Creation of a perennial grass seed area (CACILM) (Kazakhstan)
Central Asian Countries Initiative for Land Management (CACILM/ИСЦАУЗР)

DESCRIPTION

Improvement of pastures through planting perennial legumes, cereals and grasses and creating seed banks.

As a result of an increase in the number of livestock pastures were overstocked and soil and vegetation cover was degraded. To restore pastures in the area surrounding the Katon-Karagay village, a technology to improve pastures through sowing perennial legumes (sainfoin, lucerne, eastern galega), cereals (smooth brome, orchard grass, Russian wild rye), forage crops and mixed grasses was developed within the framework of the GEF/SGP “Organization of Katon-Karagay Village Pasture Management to Minimize Land Degradation” Project. The introduction of this technology allows for an increase in pasture productivity, and an improvement in the quality and weight of livestock. This leads to an increase in the income and improvement in the quality of life for the local population. The technology was applied to an area of 80 ha surrounding the Katon-Karagay village, where previously intensive livestock grazing was practiced. At present this area is under a short-term lease (5 years) to the “Mametek” Farmers’ Association (FA). The technology was introduced within the framework of the approach on “Pasture management through restoration of distant stock-breeding system and drastic improvement of pastures”, in which “Mametek” FA is one of the key parties. Practice is documented in the frame of CACILM.

Purpose of the Technology: The purpose was to restore the degraded area surrounding Katon-Karagay village for later use as a pasture, to secure perennial grass and cereal seed production for the restoration of degraded pastures and to improve pasture productivity in other areas.

Establishment / maintenance activities and inputs: The establishment and maintenance activities include fencing of the area to prevent the destruction of crops by livestock. Soil processing - plowing to a depth of 25-27 cm with subsequent harrowing and evening. Spring sowing of cover crops (barley, oats) to a depth of 5-10 cm. After cover crops are sown, perennial grasses and cereals should be sown to a depth of 2-3 cm. They should be sown in the same area as the one-year crops. One-year crops and perennial forage crops should be mown annually in autumn. The seeds for sowing in other areas should be collected in the 3 years after sowing. The seeds are intended for the further restoration of pastures in other areas. To utilize the technology the following initial activities should be conducted: purchase of materials (poles, wire), soil processing (leasing of tractors and seeders), purchase of seeds for sowing, leasing of machinery for mowing and taking away the hay. The work should be conducted by the farmers’ association with an additional labour force for a period of up to 15 days. Since the grasses are perennial, there is no need for further activities, only nitric fertilizers should be applied from time to time.

Natural / human environment: The project area is situated in an inter-mountain valley at a height of about 1000 m. The area is located within a semi-arid natural zone. The area is located within the Katon-Karagay State Natural Park and has limited economic use, mainly as pasture.
CLASSIFICATION OF THE TECHNOLOGY

**Main purpose**
- improve production
- reduce, prevent, restore land degradation
- conserve ecosystem
- protect a watershed/ downstream areas – in combination with other Technologies
- preserve/ improve biodiversity
- reduce risk of disasters
- adapt to climate change/ extremes and its impacts
- mitigate climate change and its impacts
- create beneficial economic impact
- protect a watershed/ downstream areas – in combination with other Technologies
- preserve/ improve biodiversity
- reduce risk of disasters
- adapt to climate change/ extremes and its impacts
- mitigate climate change and its impacts
- create beneficial social impact

**Land use**
Land use mixed within the same land unit: Yes - Agro-pastoralism (incl. integrated crop-livestock)

- Cropland
  - Annual cropping: fodder crops - alfalfa, fodder crops - grasses, sainfoin (Onobrychis), smooth brome (Bromus inermis)
  - Perennial (non-woody) cropping: flower crops - perennial
  - Number of growing seasons per year: 1

- Grazing land
  - Ranching
  - Intensive grazing / fodder production
  - Animal type: horses, sheep, cows

**Water supply**
- rainfed
- mixed rainfed-irrigated
- full irrigation

**Purpose related to land degradation**
- prevent land degradation ✓
- reduce land degradation ✓
- restore/ rehabilitate severely degraded land
- adapt to land degradation
- not applicable

