Reforestation site (Mia Jan Maroofi)

Afforestation for firewood production (Afghanistan)

Bunyodi jangal baroi tavlidi chubi sukht

DESCRIPTION

Non-fruit and fruit trees are planted on heavily degraded forest land to protect the land from erosion and further degradation and provide fuelwood for the local community.

Project supported implementation of afforestation has taken place in the villages of 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 and 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 580 mm. Land degradation affects all forms of land use, and includes low levels of vegetation cover, severe water erosion of topsoil, and poor soil fertility. Unsustainable agricultural practices, over-exploitation and high pressure on the natural resources are adversely impacting the socio-economic well-being of local communities, as well as contributing to the risk of being adversely affected by drought - and landslides and flash foods triggered by heavy rainfall. The data used for the documentation of the technology are based on field research conducted in Chokar watershed, namely in the villages of Sari Joy, Jawaz Khana and Dashti Mirzai. These villages represent the upper, the middle and the lower zones of Chokar watershed, respectively. They differ considerably in access to services and infrastructure, but in general are poorly served. The communities depend on land resources for sustaining their livelihoods. In a good year with high yields, wheat self-sufficiency lasts about 5 months. The three villages are home to ethnic Qarluq communities. Since 2012 the Livelihood Improvement Project Takhar (LIPT) implemented by Terre des hommes (Tdh) Switzerland has initiated a range of NRM interventions

Despite the low forest cover in Rustaq, Afghanistan, local communities strongly rely on fuelwood and animal dung for cooking and heating throughout the whole year. Forests are mainly found on community land with open access to all, and there are no protection measures in place. The high demand on fuelwood for household needs places strong pressure on the remaining patches of forests and bushes, which are currently threatened by eradication. Such high demand in the area is likely to remain as there are no other alternative energy sources. The mass destruction of local forests is one of the main causes of intensive erosion, aridification, loss of topsoil and formation of gullies. Low forest cover increases vulnerability to severe rainfall and risks of landslides.

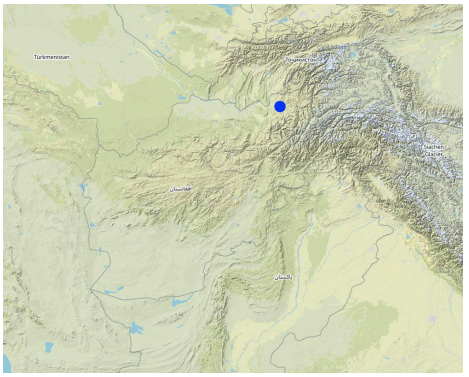
Afforestation measures in the three villages were initiated to halt the land degradation and provide sustainable firewood. The reforestation sites are largely on community land with a small share on private land. The area is characterized by hilly (16-30%) and steep (31-60%) slopes. Planting and maintaining forest in such conditions requires close support in the appropriate design of forest plots, and relevant maintenance recommendations, which can then ensure the survival of the plantation. A plot of 0.2 ha is divided into 4 m x 3 m sections. Each tree is placed in a pit of 50 cm x 30 cm with rich soil around the roots. Once the tree is planted, it is watered and covered with lime. Russian willow, acacia, mulberry and almond are the most common tree species used for afforestation purposes.

Most of the newly established forest sites are located at walking distance of the nearby villages: this is important to help provide protection of the plot from animal intrusion and ensure proper maintenance of the trees. The forest plot is watered for three years in a row. The Natural Resources Management Committees (NRMC) pays 0.60 US cents per tree per year to sustain the survival of the plantation within the first year. The funding for the irrigation is provided by the Livelihood Improvement Project Takhar (LIPT). LIPT supported the afforestation activities through the provision of technical and financial support. The tree seedlings were supplied by the project, and financial incentives were provided to engage the community in tree-planting.

The plantations are still very young: however, the land users express support for the new forest in their villages, and have observed localized stabilization of the soil and improvement in vegetation cover. There are high expectations of the new forest, which promises access to sustainable fuelwood and non-forest products, such as almonds and mulberry. The grass and tree leaves from the forest plots are already used for animal fodder.

Women and children under 15 years old are expected to be the direct beneficiaries of the new forest. They will no longer spend long hours to collect and deliver fuelwood, bushes and dung. A small portion of women reported involvement in forest establishment activities, while the majority are taking part in protecting the forests from livestock.

