Terraced plot in Sari Joy (Mia Jan Maroofi)

Terraces with improved seed and fertilizer application (Afganistán)

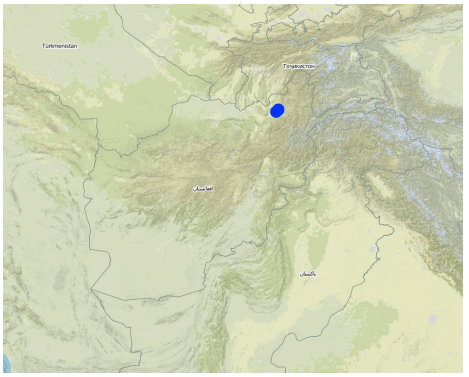
Palbandi bo tukhmihoi behbudyofta va kud

DESCRIPCIÓN

Terraces are established on mountain slopes used mainly for cropping wheat, with the purpose of soil protection from erosion, preserving runoff, sediments and nutrients on-site. Improved seeds and fertilizer are applied on the terraces for increasing crop yield, but also vegetation cover and biomass production, and thus prevent further land degradation.

Project supported implementation of terraces with application of improved seeds and fertilizer has taken place in the villages Sari Joy, Jawaz Khana and Dashti Mirzai, located in Chokar watershed of Rustaq District in Northern Afghanistan. The Chokar watershed is a mountainous area situated between 600 - 2,500 m above sea level. The climate is semi-arid with harsh and cold weather in winter and hot and dry summers. The annual precipitation in average years is 580mm. Land degradation affects all forms of land use and includes low vegetation cover, heavy top soil erosion from water, and poor soil fertility. Unsustainable agricultural practices, over-exploitation and high pressure on the natural resources are adversely impacting on the socio-economic well-being of local communities as well as contributing to the risk for being adversely affected by drought as well as landslides and flash floods triggered by heavy rainfall.
The data used for the documentation of the technology is based on field research conducted in Chokar watershed, namely in the villages: Sari Joy, Jawaz Khana and Dashti Mirzai. These villages represent the upper, the middle and the lower zone of Chokar watershed, respectively. They differ considerably in access to services and infrastructure, but in general are poorly served. The communities depend mainly on land resources for sustaining their livelihoods. In a good year with high yields, wheat-self-sufficiency lasts about 5 months.
Since 2012 the Livelihood Improvement Project Takhar (LIPT) implemented by Terre des hommes (Tdh) Switzerland has initiated a range of NRM interventions. The project introduced terraces as sustainable land management practices on private plots, situated on rolling (11-15%) and hilly (16-30%) slopes to protect the land from soil erosion and prevent the loss of water and fertile topsoil, seeds and fertilizers. The average plot size for terrace implementation is 2 Jerib (0.4 hectares) with contour strips of 40m x 4m. The height of the risers is 1m-1,5 m. Terrace benches are built along the contour by moving the soil above the bench downwards. The leveled benches of the terrace are cultivated with wheat. The risers of the terrace are mostly used for growing fodder crops, mostly alfalfa, which also helps to stabilize the terrace. If medicinal herbs (ferula) are included they are cultivated along the bench contours .
Maintenance activities include small repair work on the riser by adding some amount of soil and re-sowing of alfalfa seeds on those spots.
The terraces allow application of improved seeds and fertilizers without them being washed off. The land-users report noticeable increase of wheat yield from the terraced plot with application of improved seeds and fertilizer compared to the non-terraced plot. An average plot of 0.2 ha on non-terraced hilly cropland used to give about 70 kg of wheat (350kg/ha). On terraces the yield has increased/ doubled to 140 kg on the same plot area (700kg/ha). The expectations regarding terraces remain high as over the time the land user hope their land will become more stable and improved soil moisture and fertility will have positive impact on the productivity as well. However, so far no cost-benefit assessment has been conducted allowing attribution of individual measure to the wheat increase.
Many land users are interested in the terrace technology due to a number of environmental and economic benefits expected, however the costs for building the terrace are considered high by an average local land user. They have to rely on external support in order to have sufficient resources for implementation. Women considered an advantage that during the establishment phase, men were paid by the project to work on their own land (or other villagers land) when building the terraces. Thus, there was no need for men to go for seasonal labour migration and they stayed at home.

