Саженец с установленной бутылкой и мульчепокрытием из травы (Сосин Пётр)

Bottle irrigation of a newly planted orchard (Tajikistan)

Обёрии катраги ба воситаи зарфхои пласмаси

DESCRIPTION

A water-saving irrigation technique is used to ensure the establishment of young seedlings in arid conditions which have a water deficit.

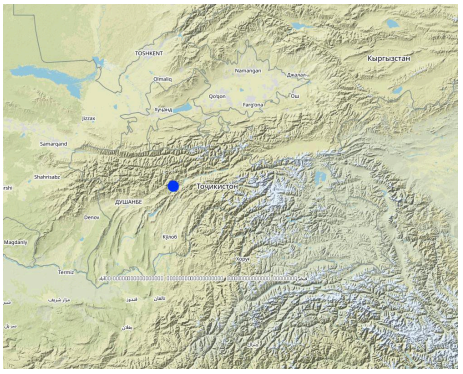
Plastic bottles, 1.5-2 litres in size, are used for this technology. The bottom of the plastic bottle is removed and retained to be used as a cover. The bottle is then turned upside down and filled with water like a funnel. In this position, the lid of the bottle is twisted open very slowly until a drip rate of 5 drops per second is achieved. As soon as the desired water drip rate is reached, the lid is stuck to the bottle with some tape. At this drip rate 1.5 litres of water will drip out of the bottle every 90-100 minutes. The bottle is then buried in the soil next to the seedling with the wide part of the funnel sticking 10cm up out of the ground. The bottle's lid must be buried at the same level as the root collar. After this, grass, straw or black film is used to mulch the soil around the newly planted seedlings. Water drips slowly out and can go straight to the roots. Thus, no watering of the upper layer is needed. This technique also helps exclude evaporation of water from the upper layer of the soil. During the growth period bottles are filled with water once every 5 days. Bottles should be filled with clean water to avoid clogging of the lids.

Purpose of the Technology: The purpose of the technology is to improve the acclimation of seedlings with minimal use of water, as well as to help reduce erosion and risk of mudslides on these steep loess slopes which can occur as a result of other irrigation techniques.

Establishment / maintenance activities and inputs: Selection of a plot, digging holes, purchase of seedlings, fencing nets, plastic bottles, preparation of bottles, planting seedlings, mulching, post-planting care for seedlings, irrigation

Natural / human environment: Middle mountain area, typical mountain brown soil, 30° slopes, rainless dry summer period. Vegetation cover is mainly large-sized cereal semi-savanna. Local population is involved in cattle-breeding and gardening.

LOCATION



Location: Nurabad District, Tajikistan, Tajikistan

No. of Technology sites analysed:

Geo-reference of selected sites
- 69.8673, 38.8675

Spread of the Technology:

In a permanently protected area?:

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

саженец, поливаемый бутылочным способом (Сосин Пётр)

CLASSIFICATION OF THE TECHNOLOGY

Main purpose

- [ ] improve production
- [x] 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
- [ ] create beneficial social impact

Land use

Cropland

- Annual cropping
- Tree and shrub cropping

Number of growing seasons per year: 1

Grazing land

- Semi-nomadic pastoralism

Forest/ woodlands Products and services: Fuelwood, Fruits and nuts

Water supply

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

Purpose related to land degradation

- [x] 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, Wg: gully erosion/ gullying

SLM group

- improved ground/ vegetation cover
- irrigation management (incl. water supply, drainage)