**Degradation addressed**
- soil erosion by water - Wt: loss of topsoil/ surface erosion
- chemical soil deterioration - Cn: fertility decline and reduced organic matter content (not caused by erosion)
- biological degradation - Bc: reduction of vegetation cover

**SLM group**
- n.a.

**SLM measures**
- vegetative measures - V2: Grasses and perennial herbaceous plants
- structural measures - S6: Walls, barriers, palisades, fences

TECHNICAL DRAWING

**Technical specifications**
The 80 ha of land are located 3 km northeast of Katon-Karagay village in the upper part of an inter-mountain valley turning to mountain slopes. The surface is undivided and has a slope of 3-5 %.

**Location**: the area surrounding Katon-Karagay village. Katon-Karagay

**Date**: 2011-11-16
Technical knowledge required for field staff / advisors: high (Technology training)

Technical knowledge required for land users: high (Technology observance)

Main technical functions: increase of biomass (quantity), promotion of vegetation species and varieties (quality, e.g. palatable fodder)

Secondary technical functions: improvement of ground cover, improvement of topsoil structure (compaction), increase in nutrient availability (supply, recycling,...), increase / maintain water stored in soil

Vegetative measure: Sowing of perennial grasses
Vegetative material: G : grass
Number of plants per (ha): 2-3 millions
Spacing between rows / strips / blocks (m): 0.5-0.6
Vertical interval within rows / strips / blocks (m): 0.01

Vegetative measure: Vegetative material: G : grass
Vegetative measure: Vegetative material: G : grass
Vegetative measure: Vegetative material: G : grass

Perennial crops species: legumes (sainfoin, lucerne, eastern galega) and cereals (smooth brome, orchardgrass, Russian wildrye)

Structural measure: fence
Spacing between structures (m): 20

Construction material (wood): Columns
Construction material (other): Wire

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**ESTABLISHMENT AND MAINTENANCE: ACTIVITIES, INPUTS AND COSTS**

### Calculation of inputs and costs
- Costs are calculated:
- Currency used for cost calculation: tenge
- Exchange rate (to USD): 1 USD = 149.6 tenge
- Average wage cost of hired labour per day: n.a

### Most important factors affecting the costs
Thin-layer and stony soil impacts the costs, labor force should be hired

#### Establishment activities
1. Acquiring of seeds (Timing/ frequency: autumn or early spring)
2. Plowing (Timing/ frequency: spring)
3. Harrowing (Timing/ frequency: spring)
4. Sowing (Timing/ frequency: spring)
5. Covering (Timing/ frequency: spring)
6. Fencing of the area (Timing/ frequency: Spring)

#### Establishment inputs and costs

<table>
<thead>
<tr>
<th>Specify input</th>
<th>Unit</th>
<th>Quantity</th>
<th>Costs per Unit (tenge)</th>
<th>Total costs per input (tenge)</th>
<th>% of costs borne by land users</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Labour</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plowing</td>
<td>person/day</td>
<td>4.0</td>
<td>25.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Fencing</td>
<td>person/day</td>
<td>5.0</td>
<td>25.0</td>
<td>125.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Harrowing</td>
<td>person/day</td>
<td>4.0</td>
<td>25.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Sowing</td>
<td>person/day</td>
<td>8.0</td>
<td>25.0</td>
<td>200.0</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Equipment</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Machine use plowing</td>
<td>machine</td>
<td>128.0</td>
<td>15.57</td>
<td>1992.96</td>
<td></td>
</tr>
<tr>
<td></td>
<td>machine</td>
<td>48.0</td>
<td>16.666666</td>
<td>800.0</td>
<td></td>
</tr>
<tr>
<td>Machine use sowing</td>
<td>machine</td>
<td>48.0</td>
<td>16.666666</td>
<td>800.0</td>
<td></td>
</tr>
<tr>
<td>Machine use covering</td>
<td>machine</td>
<td>64.0</td>
<td>6.859</td>
<td>438.98</td>
<td></td>
</tr>
<tr>
<td><strong>Plant material</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seeds</td>
<td>kg/ha</td>
<td>12.5</td>
<td>5.6</td>
<td>70.0</td>
<td></td>
</tr>
<tr>
<td><strong>Construction material</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wire, poles</td>
<td>km</td>
<td>3.2</td>
<td>93.75</td>
<td>300.0</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labour: Covering</td>
<td>person/days</td>
<td>8.0</td>
<td>25.0</td>
<td>200.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

