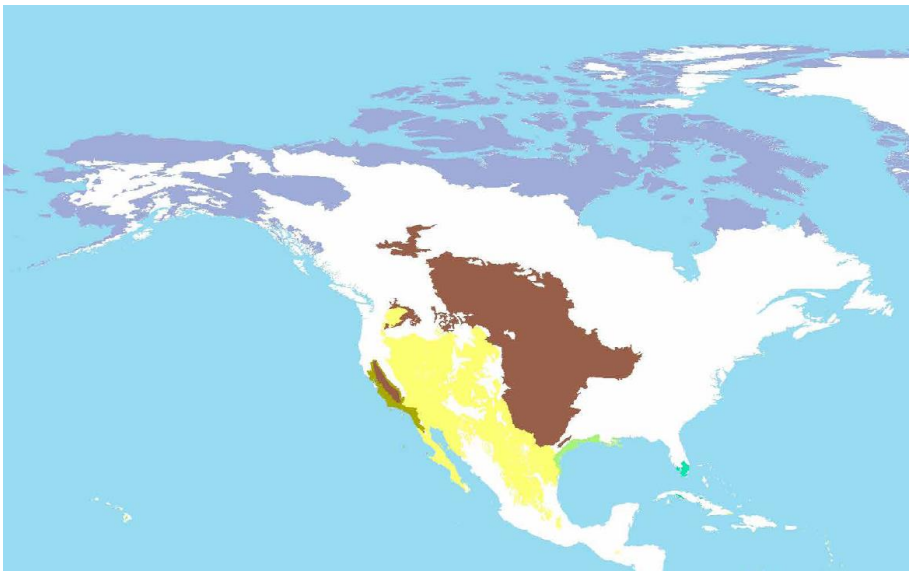
In Canada, there are approximately 3.7 million beef cattle and 0.9 million dairy cattle, distributed into approximately 40,000 and 9,000 farms, respectively. Sheep are much less numerous, in 2021, there were 1.1 million sheep distributed across 3,600 farms.[509]

According to NASS, in 2020, the United States had 5.2 million sheep, including 3.81 million breeding sheep distributed across more than 100,000 farms. There were 2.66 million goats, and over 93 million beef and 9.4 million dairy cattle,[510] across 700,000 cattle farms, ranches and feedlots. Cattle grazes over 248 million hectares, representing 27 per cent of U.S. land.[511]

The situation in Mexico is different, with up to 33.3 million beef cattle,[512] a figure that is rising, alongside the 2.6 million dairy cattle.[513] According to 2021 data, the sheep herd is stable at around 8.7 million[514] and there was a similar number of goats.[515] Sheep are raised in 50,000 production units, representing the only income for about 34 per cent of producers.[516] In Mexico, a large share of livestock production and rangeland use are for subsistence, with more diverse breeds and production systems than in the United States and Canada. Households may graze a few cattle, sheep and goats in order to use local resources. In some areas, observers describe an impoverished rural population without access to credit, technology, or the resources needed to improve their lives, and earning a living solely from grazing, farming and manual labour.[517]

Figure 20: North American Rangelands[518]

[508] Jurado-Guerra, P., Velázquez-Martínez, M., Sánchez-Gutiérrez, R.A., Álvarez-Holguín, A., Domínguez-Martínez, P.A., Gutiérrez-Luna, R., Garza-Cedillo, R.D., Luna-Luna, M. and Chávez-Ruiz, M.G. (2021) 'Los pastizales y matorrales de zonas áridas y semiáridas de México: Estatus actual, retos y perspectivas', *Revista Mexicana de Ciencias Pecuarias*, 12, pp. 261–285. https://doi.org/10.22319/rmcp.v12s3.5875.
[509] Statistics Canada (2022) 'Canada's 2021 Census of Agriculture: A story about the transformation of the agriculture industry and adaptiveness of Canadian farmers', *The Daily*, pp. 1–12. https://www150.statcan.gc.ca/n1/en/daily-quotidien/220511/dq220511a-eng.pdf?st=fqhgzSrb.
[510] NASS (2020) *Sheep and goats*, *Jewish Quarterly Review*. https://www.nass.usda.gov/Publications/Todays_Reports/reports/shep0120.pdf.
[511] National Cattlemen's Beef Association (2017) *2017 Cattlemen's Stewardship Review*. https://www.neogen.com/neocenter/blog/fast-facts-state-of-u-s-cattle-ranching/.
[512] https://www.gob.mx/cms/uploads/attachment/file/744949/Inventario_2021_bovino_para_carne.pdf
[513] https://www.gob.mx/cms/uploads/attachment/file/744950/Inventario_2021_bovino_para_leche.pdf
[514] https://www.gob.mx/cms/uploads/attachment/file/744954/Inventario_2021_ovino.pdf
[515] https://www.gob.mx/cms/uploads/attachment/file/744952/Inventario_2021_caprino.pdf
[516] Chávez-Espinoza, M., Cantú-Silva, I., González-Rodríguez, H. and Montañez-Valdez, O.D. (2021) 'Sistemas de producción de pequeños rumiantes en México y su efecto en la sostenibilidad productiva', *Revista MVZ Cordoba*, 27(1), pp. 1–14. https://doi.org/10.21897/RMVZ.2246.
[517] Huntsinger, L. and Starrs, P. (2006) 'Grazing in arid North America: A biogeographical approach', *Sécheresse*, 17(1–2), pp. 219–233. https://www.academia.edu/34386381/Grazing_in_arid_North_America_A_biogeographical_approach.
[518] ILRI, IUCN, FAO, WWF, UNEP and ILC (2021) *Rangelands Atlas*. Nairobi: ILRI. https://www.rangelandsdata.org/atlas/.



About 1.9 million hectares of Canada's natural rangelands are crown lands or managed by the Prairie Farm Rehabilitation Administration.[519] Crown land in Canada is managed by departments within each province and there is no national extension service.

Rangelands in the Contiguous United States are mostly privately owned (around 55%), with public lands below 40% and a small fraction (below 5%) under Native American tribal jurisdiction (Figure 21). Public lands in the United States are managed at the national level by federal agencies (e.g., Bureau of Land Management and Forest Service), while private land management assistance is provided by the Natural Resource Conservation Service. The Academy[520] and Government[521] [522] have made efforts to improve rangeland monitoring and management support for rangelands.

Figure 21: Ownership and productivity of the contiguous United States[523]

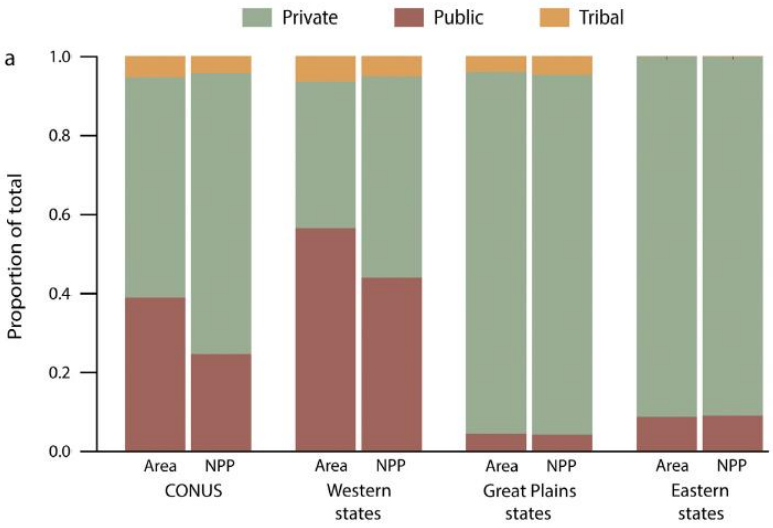
[519] Bailey, A.W., McCartney, D. and Schellenberg, M.P. (2010) Management of Canadian Prairie Rangeland, Agriculture and Agri-Food Canada. Agriculture and Agri-Food Canada. https://www.beefresearch.ca/files/pdf/fact-sheets/991_2010_02_TB_RangeMgmnt_E_WEB_2_.pdf.

[520] https://rangelands.org/

[521] https://rangelands.app/

[522] https://landscapedatacommons.org/

[523] Robinson, N.P., Allred, B.W., Naugle, D.E. and Jones, M.O. (2019) 'Patterns of rangeland productivity and land ownership: Implications for conservation and management', Ecological Applications, 29(3), pp. 1–8. https://doi.org/10.1002/eap.1862.



Mexico has an intricate land tenure system with historical bonds between communal lands and a combination of public and private ownership.[524] The *ejidos* are common lands outside human settlements or towns for cattle or orchards. There are almost 32,000 *ejidos* and local communities, with over 5.6 million *ejidatarios* (co-owners) managing over one half of the country's land. Another 15 per cent are privately owned and managed, and the remaining 5 per cent is owned by the Government. The ejidos combine crops, rangelands, urban lands and other land uses. About 66% support pastures for cattle and, to a lesser degree, sheep and goats under extensive and free grazing systems, which is often associated with land degradation.[525] The *ejido* system was transformed into private ownership due to neoliberal trends in the 1990s, impacting rural ejidos by pushing some towards parcellation and by harming rangeland management in the country. The situation demands better tools, and the implementation of property rights and collective rules to improve the management of common grazing lands.[526]

As in other parts of the world, the rangeland science paradigm in North America has been shifting towards the consideration of rangelands as complex socioecological systems. This is allowing a better understanding of the ecological dynamics and management practices, although the equally complex social factors have been historically understudied.[527] However, full integration of social sciences into the holistic understanding of rangelands as complex socioecological landscapes is both a challenge and an opportunity addressed by the North American rangeland scientific community.

[524] Schumacher, M., Durán-Díaz, P., Kurjenoja, A.K., Gutiérrez-Juárez, E. and González-Rivas, D.A. (2019) 'Evolution and collapse of ejidos in Mexico-To what extent is communal land used for urban development?', Land, 8(10). https://doi.org/10.3390/land8100146.

[525] Morett-Sánchez, J.C. and Cosío-Ruiz, C. (2017) 'Panorama de los ejidos y comunidades agrarias en México.', Agricultura Sociedad y Desarrollo, 14(1), p. 125. https://doi.org/10.22231/asyd.v14i1.526.

[526] Barrera-Perales, O.T., Sagarnaga-Villegas, L.M., Tudela-Mamani, J.W., Salas-González, J.M., Islas-Moreno, A. and Leos-Rodríguez, J.A. (2021) 'Economic valuation of rangelands in the north of mexico: A study for its conservation', Spanish Journal of Agricultural Research, 19(3). https://doi.org/10.5424/sjar/2021193-17041.

[527] Bruno, J.E., Jamsranjav, C., Jablonski, K.E., Dosamantes, E.G., Wilmer, H. and Fernández-Giménez, M.E. (2020) 'The landscape of North American Rangeland Social Science: A Systematic Map', Rangeland Ecology and Management, 73(1), pp. 181–193. https://doi.org/10.1016/j.rama.2019.10.005.

There are some shared priorities to address SRLM and restoration in the North American region. Invasive plants are a major factor in all New World rangelands, pointing to sustainable grazing as a potential mechanism to control their proliferation. The threat of struggles over water quality and quantity also influences rangeland use, especially in the desert regions, with a high potential risk of conflict generation in the future. However, social interest promoted by academics is rising in the North American region claiming to improve livestock grazing patterns and provide new opportunities for SRLM.

At the country level, Mexico's priorities are more focused on improving land rights and institutions to fight privatisation and fragmentation of common rangelands, also promoting sustainable governance and better access to markets, and adaptation to climate change and some of their manifestations, such as intense drought.[528] In contrast, land conversion seems to be more relevant in the United States and Canada rangeland alongside other challenges that include invasive plants, increasing drought, and the resurgence of large predator populations. In addition, the use of goats and other livestock as providers of healthy foods and vegetation control, is growing in the northern countries, even in small and private lands.

Nature conservation projects are also addressing some rangeland challenges, changing old patterns to avoid misguided interventions (e.g. grazing bans) that may end degrading valuable rangelands.[529] There are growing efforts to reintroduce bison, the largest native herbivore, which was almost eradicated in the late 1800s, as an important asset for rangeland management, food sovereignty and cultural value and identity, especially important to the indigenous people of the United States and Canada.[530] Currently, there are about 420,000 bison grazing public, private and Tribal lands in the United States, in an attempt to recover the value of old-growth North American rangelands.[531]

Much of the support for pastoralism in North America is provided by extension, research and academic institutions working directly with producers and grassroots organizations. The three countries support national research organizations and have a well-developed system of colleges and universities with range management or related disciplines providing rangeland research, extension, and inventory capacity in all three countries. People from both Mexico and the United States, from universities and grassroots organizations have been actively

[528] Huber-Sanwald, E. (2021) 'Action Plan for the International Year of Rangelands and Pastoralists (IYRP): The Case for Mexico', in International Grassland Congress Proceedings: XXIV International Grassland Congress / XI International Rangeland Congress https://iyrp.info/sites/iyrp.org/files/2021%20IGC-IRC%20IYRP%20Huber-Sannwald%20Mexico%20paper.pdf

[529] Huntsinger, L. and Starrs, P. (2006) 'Grazing in arid North America: A biogeographical approach', *Sécheresse*, 17(1–2), pp. 219–233. https://www.academia.edu/34386381/Grazing_in_arid_North_America_A_biogeographical_approach.

[530] Shamon, H., Cosby, O.G., Andersen, C.L., Augare, H., BearCub Stiffarm, J., Bresnan, C.E., Brock, B.L., Carlson, E., Deichmann, J.L., Epps, A., Guernsey, N., Hartway, C., Jørgensen, D., Kipp, W., Kinsey, D., Komatsu, K.J., Kunkel, K., Magnan, R., Martin, J.M., Maxwell, B.D., McShea, W.J., Mormorunni, C., Olimb, S., Rattling Hawk, M., Ready, R., Smith, R., Songer, M., Speakthunder, B., Stafne, G., Weatherwax, M. and Akre, T.S. (2022) 'The Potential of Bison Restoration as an Ecological Approach to Future Tribal Food Sovereignty on the Northern Great Plains', Frontiers in Ecology and Evolution, 10(January), pp. 1–15. https://doi.org/10.3389/fevo.2022.826282.

[531] Gates, C.C., Freese, C.H., Gogan, P.J.P. and Kotzman, M. (2010) American Bison: Status Survey and Conservation Guidelines 2010. https://portals.iucn.org/library/sites/library/files/documents/2010-005.pdf.

involved in the global support to pastoralism[532] (e.g., RISZA, the International Network for Drylands Sustainability[533] promoted by Mexican academics) while also acting at the local level, as shown in the case study below.

"Drylands Participatory Observatories (DPO)"[534] [535]

The RISZA network developed DPOs, living laboratories in the field, where pathways of action are explored with participatory methodologies.[536] DPO co-generates collaborative learning communities that generate useful information for decision-making on land management, rangeland health, drought responses, etc. This information is stored, shared and widely accessible in the participatory desert repository.[537] The DPO aims to develop action plans that foster social innovations and facilitate local hubs co-producing knowledge and innovation for SRLM. They are inclusive, participatory and transdisciplinary, specifically supporting gender equality and inter-generation equality.

DPOs are planned for the long term, first implementing the multi-stakeholder platform and then jointly designing, planning, implementing, monitoring and evaluating development programmes that target rangelands and other landscapes. The local context of DPOs coupled with direct access to the participatory desert repository allows joint work on concepts, such as resilience, adaptation and practice, at both management and policy levels. Pastoralists and other rural stakeholders become key players and decision makers at the local level, while also influencing higher levels of policymaking and long-term rangeland stewardship.[538]

A key achievement of the project is the establishment of a new modus operandi for local decision-making by co-generating useful knowledge stored in accessible digital repositories and creating local adaptive governance structures. Designed to become a global model, the Mexican Government (National Council of Science and Technology) has provided funding through five grants to co-design, via a participatory multi-stakeholder process, the second phase of the project.

Other Mexican cases provides complementary points of view while sharing the role of communities.

[532] Irving, B., Howery, L. and Peterson, J. (2021) 'Action Plan for the International Year of Rangelands and Pastoralists (IYRP): The Case for the United States , Canada , and Mexico', in International Grassland Congress Proceedings: XXIV International Grassland Congress / XI International Rangeland Congress. https://uknowledge.uky.edu/cgi/viewcontent.cgi?article=4321&context=igc

[533] http://www.risza.mx/

[534] Carvajal, I.E., Romero, G., Pérez, O., Yaguez, R., Huber-Sannwald, E., Tagueña, N.M., Martínez, C.L.L., Gómez, V.M.R. and S. Lucatello (2021) 'Participatory Observatories to Connect Multifunctional Landscapes, Link Smallholder Farmers, and Collectively Diversify Income', in *Joint XXIV International Grassland Congress / XI International Rangeland Congress*. https://uknowledge.uky.edu/cgi/viewcontent.cgi?article=4346&context=igc.

[535] http://www.risza.mx/

[536] Lauterio Martínez, C.L., Huber-Sannwald, E., Hernández Valdéz, S.D., Leyva Aguilera, J.C., Lucatello, S., Martínez Tagüeña, N., Mata Páez, R.I., Reyes Gómez, V.M. and Seingier, G. (2021) 'Collective methods to weave the pathway from desertification to sustainable development: Participatory Social-Ecological Observatories', Ecosistemas, 30(3), p. 2232. https://doi.org/10.7818/ECOS.2232.

[537] https://repositorio.risza.mx/

[538] Lauterio Martínez, C.L., Huber-Sannwald, E., Hernández Valdéz, S.D., Leyva Aguilera, J.C., Lucatello, S., Martínez Tagüeña, N., Mata Páez, R.I., Reyes Gómez, V.M. and Seingier, G. (2021) 'Collective methods to weave the pathway from desertification to sustainable development: Participatory Social-Ecological Observatories', *Ecosistemas*, 30(3), p. 2232. https://doi.org/10.7818/ECOS.2232.

Organic Livestock in the Chihuahuan Desert

This initiative aims to support a group of small producers to produce certified organic meat in the municipality of Janos, Casas Grandes and Ascensión, in the Mexican desert of Chihuahua. In adherence to the guidelines of the Conservation Program for Sustainable Development, which equipped and supported the initial phase of the project. Following the submission of a grant proposal on organic meat production, government support was provided to implement actions, , monitoring, and feedback process, while engaging farmers in meetings and follow-up actions.

Participants have established a communications channel with governmental bodies and NGOs interested in supporting the project (e.g., National Commission of Protected Natural Areas, Janos Biosphere Reserve and the Conservation Program for Sustainable Development) and which provided incentives and funded the organic meat processing centre with equipment. Moreover, the implementation of a fair marketing strategy will support the sustainability of small productions.

Social links between producers, institutions and organizations that support the initiative has been a critical achievement of the project, which aims to improve traditional livestock practices oriented towards sustainability. Participants represent a wide range of grassroots and community institutions, producers' associations, UNDP, certifying companies (the Mexican Certifier of Ecological Products and Processes [CERTIMEX]), NGOs (Tonkawa Consulting, Mexican Fund for Nature Conservation, etc.), government bodies, and research institutes.

The initiative is having significant territorial impact in the north of Chihuahua, where grasslands cover extensive regions and have notable potential for restoration. This initiative could be shared with ranchers from other regions of Mexico to scale up both organic meat and grasslands restoration.

The case below is developed under the framework of the conservation of the Golden Eagle, to improve livestock and rangeland management.

Women of the Desert and Chihuahuan Desert Eagle Warriors[539]

Rangelands are decimated in North America, especially in Mexico, without legal protection, and under multiple threats. This initiative provides action and specialist advice on regenerative grassland management and organic meat production to improve sustainability and promote grassland restoration. The underlying objective is the creation of a network of public and private protected areas, implementing sustainable livestock management plans along with conservation measures, such as translocations of white-tailed deer and monitoring of migratory grassland birds.

The initiative focuses on empowering community leaders by coordinating their engagement through local brigades (Women of the Desert and Eagle Warriors), which represent the main line of contact between protected area management and key stakeholders at each site. The project has trained and equipped these brigades to identify and monitor 40 Golden Eagle breeding territories. The brigades also deal with local conflict (e.g., destructive fires, clandestine dumps), mortality events (e.g., poaching, poisoning, collisions) or improving water sources for wildlife. The "Women of the Desert" brigade promotes the diversification of activities (mesquite honey production, living pharmacy gardens, maintenance of clean water sources, etc.). Acting as pillars of the community, they

[539] https://ovis.org.mx/

reinvigorate the pride, identity and relevance of producers who depend on the desert grasslands while hoping for a better life.

The brigades facilitate the participatory design and implementation of SRLM plans, pilot projects and Regenerative Livestock Management Plans collectively monitored and assessed for relevant *ejidos*. The cultural approach has been important, engaging new generations to continue traditional livestock farming as it represents the Chihuahuan Desert way of life and culture.

The project has gathered diverse stakeholders. The applied gender perspective targets women, young people and elders. Resources have been invested primarily in the technical group, and additional resources have been applied to equipment and incentives to develop actions. Use of the golden eagle as a symbol, the icon of Mexican culture, has facilitated people's engagement.

2340

2341 The case study below was submitted by WWF-United States and presents a holistic approach
2342 to ranching in the United States grasslands.

Sustainable Ranching Initiative[540] [541]

In the Northern Great Plains, over 70 per cent of native grasslands are privately owned, with most managed by cattle ranchers. Currently, ranch viability is threatened by narrow profit margins and fluctuating cattle markets, which are driving producers to plough up native grasslands and transform them into incentivised crop production.[542] Simultaneously, more ranchers are selling their operations to amenity and commercial interests, causing notable shifts in county demographics and lending to declining populations and public services in rural communities. Grassland wildlife has also suffered, as conversion leads to habitat loss and fragmentation.

The SRI aims to address these challenges by supporting ranchers who steward the majority of the remaining grasslands in the Northern Great Plains. The Ranch Systems and Viability Planning[543] network provides technical assistance, training, monitoring and other tools. The initiative aims to prevent the conversion of rangelands, and improve water cycle, soil health, and biodiversity while supporting communities and family ranches.

Ranchers on private and tribal lands, with an emphasis on women, youth and beginning ranchers, are the primary targets of the SRI, which is participatory and flexible recognising that each producer is unique and has different goals for their land, family, and community. SRI offers dedicated, flexible solutions to help ranchers meet their goals via a holistic, long-term approach, while supporting rangeland health. SRI also helps farmers transition to more regenerative management systems and provides support for them to restore native grasslands. Ranch Systems and Viability Planning invests in the individual, family, community, and ranch for long-term conservation outcomes.

The programme has mobilised around USD 11 million to assist ranchers. Currently, there are 83 ranches enrolled covering over 310,000 hectares. As local partners are the backbone of the support system for ranchers, WWF provides funding to ensure their involvement. The initiative could be scaled up by building peer networks of learning to support these transitions.

[540] https://www.worldwildlife.org/projects/sustainable-ranching-initiative
[541] https://www.worldwildlife.org/pages/restoring-the-northern-great-plains
[542] https://files.worldwildlife.org/wwfcmsprod/files/Publication/file/803vp43xa0_PlowprintReport_2020_FINAL_08042020.pdf
[543] https://www.worldwildlife.org/pages/ranch-systems-and-viability-planning-rsvp

Land Degradation Neutrality in North America

Data on soil degradation in Mexico are not always clear nor up-to-date. Official national sources recognise that at least 12 per cent of the national territory presents severe or extreme soil degradation[544] and 59 per cent is affected by some level of degradation, mainly due to land-use change, deforestation, postharvest handling, uneven grazing and poor soil conditions, with impacts exacerbated by climate change. Migration in the area is leading to the development of "urban belts of poverty" in the city suburbs and regional movements generating social conflicts.[545]

The National Forestry Commission, in compliance with national and international commitments, has conducted the first national study integrating indicators of land degradation and desertification.[546] Mexico has also adopted a participatory approach and places strong emphasis on the involvement of civil society, particularly communities. This approach recognises the rights of local communities, while ensuring that the ecological balance of their land is maintained over the long term. The Government of Mexico is also implementing the "Program for Sustainable Rural Development 2020–2024", aiming to reverse land degradation and incentivise sustainable agricultural practices among small-scale farmers.[547]

Considerable data document the state of soil resources in the United States. Land-use changes during the last 50 years have reduced ecosystem services. These changes have been driven by multiple social and economic factors – population growth and movement, increasing demands over lands and production. The amount of transformed land increased by over 17 million hectares between 1982 and 2012, while cropland increased by nearly 1.6 million hectares and land designated in the Conservation Reserve Program decreased by over 3.2 million hectares.[548] Data and information needed to inform land-use decisions are not always available or incorporated into policy or decision-making at all scales. However, the situation today seems to have improved. Soil erosion is reducing, the healthy soils movement is working to restore soil organic matter, and restoration has generated considerable research and efforts to reverse

[544] Universidad Autónoma de Chapingo, U. and CONAFOR (2013) *Línea base nacional de degradación de tierras y desertificación*. Jalisco. https://www.gob.mx/semarnat/documentos/linea-base-nacional-degradacion-de-tierras-y-desertificacion-parte-1.

[545] Campbell, D. and Berry, L. (2003) *Land degradation in Mexico, its extension and impact*. https://www.researchgate.net/publication/272682048_Assessing_The_Extent_Cost_And_Impact_Of_Land_Degradation_At_The_National_Level_Findings_And_Lessons_Learned_From_Seven_Pilot_Case_Studies. .

[546] https://apps1.semarnat.gob.mx:8443/dgeia/compendio_2021/dgeiawf.semarnat.gob.mx_8080/approot/dgeia_mce/html/RECUADROS_INT_GLOS/D3_SUELO/D3_R_SUELO03_11.htm

[547] Santini, N., Cuervo-Robayo A.P., and Adame M. (2023) Agricultural Land Degradation in Mexico in Muñoz-rojas, M. (2023) *Impact of Agriculture on Soil Degradation I*. Edited by P. Pereira, M. Muñoz-Rojas, I. Bogunovic, and W. Zhao. Cham: Springer International Publishing (The Handbook of Environmental Chemistry). https://doi.org/10.1007/978-3-031-32168-9.

[548] National Science and Technology, C. (2016) *The state and future of U.S. soils*. https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/ssiwg_framework_december_2016.pdf

or slow degradation trends. However, work is still needed for the United States to achieve net zero land degradation by 2030, a goal set by UNCCD in 2012.[549]

Discussion

The situation of North American Rangelands illustrates well three main issues: nature conservation; the role of pastoralism in food systems; and the particularities of the Mexican situation in relation to common rangelands.

The restoration and sustainable management of rangelands to preserve and recover old-growth ecosystems is a priority topic in the region, especially in native North American grasslands and the desert areas. Facing challenges, such as conversion, transformation and homogenisation, regenerative livestock farming, rotational grazing and other pastoralist schemes are providing viable alternatives for local producers while restoring and sustainably managing those endangered ecosystems. A nature conservation approach is used in both Mexican and United States cases, with a focus on improved SRLM to boost conservation goals through the engagement of producers. Addressing small business and linking production with the natural value of land is helping gain the support of local communities.

At a time when the sustainability of food systems is becoming a societal priority and a lever of change for rangelands, initiatives led by extension systems and producers in the United States and Canada seek to bridge gaps between the urban industrial society (which is increasingly disconnected from nature and food production) and ranchers and pastoralists. Promoting the ecological resources of rangelands is a relatively new paradigm for United States, Canadian and Mexican research and extension services, with two immediate challenges: recognising pastoralists and ranchers and their rights to use rangelands, while raising urban population awareness about the sustainability, multifunctionality, and benefits of ecosystem services produced on rangelands. The consideration of rangelands as sources of sustainable, land-based, healthy and high-quality food is an incentive to commit urban communities to engage in their preservation.