SLM measures

agronomic measures - A7: Others

vegetative measures - V1: Tree and shrub cover

structural measures - S11: Others

management measures - M1: Change of land use type

TECHNICAL DRAWING

Technical specifications

Installation of bottle when planting a seedling

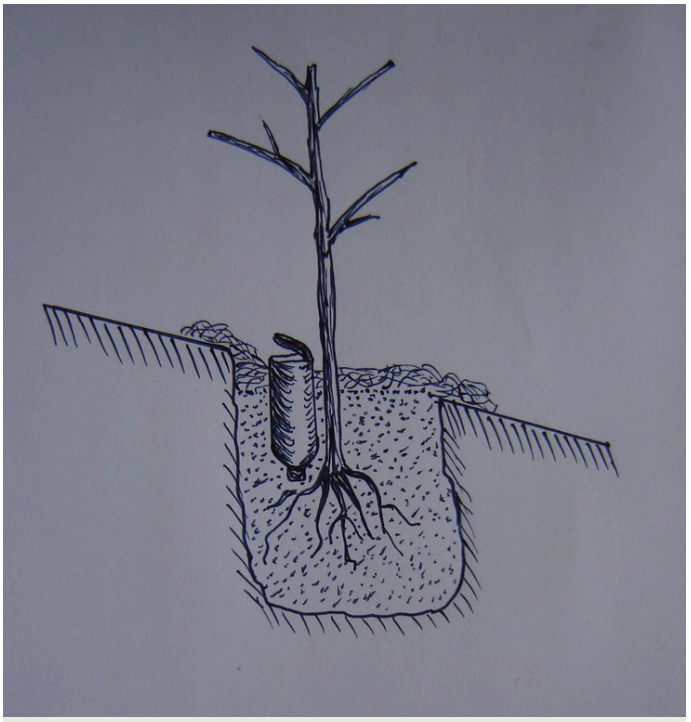
Location: Mujiharv Jamoat. Nurabad

Date: 2011.04.05

Technical knowledge required for field staff / advisors: high

Technical knowledge required for land users: moderate

Secondary technical functions: stabilisation of soil (eg by tree roots against land slides), increase / maintain water stored in soil



Author: Sosin Pjotr, Dushanbe, 21a Rudaki Avenue

ESTABLISHMENT AND MAINTENANCE: ACTIVITIES, INPUTS AND COSTS

Calculation of inputs and costs

- Costs are calculated:
- Currency used for cost calculation: **USD**
- Exchange rate (to USD): 1 USD = n.a
- Average wage cost of hired labour per day: n.a

Most important factors affecting the costs

n.a.

Establishment activities

1. Purchase of fencing net to fence the plot (Timing/ frequency: 7 days)
2. Purchase of seedlings (Timing/ frequency: 1 month)
3. Planting of seedlings (Timing/ frequency: 10 days)
4. Fencing the plot (Timing/ frequency: 10 days)

Establishment inputs and costs

Specify input	Unit	Quantity	Costs per Unit (USD)	Total costs per input (USD)	% of costs borne by land users
Labour					
Planting of seedlings	pieces	2000.0	0.227	454.0	100.0
Fencing the plot	ha	0.7	194.285	136.0	100.0
Equipment					
Fencing net to fence the plot	meters	100.0	28.2	2820.0	
Plastic bottles	pieces	2000.0	0.0045	9.0	
Plant material					
Seedlings	pieces	2000.0	1.8865	3773.0	
Total costs for establishment of the Technology				**7'192.0**	
Total costs for establishment of the Technology in USD				*7'192.0*	

Maintenance activities

1. Mulching (Timing/ frequency: None)
2. Watering (Timing/ frequency: None)
3. Plastic bottles (Timing/ frequency: None)

Maintenance inputs and costs

Specify input	Unit	Quantity	Costs per Unit (USD)	Total costs per input (USD)	% of costs borne by land users
Labour					
Mulching	ha	1.0	454.0	454.0	100.0
Watering	ha	1.0	273.0	273.0	100.0
Plastic bottles placing	pieces	2000.0	0.023	46.0	100.0
Total costs for maintenance of the Technology				**773.0**	
Total costs for maintenance of the Technology in USD				*773.0*	

NATURAL ENVIRONMENT

Average annual rainfall
- [ ] < 250 mm
- [ ] 251-500 mm
- [ ] 501-750 mm
- [ ] 751-1,000 mm
- [x] 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
Thermal climate class: subtropics

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

Landforms
- [ ] plateau/plains
- [ ] ridges
- [x] 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.
- [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)
- [ ] medium (loamy, silty)
- [ ] fine/ heavy (clay)

