Members of the Rangeland Management Association actively engaged in reseeding local fodder species to restore and sustain the rangeland ecosystem. (Gul Nabi Khan)

Reseeding local fodder species in Bamyan rangelands using indigenous and scientific methods (Afeganistão)

کاشت انواع علوفه جات محلی در علفچرهای بامیان با استفاده از رویشهای های بومی و علمی

DESCRIÇÃO

Artificial reseeding is a key method for restoring degraded rangelands. It involves reintroducing native, palatable fodder species to improve vegetation cover, soil health, and biodiversity. This process boosts forage for grazing animals, stabilizes soil, and helps combat desertification, enhancing ecosystem health and productivity.

The project "Community-based sustainable land and forest management in Afghanistan", implemented by FAO with the financial support of GEF, aims to conserve vegetation cover and ecosystems through introducing community-based sustainable land and forest management (SLM/SFM) practices in rangeland and forest areas within five targeted provinces, including Bamyan. The project introduced an integrated, community-based approach of SLM/SFM in Afghanistan for promoting biodiversity conservation, climate change mitigation, and rangeland productivity.

To enhance rangeland productivity in Bamyan province, artificial reseeding of native, locally adapted, and drought-resistant fodder species plays a vital role in restoring health and productivity of the degraded rangeland ecosystem, improving soil quality, and increasing fodder availability for livestock, which contributed to local livelihoods and environmental resilience.

Communities carefully identify highly vulnerable and degraded rangelands for reseeding initiatives. These include previously rain-fed wheat fields cultivated for human consumption, overgrazed sites, and areas with restricted grazing to support vegetation recovery before reseeding. Attention is also given to areas prone to snow avalanches and flash floods causing landslides and soil erosion, which impact downstream residential areas, irrigation systems, trails, roads, and farmlands. These zones are prioritized and mutually agreed upon for reseeding and restoration efforts.

This reseeding local fodder species technology involves several key activities.

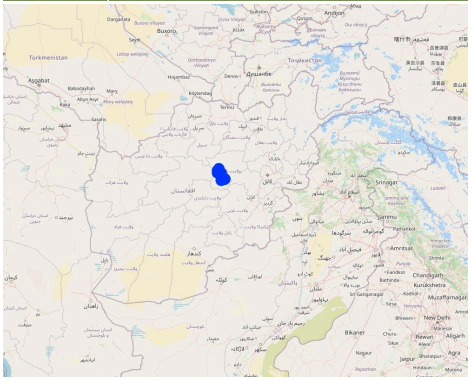
1. Identification of locally adapted drought-resistant and palatable fodder species by livestock owners and land users.
2. Identification of highly producing areas of selected fodder species to collect quality seeds.
3. Defer grazing and delay fodder harvest for the purpose of seed maturity in the targeted area.
4. Awareness raising about the maturity stages of different fodder species seeds: Through project intervention and awareness campaigns, rural residents have gained a better understanding of the seed ripening, collecting, and cultivation stages.
5. Collecting, drying, and storing seed: The fodder species' seeds are collected manually by hand. These fodder species produce longer main stems with inflorescence and spikelets on the top at an average person's breast height. Collected seed is brought to the storing facility and laid out under sunlight for drying. Once seed reaches a certain moisture content, it's stored in a cool and dry place until the day of reseeding under the direct supervision of the rangeland management association (RMA).
6. Season of reseeding local fodder seed: Reseeding activities typically begin in the autumn season, just before the first snowfall. Seeds remain in the soil throughout the winter, allowing them to overcome dormancy and germinate in the spring of the following year. Local fodder species used for reseeding include various Fennel species and other plants traditionally relied upon for winter fodder. These include: Umbelliferae ferulus (Gheghu), Winklera silaifolia (Pali), Prangos sp. (Kami), Ferula sp. (Badran), Rheum spp. (Chukri), and Koeleria cristata (Khola), a shrub locally known as Qarghna.
7.Method of Reseeding: The spacing between seeding pits (with 2–3 seeds per pit) depends on terrain slope, fodder canopy size, and existing vegetation cover. On steeper slopes or with smaller canopies, rows and plants are spaced more closely, and vice versa. Typically, rows are spaced 1–1.5 meters apart, and two plants are placed 40–60 centimeters apart.
Pits about five centimeters deep using a hoe and shovel is dug, then seeds are placed, and the seed is covered with soil and pressed with boots.
Pit spacing is estimated by a person's step length. One person can reseed approximately 3.5 kg of seed per day, and about 15 kg of fodder seed is required per hectare, though, this may vary depending on spacing and seed size.