LOCATION



Location: Sari Joy, Jawaz Khana, Dashti Mirzai, Takhar Province, Rustaq District, Afghanistan

No. of Technology sites analysed: 10-100 sites

Geo-reference of selected sites
- 69.91984, 37.10936

Spread of the Technology: evenly spread over an area (approx. 0.1-1 km2)

Date of implementation: less than 10 years ago (recently)

Type of introduction
- ☐ through land users' innovation
- ☐ as part of a traditional system (> 50 years)
- ☐ during experiments/ research
- ☑ through projects/ external interventions

Holes for planting tree seedlings (Reto Zender)

Young trees on a new forest plot (Mia Jan Maroofi)

CLASSIFICATION OF THE TECHNOLOGY

Main purpose

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

Land use

Mixed (crops/ grazing/ trees), incl. agroforestry - Silvo-pastoralism
Main products/ services: Acacia, Russian willow, mulberry. almond, grass and leaves for fodder

Water supply

- [ ] rainfed
- [x] mixed rainfed-irrigated
- [ ] full irrigation

Number of growing seasons per year: 1
Land use before implementation of the Technology: Some of the forest land has been heavily degraded and was used as grazing land for an extensive period. Most of the land is forest land.
Livestock density: n.a.

Purpose related to land degradation

- [ ] prevent land degradation
- [x] reduce land degradation
- [x] restore/ rehabilitate severely degraded land
- [ ] adapt to land degradation
- [ ] not applicable

Degradation addressed

soil erosion by water - Wt: loss of topsoil/ surface erosion

soil erosion by wind - Et: loss of topsoil

biological degradation - Bc: reduction of vegetation cover, Bq: quantity/ biomass decline

water degradation - Ha: aridification

SLM group

- improved ground/ vegetation cover

SLM measures

vegetative measures - V1: Tree and shrub cover, V2: Grasses and perennial herbaceous plants

management measures - M1: Change of land use type

TECHNICAL DRAWING

Technical specifications

The establishment activities begin with selecting the area for reforestation. Most of the reforestation sites are on slopes above 6% steepness . A plot of 0.2 ha is divided into 4 m x 3 m sections. Planting pits of 50 cm x 30 cm are prepared for planting the trees. Each tree is placed in a pit and good soil is added to the roots. Most popular species used for reforestation are: Russian willow, acacia and mulberry. The newly planted tree is watered and the trunk is covered with a lime and water solution for protection and better growth.

ESTABLISHMENT AND MAINTENANCE: ACTIVITIES, INPUTS AND COSTS

Calculation of inputs and costs

- Costs are calculated: per Technology area (size and area unit: **1 ha**)
- Currency used for cost calculation: **US Dollars**
- Exchange rate (to USD): 1 USD = 67.0
- Average wage cost of hired labour per day: 5.2-5.3 USD

Most important factors affecting the costs

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.

Establishment activities

1. Design of the forest plot (Timing/ frequency: Winter)
2. Digging pits 50 cmx 30 cm for tree plantation (Timing/ frequency: End of winter)
3. Planting tree seedlings 3m x 4m (Timing/ frequency: Spring/Rainy season)
4. Watering the tree after planting (Timing/ frequency: Spring)
5. Covering the tree with lime (Timing/ frequency: Spring)

Establishment inputs and costs (per 1 ha)

Specify input	Unit	Quantity	Costs per Unit (US Dollars)	Total costs per input (US Dollars)	% of costs borne by land users
Labour					
Design of the forest	person-day	15.0	5.3	79.5	
Digging pits/holes for the trees	person-day	22.0	5.3	116.6	
Planting tree seedlings and watering	person-day	15.0	5.3	79.5	
Fertilizer and lime application	person-day	8.0	5.3	42.4	
Equipment					
Meter	piece	1.0	2.25	2.25	
Shovel	piece	2.0	3.8	7.6	
Pickaxe	piece	1.0	2.25	2.25	
Rope	meter	500.0	0.07	35.0	
Plant material					
Accacia seedlings	piece	275.0	0.45	123.75	
Russian willow seedlings	piece	275.0	0.45	123.75	
Mulberry seedlings	piece	275.0	0.45	123.75	
Fertilizers and biocides					
DAP	kg	250.0	0.9	225.0	
Lime	kg	25.0	1.5	37.5	
Total costs for establishment of the Technology				**998.85**	