**Total costs for establishment of the Technology**
5'126.94

**Total costs for establishment of the Technology in USD**
34.27
### Maintenance activities

1. Mowing of grasses (Timing/ frequency: September)

### Maintenance inputs and costs

<table>
<thead>
<tr>
<th>Specify input</th>
<th>Unit</th>
<th>Quantity</th>
<th>Costs per Unit (tenge)</th>
<th>Total costs per input (tenge)</th>
<th>% of costs borne by land users</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labour</td>
<td>person days</td>
<td>8.0</td>
<td>25.0</td>
<td>200.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Equipment</td>
<td>machine hours</td>
<td>64.0</td>
<td>9.375</td>
<td>600.0</td>
<td></td>
</tr>
</tbody>
</table>

**Total costs for maintenance of the Technology**

800.0

**Total costs for maintenance of the Technology in USD**

5.35

### NATURAL ENVIRONMENT

**Average annual rainfall**

- < 250 mm
- 251-500 mm ✓
- 501-750 mm
- 751-1,000 mm
- 1,001-1,500 mm
- 1,501-2,000 mm
- 2,001-3,000 mm
- 3,001-4,000 mm
- > 4,000 mm

**Agro-climatic zone**

- humid ✓
- sub-humid
- semi-arid
- arid

**Specifications on climate**

- Thermal climate class: temperate

**Slope**

- flat (0-2%)
- gentle (3-5%)
- moderate (6-10%)
- rolling (11-15%)
- hilly (16-30%)
- steep (31-60%)
- very steep (>60%)

**Landforms**

- plateau/plains
- ridges
- mountain slopes
- hill slopes
- footslopes
- valley floors

**Altitude**

- 0-100 m a.s.l.
- 101-500 m a.s.l.
- 501-1,000 m a.s.l.
- 1,001-1,500 m a.s.l.
- 1,501-2,000 m a.s.l.
- 2,001-2,500 m a.s.l.
- 2,501-3,000 m a.s.l.
- 3,001-4,000 m a.s.l.
- > 4,000 m a.s.l.

**Technology is applied in**

- convex situations
- concave situations
- not relevant

**Soil depth**

- very shallow (0-20 cm)
- shallow (21-50 cm) ✓
- moderately deep (51-80 cm)
- deep (81-120 cm)
- very deep (>120 cm)

**Soil texture (topsoil)**

- coarse/ light (sandy)
- medium (loamy, silty)
- fine/ heavy (clay)

**Soil texture (> 20 cm below surface)**

- coarse/ light (sandy)
- medium (loamy, silty)
- fine/ heavy (clay)

**Topsoil organic matter content**

- high (>3%)
- medium (1-3%)
- low (<1%)

**Groundwater table**

- on surface
- < 5 m
- 5-50 m
- > 50 m ✓

**Availability of surface water**

- excess
- good ✓
- medium
- poor/ none

**Water quality (untreated)**

- good drinking water
- poor drinking water (treatment required)
- for agricultural use only (irrigation)
- unusable

**Is salinity a problem?**

- Yes
- No

**Occurrence of flooding**

- Yes
- No

**Species diversity**

- high ✓
- medium
- low

**Habitat diversity**

- high ✓
- medium
- low

### CHARACTERISTICS OF LAND USERS APPLYING THE TECHNOLOGY

**Market orientation**

- subsistence (self-supply)
- mixed (subsistence/commercial)
- commercial/ market ✓

**Off-farm income**

- less than 10% of all income ✓
- 10-50% of all income
- > 50% of all income

**Relative level of wealth**

- very poor
- poor ✓
- average
- rich
- very rich

**Level of mechanization**

- manual work
- animal traction
- mechanized/ motorized ✓

**Sedentary or nomadic**

- Sedentary
- Semi-nomadic
- Nomadic

**Individuals or groups**

- individual/ household
- groups/ community
- cooperatives/ community
- employee (company, government)