The seeds are collected using the cash-for-work model. This served (i) to provide income support to poor, vulnerable men and women through short-term employment and (ii) to rehabilitate public assets (rangelands) that are vital for sustaining the livelihoods of livestock rearing. Both men and women-headed vulnerable households benefited from the cash-for-work program of seed collection. More importantly, these fodder species' seeds are fresh, locally adapted, nutritious for livestock (help fatten livestock), available locally, and inexpensive compared to other types of fodder seed. The germination percentage of the seed and growth of the fodder is significantly high in the reseeded area.

Traditionally, rural communities knew that fodder crops grew from seeds; however, the main stems with inflorescences and spikelets were harvested before maturity and used as fuelwood for heating and cooking. Through awareness-raising campaigns and training workshops within the project, farmers were encouraged to leave the main stems intact for seed maturation, allowing for natural seed dispersal and seed collection for reseeding. The success of natural reseeding is limited compared to artificial reseeding due to several factors. In natural reseeding, seeds are often exposed and not covered by soil, making them vulnerable to environmental conditions. Moisture availability may also be insufficient for germination, and existing vegetation can compete with new growth. In contrast, artificial reseeding ensures that seeds are properly covered, protected, and placed in areas with optimal moisture, which increases the likelihood of successful germination and establishment. Recently, the demand for the local fodder seed has dramatically increased because many non-profit organizations and private businesses are purchasing these seeds. It created a new source of income for the rural communities.

The technology combines both traditional knowledge and scientific understanding, contributing to more effective restoration of the degraded rangeland ecosystem, improving soil health, and increasing fodder availability, which benefited rural communities that rely on the ecosystems for their livelihoods and enhanced their resilience.

LOCALIZAÇÃO



Localização: Punjab and Yakawalang districts, Bamyan, Afeganistão

Nº de sites de tecnologia analisados: 10-100 locais

Geo-referência de locais selecionados

- 66.97805, 34.61111
- 66.97783, 34.61121
- 67.01033, 34.61149
- 66.82883, 34.62109
- 66.88161, 34.79239
- 66.99602, 34.6162
- 66.81328, 34.70845
- 66.99691, 34.34084
- 67.15063, 34.36734
- 67.18082, 34.38401
- 67.10792, 34.41338
- 66.9622, 34.58658
- 66.98435, 34.60009
- 66.97794, 34.61083
- 66.97805, 34.61111

Difusão da tecnologia: Aplicado em pontos específicos/concentrado numa pequena área

Em uma área permanentemente protegida?: Não

Data da implementação: 2021

Tipo de introdução

- ☐ atráves de inovação dos usuários da terra
- ☐ Como parte do sistema tradicional (>50 anos)
- ☐ durante experiências/ pesquisa
- ☑ através de projetos/intervenções externas

Collection of local fodder Umbelliferae ferulus (Gheghu) seeds at their maturity stage. (Gul Nabi Khan)

Reseeding process, where 2–3 seeds are carefully placed into each pit. (Gul Nabi Khan)

CLASSIFICAÇÃO DA TECNOLOGIA

Objetivo principal

Uso da terra

- [x] Melhora a produção
- [x] Reduz, previne, recupera a degradação do solo
- [x] Preserva ecossistema
- [ ] Protege uma bacia/zonas a jusante – em combinação com outra tecnologia
- [x] Preservar/melhorar a biodiversidade
- [ ] Reduzir riscos de desastre
- [x] Adaptar a mudanças climáticas/extremos e seus impactos
- [ ] Atenuar a mudanças climáticas e seus impactos
- [ ] Criar impacto econômico benéfico
- [ ] Cria impacto social benéfico

Uso do solo misturado dentro da mesma unidade de terra: Não

Pastagem
- Pastoralismo semi-nômade
- Pastos melhorados
- Direct grazing and remaining fodder is cut for animal feeding

Tipo de animal: gado - lácteo, caprinos, ovelhas
É praticado o manejo integrado de culturas e pecuária? Não
Produtos e serviços: carne, leite, wool

Espécie	Contagem
ovelhas	647703
caprinos	250869
gado - lácteo	165274

Abastecimento de água
- [x] Precipitação natural
- [ ] Misto de precipitação natural-irrigado
- [ ] Irrigação completa