Maintenance activities

1. Protecting the trees from livestock (Timing/ frequency: Spring/Summer)
2. Pest and disease control (Timing/ frequency: Spring)
3. Irrigation (Timing/ frequency: Summer/First three years)
4. Replanting dead trees (Timing/ frequency: Spring)
5. Pruning (Timing/ frequency: Spring)

Maintenance inputs and costs (per 1 ha)

Specify input	Unit	Quantity	Costs per Unit (US Dollars)	Total costs per input (US Dollars)	% of costs borne by land users
Labour					
Pest and disease control	person day	7.5	5.3	39.75	100.0
Replanting dead trees	person day	7.5	5.3	39.75	100.0
Irrigating the trees	person day	10.0	5.3	53.0	100.0
Pruning	person day	5.0	5.3	26.5	100.0
Total costs for maintenance of the Technology				**159.0**	

NATURAL ENVIRONMENT

Average annual rainfall

- [ ] < 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

Agro-climatic zone

- [ ] humid
- [ ] sub-humid
- [x] semi-arid
- [ ] arid

Specifications on climate

Average annual rainfall in mm: 564.0
Average annual precipitation for the area was calculated with 564 mm, with minimum in dry years (2000 and 2001) of 270 mm and maximum 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.
Name of the meteorological station: Climate Forecast System Reanalysis (CFSR), http://rda.ucar.edu/pub/cfsr.html
Derived from the publicly 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

Slope

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

Landforms

- [ ] plateau/plains
- [ ] ridges
- [x] mountain slopes
- [x] 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.
- [x] 1,001-1,500 m a.s.l.
- [x] 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)
- [x] moderately deep (51-80 cm)
- [ ] deep (81-120 cm)
- [ ] very deep (> 120 cm)

Soil texture (topsoil)

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

Soil texture (> 20 cm below surface)

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

Topsoil organic matter content

- [ ] high (>3%)
- [x] medium (1-3%)
- [x] low (<1%)

Groundwater table

- [ ] on surface
- [ ] < 5 m
- [x] 5-50 m
- [ ] > 50 m

Availability of surface water

- [ ] excess
- [ ] good
- [x] medium
- [ ] poor/ none

Water quality (untreated)

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

Is salinity a problem?

- [ ] Yes
- [x] No

Occurrence of flooding

- [x] Yes
- [ ] No

Species diversity

- [ ] high
- [ ] medium
- [x] low

Habitat diversity

- [ ] high
- [ ] medium
- [x] low

CHARACTERISTICS OF LAND USERS APPLYING THE TECHNOLOGY

Market orientation
- [x] subsistence (self-supply)
- [x] mixed (subsistence/ commercial
- [ ] commercial/ market

Off-farm income
- [ ] less than 10% of all income
- [x] 10-50% of all income
- [x] > 50% of all income

Relative level of wealth
- [ ] very poor
- [ ] poor
- [x] average
- [x] rich
- [ ] very rich

Level of mechanization
- [x] manual work
- [ ] animal traction
- [ ] mechanized/ motorized

Sedentary or nomadic
- [x] Sedentary
- [ ] Semi-nomadic
- [ ] Nomadic

Individuals or groups
- [x] individual/ household
- [x] groups/ community
- [ ] cooperative
- [ ] employee (company, government)

Gender
- [x] women
- [x] men

Age
- [ ] children
- [ ] youth
- [x] middle-aged
- [x] elderly

Area used per household
- [ ] < 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
- [ ] > 10,000 ha

Scale
- [ ] small-scale
- [x] medium-scale
- [ ] large-scale

Land ownership
- [ ] state
- [ ] company
- [x] communal/ village
- [ ] group
- [x] individual, not titled
- [ ] individual, titled

Land use rights
- [ ] open access (unorganized)
- [x] communal (organized)
- [ ] leased
- [x] individual

Water use rights
- [ ] open access (unorganized)
- [x] communal (organized)
- [ ] leased
- [ ] individual

Access to services and infrastructure

IMPACTS

Socio-economic impacts

fodder production	decreased	increased
animal production	decreased	increased
wood production	decreased	increased
non-wood forest production	decreased	increased
product diversity	decreased	increased

Socio-cultural impacts

SLM/ land degradation knowledge	reduced	improved	Land users learned new methods of planting trees based on the local conditions.
situation of socially and economically disadvantaged groups (gender, age, status, ehtnicity etc.)	worsened	improved	The established forest is expected to become a reliable source for firewood, which will decrease the burden of women and children under 15 years, who spend long hours to collect firewood.