**Gender**

- women ✓
- men

**Age**

- children
- youth
- middle-aged
- elderly

**Area used per household**

- < 0.5 ha ✓

**Scale**

- small-scale ✓

**Land ownership**

- state

**Land use rights**

- open access (unorganized)

Wocat SLM Technologies

Creation of a perennial grass seed area (CACILM)
### Access to services and infrastructure

<table>
<thead>
<tr>
<th>Service</th>
<th>Poor</th>
<th>Good</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Education</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Markets</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Energy</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Roads and transport</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Drinking water and sanitation</td>
<td>✓</td>
<td>✗</td>
</tr>
<tr>
<td>Financial services</td>
<td>✗</td>
<td>✓</td>
</tr>
</tbody>
</table>

### IMPACTS

#### Socio-economic impacts

<table>
<thead>
<tr>
<th>Impact</th>
<th>Quantity before SLM: 100 kg/hectare</th>
<th>Quantity after SLM: 200 kg/hectare</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fodder production</td>
<td><strong>decreased</strong></td>
<td><strong>increased</strong></td>
</tr>
<tr>
<td>Fodder quality</td>
<td><strong>decreased</strong></td>
<td><strong>increased</strong></td>
</tr>
<tr>
<td>Animal production</td>
<td><strong>decreased</strong></td>
<td><strong>increased</strong></td>
</tr>
<tr>
<td>Risk of production failure</td>
<td><strong>increased</strong></td>
<td><strong>decreased</strong></td>
</tr>
<tr>
<td>Farm income</td>
<td><strong>decreased</strong></td>
<td><strong>increased</strong></td>
</tr>
<tr>
<td>Workload</td>
<td><strong>increased</strong></td>
<td><strong>decreased</strong></td>
</tr>
</tbody>
</table>

#### Socio-cultural impacts

<table>
<thead>
<tr>
<th>Impact</th>
<th>Improved</th>
<th>Strengthened</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food security/ self-sufficiency</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Community institutions</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>SLM/ land degradation knowledge</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Conflict mitigation</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Situation of socially and economically disadvantaged groups (gender, age, status, ethnicity etc.)</td>
<td>✗</td>
<td>✓</td>
</tr>
</tbody>
</table>

#### Ecological impacts

<table>
<thead>
<tr>
<th>Impact</th>
<th>Increased</th>
<th>Decreased</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface runoff</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Evaporation</td>
<td><strong>increased</strong></td>
<td><strong>decreased</strong></td>
</tr>
<tr>
<td>Soil moisture</td>
<td><strong>increased</strong></td>
<td><strong>decreased</strong></td>
</tr>
<tr>
<td>Soil cover</td>
<td><strong>increased</strong></td>
<td><strong>decreased</strong></td>
</tr>
<tr>
<td>Soil loss</td>
<td><strong>increased</strong></td>
<td><strong>decreased</strong></td>
</tr>
<tr>
<td>Soil crusting/ sealing</td>
<td><strong>increased</strong></td>
<td><strong>decreased</strong></td>
</tr>
<tr>
<td>Nutrient cycling/ recharge</td>
<td><strong>increased</strong></td>
<td><strong>decreased</strong></td>
</tr>
<tr>
<td>Soil organic matter/ below ground C</td>
<td><strong>increased</strong></td>
<td><strong>decreased</strong></td>
</tr>
<tr>
<td>Biomass/ above ground C</td>
<td><strong>increased</strong></td>
<td><strong>decreased</strong></td>
</tr>
<tr>
<td>Animal diversity</td>
<td><strong>increased</strong></td>
<td><strong>decreased</strong></td>
</tr>
<tr>
<td>Beneficial species (predators, earthworms, pollinators)</td>
<td><strong>increased</strong></td>
<td><strong>decreased</strong></td>
</tr>
</tbody>
</table>

#### Off-site impacts

<table>
<thead>
<tr>
<th>Impact</th>
<th>Reduced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Damage on neighbours’ fields</td>
<td><strong>reduced</strong></td>
</tr>
<tr>
<td>Damage on public/ private infrastructure</td>
<td><strong>reduced</strong></td>
</tr>
</tbody>
</table>