LUGAR



Lugar: Chokar Watershed: Sari Joy (upper watershed), Jawaz Khana (middle watershed), Dashti Mirzai (lower watershed), Takhar Province, Rustaq District, Afganistán

No. de sitios de Tecnología analizados: 10-100 sitios

Georreferencia de sitios seleccionados

- 69.85151, 36.99307
- 69.8559, 36.99288
- 69.85908, 36.98401
- 69.85951, 37.00393
- 69.86123, 36.99128
- 69.73747, 36.91176
- 69.72755, 36.91261
- 69.72692, 36.91439
- 69.84418, 37.00255
- 69.84744, 36.99752
- 69.72682, 36.91757
- 69.85151, 36.99307
- 69.71925, 36.90521
- 69.73147, 36.90648
- 69.72571, 36.9058
- 69.72609, 36.90644
- 69.71959, 36.90681
- 69.7314, 36.90869
- 69.73793, 36.90923

Difusión de la Tecnología: distribuida parejamente sobre un área (approx. 0.1-1 km2)

¿En un área de protección permanente?:

Fecha de la implementación: hace menos de 10 años (recientemente)

Tipo de introducción

- [ ] mediante la innovación de usuarios de tierras
- [ ] como parte de un sistema tradicional (> 50 años)
- [ ] durante experimentos/ investigación
- [x] mediante proyectos/ intervenciones externas

Establishment works on the terraces in Sari Joy village (Mia Jan Maroofi)

Completed terraces in Sari Joy Village (Mia Jan Maroofi)

CLASIFICACIÓN DE LA TECNOLOGÍA

Propósito principal

- [x] mejorar la producción
- [x] reducir, prevenir, restaurar la degradación de la tierra
- [ ] conservar el ecosistema
- [ ] proteger una cuenca hidrográfica/ áreas corriente abajo – en combinación con otras Tecnologías
- [ ] preservar/ mejorar biodiversidad
- [ ] reducir el riesgo de desastres naturales
- [ ] adaptarse al cambio climático/ extremos climáticos y sus impactos
- [ ] mitigar cambio climático y sus impactos
- [ ] crear impacto económico benéfico
- [ ] crear impacto social benéfico

Uso de tierra

Tierras cultivadas

- Cosecha anual
- Cultivos perennes (no leñosos)

Número de temporadas de cultivo por año: 1

Provisión de agua

- [x] de secano
- [ ] mixta de secano – irrigada
- [ ] totalmente irrigada

Propósito relacionado a la degradación de las tierras

- [ ] prevenir la degradación de la tierra
- [x] reducir la degradación de la tierra
- [x] restaurar/ rehabilitar tierra severamente degradada
- [ ] adaptarse a la degradación de la tierra
- [ ] no aplica

La degradación considerada

erosión de suelos por agua - Wt: pérdida de capa arable/ erosión de la superficie , Wg: erosión en cárcavas, Wo: efectos de degradación fuera del sitio

deterioro físico del suelo - Pi: sellado de suelo

degradación biológica - Bc: reducción de la cobertura vegetal del suelo , Bq: reducción de la cantidad/ biomasa

degradación del agua -

Grupo MST

- medida de pendiente transversal

Medidas MST

medidas agronómicas - A2: materia orgánica/ fertilidad del suelo

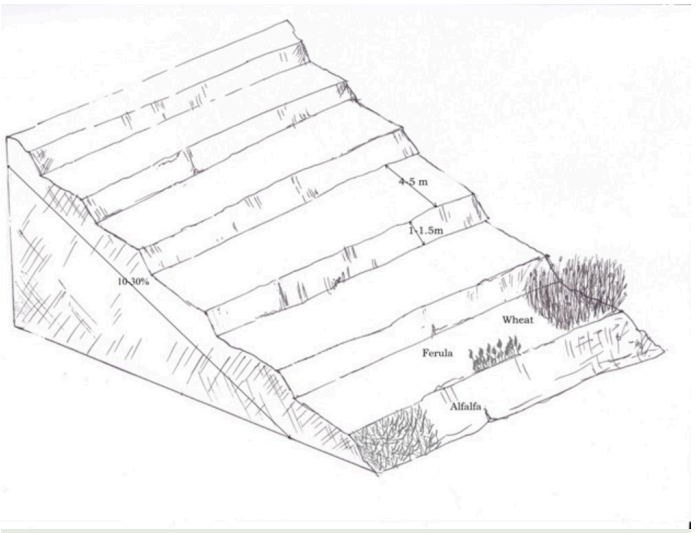
medidas vegetativas - V2: Pastos y plantas herbáceas perennes

