LESLIE
LAND MANAGEMENT
ENVIRONMENT &
SOLID-WASTE

LAND MANAGEMENT, ENVIRONMENT & SOLID-WASTE: INSIDE EDUCATION AND BUSINESS IN CENTRAL ASIA
ERASMUS-EDU-2023-CBHE Project Number: 101129032

MICRO-CREDENTIAL

CLIMATE CHANGE FOR SUSTAINABLE LAND MANAGEMENT IN CENTRAL ASIA

6.- Agriculture, Food Security and Rural Livelihoods

Activity

Group worksheet: design a climate-smart cropping system for a semi-arid district



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Objective

The objective of this group activity is to apply climate-smart agriculture principles to the design of a cropping system for a semi-arid district. Students will analyse local climate risks, select suitable crops and management practices, and justify how the system improves productivity, resilience and environmental performance.

Scenario

A semi-arid district depends mainly on smallholder agriculture. The dominant crops are wheat, barley and vegetables grown under limited irrigation. Rainfall is irregular and concentrated in a short season. Farmers report increasing drought frequency, higher summer temperatures, wind erosion, declining soil fertility and unstable yields.

The district has:

- Limited irrigation water.
- Moderate soil degradation.
- Low access to credit.
- Limited extension services.
- Small farms.
- Weak storage infrastructure.
- High dependence on seasonal rainfall.
- Increasing rural poverty.
- Some existing farmer groups.
- Local demand for cereals, vegetables and fodder.

Your group has been asked to design a climate-smart cropping system for this district.

Group task

Design a cropping system that can improve food security and rural livelihoods under climate change.

Your proposal should include crops, soil management, water management, risk reduction measures, institutional support and indicators.

Worksheet sections

1. Climate risk diagnosis

Identify the three most important climate-related risks in the district.

Climate risk	How it affects agriculture	Most affected groups
Example: drought	Reduces soil moisture and crop yields	Smallholder rainfed farmers

Groups should consider:

- Drought.
- Heat stress.
- Irregular rainfall.
- Shorter growing season.
- Soil erosion.
- Water scarcity.
- Salinity.
- Pest and disease outbreaks.
- Livestock feed shortage.
- Crop failure.
- Market instability after poor harvests.

2. Current cropping system

Describe the current cropping system.

Include:

- Main crops.
- Rainfed or irrigated areas.
- Planting season.
- Main inputs.
- Main constraints.
- Main sources of income.
- Main vulnerabilities.

3. Proposed crop combination

Select a diversified crop combination.

Possible options include:

- Drought-tolerant wheat or barley.
- Legumes, such as chickpea, lentil, pea or alfalfa.
- Fodder crops.
- Drought-tolerant vegetables.
- Cover crops.
- Local varieties adapted to dry conditions.
- Short-cycle varieties.
- Crop rotations combining cereals and legumes.

Fill in the table:

Crop or crop group	Purpose	Climate-smart justification
Wheat or barley	Staple food and income	Use of drought-tolerant varieties
Legumes	Food, income and soil fertility	Nitrogen fixation and diversification
Fodder crop	Livestock feed	Reduces feed shortage during drought

4. Soil management strategy

Select at least three soil management practices.

Examples:

- Mulching.
- Conservation tillage.
- Crop residue retention.
- Compost or manure application.
- Cover crops.
- Contour farming.
- Windbreaks.
- Shelterbelts.
- Reduced bare soil.
- Erosion control strips.
- Soil testing.
- Organic matter improvement.

Explain how each practice reduces climate risk.

5. Water management strategy

Select at least three water management measures.

Examples:

- Drip irrigation.
- Improved irrigation scheduling.
- Rainwater harvesting.
- Repair of canals.
- Soil moisture monitoring.
- Deficit irrigation for selected crops.
- Small water storage where appropriate.
- Mulching to reduce evaporation.
- Drought-tolerant varieties.
- Prioritisation of critical crop growth stages.

Explain how each measure improves water productivity.

6. Risk management and livelihood measures

Select measures that reduce household vulnerability.

Examples:

- Crop diversification.
- Farmer cooperatives.
- Community seed banks.
- Weather forecasts and seasonal advisories.
- Crop insurance.
- Savings groups.
- Improved storage.
- Local processing.
- Market access.
- Training for women and young farmers.

- Shared machinery.
- Emergency fodder banks.
- Farmer field schools.

Explain why these measures are important for rural livelihoods.

7. Mitigation and environmental co-benefits

Identify at least three environmental co-benefits.

Examples:

- Increased soil organic carbon.
- Reduced soil erosion.
- Lower fertiliser losses.
- Reduced open burning of residues.
- Improved biodiversity.
- Reduced pressure on water resources.
- Improved nutrient cycling.
- Lower emissions per unit of production.

8. Implementation plan

Prepare a simple implementation plan.

Phase	Timeframe	Main actions	Responsible actors
Phase 1	0–6 months	Farmer consultation, risk mapping, crop selection	Local authority, extension officers, farmer groups
Phase 2	6–12 months	Pilot plots and training	Extension service, cooperatives
Phase 3	Year 2	Scale-up and input access	Farmer groups, microfinance institutions
Phase 4	Year 3	Monitoring and adjustment	Local authority, farmers, researchers

9. Indicators

Define at least five indicators to evaluate the proposed system.

Examples:

Indicator	Unit	Purpose
Average crop yield	t/ha	Measures productivity
Yield variability	% or standard deviation	Measures stability
Water productivity	kg crop/m^3 water	Measures water efficiency
Area under drought-tolerant varieties	ha or %	Measures adoption
Soil organic matter	%	Measures soil improvement
Households adopting mulching	number or %	Measures practice adoption
Irrigation water use	m^3/ha	Measures water demand
Crop diversity index	number of crops	Measures diversification
Household farm income	local currency/year	Measures livelihood impact
Crop failure rate	% fields/year	Measures climate risk reduction

Required group output

Each group should submit:

1. Climate risk diagnosis.
2. Description of the current cropping system.
3. Proposed climate-smart crop combination.
4. Soil management strategy.
5. Water management strategy.
6. Risk and livelihood measures.
7. Environmental co-benefits.
8. Implementation plan.
9. Indicators.

Recommended length: 2–3 pages or 6–8 presentation slides.

Assessment criterio

Criterion	Description
Climate risk diagnosis	Main climate risks are clearly identified and linked to agriculture.
Crop system design	Proposed crops are suitable for semi-arid conditions.
Soil and water management	Practices are technically coherent and climate-relevant.
Livelihood perspective	Proposal considers farmers' income, risk and capacity.
Feasibility	Measures are realistic under limited credit and information.
Indicators	Indicators are measurable and aligned with objectives.
Integration	Proposal balances productivity, adaptation and environmental benefits.
Clarity	Worksheet is clear, structured and well justified.