Ecological impacts

surface runoff	increased	decreased
soil loss	increased	decreased
vegetation cover	decreased	increased

Off-site impacts

downstream flooding (undesired)	increased	reduced
downstream siltation	increased	decreased
buffering/ filtering capacity (by soil, vegetation, wetlands)	reduced	improved

COST-BENEFIT ANALYSIS

Benefits compared with establishment costs

Short-term returns	very negative	very positive
Long-term returns	very negative	very positive

Benefits compared with maintenance costs

Based on the multi-criteria matrix: During the FGD with SLM implementers, a multi-criteria matrix was elaborated, and different SLM practices were rated. In the framework of this exercise, SLM implementers were asked to jointly discuss and rate short term (1-3 years) and long-term (10 years) returns. As the SLM technology was only implemented 1-2 years ago, it is too early to compare benefits to maintenance costs. Farmers have little experience so far on the actual benefits of the SLM technology. The ratings are mostly based on expected benefits and not on actual benefits.

CLIMATE CHANGE

Climate-related extremes (disasters)

local rainstorm	not well at all	very well
drought	not well at all	very well

ADOPTION AND ADAPTATION

Percentage of land users in the area who have adopted the Technology
- [ ] single cases/ experimental
- [x] 1-10%
- [ ] 10-50%
- [ ] more than 50%

Of all those who have adopted the Technology, how many have done so without receiving material incentives?
- [ ] 0-10%
- [x] 10-50%
- [ ] 50-90%
- [ ] 90-100%

Number of households and/ or area covered

23.6 ha have been afforested with LIPT support

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

- [ ] Yes
- [x] 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 tree plantations protect the soil from erosion. The land is less vulnerable to heavy rainfall, which washes off the topsoil
- There are very high expectations about production of firewood. Availability of firewood in local forest will make it much easier to access firewood for cooking and heating by local households.
- Apart from firewood and wood production, other non-timber products are provided by the afforestation plots, such as fodder for livestock from grass (alfalfa, sainfoin) and tree leaves during autumn. Also some plots are planted with almond and mulberry, which can be collected for own use or for selling.
- Local people value the recreational benefit of the forest, which make their villages greener and provide green spaces for the local people.

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

- The afforestation measures in the village including establishing the forest and protecting it, mobilizing the community around a common goal, and this has a positive impact on the village as a whole.
- The planted trees and grass under the trees improve the vegetation cover and increase soil quality, which is then less prone to erosion
- Improved varieties of fruit and non-fruit tree species used for afforestation help to diversify the tree species in the village and make the soil less resistant to dry spells
- The expected combined benefits of wood and non-wood products, especially when the harvesting period starts, may have positive impact on households' income and food security.

Weaknesses/ disadvantages/ risks: land user's viewhow to overcome

- The establishment costs for afforestation measures are very high
- The young trees are vulnerability to droughts
- During maintenance some plots require irrigation
- Afforestation plots, which are established on former grazing land, reduces the grazing land in the village and deprives animals from grazing land

Weaknesses/ disadvantages/ risks: compiler's or other key resource person's viewhow to overcome

- Community provides weak or no protection of the afforestation site, which results in low tree survival
- Weak funding sources for irrigation of the afforestation plots, particularly during the first three years when the trees are young, might compromise the new plantations
- Afforestation is established mostly on community land, where unclear land tenure rights persist, which may cause conflict in the community over forest vs grazing land

REFERENCES

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Full description in the WOCAT database
https://qcat.wocat.net/en/wocat/technologies/view/technologies_668/

Linked SLM data
n.a.

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- Terre des Hommes (Terre des Hommes) - Switzerland

Project
- 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)

Key references
- Guidelines for Focus Groups Discussions:
- Methods section of the Rustaq NRM study: