ERASMUS-EDU-2023-CBHE
Project number: 101129032

Duration: 36 months
(01/01/2024 – 31/12/2026)

LESLIE
LAND MANAGEMENT
ENVIRONMENT &
SOLID-WASTE

MICRO-CREDENTIAL

CLIMATE CHANGE FOR SUSTAINABLE LAND MANAGEMENT IN CENTRAL ASIA

6. – Agriculture, Food Security and Rural Livelihoods

Rangelands, Livestock and Pasture Degradation

CC-W06-V22

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Bukhara State Technical University
(*prev. "TIIIAME" NRU BINRM*)

Learning objectives

1. **Understand the role of rangelands and extensive livestock systems in Central Asia**
2. Explain how climate variability affects forage availability, quality and seasonal access
3. Distinguish pasture degradation from short-term climate-driven fluctuations in productivity
4. Identify management options that strengthen rangeland resilience without duplicating crop-focused adaptation

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Rangelands in Central Asia

A landscape-dominant land use

72% aprox. Of Central Asia's area is rangeland according to FAO regional reporting

Major rangeland environments

- **Desert & semi-desert**
- **Steppe & dry grassland**
- **Mountain pasture**

Why they matter

Forage base Supports extensive livestock systems across arid, steppe and mountain zones

Mobility Seasonal movement links complementary grazing areas and water sources

Biodiversity Rangelands host dryland and mountain species and ecosystem functions

Livelihoods Pastoral production contributes to food, income and cultural identity

→ **Rangelands are not marginal "empty" lands: they are production landscapes whose value depends on ecological condition and access.**

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From climate signal to rangeland response

Warmer conditions Higher evaporative demand and more livestock heat exposure	→	**Green-up & senescence timing**
Rainfall variability More variable soil-water recharge and drought risk	→	**Forage biomass & nutritive quality**
Snow & melt timing Seasonal access and mountain water availability can shift	→	**Water-point reliability & usable grazing area**
Extreme events Drought, wildfire, severe winter or heavy rainfall can cause abrupt losses	→	**Species composition & recovery capacity**

Key point: climate affects livestock largely through forage, water and access—not only through direct heat stress.

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Seasonal forage dynamics and climate sensivity

Pastoral systems manage strong seasonality; climate change alters the timing, duration and reliability of forage.

Rapid green-up
High-quality forage; timing depends on temperature and soil moisture

Dry-down risk
Heat and low rainfall can shorten the productive period

Autumn recovery
Regrowth is highly dependent on late-season moisture

Feed gap
Stored feed, migration and access to winter pasture become critical



Lowland / arid rangelands

- Short moisture-limited growth pulse
- High sensitivity to drought and water-point availability
- Mobility helps avoid localised grazing pressure

Mountain pastures

- Later green-up and strong altitudinal gradients
- Snowmelt timing influences access and forage development
- Seasonal movement can spread grazing pressure across elevations

→ **A longer frost-free period does not automatically mean more usable forage: seasonal water balance and grazing access remain decisive.**

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Livestock systems and the role of mobility

Mobility is a management strategy for spatially and seasonally variable forage—not simply a traditional practice.



Typical extensive systems

- Sheep and goats across drylands and mountain systems
- Cattle and horses in steppe and mixed systems
- Camels in arid zones; yaks in high-mountain areas
- Seasonal and transhumant movements where access permits

Why mobility matters

- tracks forage and water
- reduces pressure on single sites
- spreads climate risk

Current constraints | Fragmented routes, insecure tenure, border restrictions, infrastructure and land conversion can reduce flexibility.

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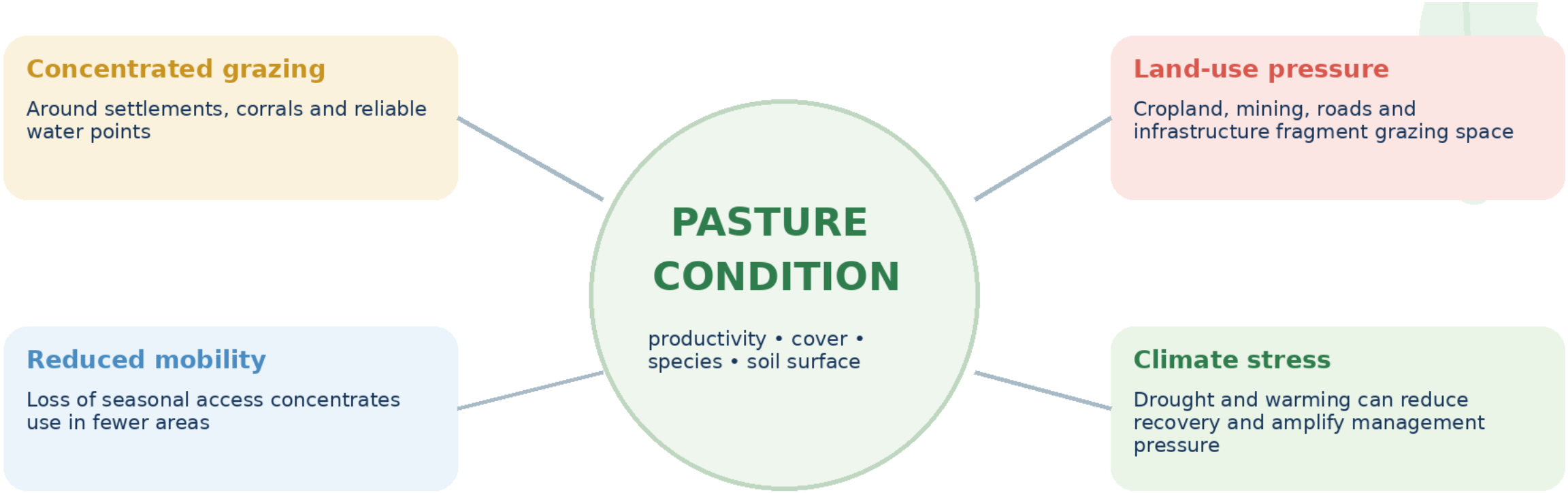
Pasture degradation is multi-causal



Scientific caution: **short-term low biomass after drought is not automatically long-term degradation; trends must be interpreted with climate and management history.**

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What pasture degradation looks like

Use multiple indicators. No single field sign is sufficient on its own.

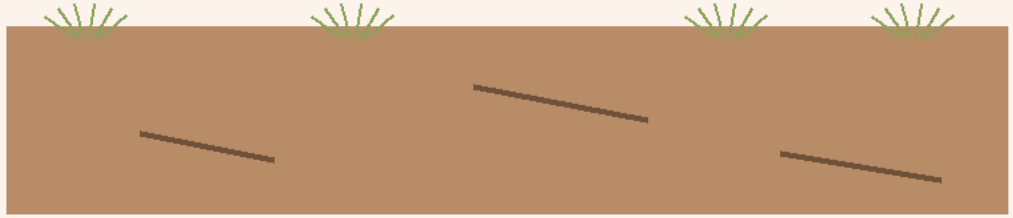
Relatively functional rangeland

- Perennial and palatable species remain present
- Low or stable bare-ground fraction
- Evidence of recovery after seasonal grazing



Degradation warning signs

- Declining vegetation or palatable-species cover
- Increasing bare ground, erosion or surface sealing
- Lower forage biomass or stronger shrub/weed dominance



Monitor change over time

Vegetation cover **Forage biomass** **Bare ground** **Erosion signs** **Grazing distribution**

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Managing grazing pressure: distribution matters

Sustainable grazing is not defined by one universal stocking rate.

Same herd size — different outcome

Concentrated use



near water / settlements

Distributed use



across seasonal pastures

Management implications

1. **Match use to forage availability**
   Adjust animal numbers, timing and duration to current conditions
2. **Spread pressure spatially**
   Maintain access to remote and seasonal grazing areas
3. **Protect recovery periods**
   Avoid repeated defoliation before plants recover
4. **Monitor condition**
   Combine vegetation, bare-ground, soil and grazing-distribution indicators

→ **The objective is balanced use in space and time, not simply reducing livestock numbers everywhere.**

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Adaptation portfolio for resilient rangelands

Adaptation works best when ecological, livelihood and governance measures reinforce each other.

Mobility & access

- Keep seasonal routes functional
- Improve access to remote pastures
- Plan water points without concentrating pressure

Adaptive grazing

- Use flexible grazing calendars
- Rest heavily used areas when needed
- Adjust pressure after drought or poor seasons

Livestock resilience

- Maintain locally adapted breeds
- Strengthen animal health and feed reserves
- Diversify income and market options

Governance & information

- Secure and transparent pasture-use rights
- Community-based planning and monitoring
- Climate services and early-warning information

Key principle: preserve flexibility so pastoralists can respond to highly variable forage and water conditions.

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Drought and severe-winter preparedness

Preparedness reduces the need for crisis responses after forage and livestock losses have already occurred.

Early warning inputs

- seasonal forecasts
- vegetation / forage monitoring
- water-source status
- animal body condition



Preparedness assets

- accessible reserve pastures
- feed and fodder stocks
- veterinary capacity
- pre-agreed decision rules

→ **Drought resilience depends on decisions made before the shock: monitoring, mobility, reserves and governance determine response capacity.**

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Restoring degraded pastures: avoid – reduce - restore

Restoration is most durable when the degradation pressure is addressed first.

1 AVOID — **Prevent new degradation**

protect intact areas • maintain mobility • avoid chronic concentration

2 REDUCE — **Remove or lessen the pressure**

redistribute grazing • manage water points • adjust seasonal use

3 RESTORE — **Recover ecological function**

rest periods • assisted natural regeneration • erosion control • reseeding where justified

4 MONITOR — **Track response and adapt**

vegetation cover • bare ground • forage recovery • soil-surface condition

Restoration target: recover forage production, soil protection and resilience—not simply maximize plant biomass.

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Central Asian examples: management and governance

Examples illustrate different entry points; they are not one-size-fits-all prescriptions.

Kazakhstan

- Rotational grazing is included among good grassland-management practices in the Sustainable Livestock Development Program
- Better grazing management is linked with vegetation cover, soil organic matter and biodiversity benefits

Kyrgyz Republic

- Pasture-user unions and local pasture committees were established under the 2009 Pastures Law
- Current FAO-supported work combines community landscape management, pasture restoration and monitoring

Regional lesson

- Research across Central Asia highlights mobility, collective action, tenure and locally adapted technical packages
- Remote-pasture access can reduce pressure around settlements

Governance is part of adaptation: access rules and institutions shape where, when and how grazing pressure occurs.

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Key Messages

1. **Climate sensitivity is mediated by forage, water and access.**
2. Mobility can be an adaptation mechanism when routes and tenure allow it.
3. Pasture degradation is multi-causal and must be separated from short-term drought effects.
4. Sustainable management combines grazing distribution, preparedness, restoration and governance.
5. **Rangeland resilience depends on soil condition**

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Check your learning

1. Why can the same herd size produce very different grazing impacts in two landscapes?
2. How does mobility reduce vulnerability to variable forage and water availability?
3. Which indicators would you combine to distinguish drought effects from persistent degradation?
4. Why should restoration begin by addressing the pressure that caused degradation?

Selected resources

IPCC AR6 WGII
Impacts, adaptation and vulnerability

FAO Pastoralist Knowledge Hub
Central Asia network and evidence

UNCCD (2024)
Global Land Outlook: Rangelands

Mirzabaev et al. (2016)
Rangelands of Central Asia

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