### COST-BENEFIT ANALYSIS

#### Benefits compared with establishment costs

<table>
<thead>
<tr>
<th>Returns</th>
<th>Very positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short-term</td>
<td>✗</td>
</tr>
<tr>
<td>Long-term</td>
<td>✓</td>
</tr>
</tbody>
</table>

#### Benefits compared with maintenance costs

<table>
<thead>
<tr>
<th>Returns</th>
<th>Very positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short-term</td>
<td>✗</td>
</tr>
<tr>
<td>Long-term</td>
<td>✓</td>
</tr>
</tbody>
</table>

### CLIMATE CHANGE

Gradual climate change

<table>
<thead>
<tr>
<th>Annual temperature increase</th>
<th>Not well at all</th>
<th>Good</th>
<th>Very well</th>
</tr>
</thead>
</table>
Climate-related extremes (disasters)

- local rainstorm
- local windstorm
- drought
- general (river) flood

<table>
<thead>
<tr>
<th>在当地降雨</th>
<th>一点也不好</th>
<th>一般</th>
<th>非常好</th>
</tr>
</thead>
<tbody>
<tr>
<td>风暴</td>
<td>一点也不好</td>
<td>一般</td>
<td>非常好</td>
</tr>
<tr>
<td>干旱</td>
<td>一点也不好</td>
<td>一般</td>
<td>非常好</td>
</tr>
<tr>
<td>洪水</td>
<td>一点也不好</td>
<td>一般</td>
<td>非常好</td>
</tr>
</tbody>
</table>

ADOPTION AND ADAPTATION

Percentage of land users in the area who have adopted the Technology

- single cases/ experimental
  - 1-10%
  - 11-50%
  - > 50%

Of all those who have adopted the Technology, how many have done so without receiving material incentives?

- 0-10%
- 11-50%
- 51-90%
- 91-100%

Has the Technology been modified recently to adapt to changing conditions?

- Yes
- No

To which changing conditions?

- climatic change/ extremes
- changing markets
- labour availability (e.g. due to migration)

CONCLUSIONS AND LESSONS LEARNT

Strengths: land user's view

- The opportunity for additional income
- An improvement in grass quality and forage base, an increase in livestock weight

Strengths: compiler's or other key resource person's view

- Land degradation stopped

How can they be sustained / enhanced? An expansion in the use of the technology and interest of the local population will result in the restoration and greater productivity of a larger area.

- High cost efficiency
- Low-cost technology

How can they be sustained / enhanced? Due to its low initial investment, people will be interested in using the technology

- Complete support by the population and local authorities

Weaknesses/ disadvantages/ risks: land user's view → how to overcome

- In the event of a change in the local administration, people are unsure if the lease will be renewed. → Efforts should be made to renew the lease when it expires

Weaknesses/ disadvantages/ risks: compiler's or other key resource person's view → how to overcome

- After a short-term lease expires, the opportunity for project extension is not clear → Efforts should be made to renew the lease when it expires

REFERENCES

Compiler
Konstantin Pachikin

Reviewer
Alexandra Gavilano
Fabian Ottiger

Date of documentation: Dec. 12, 2011
Last update: Sept. 4, 2019

Resource persons
Toktasyin Bakimbayev - land user
Vladimir Cheranev - SLM specialist

Full description in the WOCAT database

Linked SLM data
Approaches: Rangeland management through the restoration of distant stock-breeding systems and the drastic improvement of rangelands https://qcat.wocat.net/en/wocat/approaches/view/approaches_2455/

Documentation was facilitated by
Institution
- Kazakh Research Institute for Soil Science and Agr (Kazakh Research Institute for Soil Science and Agr) - Kazakhstan
Project
- Central Asian Countries Initiative for Land Management (CACILM I)

Key references
- Содержание и допустимые нормы нагрузки животных на землях населенных пунктов и многолетние травы, используемые для улучшения пастбищ и сенокосов. Серекпаев Н.А., 2010: С. Катон-Карагай / бесплатно