Objetivo relacionado à degradação da terra
- [x] Prevenir degradação do solo
- [ ] Reduzir a degradação do solo
- [x] Recuperar/reabilitar solo severamente degradado
- [ ] Adaptar à degradação do solo
- [ ] Não aplicável

Degradação abordada

Erosão do solo pela água - Wt: Perda do solo superficial/erosão de superfície, Wg: Erosão por ravinas/ravinamento, Wm: movimento de massas/deslizamentos

Degradação biológica - Bc: redução da cobertura vegetal, Bh: perda dos habitats, Bq: quantidade/ declínio da biomassa, Bs: Qualidade e composição de espécies/declínio de diversidade

Grupo de GST
- Reserva (suspensão do uso, apoio à recuperação)
- Gestão de pastoralismo e pastagem
- Solo/cobertura vegetal melhorada
- rangeland restoration

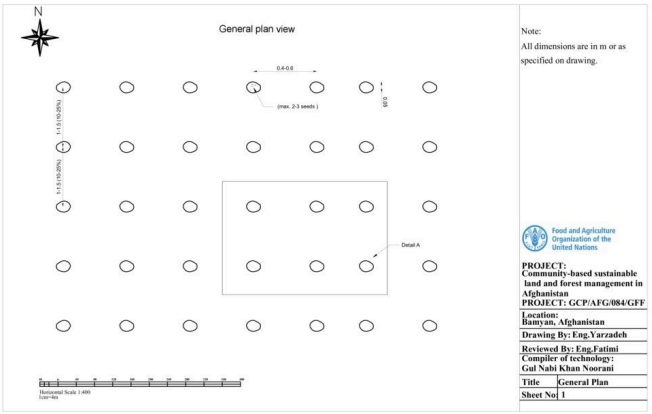
Medidas de GST

Medidas vegetativas - V2: gramíneas e plantas herbáceas perenes

Medidas de gestão - M1: Mudança no tipo de uso da terra

DESENHO TÉCNICO

Especificações técnicas
General specifications of the technology:
1. Local fodder crops, such as species from the Ferula and Prangos genera, are well-suited to semi-arid conditions due to their drought and cold resistance.
2. A moderate slope of 10-25% is ideal for reseeding.
3. On such slopes, the recommended distance between two rows is 1-1.5 meters, while the spacing between two seeding pits should be 0.40-0.60 meters. The spacing between pits can be estimated using a person's step. The depth of each pit should be approximately 0.05 meters.
4.The width of the pit is determined by a single strike with a hoe or mattock.
5. The distance between rows and plants can vary depending on the slope, soil type, vegetation cover, and canopy size of the fodder crop. For steeper slopes or species with small canopies, the spacing between rows and plants should be reduced, and vice versa.
6.Small pits for planting are dug using tools such as hoes or mattocks.
7. 2-3 seeds are placed in each pit.
8. The seeds are covered with soil using a person's foot, boot, or a similar implement.
9. Approximately 15 kilograms of seed are required per hectare for reseeding using this technology.
10. It is important to note that the quantity of seed required per hectare depends on the spacing between rows and plants, as well as the size of the seed.



Author: Ms. Samira Yarzadeh and Mr. Sayed Habibullah Fatimi

ESTABELECIMENTO E MANUTENÇÃO: ATIVIDADES, INSUMOS E CUSTOS

Cálculo de insumos e custos
- Os custos são calculados: por área de tecnologia (tamanho e unidade de área: **539 hectares**)
- Moeda utilizada para o cálculo de custos: **AFN**
- Taxa de câmbio (para USD): 1 USD = 69.0 AFN
- Custo salarial médio da mão-de-obra contratada por dia: 350 AFN

Fatores mais importantes que afetam os custos
The most important factors affecting the costs are the seed of local fodder types and their availability during the growing season, as well as the cost of rangers patrolling the technology area.

Atividades de implantação
1. Identification of locally adapted drought-resistant and palatable fodder species by livestock owners and land users. (Periodicidade/frequência: April and May)
2. Identification of highly producing areas of selected fodder species for seed collection. (Periodicidade/frequência: June and July)
3. Deferring grazing and delaying fodder harvest for the purpose of seed maturity in the targeted area. (Periodicidade/frequência: June, July, August and September)
4. Awareness raising about the maturity stages of different fodder species seeds: (Periodicidade/frequência: August and September)
5. Collecting, drying, and storing seed (Periodicidade/frequência: September)
6. Identifying sites for reseeding (Periodicidade/frequência: September)
7. Mobilization of community members for reseeding campaign (Periodicidade/frequência: September and October)
8. Reseeding: Transporting seed and agricultural tools to the area, preparation of field, digging planting pits, reseeding and covering the seed. (Periodicidade/frequência: October and November)
9. Controlling grazing in the next growing season (Periodicidade/frequência: April, May, June, July (following year))

Estabelecer insumos e custos (per 539 hectares)

Especifique a entrada	Unidade	Quantidade	Custos por unidade (AFN)	Custos totais por entrada (AFN)	% dos custos arcados pelos usuários da terra
Mão-de-obra					
Collecting of local fodder seed (Kami, Ghegho, Chukri, Khola, Badra, Qarghana)	person-days	5,0	350,0	1750,0	
Drying and storing of local fodder seed	person-days	3,0	350,0	1050,0	
Reseeding of local fodder seed in rangeland	person-days	8,0	350,0	2800,0	100,0
Equipamento					
Pit digging equipment i.e., shovel, hoe, pick mattock	no.	5,0	250,0	1250,0	100,0
Plastic bags for collecting seed (reusable)	pieces	3,0	20,0	60,0	100,0
Custos totais para a implantação da tecnologia				**6'910.0**	
Custos totais para o estabelecimento da Tecnologia em USD				*100.14*	

Atividades de manutenção
1. Control grazing and fodder harvesting (Periodicidade/frequência: 12 months/ annually)
2. Restrict cutting perennial shrubs for forage, firewood and their uprooting (Periodicidade/frequência: 12 months/ annually)
3. Reseeding is done in the pits where there was no germination. (Periodicidade/frequência: Growing season/ once a year)
4. Conduct workshops and awareness raising for herders on SLM. (Periodicidade/frequência: Growing season/ twice a year)

Insumos e custos de manutenção (per 539 hectares)

Especifique a entrada	Unidade	Quantidade	Custos por unidade (AFN)	Custos totais por entrada (AFN)	% dos custos arcados pelos usuários da terra
Mão-de-obra					

Community members, acting as rangers, patrol the area to control grazing, fodder collection, and shrub harvesting	person-day	240,0	200,0	48000,0	100,0
Reseeding of pits where there was no germination.	person-day	2,0	350,0	700,0	100,0
Conduct awareness raising for herders on SLM.	no.	3,0	3000,0	9000,0	
Custos totais para a manutenção da tecnologia				**57'700.0**	
Custos totais de manutenção da Tecnologia em USD				*836.23*	

AMBIENTE NATURAL

Média pluviométrica anual
- [x] <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

Zona agroclimática
- [ ] úmido
- [ ] Subúmido
- [x] Semiárido
- [ ] Árido

Especificações sobre o clima

Pluviosidade média anual em mm: 150.0
The average annual rainfall in Bamyan, Afghanistan, is relatively low, as the region is characterized by a semi-arid to arid climate. On average it is around 100–150 mm annually.
Most of the precipitation occurs during the spring season (March to May) and occasionally in the early summer. Snowfall is common in the winter months due to Bamyan's high elevation (about 2,500-3,000 meters above sea level), contributing to water availability through snowmelt in spring and summer seasons.
Nome da estação meteorológica: World weather online
The mean annual temperature in Bamyan varies around 6–8°C (43–46°F). The region experiences a wide temperature range throughout the year due to its high-altitude and semi-arid climate. Bamyan winters are very cold and snowy, while summers are hot and dry.
Winter (December–February): Extremely cold, with average temperatures ranging from -10°C to -15°C (14°F to 5°F). Nights can be even colder, with temperatures dropping below -30°C (-4°F).
Summer (June–August): Relatively mild, with average daytime temperatures around 20–25°C (68–77°F). Nights remain cool due to the high altitude.
Spring and Autumn: Transition seasons with moderate temperatures, ranging from 5–15°C (41–59°F).

Inclinação
- [ ] Plano (0-2%)
- [ ] Suave ondulado (3-5%)
- [x] Ondulado (6-10%)
- [ ] Moderadamente ondulado (11-15%)
- [x] Forte ondulado (16-30%)
- [ ] Montanhoso (31-60%)
- [ ] Escarpado (>60%)

Formas de relevo
- [x] Planalto/planície
- [ ] Cumes
- [x] Encosta de serra
- [ ] Encosta de morro
- [ ] Sopés
- [ ] Fundos de vale

Altitude
- [ ] 0-100 m s.n.m.
- [ ] 101-500 m s.n.m.
- [ ] 501-1.000 m s.n.m.
- [ ] 1.001-1.500 m s.n.m.
- [ ] 1.501-2.000 m s.n.m.
- [ ] 2.001-2.500 m s.n.m.
- [x] 2.501-3.000 m s.n.m.
- [x] 3.001-4.000 m s.n.m.
- [ ] > 4.000 m s.n.m.