medidas estructurales - S1: Terrazas

DIBUJO TÉCNICO

Especificaciones técnicas

Terraces are established predominantly on a privately owned land in a mountainous landscape with varying steepness of slopes.
The average size of a plot is 2 Jerib, which is equal to 0.4 ha. The design of the terrace depends on the steepness of the slope. Mostly rolling (11-15%) and hilly (16-30%) slopes are used for building terraces.
Using an A-frame, the terrace is designed by dividing the slope into contour strips. Depending on the slope steepness, the terrace bench is around 4m wide and the the height of the risers is 1m-1,5 m. The terrace benches are built along the contour by moving the soil of upper bench to the lower bench. The leveled benches of the terrace are cultivated with wheat. The risers of the terrace are mostly used for growing fodder crops, such as alfalfa, which also helps to stabilize the terrace. If medicinal herbs are included, such as ferula, they are cultivated along the bench contours.



Author: Aslam Qadamov

ESTABLECIMIENTO/ MANTENIMIENTO: ACTIVIDADES, INSUMOS Y COSTOS

Cálculo de insumos y costos

- Los costos se calculan: por área de Tecnología (unidad de tamaño y área: **1 ha**)
- Moneda usada para calcular costos: **USD**
- Tasa de cambio (a USD): 1 USD = 67.0
- Costo promedio por día del sueldo de la mano de obra contratada: 5.2-5.3 USD

Factores más determinantes que afectan los costos

Due to the remoteness of the villages where the Technology has been implemented, all the inputs for establishment, such as agricultural equipment, plant material, fertilizers, etc., are purchased in Rustaq town. The expenses for traveling and delivering the inputs affect the establishment costs.

Actividades de establecimiento

1. Selection of the area for establishing a terrace (Men) (Momento/ frequencia: Autumn)
2. Designing of the terrace using A-frame, assisted by trained technician/project staff (Men) (Momento/ frequencia: End of autumn after rainy days)
3. Leveling the soil with a shovel (Men) (Momento/ frequencia: Autumn/Winter)
4. Sowing of alfalfa seeds on the risers (Men/women) (Momento/ frequencia: After 20 days of sowing wheat)
5. Sowing of wheat seeds on benches (Men/Women) (Momento/ frequencia: Winter/Spring)
6. Sowing of ferula along the contours (Men/women) (Momento/ frequencia: Winter/Spring)

Insumos y costos para establecimiento (per 1 ha)

Especifique insumo	Unidad	Cantidad	Costos por unidad (USD)	Costos totales por insumo (USD)	% de los costos cubiertos por los usuarios de las tierras
Mano de obra					
Designing of the terrace using A-frame	person-day	10,0	9,0	90,0	
Leveling the soil with a shovel	person-day	150,0	5,3	795,0	51,0
Sowing of wheat and alfalfa seeds	person-day	10,0	5,3	53,0	51,0
Sowing of ferula	person-day	2,0	5,3	10,6	100,0
Equipo					
Pick axe	Pcs	1,0	3,0	3,0	100,0
Pitchfork	Pcs	1,0	5,3	5,3	100,0
Wheel barrow	Pcs	1,0	38,0	38,0	100,0
Shovel	Pcs	1,0	3,8	3,8	
Hoe	Pcs	1,0	7,5	7,5	
A-Frame	Pcs	1,0	6,0	6,0	
Material para plantas					
Wheat seeds	Kg	140,0	0,42	58,8	
Alfalfa seeds	Kg	17,5	0,42	7,35	100,0
Ferula seeds	Kg	2,5	6,35	15,88	100,0
Fertilizantes y biocidas					
DAP	Kg	125,0	0,9	112,5	
Urea	Kg	125,0	0,45	56,25	
Herbicide	Liter	50,0	0,25	12,5	
Costos totales para establecer la Tecnología				**1'275.48**	
Costos totales para establecer la Tecnología en USD				*19.04*	