The consideration of common rangelands, as with the Mexican Ejidos, is globally significant, and should encompass improved collective land rights, upgraded institutions and participatory governance mechanisms. Governance of common lands poses challenges for many countries in the world who seek viable alternatives to facilitate secure rights, collective management and adaptive investment as a way to ensure a long-term viability of the critical resources they host. Traditional pastoralist systems offer a valuable pool of ideas, tools and working mechanisms to improve the way common lands are managed worldwide.

[549] Brevik E.C. (2023) Agricultural Land Degradation in the United States of America in Muñoz-rojas, M. (2023) *Impact of Agriculture on Soil Degradation I*. Edited by P. Pereira, M. Muñoz-Rojas, I. Bogunovic, and W. Zhao. Cham: Springer International Publishing (The Handbook of Environmental Chemistry). https://doi.org/10.1007/978-3-031-32168-9

4.10 Central and South Africa and Australia

This final section collects case studies from countries where no regional analysis has been performed, using them to analyse issues that have not been addressed in depth in the previous chapters. The first case is from Angola.

Restoration of traditional pastoral management forums (*Jangos Pastoris*) to reduce land degradation and improve local livelihoods in Angola,[550] [551]

The Government of Angola is working to improve policies directed at livestock mobility throughout the transhumance migration routes. Transhumant pastoral communities of Southern Angola traditionally held gatherings of chieftains and community leaders to discuss the management of commonly held pastoral resources. The role of these traditional management systems was essentially to keep the animals in remote mountainous areas during the rainy season (to allow for local agriculture) and bring them back to the lowland during the dry season, leaving rangelands to recover and rest. Conflict and mismanagement (e.g., intrusion by livestock on crops) have led to the breakdown of this governance model and the abandonment of traditional management.

The Jango Pastoril approach, underpinned by the Green Negotiated Territorial Development Methodology,[552] consists of reviving traditional pastoral forums to achieve SRLM and enhance local livelihoods. The process began with two forum meetings in each area, including training on different topics. Following the meetings, five Jango Pastoril were established or revived, each with their own contexts and stakeholders. Each one produced SRLM plans with administrative and community support, sometimes creating grazing reserves. The five plans were then combined into a comprehensive plan for the main transhumance routes served by the RETESA project.[553]

FAO and government specialists supported the process, providing technical support, monitoring and feedback. Municipal and communal administrations and their representatives co-coordinate the organization and logistics of the Jango Pastoril forums and endorse decisions and, thus, must participate actively in the meetings.

Through the Jango Pastoril approach, an institution is formed with formalities and objectives that are easily understood and appropriated by locals. Jango Pastoril may produce communal management plans for the rehabilitation of rangelands and then, engage communities to participate in meetings and field visits, select the species, collect seeds, install a nursery, identify and execute planting projects, and maintain and monitor them during follow-up visits. By entering into agreements and producing management plans that improve local resources, the communities show unity against the conversion and privatisation of land, which is a cost-effective way to increase their resilience.

The case below comes from Zambia, in the crossroads between South, East and Central Africa, where corridors are being deployed to protect wildlife.

[550] https://qcat.wocat.net/en/wocat/approaches/view/approaches_3173/

[551] FAO (2018) *Final Evaluation of the Project "Land Rehabilitation and Rangelands Management in Smallholders Agro-pastoral Production Systems in South Western Angola (RETESA)"*. https://www.fao.org/documents/card/en/c/CA2863EN.

[552] https://www.fao.org/in-action/territorios-inteligentes/recursos/publicaciones/detalle/en/c/1099140/

[553] FAO (2018) *Final Evaluation of the Project "Land Rehabilitation and Rangelands Management in Smallholders Agro-pastoral Production Systems in South Western Angola (RETESA)"*. https://www.fao.org/documents/card/en/c/CA2863EN.

Forestry Landuse Restoration Project (FLR), complemented with other projects under GEF VII, Dream fund projects, and Germany BMZ Bengo-supported projects, led by WWF-Zambia[554] (2020–2024) and presented by Nkombo Nachilala

FLR projects have been integrated into the WWF initiative, "KAZA arise", which aims to reverse the degradation of the Kavango-Zambezi Transfontier Conservation Area in Southern Zambia, through the deliberate promotion of farmer-led regeneration protection of rangelands. This initiative combats the misconception that protected areas will regenerate themselves with nominal protection, engaging small-scale farmers and traditional leaders in the process.

Globally, FLR action focuses on promoting nature-based solutions for climate through the development of long-term finance for protected areas, specifically indigenous and community conserved areas. The underlying idea is to drive private sector leadership to invest in positive action for nature, addressing degradation and restoration alongside health programmes and incentives for people's well-being. The total investment is around USD 12 million between 2020 and 2023.
This project has developed the first integrated General Management Plans for different protected areas in Zambia. The first one was developed in Kafue Flats, including Blue Lagoon and Lochnivar National Parks, and three other General Management Plans for Sichifulo, Mufunta and Mulobezi Game Management Areas. Those plans were developed under Community Based Natural Resources Management (CBNRM) structures, targeting alternative livelihoods, anti-poaching, habitat loss, fragmentation, degradation, human wildlife conflicts and governance systems. The project led to the mapping of 20 wildlife corridors for land restoration, most of them connecting the the Kavango-Zambezi Transfontier Conservation Area with Kafue and Sioma Ngwezi. As a result of this work, WWF and other stakeholders in Zambia proposed the inclusion of corridor protection in the Zambia Wildlife Act.

2410

2411 A final case in Africa provides insight into rangeland management in the South.

Rangeland Management and Improvement: learning from champion pastoralists[555]

This project supports livestock farmers in understanding the link between their income and the management of their rangelands. South Africa is challenged by rangeland degradation of private and communal lands, which is exacerbated by climatic change. Duringthe 2015–2019 multi-year drought,[556] most pastoralists lost animals due to feed shortage or to forced destocking. The project identified pastoralists who successfully managed their land despite the drought, and analysed the management strategies they adopted. Grassroots organizations and the Department of Agriculture were consulted in the nine provinces, and 100 pastoralists, identified as "champion farmers", were selected and key lessons learned from them were integrated into South Africa's National Veld (Rangeland) Management Strategy.

The management strategies will be used as a benchmark to assist other pastoralists, mostly those farming livestock as well as wildlife, facing similar conditions to sustain their rangelands during drought periods. Both commercial and small-scale farming systems were targeted across different rangeland biomes: savanna; grassland; Nama-Karoo; succulent Karoo; and Albany Thicket.

[554] https://www.wwfzm.panda.org/
[555] https://www.arc.agric.za/Pages/Home.aspx
[556] Mudau, H.S., Ravhuhali, K.E., Sipango, N., Mokoboki, H.K. and Moyo, B. (2022) 'Veld restoration strategies in South African semi-arid rangelands. Are there any successes?—A review', *Frontiers in Environmental Science*, 10(October), pp. 1–18. https://doi.org/10.3389/fenvs.2022.960345.

Funded by the National Department of Agriculture, 12 research staff and 30 post-graduate students, assisted by two administrative staff, implemented the project with about USD 300,000.

The ecological and business knowledge of resilient livestock pastoralists was documented,[557] alongside their strategies to ensure sustainability even in times of drought. These strategies have been tested on the ground with positive outcomes, supporting the research team with knowledge of effective approaches in each context. As a result, it is believed that positive outcomes should be expected when these same strategies are applied by pastoralists facing similar conditions. This is especially interesting since South Africa's land reform programme is incentivising a new generation of pastoralists. The project also trained and employed interns throughout the country who played an important role while gaining valuable research skills.

2412

2413 The final case, from Australia, illustrates a better economic approach to SRLM and restoration.

Northern Australia Climate Program (NACP),[558] [559] [560]

The NACP delivers innovative research, development and extension outcomes to improve the capacity of the red meat industry in managing drought and climate risk across northern Australia. The NACP aims to improve existing climate models and forecast tools, develop new products and build the capacity of rangeland producers to manage the challenges posed by droughts and climate variability.[561] The initiative vertically integrates leading world climate modelling research, the development of industry-relevant products, and the delivery of extension services. It targets the entire red meat supply chain, from producers to processing and export, to improve weather and climate awareness, knowledge, skills, and practical experience to reduce climate risk and drive positive outcomes.

Three iterations of the NACP have been undertaken since 2017. NACP1 (2017) collected responses from 250 producers and 50 community members, identifying key issues preventing business resilience and capacity to manage climate risk.

NACP2 aimed to improve regional climate forecasting tools. "Climate Mates" were selected for their industry knowledge and capacity to network and communicate with producers. Their work helped improve the use of weather and climate forecasts across a region that supports 15 million cattle.

In NACP2, a web-based Australian Drought Monitor[562] was developed to address inefficiencies in subjective assessments and conduct data analyses on drought. The Queensland Government now uses it in drought policy decision-making.

---

[557] Finca, A., Linnane, S., Slinger, J., Getty, D. and Igshaan Samuels, M. (2023) 'Implications of the breakdown in the indigenous knowledge system for rangeland management and policy: a case study from the Eastern Cape in South Africa', *African Journal of Range & Forage Science*, 40(1), pp. 47–61. https://doi.org/10.2989/10220119.2022.2138973.

[558] https://www.nacp.org.au/

[559] https://www.unisq.edu.au/research/institutes-centres/ilse/applied-climate-science

[560] https://www.unisq.edu.au/

[561] Cobon, D., Jarvis, C., Reardon-Smith, K., Guillory, L., Pudmenzky, C., Nguyen-Huy, T., Mushtaq, S. and Stone, R. (2021) 'Northern Australia Climate Program: Supporting adaptation in rangeland grazing systems through more targeted climate forecasts, improved drought information and an innovative extension program', *Rangeland Journal*, 43(3), pp. 87–100. https://doi.org/10.1071/RJ20074.

[562] https://nacp.org.au/drought_monitor

The value of investing in the second iteration was estimated using Benefit Cost Analysis (BCA),[563] delivering an estimated total benefit for Queensland of USD 55.5 million and a BCA of 5.26 to 1. The main impact identified and valued in this assessment was improved management decision-making by producers, which increased productivity and performance of Queensland pastoral managers. Other results included an improved social license for grazing activities in pastoral Queensland and reduced government costs in delivering drought support. However, the independent BCA undervalued the benefits.

The importance of an end-to-end programme, integrating climate model improvements (research) with tailored forecast products (development) through direct engagement with stakeholders (extension), on-the-ground application of technologies (adoption) and improvement in industry and community resilience (impact) are central to the success of the programme.

Since 2017, the NACP has assisted the pastoral grazing industry to better manage drought risk and climate variability. NACP funding is sourced from the beef cattle industry, government, and academia, representing the programme's broad range of aims and target beneficiaries. The programme funds scientists in the United Kingdom and Australia, with notable scientific outcomes.[564]

Discussion

These case studies show the importance of understanding how to implement actions on rangelands, ensuring benefits for producers, and learning from past errors.

First, interventions on rangelands must be based upon participatory processes that have already been undertaken. A common shortcoming of participation-based initiatives is the lack of continuity between decisions and intervention. Although participatory processes should not be stalled due to a lack of resources for implementation, efforts must be made to ensure continuity. Numerous participatory processes have been successful when the interventions have been undertaken directly by participants, who assume all charges and provide all resources needed. But these are endogenous processes, devised by the commitment of their promoters. Regardless, the foreseeable results should be agreed upon as part of the participatory process and clearly envisioned by their participants.

In addition, rangeland projects often set socioeconomic objectives that are general and undefined. Sometimes, an increase in collective ecosystem services is wrongly perceived as a good enough result for everybody. Project promoters often imply that an improvement delivered by the project will yield improvements in income or agricultural performance. However, this is unfair for project participants who are often risking their own livelihoods. An improved economic framework is needed to formulate project design and effectively

[563] Agtrans Research (2020) 'Appendix 4 : An Impact Assessment of USQ4 : ' Innovative drought and climate variability RD & E to enhance business resilience and build producer capacity to manage climate risk across the northern Australian red meat industry (NACP Phase 2)', (August). https://www.nacp.org.au/static/pdf/Benefit-Cost percent20Analysis percent20of percent20the percent20Drought percent20and percent20Climate percent20Adaptation percent20Program percent20Appendix percent204- percent20An percent20Impact percent20Assessment percent20of percent20USQ4.pdf

[564] Lavender, S.L., Cowan, T., Hawcroft, M., Wheeler, M.C., Jarvis, C., Cobon, D., Nguyen, H., Hudson, D., Sharmila, S., Marshall, A.G., de Burgh-Day, C., Milton, S., Stirling, A., Alves, O. and Hendon, H.H. (2022) 'The Northern Australia Climate Program: Overview and Selected Highlights', *Bulletin of the American Meteorological Society*, 103(11), pp. E2492–E2505. https://doi.org/10.1175/BAMS-D-21-0309.1.

implement them. This way, participants' engagement is reinforced, and additional resources are made available for other measures. Farmer and pastoralist engagement is critical, so their needs should be considered from the start.

Rangeland and pastoralist projects have changed considerably since the late 20th century. The case studies presented show clear advances in governance, participation and the use of a community-based approach. However, gaps and flaws may diminish the outcomes of some initiatives. While some of the major flaws have already been commented, there are always 'minor' aspects of the project which can also limit their effectiveness: the risk of burnout among project participants where there is more engagement in planning than in implementation; economic frameworks that are not properly devised or implemented; evaluation mechanisms that are poorly implemented; lack of consideration for participants' values or cultural backgrounds; and greater attention on the comfort of the technical team than on effective implementation. To achieve the desired results, a proper design of the project must be followed by proper implementation, caring for the processes and participants involved.

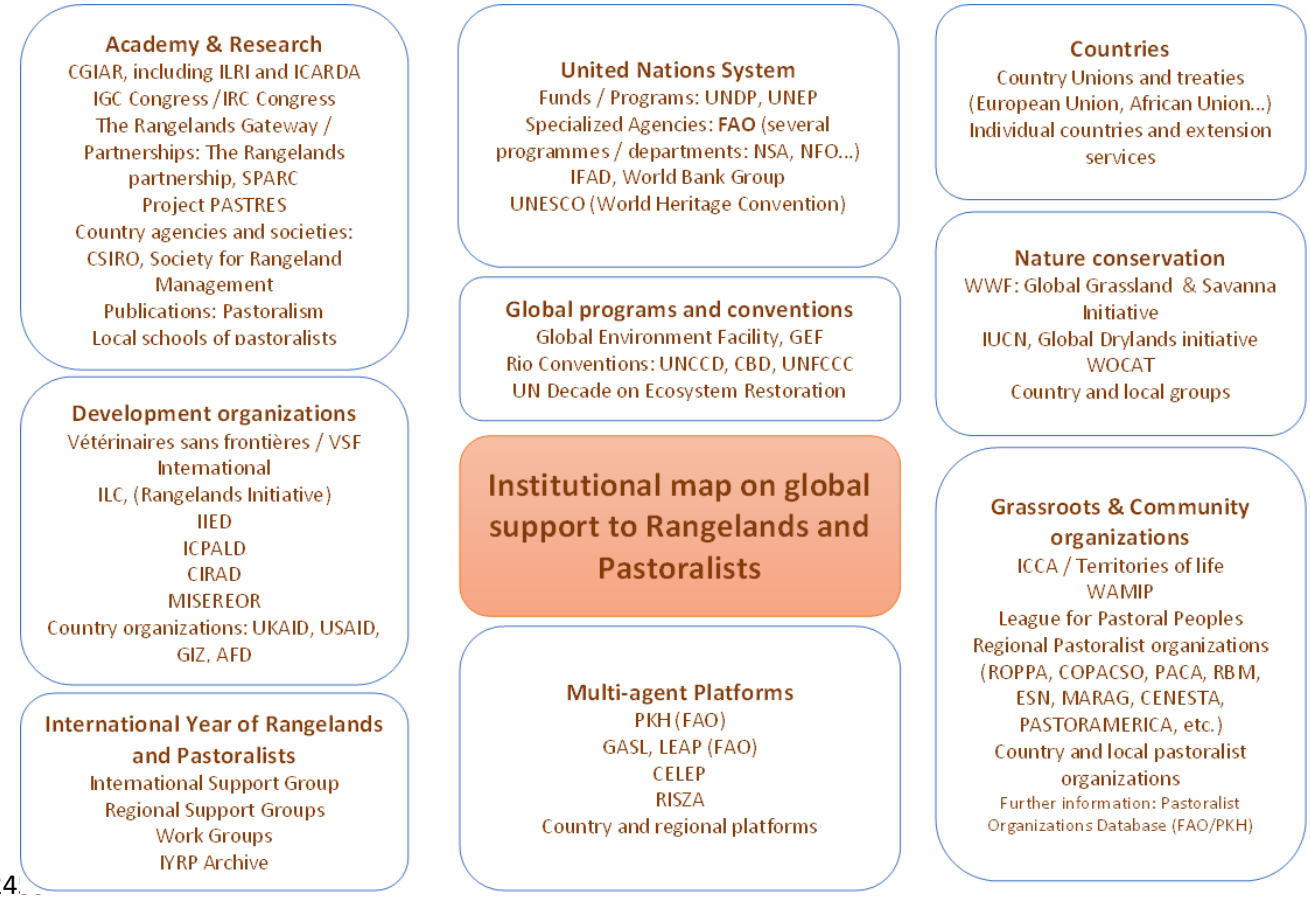
Chapter 5: Mobilising support for rangelands and pastoralism

This chapter is structured around initiatives with a focus on planning, management, and restoration of rangelands as it relates to the culture and social issues of nomadic, transhumant, and mobile pastoralists, agropastoralists, and others using rangelands for grazing livestock.

5.1 Introduction

This section introduces the global and regional networks and initiatives supporting rangelands and pastoralism, concentrating on the upcoming UN International Year of Rangelands and Pastoralists (IYRP) and emerging opportunities for attracting greater attention as illustrated in Figure 22.

Figure 22: Map of organizations and institutions supporting rangelands and pastoralism



The initiatives contained in the report are summarised in Table 16, providing their context and approach along with the supporting organizations.

Table 16: Global and regional initiatives supporting sustainable pastoralism

2463

Approach	*Background*	*Examples of global initiatives*
Political / policy	International support for Land Degradation Neutrality in rangelands	LDN target setting programme [565] (UNCCD)
Political / policy	Global policy approaches	PASTRES Project[566]: Assessing policy frame in pastoral areas Policy framework for pastoralism in Africa[567] (AU)
Ecological / Conservation	Ecosystem approach to grasslands, savannahs and rangelands	Global Grassland & Savannahs Dialogue Platform[568] GrassBank: collective database for WWF's Global Grasslands & Savannahs Initiative (GGSI)[569]
Social	Addressing social aspects or rangelands and pastoralist peoples	World Alliance of Mobile Indigenous Peoples[570] (WAMIP) Pastoralist Knowledge Hub[571] (FAO)
Social / Cultural	Recognising the heritage value of pastoralist cultures and landscapes	Global Strategy: Support to agropastoral cultural landscapes[572] (UNESCO / World Heritage) Transhumance: list of intangible heritage[573] (UNESCO) Perspectives on pastoralism film festival[574] (CELEP) Accounting for pastoralists[575] and Pastoralist map[576] (LPP)
Social / Gender	Gender perspective and pastoral women	Global Gathering of Women Pastoralists[577] (ILC)
Economic / Financial	Analysis of the economics of pastoralism and the role of rangelands Global investments in rangelands	De-risking, Inclusion and Value Enhancement of Pastoral Economies in the Horn of Africa (DRIVE) Project[578] Homing in on the range: Enabling Investments[579] (IUCN) The economics of pastoralism in Argentina, Chad and Mongolia[580] (FAO)
Knowledge / Research	Co-construction of knowledge: focus on global research	The Rangelands Atlas[581] Rangelands gateway[582] (The rangelands partnership) Global Rangeland Monitoring[583] (CSIRO) and simulation tool[584] (ILRI) International Grassland & Rangeland Congresses: IGC/IRC2021 / IGC2023 / IRC2025[585]

[565] https://www.unccd.int/land-and-life/land-degradation-neutrality/projects-programmes/ldn-target-setting
[566] https://pastres.org/publications/
[567] https://au.int/en/documents/20130415/policy-framework-pastoralism-africa
[568] https://globallandusechange.org/en/projects/global-grassland-dialoque-platform/why-a-global-grassland-dialog-platform/
[569] https://wwf.panda.org/discover/our_focus/food_practice/grasslands_and_savannahs/
[570] https://wamipglobal.com/
[571] https://www.fao.org/pastoralist-knowledge-hub/en/
[572] https://whc.unesco.org/en/activities/818/
[573] https://ich.unesco.org/en/RL/transhumance-the-seasonal-droving-of-livestock-along-migratory-routes-in-the-mediterranean-and-in-the-alps-01470
[574] https://www.pastoralistfilmfestival.com/
[575] http://www.pastoralpeoples.org/thematic/accounting-for-pastoralists-studies/
[576] http://www.pastoralpeoples.org/pastoralist-map/
[577] https://landportal.org/fr/node/13677
[578] https://www.worldbank.org/en/news/infographic/2022/06/24/the-de-risking-inclusion-and-value-enhancement-of-pastoral-economies-in-the-horn-of-africa-drive-in-a-nutshell
[579] https://portals.iucn.org/library/sites/library/files/documents/Rep-2015-021.pdf
[580] https://www.fao.org/publications/card/fr/c/CB1271EN/
[581] https://www.rangelandsdata.org/atlas/
[582] https://rangelandsgateway.org/
[583] https://www.csiro.au/en/research/animals/livestock/rapp-map-geoglam
[584] https://www.iwmi.cgiar.org/archive/wle/content/global-rangeland-simulation-tool/index.html
[585] https://www.iyrp.info/international-grassland-rangeland-congresses-igcirc2021-igc2023-irc2025

		Quantification of intake and diet selection of ruminants grazing heterogeneous pasture[586] (IAEA)
Knowledge / Management / Practice	Co-construction of knowledge: focus on SRLM and good practice	Global Database on SLM[587] (WOCAT) WeCAN Community of Practice[588] (FAO) Standards for LDN in Rangelands
Knowledge / Training	Training programmes at the global level	MOOC Course "Pastoralism in Development"[589] IED/Misereor
Tenure / Rights	Securing land rights for pastoralists and rangeland local communities	Rangelands Initiative[590] (ILC) FAO Voluntary Guidelines[591]
Governance	Global support of improved rangeland governance	ICCA/Territories of Life: Rangelands[592] (ICCA Consortium)
Transversal	Global collective, multi-agent and transversal action	International Year of Rangelands and Pastoralists[593]

Some of these initiatives are described below in more detail, using the conceptual framework (Figure 4) as a tool to arrange them according to the policy and socioeconomic environment.

5.2 Global and regional policy and monitoring frameworks

Global processes and commitments are critical to assist countries in creating the enabling environments for SRLM and restoration, especially under the lens of sustainable development, climate change mitigation and adaptation, biodiversity conservation, and ecosystem restoration.

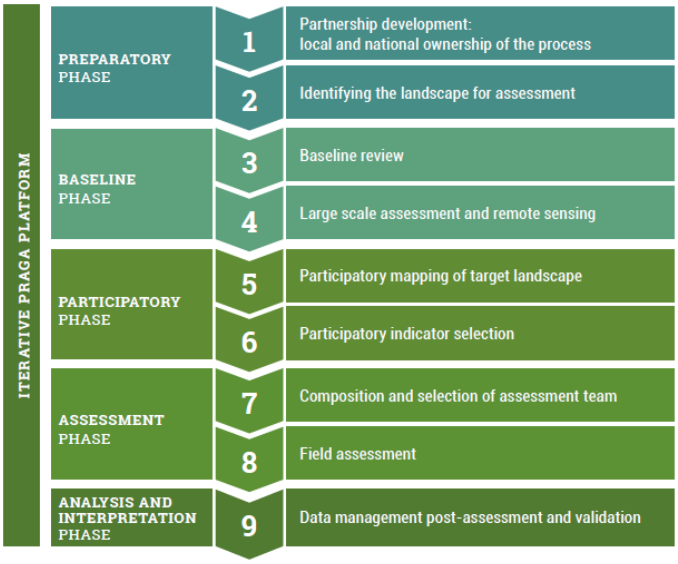
LDN, enshrined in SDG target 15.3, is one target-setting approach that attempts to bridge the gap between environmental and socioeconomic approaches to SRLM and restoration. The UNCCD secretariat and the Global Mechanism established the **LDN Target Setting Programme** (LDN TSP) to assist countries to achieve LDN by 2030. Over 130 countries are now committed to promoting a national LDN target-setting process with the aim of mobilizing resources for **LDN Transformative Projects and Programmes** (TPP). Both initiatives provide practical tools, capacity building, and strategic guidance to establish and implement these voluntary LDN targets through good rangeland management practices.[594]

Other global institutions, such as the FAO and IUCN, have adopted the LDN approach to promote participatory methodologies for monitoring and assessing rangelands.[595] They have developed the **Participatory Rangeland and Grassland Assessment Methodology** (PRAGA)[596] to assess the health and status of rangelands. PRAGA is meant to address critical gaps in understanding and make available knowledge, information, and data on rangelands, including land degradation processes. PRAGA also identifies cost-effective options to strengthens the capacity of local and national actors. As a complement, the **Livestock Environmental**

[586] https://www.iaea.org/projects/crp/d31029
[587] https://www.wocat.net/en/global-slm-database/
[588] https://www.fao.org/dryland-forestry/wecan-community-practice/en
[589] https://pastoralismindevelopment.moodlecloud.com/login/index.php
[590] https://rangelandsinitiative.org/
[591] https://www.fao.org/tenure/voluntary-guidelines/en/
[592] https://www.iccaconsortium.org/index.php/2023/02/17/rangelands-pastoralism-global-initiative-pastoralists-territories-of-life-workshop-recap/
[593] https://iyrp.info/
[594] https://www.unccd.int/land-and-life/land-degradation-neutrality/overview
[595] Onyango, V., Davies, J., Sharpe, N., Maiga, S.I., Ogali, C., Perez-Rocha, J. and Isakov, A. (2021) *Land degradation neutrality*. FAO and IUCN. https://doi.org/10.4060/cb6131en.
[596] https://portals.iucn.org/library/node/50350

Assessment and Performance Partnership (LEAP)[597] is a multi-stakeholder initiative that seeks to improve the environmental sustainability of the livestock sector via harmonised methods, metrics, indicators, and data.

Figure 23: Nine key steps to implement the PRAGA Methodology



In addition to these global frameworks, the Global Agenda on Sustainable Livestock is developing a partnership of livestock sector stakeholders committed to the sustainable development of the sector.[598] Despite these efforts, there are still too few examples (many of which are contained in Chapter 4) of how these international policy frameworks generate national commitments on sustainable pastoralism. At the regional level, the approach drafted by the African Union (shown below) offers a promising pathway to implement trans-boundary and coordinated policies that support rangelands and pastoralism.

Policy Framework for Pastoralism in Africa[599]

Recognising a continent-wide need for a policy to recognise the rights of pastoralists and provide pastoral lands with the same services (security, health, education, infrastructure, and economic opportunities) as non-pastoral areas, the African Union introduced its Policy Framework for Pastoralism in Africa. The framework aims to: secure, protect and improve the lives, livelihoods and rights of African pastoralist communities; contribute to food security and pastoralist production, enabling a more inclusive and efficient pastoralism; and ensure commitment to political, social and economic development of pastoral communities and areas, while reinforcing the contribution of pastoral livestock to national, regional and continent-wide economies. Special attention is given to strengthen the roles and rights of women in pastoral communities, to legitimise indigenous pastoral institutions, and to support pastoralist access to rangelands through the reform of land tenure policy and legislation and participatory land-use planning.