A tecnologia é aplicada em
- [ ] Posições convexas
- [ ] Posições côncavas
- [x] Não relevante

Profundidade do solo
- [x] Muito raso (0-20 cm)
- [x] Raso (21-50 cm)
- [ ] Moderadamente profundo (51-80 cm)
- [ ] Profundo (81-120 cm)
- [ ] Muito profundo (>120 cm)

Textura do solo (superficial)
- [x] Grosso/fino (arenoso)
- [x] Médio (limoso, siltoso)
- [ ] Fino/pesado (argila)

Textura do solo (>20 cm abaixo da superfície)
- [x] Grosso/fino (arenoso)
- [x] Médio (limoso, siltoso)
- [ ] Fino/pesado (argila)

Teor de matéria orgânica do solo superior
- [ ] Alto (>3%)
- [x] Médio (1-3%)
- [x] Baixo (<1%)

Lençol freático
- [ ] Na superfície
- [ ] < 5 m
- [x] 5-50 m
- [ ] > 50 m

Disponibilidade de água de superfície
- [ ] Excesso
- [x] Bom
- [ ] Médio
- [ ] Precário/nenhum

Qualidade da água (não tratada)
- [x] Água potável boa
- [ ] Água potável precária (tratamento necessário)
- [ ] apenas para uso agrícola (irrigação)
- [ ] Inutilizável

A qualidade da água refere-se a: águas subterrâneas

A salinidade é um problema?
- [ ] Sim
- [x] Não

Ocorrência de enchentes
- [ ] Sim
- [x] Não

Diversidade de espécies
- [ ] Alto
- [x] Médio
- [ ] Baixo

Diversidade de habitat
- [ ] Alto
- [x] Médio
- [ ] Baixo

CARACTERÍSTICAS DOS USUÁRIOS DA TERRA QUE UTILIZAM A TECNOLOGIA

Orientação de mercado
- [x] Subsistência (autoabastecimento)
- [x] misto (subsistência/comercial)
- [ ] Comercial/mercado

Rendimento não agrícola
- [x] Menos de 10% de toda renda
- [ ] 10-50% de toda renda
- [ ] >50% de toda renda

Nível relativo de riqueza
- [ ] Muito pobre
- [x] Pobre
- [ ] Média
- [ ] Rico
- [ ] Muito rico

Nível de mecanização
- [ ] Trabalho manual
- [x] Tração animal
- [ ] Mecanizado/motorizado

Sedentário ou nômade
- [x] Sedentário
- [x] Semi-nômade
- [ ] Nômade

Indivíduos ou grupos
- [ ] Indivíduo/unidade familiar
- [x] Grupos/comunidade
- [ ] Cooperativa
- [ ] Empregado (empresa, governo)

Gênero
- [x] Mulheres
- [x] Homens

Idade
- [ ] Crianças
- [x] Jovens
- [x] meia-idade
- [ ] idosos

Área utilizada por residência
- [ ] < 0,5 ha
- [ ] 0,5-1 ha
- [ ] 1-2 ha
- [ ] 2-5 ha
- [ ] 5-15 ha
- [ ] 15-50 ha
- [ ] 50-100 ha
- [x] 100-500 ha
- [ ] 500-1.000 ha
- [ ] 1.000-10.000 ha
- [ ] > 10.000 ha

Escala
- [ ] Pequena escala
- [x] Média escala
- [ ] Grande escala

Propriedade da terra
- [ ] Estado
- [ ] Empresa
- [x] Comunitário/rural
- [ ] Grupo
- [ ] Indivíduo, não intitulado
- [ ] Indivíduo, intitulado

Direitos do uso da terra
- [ ] Acesso livre (não organizado)
- [x] Comunitário (organizado)
- [ ] Arrendado
- [ ] Indivíduo

Direitos do uso da água
- [ ] Acesso livre (não organizado)
- [x] Comunitário (organizado)
- [ ] Arrendado
- [x] Indivíduo

Acesso a serviços e infraestrutura

Saúde	Pobre ✓ Bom
Educação	Pobre ✓ Bom
Assistência técnica	Pobre ✓ Bom
Emprego (p. ex. não agrícola)	Pobre ✓ Bom
Mercados	Pobre ✓ Bom
Energia	Pobre ✓ Bom
Vias e transporte	Pobre ✓ Bom
Água potável e saneamento	Pobre ✓ Bom
Serviços financeiros	Pobre ✓ Bom

Comentários

Access to services and infrastructure in Bamyan is limited due to its remote location and mountainous terrain. Basic services such as healthcare, education, and clean water are available but often insufficient, particularly in rural areas. Infrastructure like roads and electricity is underdeveloped.