Actividades de mantenimiento

1. Ploughing the land with animal traction (Men) (Momento/ frequencia: Winter/Spring/Annually)
2. Sowing of wheat seeds on benches (Men/Women) (Momento/ frequencia: Winter/Spring/Annually)
3. Application of fertilizer (Men/Women) (Momento/ frequencia: Fall)
4. Weeding (Women) (Momento/ frequencia: Summer)
5. Harvesting wheat (Men and women together) (Momento/ frequencia: Summer/Fall)
6. Harvesting alfalfa (Men and women together) (Momento/ frequencia: Summer/Fall)
7. Collecting and delivering harvested wheat (Men and women) (Momento/ frequencia: Fall)
8. Collecting and delivering harvested alfalfa (Men and women) (Momento/ frequencia: Fall)
9. Repairing terrace risers with a shovel (Men) (Momento/ frequencia: Winter/Spring/After heavy rain or snow)
10. Sowing alfalfa seeds on the repaired area (Men/Women) (Momento/ frequencia: Winter/Spring/When required)

Insumos y costos de mantenimiento (per 1 ha)

Especifique insumo	Unidad	Cantidad	Costos por unidad (USD)	Costos totales por insumo (USD)	% de los costos cubiertos por los usuarios de las tierras

Mano de obra					
Ploughing the land with animal traction	person day	2,5	5,3	13,25	100,0
Sowing of wheat seeds on benches	person day	5,0	5,3	26,5	100,0
Weeding and Fertilizer application	person day	5,0	5,3	26,5	100,0
Harvesting and delivering wheat and alfalfa	person day	70,0	5,3	371,0	100,0
Equipo					
Sickle	Pcs	1,0			100,0
Material para plantas					
Wheat seeds	Kg	140,0	0,42	58,8	100,0
Fertilizantes y biocidas					
DAP	Kg	125,0	0,9	112,5	100,0
Urea	Kg	125,0	0,45	56,25	100,0
Herbicide	Liter	50,0	0,25	12,5	100,0
Indique los costos totales para mantenecer la Tecnología				**677.3**	
Costos totales para mantener la Tecnología en USD				*10.11*	

ENTORNO NATURAL

Promedio anual de lluvia
- [ ] < 250 mm
- [x] 251-500 mm
- [x] 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
- [ ] húmeda
- [ ] Sub-húmeda
- [x] semi-árida
- [ ] árida

Especificaciones sobre el clima
Promedio anual de lluvia en mm:580.0
Average annual precipitation for the area was calculated with 580 mm, with minimums in dry years (2000 and 2001) of 270 mm and maximums in wet years (2009/2010) of 830 mm. The absolute maximum rainfall was calculated for 1986 with 1024 mm. The data series covers the time from 1979 to 2014.
Nombre de la estación meteorológica: Climate Forecast System Reanalysis (CFSR), http://rda.ucar.edu/pub/cfsr.html
Specifications: Derived from the publically available dataset on length of growing period (LGP) (Fischer 2009 / IIASA-FAO). Internet link: http://tiles.arcgis.com/tiles/P8Cok4qAP1sTVE59/arcgis/rest/services/Length_of_growing_pe

Pendiente
- [ ] plana (0-2 %)
- [ ] ligera (3-5%)
- [ ] moderada (6-10%)
- [x] ondulada (11-15%)
- [x] accidentada (16-30%)
- [ ] empinada (31-60%)
- [ ] muy empinada (>60%)

Formaciones telúricas
- [ ] meseta/ planicies
- [ ] cordilleras
- [x] laderas montañosas
- [x] laderas de cerro
- [ ] pies de monte
- [ ] fondo del valle

Altura
- [ ] 0-100 m s.n.m.
- [ ] 101-500 m s.n.m.
- [ ] 501-1,000 m s.n.m
- [x] 1,001-1,500 m s.n.m
- [x] 1,501-2,000 m s.n.m
- [ ] 2,001-2,500 m s.n.m
- [ ] 2,501-3,000 m s.n.m
- [ ] 3,001-4,000 m s.n.m
- [ ] > 4,000 m s.n.m

La Tecnología se aplica en
- [ ] situaciones convexas
- [ ] situaciones cóncavas
- [ ] no relevante

Profundidad promedio del suelo
- [ ] muy superficial (0-20 cm)
- [ ] superficial (21-50 cm)
- [ ] moderadamente profunda (51-80 cm)
- [ ] profunda (81-120 cm)
- [ ] muy profunda (>120 cm)

Textura del suelo (capa arable)
- [ ] áspera/ ligera (arenosa)
- [x] mediana (limosa)
- [ ] fina/ pesada (arcilla)

Textura del suelo (> 20 cm debajo de la superficie)
- [ ] áspera/ ligera (arenosa)
- [x] mediana (limosa)
- [ ] fina/ pesada (arcilla)