Topsoil organic matter content
- [ ] high (>3%)
- [x] medium (1-3%)
- [ ] low (<1%)

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

Water quality refers to:

Is salinity a problem?
- [ ] Yes
- [ ] No

Occurrence of flooding
- [ ] Yes
- [ ] No

Species diversity
- [ ] high
- [x] medium
- [ ] low

Habitat diversity
- [ ] high
- [ ] medium
- [ ] low

CHARACTERISTICS OF LAND USERS APPLYING THE TECHNOLOGY

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

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

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

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

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

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

Gender
- [ ] women
- [x] men

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

Area used per household
- [ ] < 0.5 ha
- [ ] 0.5-1 ha
- [x] 1-2 ha
- [ ] 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
- [x] small-scale
- [ ] medium-scale
- [ ] large-scale

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

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

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

Access to services and infrastructure

health	poor	✓	good
education	poor	✓	good
technical assistance	poor	✓	good

markets — poor ✓ good
energy — poor ✓ good
roads and transport — poor ✓ good
drinking water and sanitation — poor ✓ good
financial services — poor ✓ good

IMPACTS

Socio-economic impacts

product diversity — decreased ✓ increased
demand for irrigation water — increased ✓ decreased — by using the bottle irrigation
farm income — decreased ✓ increased — income from the orchard
diversity of income sources — decreased ✓ increased

Socio-cultural impacts

food security/ self-sufficiency — reduced ✓ improved
recreational opportunities — reduced ✓ improved
SLM/ land degradation knowledge — reduced ✓ improved
conflict mitigation — worsened ✓ improved
Livelihoods and human well-being — reduced ✓ improved — No improvement in livelihood is observed within the first three years after planting a new orchard. Livelihoods should improve with the first fruit bearing season.

Ecological impacts

surface runoff — increased ✓ decreased — из-за мульчирования
evaporation — increased ✓ decreased — from mulching
soil moisture — decreased ✓ increased — while watering
soil cover — reduced ✓ improved
soil loss — increased ✓ decreased — decreased erosion
biomass/ above ground C — decreased ✓ increased
plant diversity — decreased ✓ increased
habitat diversity — decreased ✓ increased
pest/ disease control — decreased ✓ increased
Hazard towards adverse events — increased ✓ decreased

Off-site impacts

water availability (groundwater, springs) — decreased ✓ increased

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

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

CLIMATE CHANGE

Gradual climate change

annual temperature increase — not well at all ✓ very well

Climate-related extremes (disasters)

local rainstorm — not well at all ✓ very well
local windstorm — not well at all ✓ very well
drought — not well at all ✓ very well
general (river) flood — not well at all ✓ very well — Answer: not known

Other climate-related consequences

reduced growing period — 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%
- [ ] 11-50%
- [ ] > 50%

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

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

Number of households and/ or area covered

360 Households

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

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

- Prevents water erosion on steep slopes

  How can they be sustained / enhanced? The demand for this technology among farmers will grow together with the development of gardening and reduction of risk of natural disasters which cause land slides, mudslides and erosion.
- Prevents land slides

  How can they be sustained / enhanced? For the period of existence of the orchard
- Increases the percentage of fruit trees that aclimatise and survive.

  How can they be sustained / enhanced? Used for a period of two to three years until the root system is two-metres deep
- Bottle irrigation saves water resources

  How can they be sustained / enhanced? For a period of two to three years
- Furrow irrigation is inappropriate for steep slopes since a surplus of water saturates loess soils causing land slides

  How can they be sustained / enhanced? Not recommended

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

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

- Bottle irrigation requires frequent re-filling and is labour intensive
  Introduce drip irrigation

REFERENCES

Compiler
Pjotr M Sosin

Editors

Reviewer
Alexandra Gavilano
David Streiff
Joana Eichenberger

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Resource persons
Pjotr M Sosin - SLM specialist

Full description in the WOCAT database
https://qcat.wocat.net/en/wocat/technologies/view/technologies_1029/

Linked SLM data
n.a.

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