IMPACTOS

Impactos socioeconômicos

Produção de forragens

diminuído ✓ aumentado

Quantidade anterior à GST: 560 Kg/hectare
Quantidade posterior à GST: 1050 kg/hectare
The fodder production per hectare in Bamyan's rangelands varies significantly based on land conditions and management practices. In rehabilitated rangelands, such as those supported by FAO-GEF projects, forage production enhanced through reseeding and rotational grazing strategies.

Produção animal

diminuído ✓ aumentado

Quantidade anterior à GST: 6 litters milk/cow/day
Quantidade posterior à GST: 12 litters milk/cow/day
The integration of indigenous and scientific fodder production techniques (reseeding of local fodder) and availability of nutritious fodder has boosted both health and livestock productivity sustainably.

Área de produção (nova terra sob cultivo/uso)

diminuído ✓ aumentado

Quantidade anterior à GST: 0
Quantidade posterior à GST: 539 hectares
The fodder producing area has been increased from zero to hunderd hectares of rangeland.

Disponibilidade de água potável

diminuído ✓ aumentado

Quantidade anterior à GST: 5 liters/minute (discharge of spring)
Quantidade posterior à GST: 11 liters/minute (discharge of spring)
Reseeding and improving vegetation cover on rangelands significantly enhanced the infiltration of rainfall and snowmelt, ultimately benefiting underground water reserves and increasing the availability of animal drinking points, irrigation water and drinking water sources such as spring.

Disponibilidade de água para criação de animais

diminuído ✓ aumentado

Disponibilidade de água para irrigação

diminuído ✓ aumentado

Diversidade de fontes de rendimento

diminuído ✓ aumentado

Quantidade anterior à GST: Potato cultivation and Livestock
Quantidade posterior à GST: Potato cultivation, livestock and seed collection
RMA members now harvest fodder seeds once they reach maturity and sell them in the market, contributing to both local livelihoods (income) and the sustainability of rangeland management.

Impactos socioculturais

Instituições comunitárias

Enfraquecido ✓ Fortalecido

Quantidade anterior à GST: Zero community institution
Quantidade posterior à GST: 7 rangeland management associations (RMAs)
The community institutions in the area are primarily organized as Rangeland Management Associations (RMAs).

Conhecimento de GST/ degradação da terra

Reduzido ✓ Melhorado

Quantidade anterior à GST: Zero capacity building workshop
Quantidade posterior à GST: Capacity of 10,000 RMA's member build.
The capacity of RMA members is enhanced through training, community-based workshops, and awareness-raising initiatives focused on Sustainable Land Management (SLM) and Sustainable Forest Management (SFM).

Atenuação de conflitos

Agravado ✓ Melhorado

Quantidade anterior à GST: 4 conflicts / village/year
Quantidade posterior à GST: 0 conflicts/village/year
Increasing the quantity and availability of water and fodder helps reduce conflicts by addressing resource scarcity, which is often a source of tension. When communities have enough access to these essential resources, competition decreases, and cooperation can grow.

Impactos ecológicos

Cobertura do solo

Reduzido ✓ Melhorado

Quantidade anterior à GST: 30-40%
Quantidade posterior à GST: 70-80%
Reseeding improves soil cover, protecting it from erosion, stabilizing the soil, enhancing water retention, and restoring nutrients. This supports ecosystem recovery and promotes healthier soils and sustainable land use.

Perda de solo

aumentado ✓ diminuído

Quantidade anterior à GST: 40-50%
Quantidade posterior à GST: 0
Soil loss varies depending on topography, land use, and management practices. Soil loss rates typically range between 2.2 to 38 tons per hectare per year (t/ha/year), depending on slope steepness and vegetation cover. Higher rates are observed in areas with steep terrain and minimal vegetation, while conservation practices can reduce these rates significantly.

Cobertura vegetal

diminuído ✓ aumentado

Quantidade anterior à GST: 30-40%
Quantidade posterior à GST: 70-80%
Reseeding improved vegetation coverage by introducing new plant seeds to degraded areas, promoting their regrowth and restoring ecosystems.

Biomassa/carbono acima do solo

diminuído ✓ aumentado

Quantidade anterior à GST: 0.2-2 Ton/hectare
Quantidade posterior à GST: 4-5 ton/hectare
Reseeding local fodder seeds in rangelands enhances aboveground biomass carbon by increasing vegetation growth, which sequesters more carbon.

Diversidade vegetal

diminuído ✓ aumentado

Quantidade anterior à GST: 5-15 species/species/square meter
Quantidade posterior à GST: 15-25 species/species/square meter
Plant diversity is relatively high, featuring a variety of native grasses, shrubs, and medicinal plants adapted to the region's arid and semi-arid conditions. The plant diversity can vary widely depending on factors like altitude, grazing pressure, and management practices.

Espécies benéficas (predadores, minhocas, polinizadores)

diminuído ✓ aumentado

Quantidade anterior à GST: 0
Quantidade posterior à GST: 2-5 species/ technology area
Bees and birds

Impactos da inundação

aumentado ✓ diminuído

Quantidade anterior à GST: 2-3 floods / year
Quantidade posterior à GST: 0 floods/year
Reseeding reduces flooding by establishing vegetation cover that stabilizes the soil, enhances water infiltration, and slows surface runoff, thus decreasing the volume and velocity of water that can lead to floods.

Deslizamentos de terra/fluxos de escombros

aumentado ✓ diminuído

Quantidade anterior à GST: 50,000 m3/winter season
Quantidade posterior à GST: 5000 m3/winter season
Reseeding helps reduce landslides by promoting the growth of vegetation. The roots bind soil particles together, increasing slope stability and reducing soil erosion caused by water runoff and snow fall.

Impactos da seca

aumentado ✓ diminuído

Quantidade anterior à GST: 560 Kg/hectare (fodder yield)
Quantidade posterior à GST: 1050 kg/hectare (fodder yield)
Reseeding of different fodder species enhances soil moisture retention, reduces surface evaporation, and improves water infiltration.

Impactos fora do local

disponibilidade de água (lençóis freáticos, nascentes)

diminuído ✓ aumentado

Quantidade anterior à GST: 5 liters/minute (discharge of spring)
Quantidade posterior à GST: 11 liters/minute (discharge of spring)
Reseeding and improving vegetation cover enhanced the infiltration of rainfall and snowmelt, ultimately benefiting ground water recharge and increasing water availability: animal drinking points, irrigation water and drinking water sources such as springs.

Cheias de jusante (indesejada)

aumentado ✓ Reduzido

Quantidade anterior à GST: 2-3 floods/year
Quantidade posterior à GST: 0 floods/year
Vegetation cover stabilizes the soil, enhances water infiltration, and slows surface runoff, thus decreasing the volume and velocity of water that can lead downstream floodsing and damage.

Sedimentação a jusante

aumentado ✓ diminuído

Quantidade anterior à GST: 2-3 floods/year
Quantidade posterior à GST: 0 floods/year
Reseeding helps reduce downstream siltation and river water pollution by stabilizing the soil, preventing erosion, and promoting the growth of vegetation that intercepts and filters runoff.

Capacidade de tamponamento/filtragem (pelo solo, vegetação, zonas úmidas)

Reduzido ✓ Melhorado

Reseeding helped increase buffering and filtering capacity by reintroducing vegetation that acts as a natural barrier against pollutants and runoff. The plant roots stabilize the soil, reducing erosion, while the vegetation cover slows water movement, allowing it to infiltrate the ground.

Danos em áreas vizinhas

aumentado ✓ Reduzido

Quantidade anterior à GST: 2-3 floods/year
Quantidade posterior à GST: 0 floods/year
Reseeding and better soil cover helped reduce flash flood damage to neighboring agricultural fields downstream.

Impacto dos gases de efeito estufa

aumentado — Reduzido

Quantidade anterior à GST: 0.5-2 tons of sequestered CO_2/ hectare annually
Quantidade posterior à GST: 3-4 tons of sequestered CO_2/ hectare annually
Reseeding reduces greenhouse gases by enhancing carbon sequestration in plants and soil, while also minimizing emissions of nitrous oxide and methane from degraded areas.

ANÁLISE DO CUSTO-BENEFÍCIO

Benefícios em relação aos custos de estabelecimento

Retornos a curto prazo — muito negativo ... muito positivo
Retornos a longo prazo — muito negativo ... muito positivo

Benefícios em relação aos custos de manutenção

Retornos a curto prazo — muito negativo ... muito positivo
Retornos a longo prazo — muito negativo ... muito positivo

Reseeding Bamyan rangelands requires investment in seeds, labor, and maintenance, but provides long-term benefits like better vegetation, soil stability, and carbon sequestration. It improves grazing, reduces flood and erosion risks, and helps mitigate climate impacts. The ecological and economic gains outweigh the initial costs.

MUDANÇA CLIMÁTICA

Mudança climática gradual

Temperatura anual redução/diminuição — não bem em absoluto ... muito bem
Precipitação pluviométrica anual aumento — não bem em absoluto ... muito bem

Extremos (desastres) relacionados ao clima

Seca — não bem em absoluto ... muito bem
Inundação súbita — não bem em absoluto ... muito bem
Deslizamento de terra — não bem em absoluto ... muito bem
avalanche — não bem em absoluto ... muito bem

ADOÇÃO E ADAPTAÇÃO

Porcentagem de usuários de terras na área que adotaram a Tecnologia

- [ ] casos isolados/experimental
- [ ] 1-10%
- [x] 11-50%
- [ ] > 50%

De todos aqueles que adotaram a Tecnologia, quantos o fizeram sem receber incentivos materiais?

- [x] 0-10%
- [ ] 11-50%
- [ ] 51-90%
- [ ] 91-100%

A tecnologia foi recentemente modificada para adaptar-se as condições variáveis?

- [ ] Sim
- [x] Não

A quais condições de mudança?

- [ ] Mudança climática/extremo
- [ ] Mercados dinâmicos
- [ ] Disponibilidade de mão-de-obra (p. ex. devido à migração)

CONCLUSÕES E EXPERIÊNCIAS ADQUIRIDAS

Pontos fortes: visão do usuário de terra

- Enhances the availability of high-quality forage, leading to better livestock health and productivity.
- Restores degraded land which increasing grazing rangeland area.
- Alternative source of income through temporary employment.
- It's easy to adopt and many pastoral communities have already replicated.
- It requires locally available seeds, labor, and traditional knowledge, making it cost-effective and practical for communities to implement.
- Community members choose palatable, nutritious and drought resistant fodder species which enhance their livestock production.

Pontos fortes: a visão do/a compilador/a ou de outra pessoa capacitada

- Reseeded areas help control soil erosion and improve soil fertility through vegetation cover.
- Improved biodiversity through the reintroduction of native species.
- Reseeding supports carbon sequestration and contributes to climate resilience and adaptation.
- The technology involved local communities which ensures better understanding, ownership, replication and sustainability of the process.
- Local or indigenous species used in reseeding are well-adapted to local conditions, increasing the likelihood of successful germination and growth.
- Through training and awareness raising, now community members are allowing fodder to grow until seeds are fully mature. This ensures effective seed production (collection) and natural dispersal, aiding in rangeland regeneration and biodiversity improvement.
- Alternative income through employment in local fodder seed collection and sales.

Pontos fracos/desvantagens/riscos: visão do usuário de terracomo superar

- Reseeding requires an initial investment in establishing a rangeland management association, seeds and labor. By establishing RMA and mobilizing community members to contribute and seek funding from governments, NGOs, or international organizations.
- Control grazing: Livestock grazing in reseeded areas can damage young plants, reducing effectiveness. Require an agreement with community to control grazing in the area. Also, implement rotational grazing systems and fencing to protect reseeded areas until vegetation is established.
- Benefits from reseeding take time to return, potentially discouraging land users seeking quick results. Identify alternative grazing area. Provide short-term solution of supplemental feed to address immediate needs.

Pontos fracos/desvantagens/riscos: a visão do/a compilador/a ou de outra pessoa capacitadacomo superar

- Implementing reseeding may limit access to grazing lands temporarily, potentially causing disputes among land users, especially in areas with shared resources. Through agreement of all land users.
- Reseeding success is highly dependent on favorable weather conditions. Drought or erratic rainfall can lead to poor germination and growth. Explore the potential to integrate rainwater harvesting structures in future reseeding activities

REFERÊNCIAS

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Members The RMA - usuário de terra

Descrição completa no banco de dados do WOCAT
https://qcat.wocat.net/pt/wocat/technologies/view/technologies_7402/
Vídeo: https://player.vimeo.com/video/1030696467

Dados GST vinculados
n.a.

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Links para informação relevante que está disponível online

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