Materia orgánica de capa arable
- [ ] elevada (>3%)
- [x] media (1-3%)
- [x] baja (<1%)

Agua subterránea
- [ ] en superficie
- [ ] < 5 m
- [ ] 5-50 m
- [ ] > 50 m

Disponibilidad de aguas superficiales
- [ ] excesiva
- [ ] bueno
- [x] mediana
- [ ] pobre/ ninguna

Calidad de agua (sin tratar)
- [x] agua potable de buena calidad
- [ ] agua potable de mala calidad (requiere tratamiento)
- [ ] solo para uso agrícola (irrigación)
- [ ] inutilizable

La calidad de agua se refiere a:

¿La salinidad del agua es un problema?
- [ ] Sí
- [x] No

Incidencia de inundaciones
- [x] Sí
- [ ] No

Diversidad de especies
- [ ] elevada
- [ ] mediana
- [x] baja

Diversidad de hábitats
- [ ] elevada
- [ ] mediana
- [x] baja

LAS CARACTERÍSTICAS DE LOS USUARIOS DE LA TIERRA QUE APLICAN LA TECNOLOGÍA

Orientación del mercado
- [x] subsistencia (autoprovisionamiento)
- [x] mixta (subsistencia/ comercial)
- [ ] comercial/ mercado

Ingresos no agrarios
- [ ] menos del 10% de todos los ingresos
- [x] 10-50% de todo el ingreso
- [x] > 50% de todo el ingreso

Nivel relativo de riqueza
- [ ] muy pobre
- [ ] pobre
- [x] promedio
- [x] rico
- [ ] muy rico

Nivel de mecanización
- [x] trabajo manual
- [x] tracción animal
- [ ] mecanizado/motorizado

Sedentario o nómada
- [x] Sedentario
- [ ] Semi-nómada
- [ ] Nómada

Individuos o grupos
- [x] individual/ doméstico
- [ ] grupos/ comunal
- [ ] cooperativa
- [ ] empleado (compañía, gobierno)

Género
- [x] mujeres
- [x] hombres

Edad
- [ ] niños
- [ ] jóvenes
- [x] personas de mediana edad
- [x] ancianos

Área usada por hogar
- [ ] < 0.5 ha
- [ ] 0.5-1 ha
- [ ] 1-2 ha
- [x] 2-5 ha
- [ ] 5-15 ha
- [ ] 15-50 ha
- [ ] 50-100 ha
- [ ] 100-500 ha
- [ ] 500-1,000 ha
- [ ] 1,000-10,000 ha

Escala
- [ ] pequeña escala
- [x] escala mediana
- [ ] gran escala

Tenencia de tierra
- [ ] estado
- [ ] compañía
- [ ] comunitaria/ aldea
- [ ] grupal
- [x] individual, sin título
- [ ] individual, con título

Derechos de uso de tierra
- [ ] acceso abierto (no organizado)
- [ ] comunitarios (organizado)
- [ ] arrendamiento
- [x] individual

Derechos de uso de agua
- [ ] acceso abierto (no organizado)
- [x] comunitarios (organizado)
- [ ] arrendamiento
- [ ] individual

☐ > 10,000 ha

Acceso a servicios e infraestructura

IMPACTO

Impactos socioeconómicos

Producción de cultivo

disminuyó ☐☐☐☐☐☐✓ incrementó

Cantidad antes de MST: 350 kg / ha
Cantidad luego de MST: 700 kg / ha
The integration of measures including agronomic (improved seed and fertilizer) and structural (terraces to control water flow and loss of top soil, including nutrients and seeds) results in an increase of crop yield already in the first year. The effects cannot be attributed to one or the other measure specifically.

producción de forraje

disminuyó ☐☐☐☐✓☐☐ incrementó

Alfalfa is planted on the risers.

diversidad de producto

disminuyó ☐☐☐☐✓☐☐ incrementó

área de producción (nuevas tierras bajo cultivo/ en uso)

disminuyó ☐☐☐✓☐☐☐ incrementó

No change in total area for production, as the riser of the terraces are used for fodder production. However, there is some reduction of area available for annual crop production.

Impactos socioculturales

seguridad alimentaria/ autosuficiencia

disminuyó ☐☐☐☐✓☐☐ mejoró

The yield of the main staple crop (wheat)has been reported to be double on terraced plots with application of improved seed and fertilizer. In addition, fodder crops, such as alfalfa grown on the risers, can be harvested.

MST/ conocimiento de la degradación de la tierra

disminuyó ☐☐☐☐✓☐☐ mejoró

Technicians in the villages were trained in the use of A-frames. Implementers of terraces voiced that they themselves would not be able to replicated the designing of terraces.

situación de grupos en desventaja social y económica (género, etáreo, estatus, etnicidad, etc.)

empeoró ☐✓☐☐☐☐☐ mejoró

Female headed households are not included. Technology is implemented on private land, therefore people without land are excluded. However, they have the opportunity to earn income as a hired worker for the SLM implementers.

Impactos ecológicos

escurrimiento superficial

incrementó ☐☐☐☐✓☐☐ disminuyó

humedad del suelo

disminuyó ☐☐☐☐✓☐☐ incrementó

in situ water harvesting

pérdida de suelo

incrementó ☐☐☐☐☐✓☐ disminuyó

cubierta vegetal

disminuyó ☐☐☐☐✓☐☐ incrementó

Both an increase in vegetation cover during the growing season when most erosive rains are observed as well as permenant vegetation cover from perennial alfalfa plants can been observed.

biomasa/ sobre suelo C

disminuyó ☐☐☐☐✓☐☐ incrementó

Impactos fuera del sitio

inundaciones río abajo (no deseadas)

incrementó ☐☐☐☐✓☐☐ disminuyó

colmatación río abajo

incrementó ☐☐☐☐✓☐☐ disminuyó

capacidad de amortiguación/ filtrado (por suelo, vegetación, humedales)

disminuyó ☐☐☐☐✓☐☐ mejoró

ANÁLISIS COSTO-BENEFICIO

Beneficios comparados con los costos de establecimiento

Beneficios comparados con costos de mantenimiento

Costs: As larger parts of the establishment of the technology were covered by the project, farmers consideration of the total costs are likely underestimated. Benefits: Two plots were terraced in 2012, and 5 plots in 2013. However, most terraces were implemented in 2014 (11 plots) and 2015 (8 plots). The Rustaq NRM study was conducted in autumn 2016. 1-2 years of cultivating the terrace system is too short a period for providing evidence on short- and long-term returns.

CAMBIO CLIMÁTICO

Extremos (desastres) relacionados al clima

tormenta de lluvia local

nada bien ☐☐☐☐☐✓ muy bien

sequía

nada bien ☐☐☐☐✓☐ muy bien

ADOPCIÓN Y ADAPTACIÓN

Porcentaje de usuarios de la tierra que adoptaron la Tecnología

- ☐ casos individuales / experimentales
- ☑ 1-10%
- ☐ 11-50%
- ☐ > 50%

De todos quienes adoptaron la Tecnología, ¿cuántos lo hicieron sin recibir incentivos/ pagos materiales?

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

Número de hogares y/ o área cubierta

10.7 ha has been terraced within the 3 study villages with LIPT project support.

¿La tecnología fue modificada recientemente para adaptarse a las condiciones cambiantes?

- [x] Sí
- [ ] No

¿A qué condiciones cambiantes?

- [ ] cambios climáticos / extremos
- [x] mercados cambiantes
- [ ] disponibilidad de mano de obra (ej. debido a migración)

Ferula is planted on the terrace in addition to wheat and alfalfa. The resin-like gum from the dried sap extracted from the stem and roots of Ferula is in high demand as a basic product for pharmaceuticals. Ferula can be sold to local merchants, who resell it to India, and is thus intercropped by some farmers on the terraces.

CONCLUSIONES Y LECCIONES APRENDIDAS

Fortalezas: perspectiva del usuario de tierras

- Notable higher crop yields on the plots where improved seeds and fertilizer are applied on newly established terraces. Farmers have high expectations for the years to come and for yields of annual crops (such as wheat) to remain high.
- Diversity of crops planted on terraces is valued by the land users. For example, cultivating wheat and alfalfa on the terraced plot provides household with the key crop and also fodder for the livestock and thereby contributes to securing food for the family and maintaining better health of their cattle. Additionally, some farmers have started intercropping Ferula, a medical herb and cash crop.
- Farmers percieve soil quality on terraced plots with fertilizer application to improve. An improvement in soil fertility (which may relate first of all to the effects of fertilizer application) and increased soil moisture have been reported. Single statements also related to effectiveness of applying fertilizer on terraced plots, as here fertilizer is not washed away during rains.
- Terraced plots are considered less vulnerable to the effects of rainstorms and dry spells, than non-terraced plots on slopes where annual crops are cultivated.
- Women considered an advantage that during the establishment phase, men were paid by the project to work on their own land when building the terraces. Thus, there was no need for men to go for seasonal labour migration and they stayed at home. At the same time the terracing of the land is seen as an opportunity to improve the land resources on their families plots. An increase in women's workload related to bringing food to the field during establishment was considered to be acceptable, especially compared to the expected increase in yields.

Fortalezas: punto de vista del compilador o de otra persona recurso clave

- The application of fertilizer on terraces is expected to show multiple effects: yields from these fertility depleted croplands can be increased. This includes an increase in biomass production, which may be used as green manure on the field or as animal feed or as straw. Further, vegetation cover during the growing period can be increased, which helps to protect the soil from erosive rains.
- The project paid establishment of terraces on farmers' plots provided 20 days of employment per 2 jerib (0.4 ha) plot for farmers in their home villages. At the same time the terracing is a long-term investment into the land resources. Terracing provides an opportunity to decrease soil degradation and even to rehabilitate degraded lands. Application of improved seeds and fertilizer contribute in the establishment year to increased crop and fodder yields.

Debilidades/ desventajas/ riesgos: perspectiva del usuario de tierrascómo sobreponerse

- The implementation costs are high and land users state that it is impossible for them to cover establishment costs on their own.
- Farmers expectations partly exceeded the actual yield harvested from the terraces in the first years after the implementation.
- Both men and women from households that have implemened terraces state that during the establishment year the household experiences an increased workload, that is not well compatible with other on-going household / farm activities.
- The production area for annual crops only is slighty reduced. So far not all farmers seem to use the production area fully. Intercropping with perennial plants is recommended in order to use the risers of the terraces for fodder production. Some farmers have started intercropping of Ferula as cash crop.
- Sufficient own land is required. How does the amount of cropland affect the innovation readiness of a farmer? A better understanding is required on farmers willingness to take a risk for investing in a new SLM technology, and especially terracing, and influencing factors.

Debilidades/ desventajas/ riesgos: punto de vista del compilador o de otra persona recurso clavecómo sobreponerse

- The technology requires technical knowledge for implementation and maintenance, which is key for successful adoption, replication and upscaling. The project trained technicians to support land users with the design of terraces. While the project aided implementation of terraces has improved the general knowledge and awareness of the land users on the benefits of SLM practices, most farmers will not be able to design terraces on their own.
- Technically correct design of the terrace presents a challenge and might not be always achieved. Forward sloping terrace benches may lead to channeled runoff and have the risk of rills and gully formation.
- There is an attribution gap regarding the increased wheat yields, especially with regard to individual contribution of the terraces, the application of improved seeds and the fertilizer, and the combined effects (role of terraces in making improved seed and fertilizer application effective). A cost benefit analysis (CBA) needs to be conducted to determine short- and long-term returns of the SLM technology. On farm trials are necessary for assessing impacts of the different measures (agricultural, vegetative and structural measures) before-and-after, as well as with-without the SLM technology.
- Terrace maintenance is crucial. If not maintained properly for a longer period of time, the damaged terrace can lead to further land degradation through channeled runoff, sever erosion and possible risks of disaster for the surrounding settlements on the slopes.
- The technology is established mainly by better-off households, which own more land than the average SLM implementer.

REFERENCIAS

Compilador
Roziya Kirgizbekova

Editors
Bettina Wolfgramm

Revisado por
Rima Mekdaschi Studer
Alexandra Gavilano

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Personas de referencia

Habibullah Mohammad Azim - usuario de la tierra
MIAJAN MAROOFI - Especialista MST
Reto Zehnder - Especialista MST
Roziya Kirgizbekova - Researcher

Descripción completa en la base de datos de WOCAT

https://qcat.wocat.net/es/wocat/technologies/view/technologies_607/

Datos MST vinculados

Approaches: Watershed Associations (WSA) and Natural Resource Management Committees (NRMC) https://qcat.wocat.net/es/wocat/approaches/view/approaches_545/

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Proyecto

- Livelihood Improvement Project Takhar, Afghanistan (LIPT)
- Potential and limitations for improved natural resource management (NRM) in mountain communities in the Rustaq district, Afghanistan (Rustaq NRM Study)