This framework also addresses other major issues related to rangeland and pastoralist management, including pastoral mobility within and between states; animal and human

[597] https://www.fao.org/partnerships/leap/en/
[598] https://www.livestockdialogue.org/
[599] https://au.int/en/documents/20130415/policy-framework-pastoralism-africa

health systems; institutionalisation of risk-based drought management systems; marketing and value chains; credit and financial services for pastoralists; recognition of genetic and cultural heritage; and support for research, extension services, and the promotion of indigenous knowledge.

Other initiatives focused on sustainable pastoralism include the **PASTRES Program**[600] which produces reports about policy frameworks in different regions: Europe;[601] Sub-Saharan Africa;[602] West Asia and North Africa;[603] and Asia.[604] A book on Pastoralism and Development[605] was also published, advocating for a new policy narrative on pastoralism.[606]

5.3 Land rights and tenure security

National policies often determine who has the right to control and access rangeland resources. All forms of commonly owned or managed rangelands, including those maintained by states and local authorities, and areas managed traditionally by indigenous peoples and local communities constitute valuable assets for pastoralist livelihoods.

International institutions and UN bodies have carried out diverse initiatives on improving land tenure security in rangelands and pastoralist environments.[607] In 2012, the FAO's Committee of Food Security endorsed the **Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests** (Chapter 4 on West Africa.).[608] The FAO supported the operationalisation of these guidelines and promoted multi-stakeholder platforms[609] to facilitate their implementation at national and sub-national levels, including in countries with sizeable rangelands, such as Mongolia, Kenya, Tanzania, and Mauritania. Most global actors recognise that secure land tenure for pastoralists is key to sustainable rangeland management, and attribute project and programme failures to a lack of secure land rights,[610] often coupled with

[600] https://pastres.org/
[601] Nori, M. (2022) *Assessing the policy frame in pastoral areas of Europe*, *SSRN Electronic Journal*. https://hdl.handle.net/1814/73811.
[602] Nori, M. (2022) 'Assessing the Policy Frame in Pastoral Areas of Sub-Saharan Africa (SSA)', *SSRN Electronic Journal* [Preprint]. https://doi.org/10.2139/ssrn.4071572.
[603] Nori, M. (2022) 'Assessing the policy frame in pastoral areas of West Asia and North Africa (WANA)'. https://hdl.handle.net/1814/74315.
[604] Nori, M. (2022) *Assessing the policy frame in pastoral areas of Asia RSC Policy Paper 2022/04*. https://cadmus.eui.eu/bitstream/handle/1814/74314/RSC_PP_2022_03_FINAL.pdf?
[605] Scoones, I., Bose, S., Gogineni, R., Maru, N., Mohamed, T., Nori, M., Pappagallo, L., Simula, G., Taye, M. and Tsering, P. (2023) Pastoralism, Uncertainty and Development. Edited by I. Scoones. PRACTICAL ACTION PUBLISHING. https://doi.org/10.3362/9781788532457.
[606] Roe, E. (2020) *A New Policy Narrative for Pastoralism ? Pastoralists as Reliability Professionals and Pastoralist Systems as Infrastructure*. https://www.ids.ac.uk/download.php?file=wp-content/uploads/2020/01/STEPS-working-paper-113-Roe-FINAL-for-opendocs.pdf.
[607] IFAD (2014) 'Lessons learned Pastoralism land rights and tenure'. https://www.ifad.org/zh-TW/web/knowledge/-/leçons-apprises-pastoralisme-droits-et-régimes-fonciers.
[608] https://www.fao.org/tenure/voluntary-guidelines/en/
[609] https://www.fao.org/tenure/msps/en/
[610] Coppock, D.L., Crowley, L., Durham, S.L., Groves, D., Jamison, J.C., Karlan, D., Norton, B.E. and Ramsey, R.D. (2022) 'Community-based rangeland management in Namibia improves resource governance but not environmental and economic outcomes', Communications Earth and Environment, 3(1). https://doi.org/10.1038/s43247-022-00361-5.

increasing land degradation.[611] These actors point to participatory management, the recognition of traditional institutions, and enhanced land rights as priority areas for scaling up SLRM and restoration.

> The ILC[612] has been promoting the **Rangelands Initiative**[613] to build a global network and work programme to make rangelands more secure for local users. The initiative includes one global and three regional components, each one bringing together organizations and creating networks in their respective areas. According to its strategy document,[614] the Rangelands Initiative works with different stakeholders to increase tenure security of local rangeland users through the improved implementation of enabling policy and legislation.

Land tenure has been a key global issue for the UNCCD. A GLO Working Paper, "Strengthening Tenure and Resource Rights for Land Restoration",[615] outlined the key lessons learned and recommendations to improve tenure security and boost restoration potential, including the creation of a shared tenure/restoration vision and the monitoring of socioecological impacts.

5.4 Grassroots organisations and pastoral voices

Rangelands are framed as socioecological systems, keeping the predominant focus on social and cultural factors, and the need to balance different interests and negotiate trade-offs.

> The **League for Pastoral Peoples**[616] was founded in 1992 to provide relief to Raika camel pastoralists in India during an acute crisis, and currently supports pastoral societies and other small-scale livestock keepers through research, technical support, advisory services, and advocacy. They have developed a series of studies, "Accounting for Pastoralists",[617] that diagnose the condition of pastoralists in different countries. The League recently produced the introductory brief, Accounting for Pastoralists: Why it is important and how to do it?,[618] and diagnostics on pastoralists in Mozambique[619], Spain[620], Iran[621], Uganda[622], Kenya[623], India[624], Germany[625], and Argentina.[626] They also produced the Pastoralist map,[627] a collective effort to

[611] Global Landscapes Forum, G. (2021) 'Meeting land tenure needs of pastoralists key to restoring rangelands', in *GLF Africa Digital Conference 2021*. https://hdl.handle.net/10568/113947.
[612] https://www.landcoalition.org/en/
[613] https://rangelandsinitiative.org/
[614] https://cgspace.cgiar.org/rest/bitstreams/336727b0-8ed5-4535-be9e-14ea6fbbcf92/retrieve
[615] Chigbu, U.E., Mabakeng, M.R. and Chilombo, A. (2021) Strengthening tenure and resource rights for land restoration. Bönn: UNCCD Global Land Outlook Working Paper. https://www.unccd.int/sites/default/files/2022-03/UNCCD percent20GLO percent20WP percent20tenure.pdf
[616] http://www.pastoralpeoples.org/
[617] http://www.pastoralpeoples.org/thematic/accounting-for-pastoralists-studies/
[618] http://www.pastoralpeoples.org/wp-content/uploads/2020/09/Accounting4pastoralists-SUM.pdf
[619] http://www.pastoralpeoples.org/wp-content/uploads/2023/03/Accounting4pastoralists-MZ.pdf
[620] http://www.pastoralpeoples.org/wp-content/uploads/2023/03/Accounting4pastoralists-ES.pdf
[621] http://www.pastoralpeoples.org/wp-content/uploads/2023/03/Accounting4pastoralists-IR.pdf
[622] http://www.pastoralpeoples.org/wp-content/uploads/2020/09/Accounting4pastoralists-UG.pdf
[623] http://www.pastoralpeoples.org/wp-content/uploads/2020/09/Accounting4pastoralists-KE.pdf
[624] http://www.pastoralpeoples.org/wp-content/uploads/2020/09/Accounting4pastoralists-IN.pdf
[625] http://www.pastoralpeoples.org/wp-content/uploads/2020/09/Accounting4pastoralists-in-Germany.pdf
[626] http://www.pastoralpeoples.org/wp-content/uploads/2020/09/Accounting4pastoralists-AR.pdf
[627] http://www.pastoralpeoples.org/pastoralist-map/

portray the diversity of pastoral communities and efforts to generate global knowledge on pastoral ways of life.

Figure 24: Pastoralist map[628]

Although there is a rising global social movement supporting pastoralism, achieving the full and meaningful participation of pastoralists in SRLM and restoration continues to be a challenge. The engagement of mobile pastoralists is a critical aspect of this challenge, given the practices of nomads and transhumant communities are often not in alignment with conventional participation methodologies.[629] Supported by activities, such as the **Global Pastoralists' Gatherings** at Tur-mi, Ethiopia (2005) and Segovia, Spain (2007) or the 2002 **Dana Declaration**,[630] mobile pastoralists have gained access to global spaces where they can forge common identities to advocate for their rights.[631]

The **World Alliance of Pastoralist Communities and Mobile Indigenous Peoples** (WAMIP) is a global grassroots organization created to provide a common space to preserve mobile pastoralist forms of life, as well as their livelihoods and cultural identity. It aims to help communities to manage common property resources sustainably, secure full respect for pastoralist rights, and ensure an active presence in different international for a, such as IFAD's Indigenous People`s forum[632]; or FAO's LEAP[633]). Critically, WAMIP is an independent grassroots movement formed by pastoralists themselves, working alongside other organizations to influence policies.[634]

[628] http://umap.openstreetmap.fr/en/map/a-map-of-pastoralists-worldwide_563977
[629] Kratlï, S. and Dyer, C. (2009) Mobile Pastoralists and Education : Strategic Options. IIED. https://www.iied.org/sites/default/files/pdfs/migrate/10021IIED.pdf.
[630] https://iyrp.info/dana-declaration-mobile-peoples-conservation
[631] Upton, C. (2014) 'The new politics of pastoralism: Identity, justice and global activism', Geoforum, 54, pp. 207–216. https://doi.org/10.1016/j.geoforum.2013.11.011.
[632] https://www.ifad.org/en/indigenous-peoples-forum
[633] https://www.fao.org/partnerships/leap/en/
[634] https://wamipglobal.com/

Grassroots organizations are instrumental in amplifying the voices of pastoralists, which need to be facilitated, funded and supported. International organizations, such as IFAD,[635] which developed a toolkit for engaging with pastoralists,[636] and the **Coalition of European Lobbies for Eastern African Pastoralism** (CELEP),[637] which unites supporting and grassroots organizations to lobby for pastoralism in Eastern Africa, are taking such measures. In addition, FAO is promoting this approach through the **Pastoralist Knowledge Hub** (PKH),[638] a multi-actor platform bringing together pastoralist organizations and international partners to ensure that pastoralist voices are heard in global policy dialogues and knowledge-sharing fora. FAO provides technical and logistical support and dedicated staff for more than 50 international organizations actively engaged as partners of the Hub.[639]

Figure 25: Workflow of PKH to ensure pastoral issues are integrated into policy discussions[640]

Other international networks and initiatives have been initiated to address specific rangeland issues or have emerged from gatherings or events. These are usually focused on specific fields of work or geographical areas of interest (e.g., drylands) and are usually positioned close to their origins, relying on wider networks for a global presence. FAO's Committee on Forestry **Working Group on dryland forests and agrosilvopastoral systems**[641] is one example. Other institutions promote international initiatives with tight links to rangelands and pastoralism, include the RISZA network in Mexico.[642] Launched in 2017, the network, RISZA, has over 500 members belonging to various stakeholder groups, academics, NGOs, and government. RISZA promotes transdisciplinary and participatory research on socioecological systems, fosters intercultural dialogue, and enhances local governance structures.

5.5 Cultural values and heritage

The interdependence between land, animals, and humans in rangelands and pastoralist environments has created a diverse cultural landscape heritage with unique identities.[643] UNESCO recognises pastoralist singularities through pastoral cultural landscapes that are recognised as World Heritage sites.[644] The current list of **UNESCO World Heritage Sites** includes

[635] https://www.ifad.org/en/
[636] IFAD (2018) *How to do Engaging with pastoralists –*. IFAD. https://www.ifad.org/en/web/knowledge/-/publication/toolkit-engaging-with-pastoralists-a-holistic-development-approach.
[637] https://www.celep.info/
[638] https://www.fao.org/pastoralist-knowledge-hub/en/
[639] https://www.fao.org/pastoralist-knowledge-hub/partners/our-partners/en/
[640] https://www.fao.org/pastoralist-knowledge-hub/what-we-do/why-a-hub/en/
[641] https://www.fao.org/dryland-forestry/working-group/en/
[642] http://www.risza.mx/
[643] Zinsstag, J., Schelling, E., Bonfoh, B., Crump, L. and Krätli, S. (2016) A vision of the future of pastoralism, Revue Scientifique et Technique de l'OIE. Edited by J. Zinsstag, E. Schelling, and B. Bonfoh.. https://doi.org/https://doi.org/10.20506/rst.issue.35.2.2521.
[644] https://whc.unesco.org/en/culturallandscape/

mobile pastoral systems in Europe, the Middle East, Central Asia, the Himalayas and the Sahel, as well as southern Africa, representing the value and diversity of cultures and livestock systems around the world.[645] UNESCO also recognises the importance of these systems through the development of a global strategy to support agro-pastoral cultural landscapes,[646] which is underway in the Mediterranean region.

FAO has recognised some pastoralist systems as **Globally Important Agricultural Heritage Systems**,[647] acknowledging that these communities are intricately entwined with their territorial, cultural, and agricultural landscapes. Some examples highlight the links between pastoralists and farmers in Morocco's eastern territories, the Thale Noi Wetland Buffalo Pastoral Agro-Eco-System in Thailand, and the agrosilvopastoral system of the mountains of León in Spain. Since 2005, FAO has designated 74 systems in 24 countries with a significant presence of pastoralism, including agrosilvopastoral systems.[648]

UNESCO's recognition of **Transhumance as Intangible Heritage** further demonstrates the increasing global recognition of pastoralist cultures and landscapes. The International Cooperation Programme, *Terre Rurali d'Europa* (TRE), presents an interesting case study showing the efforts of six European countries to recognise pastoralists via a coordinated sustainable development programme.[649]

International Cooperation Programme, *Terre Rurali d'Europa* (TRE) with a first Project: Parcovie 2030

This programme includes a transhumance safeguarding plan in all European countries within the framework of transhumance recognised by UNESCO as Intangible Cultural Heritage. The programme aims to create opportunities to finance both national and international actions with EU grants. Public and private sector bodies in European countries with UNESCO nomination manage TRE, and the CRAMM and GEACO SRL guide its implementation. Following the first UNESCO nomination, a working group of experts was set up within CRAMM in Italy, Albania, Austria, Greece, France and Spain to coordinate and undertake actions within the framework of EU programming.

Currently, the partnership includes six countries involved in the first and second Transhumance UNESCO Nomination with the aim to incorporate four other countries in the third stage. TRE contributes to the recovery and redevelopment of the historical, cultural and environmental heritage of the agrosilvopastoral traditions, agri-food productions and crafts, and offers support to other countries interested in participating.

Activities include the recovery of agropastoral traditions and culture and events celebrating transhumance in countries with UNESCO recognition and in those anticipating recognition. The establishment of European groups in the six countries received EUR 2.5 million from Italy in response to an open call for a national safeguarding plan to ensure programme

[645] Stolton, S., Dudley, N. and Zogib, L. (no date) Mobile Pastoralism and World Heritage. A DiversEarth publication (Switzerland). Travelled, Equilibrium Research & Roads Less. https://roads-less-travelled.org/wp-content/uploads/2019/08/Mobile-Pastoralism-and-the-World-Heritage-Convention-_-For-Web.pdf.
[646] https://whc.unesco.org/en/activities/818/
[647] https://www.fao.org/giahs/en/
[648] https://www.fao.org/giahs/giahsaroundtheworld/en/
[649] https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/3825

funding, while human resources are pooled from pastoral networks, universities, research institutions, grassroots organizations, and other actors.

Institutions that celebrate the cultural heritage of rangelands globally use traditional and social media to help disseminate information on pastoralist movements. The "**Perspectives on Pastoralism Film Festival**"[650], promoted by CELEP, aims to increase global awareness of pastoralist livelihoods and challenges. The second edition of this film festival was launched in September 2022, with local screenings planned worldwide.

5.6 Pastoralist women and girls

Gender is an important aspect of the pastoralist movement. International organizations have made advances in integrating gender perspective into rangeland and pastoralist initiatives,[651] [652] and related research has been conducted throughout the world.[653] [654]

Global initiatives promote pastoralist women networks and the application of a gender lens to SLRM and restoration. The **Global Gathering of Women Pastoralists**[655], held in 2010 in Mera (Gujarat), India and promoted by the **Maldhari Rural Action Group**[656] with the support of international organizations, brought together over 100 women from herding communities in 32 countries and issued the **Mera Declaration.**[657] This communique provides political guidance on the promotion of pastoralist support and the application of a gender responsive lens to project interventions, encouraging the formal education of pastoralist girls and discouraging their engagement in labour.[658]

5.7 Nature conservation

As the understanding of rangeland ecology has grown, so has the awareness of the multiple benefits of health and productive rangelands, grasslands, and savannahs around the world. WWF and other organizations have spearheaded a multi-actor initiative, the **Global Grasslands and Savannahs Initiative** (GGSI)[659] to seek consensus on the human, biological, and economic importance of these ecosystems. It aims to convene influencers and experts, advocate and share information and best management practices, and it has produced guidelines to spur positive action to protect grasslands based on the three lines of action, like those of LDN.

---

[650] https://www.pastoralistfilmfestival.com/

[651] Flintan, F. and Cullis, A. (2010) *Introductory Guidelines to Participatory Rangeland Management in Pastoral Areas*. https://hdl.handle.net/10568/99430.

[652] UNCCD and IFAD (2007) *Women Pastoralists: Preserving traditional knowledge Facing modern challenges*, *Women*. http://library.unccd.int/Details/fullCatalogue/833.

[653] Valdivia, C., Gilles, J.L. and Turin, C. (2013) 'Andean pastoral women in a changing world: Opportunities and challenges', *Rangelands*, 35(6), pp. 75–81. https://doi.org/10.2111/RANGELANDS-D-13-00038.1.

[654] Kipury, N. and Ridgewell, A. (2008) *A double bind : the exclusion of pastoralist women in the East and Horn of Africa*. https://www.refworld.org/pdfid/494672bc2.pdf.

[655] https://landportal.org/fr/node/13677

[656] http://www.marag.org/

[657]https://landportal.org/node/8047#:~:text=We percent20women percent20pastoralists percent20want percent20our,traditional percent20cultural percent20legacies percent20and percent20lifestyles.

[658] Jode, H. de and Flintan, F.E. (2020) 'How to do gender and pastoralism'. https://hdl.handle.net/10568/108874.

[659] https://wwf.panda.org/discover/our_focus/food_practice/grasslands_and_savannahs/

Table 17: Activities to protect grasslands and savannahs at the landscape level

PROTECT/AVOID	MANAGE/REDUCE	RESTORE/REVERSE
• Protect for permanence • Ensure zero new conversion • Create and improve protected status (public and private) • Support both communities and economic uses	• Improve sustainable production (close yield gaps, prevent new conversions) • Support land-use planning • Incentivise good conservation practices	• Restore ecological function (for biodiversity, water, carbon and people) • Build capacity of farmers and local communities • Use business cases to incentivise change

Using an ecosystem approach, the GGSI is developing **GrassBank**, a global database of information on grasslands and savannahs across the WWF network of diverse expertise and knowledge, systematising and making it available to improve the GGSI strategy and global action plan to conserve and restore grassland ecosystems.

5.8 Co-creation of knowledge

Knowledge gained through practice, experience, tradition, scientific data, and/or research is foundational for informed decision-making on SLRM and restoration. Knowledge should be co-created and shared in a way that is accessible and that has practical applications for a broad range of policymakers and stakeholders.

Academics and research institutions are instrumental in helping to develop knowledge that is fit-for-purpose. The use of a transdisciplinary perspective has matured in recent years, helping to further a global understanding of rangeland ecology, and associated socioecological and governance issues, most notably at the **Joint International Grassland & International Rangeland Virtual Congress** held in 2021.[660]

The **Rangelands Partnership** is an academic initiative which aims to bridge the gap between researchers and field practitioners by providing timely and reliable information on rangelands. Originally based in North American universities and institutions, it has expanded into a global partnership. Their flagship project, **The Rangelands Gateway**[661], is a global repository on rangeland ecology and management, which offers communications and training tools as well as a decision toolbox, with 50 instruments to facilitate rangeland management. The Gateway acts as a knowledge product repository for the IYRP.

Rangeland research has been slow incorporating pastoralist knowledge even though these indigenous approaches and practices have been used for generations to sustainably manage rangelands.[662] Georeferenced data (e.g., spatially explicit maps of rangeland use based on field data) are scarce and often difficult to disaggregate by production system, especially in extensive livestock systems. Monitoring key indicators for rangeland management and pastoralism (e.g., seasonal grazing pressures, livestock species, rotation periods, other land-based production activities) are nearly impossible to extract from official sources. However, collaborative partnerships are beginning to transform how knowledge is produced and shared.

[660] http://2021kenya-igc-irc.rangelandcongress.org/
[661] https://rangelandsgateway.org/
[662] Oba, G. (2012) 'Harnessing pastoralists' indigenous knowledge for rangeland management: three African case studies', Pastoralism, 2(1), p. 1. https://doi.org/10.1186/2041-7136-2-1.

The **Rangelands Atlas**[663] was developed by a consortium of international organizations (ILRI, WWF, ILC, FAO, UNEP, Rangelands Initiative) to map the extent of rangelands worldwide, documenting and raising awareness of their environmental, economic, and social values. The Atlas contains maps and case studies which draw attention to the changes taking place on rangelands due to climate change, land use and land use change, investments, and other direct and indirect drivers. It exemplifies how global partnerships are filling knowledge gaps and inspiring future initiatives.

A similar gap in actionable data pertains to rangeland monitoring and assessment which is needed to track progress in SRLM and restoration. New initiatives are striving to fill this gap including the **Global Rangelands Monitoring**[664], hosted by the Commonwealth Scientific and Industrial Research Organization (CSIRO), which provides a free online tool to monitor the condition of the world's rangelands in support of sustainable land use and animal production. The **Global Pasture Watch**[665] is the result of a partnership led by the World Resources Institute and Cornell University to map and monitor global grasslands and livestock, aiming to provide data for decision-making on pressing issues like carbon storage and rangeland conversion.

The ILRI hosts the **Global Rangeland Simulation Tool**[666], developed in collaboration with Colorado State University, which is based on G-Range, a simulation model used for global analyses of the evolution of native rangelands. The IAEA supports the **Quantification of intake and diet selection of ruminants**,[667] which utilizes stable isotopes to develop a practical method to predict pasture intake of ruminants grazing on heterogeneous rangelands. This allows farmers to know the nutritional value their animals obtain from grazing and can help them design effective feed supplementation strategies to optimise livestock production.

Management and practice

The traditional ecological knowledge and cultural heritage of rangeland producers must be appropriately recognized and integrated in current knowledge development and transmission. This approach helps support bottom-up pastoral initiatives and improve the way rangelands are managed, facilitating the design of more effective policies and investment strategies in the rangelands.[668]

One challenge is how to transmit knowledge so it can improve practitioner competence and confer new skills. Educational exchanges and peer-to-peer learning among pastoralists from different parts of the world could elicit additional tools to address shared challenges as well as help collect and systematise SRLM and restoration practices.

[663] ILRI, IUCN, FAO, WWF, UNEP and ILC (2021) Rangelands Atlas. Nairobi: ILRI. https://www.rangelandsdata.org/atlas/.

[664] https://www.csiro.au/en/research/animals/livestock/rapp-map-geoglam

[665] https://www.wri.org/events/2023/4/global-pasture-watch-mapping-monitoring-global-grasslands-livestock

[666] https://www.iwmi.cgiar.org/archive/wle/content/global-rangeland-simulation-tool/index.html

[667] https://www.iaea.org/projects/crp/d31029

[668] Sharifian, A., Gantuya, B., Wario, H.T., Kotowski, M.A., Barani, H., Manzano, P., Krätli, S., Babai, D., Biró, M., Sáfián, L., Erdenetsogt, J., Qabel, Q.M. and Molnár, Z. (2023) 'Global principles in local traditional knowledge: A review of forage plant-livestock-herder interactions', *Journal of Environmental Management*, 328. https://doi.org/10.1016/j.jenvman.2022.116966.

The **Global database on Sustainable Land Management (SLM)**[669] was developed by the WOCAT and its partners. The database offers a framework and set of tools for documentation, monitoring, evaluation, and dissemination of SLM knowledge. Data is first collected through reviewed questionnaires, and then the practices identified are included in the Global SLM Database. In addition, a land degradation and mapping questionnaire, developed in collaboration with the FAO/Land Degradation Assessment in Drylands project, can help assess the spatial coverage of land degradation and SLM. Although the Global SLM Database does not specifically target rangelands, it hosts the most complete repository of current SRLM and restoration practices.

There is no doubt that global initiatives, bringing together pastoralists and rangeland managers from diverse regions, offer great advances in practical knowledge and expand the vision of practitioners as demonstrated by the PKH and other collaborations.

Hosted by FAO, the **WeCaN Nurturing Community of Knowledge Practice for Women in dryland forests and agrosilvopastoral systems**[670] is a platform for women's empowerment in dryland regions, offering women a safe space to connect, share best practices, have their voices heard, and engage in knowledge-sharing events and trainings, while developing advocacy and gender mainstreaming skills. WeCaN community members are focal points from grassroots and women's organizations, NGOs/CSOs, and other stakeholders committed to gender responsive approaches in dryland areas. The platform links national and regional networks to share knowledge and experiences via South-South Cooperation.

Education and training

Training is a critical element for knowledge transmission and dissemination in rangeland projects and programmes. While traditional education offers a wide range of opportunities, innovative approaches for training rangeland managers and implementing agencies outside the formal academic context are becoming more popular. Several international organizations have arranged for free and open training opportunities that cover a variety of rangeland and pastoralism topics, including the ILC's learning hub[671] and the Rangeland Gateway.[672]

A first edition of the global **Massive Open Online Course on Pastoralism and development,**[673] organized by the International Institute for Environment and Development, was successfully launched in January 2023 with the enrolment of over 1,000 students. The course targets individuals working on pastoralism from different disciplines, as well as professionals seeking additional training. The methodology is consistent with the pedagogical approach of a Massive Open Online Course, supporting substantive learning via a broad range of media, and highlighting the latest advances in research and theory. A self-study version of the course will be available soon.

669 https://www.wocat.net/en/global-slm-database/
670 https://www.fao.org/dryland-forestry/wecan-community-practice/en/
671 https://learn.landcoalition.org/en/
672 https://rangelandsgateway.org/
673 https://www.iied.org/mooc-pastoralism-development-online-learning-journey

One concern with these new training initiatives is that they often apply learning methodologies that ignore the knowledge and experience of the trainees, which is crucial to SRLM and restoration. Pastoralist mobility requires tailored educational initiatives, with the design, delivery, and training methodology adapted to the communities, not vice versa.[674] [675]

> FAO promoted **Pastoralist Field Schools**[676] -- as an adaptation of the "Farmer Field Schools"[677] methodology and in partnership with ILRI and *Vétérinaires Sans Frontières* Belgium -- which was piloted in 2006 in Turkana, Kenya, and upscaled to different African countries. Pastoralist Field Schools usually involve a group of pastoralists (including elders, men, women, and youth) and a well-trained local facilitator. They meet regularly over a defined period to share experience through a peer-to-peer learning process. The Pastoralist Field Schools encompass the entire annual cycle, enabling participants to share adaptation strategies at each stage. A guide for facilitators[678] was subsequently published by FAO and *Vétérinaires Sans Frontières*.

5.9 Resource mobilisation

Pastoralist communities across the world share many of the same economic and financial challenges. Funding mechanisms need to be more flexible as economic data is limited and often undervalues the real contribution of rangelands and pastoralism to livestock production and the overall agricultural output. This data gap means that economic decisions on rangelands (e.g., conversion to other land uses) are made under weak economic assumptions that may not be rational nor efficient.[679] Assessments of the importance of pastoralist production, such as the FAO study on the **economics of pastoralism in Argentina, Chad and Mongolia**[680], the GIZ's **Economics of Land Degradation** Initiative[681], and the IUCN's **Global Review of the Economics of Pastoralism**[682] show that pastoralism has broad tangible and intangible values.

The production and marketing practices of pastoralists warrants unconventional financial tools. Cash is not their only form of currency, and they often see livestock as a measure of wealth. Production is often not steady or predictable affected by nature-based risks and

---

[674] Kratlï, S. and Dyer, C. (2009) Mobile Pastoralists and Education : Strategic Options. IIED. https://www.iied.org/sites/default/files/pdfs/migrate/10021IIED.pdf.

[675] Dyer, C. (2016) 'Approaches to education provision for mobile pastoralists', OIE Revue Scientifique et Technique, 35(2), pp. 631–648. https://doi.org/10.20506/rst.35.2.2525 .

[676] https://www.fao.org/capacity-development/news-list/detail/en/c/883112/

[677] http://en.wikipedia.org/wiki/Farmer_Field_School

[678] FAO (2013) Pastoralist Field Schools Training of Facilitators Manual. ECHO, EC a. FAO. https://www.fao.org/3/bl492e/bl492e.pdf.

[679] Macgregor, J. and Hesse, C. (2013) 'Pastoralism Africa ' s invisible economic powerhouse ?', World Economics, 14(1), pp. 35–71. https://www.researchgate.net/publication/320258149_Pastoralism_Africa's_invisible_economic_powerhouse.

[680] Wane, A., Cesaro, J., Duteurtre, G., Touré, I., Ndiaye, A., Alary, V., Juanès, X., Ickowicz, A., Ferrari, S. and Velasco, G. (2020) *The economics of pastoralism in Argentina, Chad and Mongolia*, *The Economics of Pastoralism*. FAO. https://doi.org/10.4060/cb1271en.

[681] https://landportal.org/es/organization/economics-land-degradation-initiative

[682] Hatfield, R., Davies, J., Wane, A., Kerven, C., Dutilly-Diane, C., Biber, J.P., Merega, J.L., Odhiambo, M.O., Behnke, R. and Gura, S. (2006) 'Global Review of the Economics of Pastoralism'. https://www.iucn.org/content/report-global-review-economics-pastoralism.

determined by mobility and land use far from markets.[683] Pastoralists have adapted their economies accordingly and often follow alternative investment paths. For example, they invest heavily in social capital to build mutual support networks that protect them against extreme events. They are often self-sufficient and rely on few external inputs, and tend to capitalise on opportunities, such as demand peaks linked to the social activities (e.g., proximity to markets, annual celebrations, religious festivals).

Multifunctionality, diversified and high-value products, and sustainable management practices can be enhanced with stronger supply chains.[684] Investments can make a positive contribution in several key areas by: 1) strengthening and expanding value chains for rangeland products based on their quality, demand, and low environmental footprint; 2) incentivising the protection and delivery of essential ecosystem services (e.g., soil, water, biodiversity, carbon) provided by pastoralism; and 3) promoting tailored insurance and risk management.[685]

New investment opportunities for SRLM and restoration include information technology for extensive livestock production; rangeland-adapted infrastructure (e.g., mobile abattoirs, collective processing facilities) and livestock health services; sustainable value chains; insurance and risk prevention mechanisms.[686] As rangelands are critical providers of ecosystem services, investments can be linked to direct payments, carbon markets, wildfire prevention contracts, vegetation control in protected habitats, management area leases, etc.[687]

> The World Bank is mobilising funds in the Horn of Africa,[688] through the **DRIVE project**[689] with USD 572 million in private capital, to help pastoralists acquire drought insurance and increase savings, gain access to digital accounts, and attract more private investment in pastoral areas.

Several international institutions consider pastoralism as a priority for direct investments. Some projects target financial resilience in pastoral communities, led by research and bilateral development aid institutions (ILRI-CGIAR, World Bank, USAID, UKAid, etc.), especially in Africa. UN institutions, such as UNCCD and FAO, have intensified their work in support of sustainable pastoralism, which could open new sources of funding to support projects and programmes.

---

[683] Rueff, H. and Rahim, I. (2016) 'Enhancing the economic viability of pastoralism: the need to balance interventions', *Revue Scientifique et Technique de l'OIE*, 35(2), pp. 577–586. https://doi.org/10.20506/rst.35.2.2542.

[684] FAO (2022) *Grazing with trees*, *Grazing with trees*. FAO. https://doi.org/10.4060/cc2280en.

[685] Ouedraogo, R. and Davies, J. (2016) 'Enabling sustainable pastoralism: policies and investments that optimise livestock production and rangeland stewardship', Revue Scientifique et Technique de l'OIE, 35(2), pp. 619–630. https://doi.org/10.20506/rst.35.2.2544.

[686] Davies, J., Ogali, C., Laban, P. and Metternicht, G. (2015) 'Homing in on the range: enabling investments for sustainable land management', *IucnIUCN*, p. 23. https://portals.iucn.org/library/sites/library/files/documents/Rep-2015-021.pdf .

[687] Louhaichi, M., Yigezu, Y.A., Werner, J., Dashtseren, L., El-Shater, T. and Ahmed, M. (2016) 'Financial incentives: Possible options for sustainable rangeland management?', *Journal of Environmental Management*, 180, pp. 493–503. https://doi.org/10.1016/j.jenvman.2016.05.077.

[688] https://www.worldbank.org/en/news/press-release/2022/06/23/world-bank-boosts-pastoral-economies-and-climate-action-in-the-horn-of-africa

[689] https://www.worldbank.org/en/news/infographic/2022/06/24/the-de-risking-inclusion-and-value-enhancement-of-pastoral-economies-in-the-horn-of-africa-drive-in-a-nutshell

Most of these initiatives are still in early development, as they are being designed, tested and piloted, thus pointing to the urgent need to accelerate efforts.

5.10 Governance

The inclusive and responsible governance of rangelands is the ultimate scenario by which land degradation can be controlled, and the conditions to enable SRLM and restoration can be secured for the long term. Improving the governance of rangelands implies strengthening the decision-making capacity of local communities and enhancing their social capital.

> In November 2022, the ICCA Consortium[690] organized a workshop to conceive a global initiative to support pastoralists' territories and their self-determined priorities and plans. The purpose of the workshop, "**Rangelands and Pastoralism: Towards a Global Initiative for Pastoralists' Territories of Life**",[691] was to provide a platform for pastoralist communities and their supporting organizations to share perspectives on, and experiences with, conserving, sustaining, and defending rangelands and to establish a framework for this global initiative. **Territories of Life** recognises and respects the central role of indigenous peoples and local communities in land stewardship through their deep cultural and spiritual relationships and traditional governance systems. This initiative also helps pastoral communities to secure collective land rights and self-governance systems, uphold human rights in all processes that affect local communities, and advocate for the development of human rights-based financing tools.

The adoption of sustainable models for land governance and tenure security constitutes an aspiration for many initiatives on rangelands and pastoralism. International institutions, such as FAO[692] and IUCN[693], have endorsed participatory models of rangeland management that ultimately shape the governance of these territories. These models focus on improving stakeholder participation, securing rights to enforce their decisions, ensuring meaningful engagement, incorporating gender and equity consideration, managing natural resource conflicts, and preventing encroachment and abuse.

5.11 Celebrating rangelands and building a transversal approach

In 2022, the UN General Assembly declared 2026 the International Year of Rangeland and Pastoralism (IYRP)[694] based on a proposal by the Government of Mongolia. The IYRP reinforces the many commitments and actions made by organizations and institutions to provide global support to rangelands and pastoralist communities. The declaration of IYRP has already started a wave of enthusiasm across the world, including explicit support being provided by more than 100 governments and 330 organizations.[695]

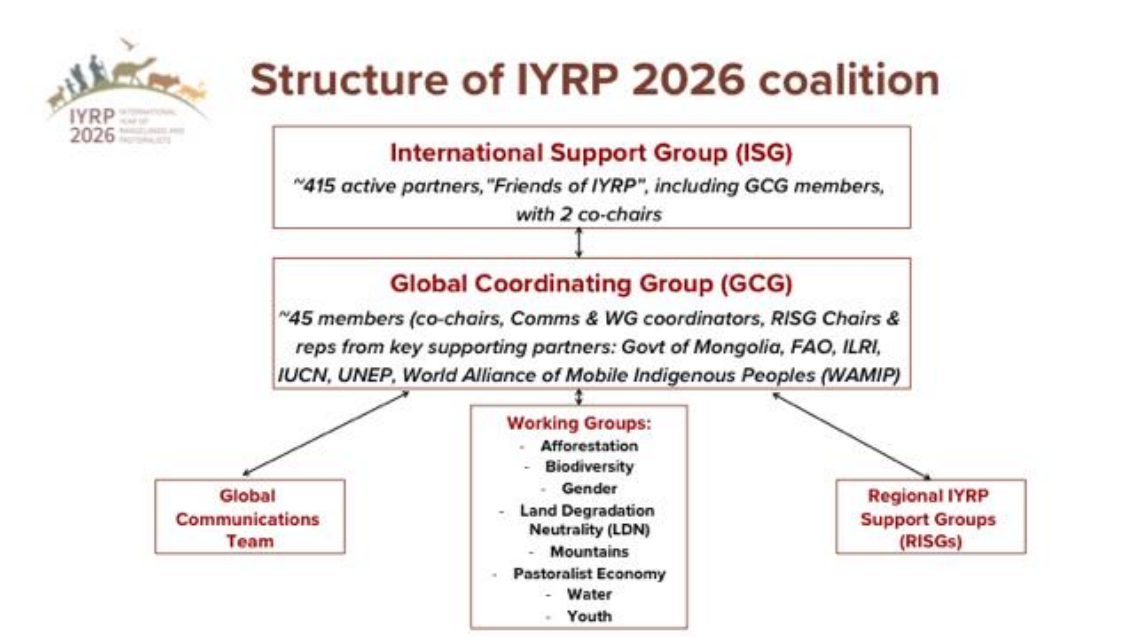
The IYRP declaration is also leading an unprecedented collective effort to coordinate global action on behalf rangelands and pastoralism and improve their role in the arena of global

[690] https://www.iccaconsortium.org/
[691] https://www.iccaconsortium.org/2023/02/17/rangelands-pastoralism-global-initiative-pastoralists-territories-of-life-workshop-recap/
[692] Davies, J., Herrera, P.M., Ruiz-Mirazo, J., Mohamed-Katerere, J., Hannam, I. and Nuesiri, E. (2016) Improving governance of pastoral lands. FAO. https://www.fao.org/3/a-i5771e.pdf.
[693] Herrera, P. M., Davies, J. and Baena, P.P.M. (2014) The Governance of Rangelands. Routledge. https://doi.org/10.4324/9781315768014.
[694] https://iyrp.info/
[695] https://iyrp.info/friends-of-iyrp

change, sustainable development, and ecosystem restoration. As FAO takes the lead on the implementation of the IYRP starting in 2024, there will be an impressive network of governments, civil society, research organizations, and international institutions already organised to support its development.

The collective effort on launching and disseminating the IYRP is arranged through a wide coalition, structured around the **International Support Group (ISG-IYRP).** The ISG-IYRP is a network of individuals and organizations that supports current development of the IYRP, including its website and archives, and implements different activities, work groups and events for the IYRP. The ISG-IYRP supports IYRP activities through its two co-chairs, a coordination group, and thematic working groups (e.g., land degradation, afforestation, biodiversity, gender, mountains, water). The ISG-IYRP is decentralized with 10 regional support groups, a communications team, and a global mailing list for the dissemination of information and activities.

Figure 26: Structure of global support for IYRP[696]



Educational, creative, and cultural activities are also a priority for the IYRP. A presentation video[697] and a collection of images and stories from worldwide pastoralists are displayed on the IYRP website. The website also centralises and disseminates all forms of information around the IYRP celebration, including news, events and knowledge resources, videos, and communications materials.[698] The infrastructure of the Rangelands Gateway stores the information and resources generated in the IYRP archives.[699]

[696] https://iyrp.info/iyrp-newsletter-may-2023
[697] https://www.youtube.com/watch?v=FnzQ4wnY2iM
[698] https://www.iyrp.info/resources/front
[699] https://rangelandsgateway.org/international-year-rangelands-and-pastoralists-initiative

The IYRP is inspired by a global vision that recognises the needs and aspirations of rangeland producer communities and advocates for capacity building and responsible investment in the pastoral livestock sector. Pastoralist communities and their grassroots organizations are the real protagonists of the declaration and will play a leading role in the design and implementation of the IYRP programme of activities. Although it is still too soon to have a calendar arranged, the focus of the IYRP is organised across 12 themes or priority issues, each one to be highlighted monthly throughout the year. As the observance of the IYRP quickly approaches, activities are already being planned.

Figure 27: The 12 themes of the IYRP defining global priority issues[700]

Beyond the celebration of the rangelands and the pastoralist culture, beyond the global support raised, beyond improving the public image of pastoralists and their lands, the greatest value of the IYRP is to offer an amazing opportunity to reach a global consensus on the way rangelands should be managed, protected, and restored. The declaration of IYRP has already fostered many alliances and gatherings, many different actors talking to each other, and promoting synchronised actions and a collective wish to agree on the essentials. The IYRP could become a turning point for rangelands and pastoralists where the new narrative of diversity, flexibility, variability, adaptation, and participation is mainstreamed and adopted at the international, national, and local levels. This may sound too ambitious, but fit-for-purpose strategies and tools are needed to face the challenges imposed by human activities and global changes. The IYRP could be the moment where society realizes that almost half of its land and the lion's share of animal production are critical assets for a sustainable future.

[700] Niamir-fuller, M. (2021) 'Knowledge Priority Themes and Issues for the International Year of Rangelands and Pastoralists', in 2021 IGC/IRC Congress. https://uknowledge.uky.edu/cgi/viewcontent.cgi?article=4318&context=igc.

Chapter 6: Recommendations

This final chapter offers a series of recommendations to foster an enabling environment that allows local communities and indigenous peoples from pastoralist, agropastoralist, and other related traditions to effectively conserve, manage, and restore rangelands for improved livelihoods and ecosystem services. The recommendations target governments, civil society organizations, research institutions, investors, communities, and other stakeholders engaged in developing, implementing, monitoring, and financing rangeland and pastoralist initiatives. Their aim is to assist decisionmakers to redesign normative and operational frameworks to improve the quality and outcomes of rangeland projects and programmes.

A fundamental assumption of this new paradigm is that rangeland communities are entitled to participate, in collaboration with their government and other stakeholders, in all aspects of planning and design. It recognises that pastoralists, in most cases, have the necessary knowledge, experience, and skills to successfully implement SRLM and restoration activities. It also calls for their rights and aspirations to be respected and equitably considered throughout the life cycle of rangeland initiatives. The key messages emerging from the conceptual framework are presented first, followed by suggested actions related to policy and legal and sustainability frameworks (including its economic, social, and environmental components) which aim to increase stakeholder capacity and the effectiveness of rangeland and pastoralist initiatives, and finally recommendations for implementation, knowledge, and governance frameworks.

6.1 Conceptual framework

The overarching conceptual framework in the report is a useful analytical tool that describes rangeland characteristics and dynamics. It offers a holistic understanding of rangelands and pastoralist systems to assist in the formulation and application of more effective frameworks for policy, investment, implementation, monitoring, and governance. Key messages include:

- Rangelands constitute the most expansive land use on Earth and provide critical goods and services and should be managed according to their unique characteristics and dynamics.
- Maintaining health and productive rangelands is largely dependent on the policy and social environment, including institutional and governance arrangements which requires a participatory approach to be successful.
- Pastoralism and extensive livestock production take advantage of multifunctionality and diversity in rangeland landscape, which can often inform flexible and cost-effective strategies and approaches to sustainable rangeland management and restoration.
- Investments in rangelands and pastoralist initiatives need to be mobilised under flexible and innovative schemes, given priority to the returns on natural, human, and social capital.

6.2 Policy and legal frameworks

Policy and legal frameworks need to be developed or revised to recognize the true value and key priorities of rangelands and pastoralists, promote responsible land governance, incentivise sustainable management practices, create trusted institutions, partnerships, and dialogue platforms, and encourage sustained investments that promote healthy and productive rangelands. Key suggestions include:

- Rangelands should be given due priority in national policies, legislation, and investment plans and assume their rightful place in integrated land use planning, starting by recognising the full suite of social, economic, and environmental values.
- The legal recognition and protection of pastoralist and extensive livestock production systems and their value chains are essential to increase the number and quality of rangeland initiatives that deliver positive social, economic, and environmental outcomes.
- The distinctive characteristics of rangelands and their production systems demand tailored policies, laws, and institutions; inequalities and conflicts, which often arise between states, pastoral communities, and other rangeland users, need to be considered before drafting new policy or legal instruments.
- Cooperation is key to preserve pastoral culture, heritage, and mobility across the rangelands, which often extend across borders while coordination mechanisms at the national level can help unify strategies and action plans for rangelands.

Key recommendations for normative frameworks include:

- Adopt international treaties supporting rangeland systems and their key features, especially indigenous and community land rights, livestock cross-border mobility, common lands, trade, etc.
- Develop rangeland and pastoral laws at the national level that recognise and differentiate among extensive production systems, their goods and services, and a continuum of land rights that promote their role in sustainable management.
- Design strategies and action plans to mainstream SRLM and restoration activities that are aligned with pastoralist traditions and leveraging their skills and practices to preserve and rehabilitate rangelands and their values with the aim of achieving LDN.
- Incorporate rangelands in initiatives for nature conservation and protected areas to ensure their proper management while preserving the livelihoods and ecosystem services they provide.
- Implement coordination mechanisms between government levels and departments to promote synergies, facilitate transboundary movement and cooperation, and authorize multilevel decision-making.
- Develop land planning mechanisms adapted to and based on the participation of pastoralists and rangeland users.
- Rule, assess and control the impact of privative uses, such as mining, renewable energy generation, and infrastructure building, that can displace or harm the traditional rangeland productions.

6.3 Sustainability frameworks

Rangelands sustainability is based on their economic, social, and environmental performance, which are governed by management practices and influence the development and maintenance of landscape functions. A sustainability framework should contribute, in its three dimensions, to the long-term delivery of the essential provisioning, regulating, cultural, and supporting ecosystem services provided by rangelands.

Economic dimensions

The economic viability of SRLM and restoration projects and programmes increasingly rely on flexible and long-term investments, innovative economic models and financial instruments,

and context-specific strategies that link markets and value chains to pastoralist production systems.

Key economic recommendations include:

- Promote innovative economic and financial mechanisms that are accessible to stakeholders, incentivise good practices, stimulate market participation, and increase investments for sustainable pastoralism in the rangelands.
- Reduce and eliminate harmful subsidies that provide perverse incentives which result in the degradation or loss of healthy and productive rangelands.
- Develop market and value chain strategies that are context-appropriate, harness competitive advantages, and create profitable opportunities for rangeland communities and extensive production systems.
- Recognize that impactful investments must be sustained over the long-term and based on low input and variable output production systems that also provide essential non-market goods and services to the wider landscape.
- Manage risks and uncertainty in a creative but economically sound way by promoting adapted investment risk management tools, such as insurance, resource-pooling, and community investment.
- Learn from pastoralism to develop financial instruments able to draw profit from variability, uncertainty and diversity, and address the opportunities given by this new approach.

Social dimensions

Social capital supports the long-term capacity of the community to develop governance and management systems that are appropriate for the local context. Rangeland initiatives should aim to build and enhance social capital related to participation, networking, capacity building, mutual support, quality of life, conflict-solving, culture, and other social issues. A gender responsive and social inclusion approach can reduce poverty, systemic inequalities, and other vulnerabilities that characterise marginalised or disenfranchised groups in the rangelands.

Key social recommendations include:

- Design and implement initiatives that target local livelihoods, leverage traditional institutions, and enhance community resilience as a path to justice and equitable benefit sharing.
- Promote pastoralist and rangeland associations and networks to safeguard cultures, values, and beliefs to ensure the adequate provision of human resources and expertise needed for rangeland governance and management.
- Generate, support and facilitate women-led, women-driven and women-only initiatives, groups and institutions, along with the mixed ones, to ensure that their voice is actually heard, and they get an equitable level of representation and decision-making capacity.
- Celebrate pastoralism and rangelands across cultural manifestations, local traditions and communities to share the common heritage and culture that permeates the world rangelands.

Environmental dimensions

The environmental sustainability of rangelands is related to their ecological integrity and functioning. Achieving LDN is a primary objective of many rangeland and pastoralist initiatives that promote their conservation, sustainable use, and restoration.

Key environmental recommendations include:

- Conserve and restore the integrity, functionality, and ecosystem services provided by rangelands and which are largely managed by pastoralists.
- Prevent rangeland conversion, land grabbing and abusive uses that do not respect the diversity and multifunctionality of rangelands, especially on indigenous and common lands.
- Balance the economic, social, and environmental trade-offs in land use decisions and optimise resource use efficiency in management practices.
- Address wildlife conflict and coexistence recognising pastoralist challenges while supporting creative and mutually beneficial solutions for both rangeland producers and wild animals.
- Employ LDN targets to design, implement, and finance SRLM and restoration globally.
- Integrate climate change adaptation and mitigation into rangeland management, promoting win-win scenarios that increase carbon storage and resilience.
- Design conservation measures that reduce biodiversity loss above and below ground while boosting the health and productivity of extensive livestock production systems.
- Adopt pastoralism-based strategies to control vegetation on rangelands, forests and open landscapes to prevent wildfires and facilitate other prevention and extinction measures.
- Use agroforestry and pastoralist perspectives to adapt rangelands and other land uses to climate change by mobilising biomass, shadowing and modulating vegetation growth, promoting multifunctionality and improving water dynamics.

6.4 Knowledge frameworks

Knowledge is required for conducting baseline assessments, designing implementation strategies, and monitoring the results of rangeland projects and programmes. Traditional knowledge, scientific and empirical research, and innovation must come together in projects and programmes to realise the full potential of SRLM and restoration initiatives.

Key knowledge recommendations include:

- Promote the co-creation of knowledge and innovation by integrating research, traditional practices, and field evidence into flexible, multi-disciplinary, and multi-actor structures linked to existing networks.
- Integrate rangelands management and pastoralism in the curricula of agricultural, ecology and land studies at the different education levels.
- Create platforms for knowledge exchange and databases to collect and disseminate information on rangelands and pastoralist systems.
- Develop decentralised rangeland extension services to test and validate the strategies, technologies, and practices that emerge from the co-creation of knowledge.
- Monitor rangeland initiatives based on field or remotely sensed data and information.

- Promote field and mobile schools, peer to peer learning, shepherd's schools and endogenous learning and training initiatives, and facilitate the exchange, networking and knowledge-sharing among them.
- Produce online courses, audiovisuals, books, manuals, publications, documentaries, films and any other dissemination material that could extend the rangeland perspective.

6.5 Management frameworks

Rangeland management can be approached in two complementary ways: (1) adopt integrated land use planning and landscape management to safeguard their essential ecosystem services, and (2) leverage extensive production systems, livestock management, and pastoralist mobility as effective tools to sustainably manage soil, water, and biodiversity resources and support livelihoods in the rangelands.

Sustainable rangeland management

Evidence and research have demonstrated that rangelands need to be managed in a more flexible and adaptable way as part of the new rangeland paradigm, which includes the following:

- **Shift to resilience-based, adaptable, and flexible models** that encourage integrated management practices that support the livelihoods of pastoralists and other rangeland communities under variable conditions.
- **Prioritise pastoralism in rangeland management** to achieve LDN and other restoration commitments, including through silvopastoral and agroforestry systems that pool resources and enhance synergies.
- **Address the multifunctionality of rangelands** by integrating different but compatible land uses, such as livestock production, forest products, beekeeping, herb collection, hunting, ecotourism, and nature conservation.
- **Preserve pastoral infrastructure to guarantee mobility and stewardship** under multipurpose schemes, including securing corridors, livestock tracks, shelters, woody feed banks, water points, open areas, grazing reserves, enclosures, and other critical infrastructure that allows communities to adapt and cope to stress and shocks.
- **Integrate risk prevention into rangeland management** by encouraging pastoralist strategies, insurance schemes, and other methods that increase resilience.
- **Mainstream and upscale integrated land use planning and landscape management** that embraces full and meaningful participation, interventions at multiple scales, and appropriate timelines as well as cultural and heritage components.

Managing livestock, grazing, and mobility

Livestock and grazing management are essential components of most SRLM and restoration initiatives, which includes the following:

- **Guarantee the necessary conditions for livestock mobility** (e.g., nomadic, transhumant, seasonal, rotational, local) to adapt and secure those uses for the future, independent of the current situation and perspectives.
- **Acknowledge the value of livestock to local communities** and provide incentives and other support mechanisms for integrated land and livestock management.
- **Improve rotational grazing planning and practices** by scheduling stocks under specific timelines that ensure adequate resting periods for rangeland health and recovery.

Regenerative, holistic, rational, multi-paddock, and other systems can have positive outcomes, although they should be carefully tested and adapted to local conditions.

- **Promote, improve, manage, and raise native and locally adapted breeds** to preserve their cultural and genetic heritage and develop adaptable, flexible grazing strategies.
- **Improve animal health, reproduction, and breeding** under pastoralist conditions to capitalise on their improved health status and adaptive capacity and promote mobile services and holistic solutions following the One Health approach.
- **Adapt livestock management practices to climate change** under an integrated mitigation-adaptation approach based on the multifunctional characteristics of rangelands. This can increase food and nutrient availability and shelter under silvopastoral schemes, enhance nutrient and fertility cycling, and improve mobility and risk management.

6.6 Governance frameworks

Policy and legal frameworks should also promote participatory decision-making at the local level. The goal is addressing the transition from current degradation scenarios to more effective governance schemes that encourage sustainable rangeland management.

Key governance recommendations include:

- Promoting the fair legal treatment and protection of rangelands and their resources through secure and equitable rights of access and appropriate tenure arrangements.
- Establish participatory, collaborative, multi-stakeholder platforms for inclusive and responsible rangeland governance at local and district levels, supported by national frameworks that provide capacity development for and legitimacy to their decision-making.
- Recover or strengthen traditional governance institutions or create new participatory ones to manage those governance arrangements.
- Develop mechanisms to manage disputes and conflicts as well as negotiate trade-offs and leverage synergies that result in positive outcomes for rangelands and their communities.
- Provide technical support, trained facilitation teams, safe environments, operational and regulatory capacity, and sufficient resources to sustain participatory governance processes.

6.7 Final remarks

Rangelands offer a world of opportunities. However, these are often undermined or compromised by short-sighted economic and social policies. Systemic approaches are needed to properly manage and restore both rangelands and pastoral livelihoods. Pastoralism and other extensive livestock practices are often the best way to develop mutually beneficial outcomes for rangeland economies and societies. This approach demands an equitable distribution of responsibilities, engagement, and skills from all stakeholder groups involved.

Following the above recommendations, governments should consider new development pathways that provide for the necessary legal and enabling conditions, such as tenure security, and coordination mechanisms that facilitate responsible governance and trusted institutions. Local communities recognise that protecting and restoring their rangelands is a key step to safeguard their health, wealth, and livelihoods but they often feel powerless, exploited, and disenfranchised.

Institutions, investors, and donors should move from their comfort zone to allocate resources and finance that supports the diversity of pastoralist initiatives and delivery of multiple co-benefits. Cost-effective solutions are readily available, and coordinated action at all levels could set them in motion.