WORLD OVERVIEW OF CONSERVATION APPROACHES AND TECHNOLOGIES

A Framework for
Documentation and Evaluation of
Land Conservation

TECHNOLOGIES

B basic

WOCAT Questionnaire
Revised 2007

Technology Code

QT | | | | | | |

country code **consecutive number**

WOCAT

A Framework for
Documentation and Evaluation of
Land Conservation

Within the framework of sustainable land management (SLM),

WOCAT's vision is that land and livelihoods are improved through sharing and enhancing knowledge about sustainable land management.

WOCAT's mission is to support innovation and decision-making processes in sustainable land management, particularly in connection with soil and water conservation (SWC). This is done by:

- connecting stakeholders,
- analysing and synthesising experiences and setting direction,
- enhancing capacity and knowledge,
- developing and applying standardized tools for documenting, monitoring, evaluating, sharing and using knowledge

WOCAT's target group is SWC specialists:

- at the field level, including agricultural advisors, project implementers, land users,
- at the (sub-)national level, including planners, project designers, decision makers, researchers,
- at the regional and global levels, including international programme planners, donors.

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Introduction to the questionnaire

The ultimate goal of this exercise is to improve the effectiveness of SLM by analysing field experience. To achieve this, we need to obtain a better understanding of the reasons behind successful experience with SLM – be it introduced by projects or found in traditional systems. Within SLM WOCAT focuses mainly on efforts to prevent and reduce land degradation through conservation technologies and their implementation approaches.

It is necessary to analyse not only so-called "successful" examples, but also those which may be considered – at least partially – a failure. The reasons for failure are equally important for our analysis.

Three questionnaires

WOCAT has developed a set of three questionnaires to analyse and evaluate SLM:

- *Questionnaire on SLM Technologies (QT)*
- *Questionnaire on SLM Approaches (QA)*
- *Questionnaire on the SLM Map (QM)*

Questionnaire on SLM Technologies (QT): QT addresses the following questions: **what** are the specifications of the technology, and **where** is it used (natural and human environment), what impact does it have. The questionnaire consists of three main parts: 1. General information; 2. Specification of SLM Technology; 3. Analysis of SLM Technology.

A **SLM Technology** consists of one or more *conservation measures* belonging to the following categories:

- ***agronomic*** (eg intercropping, contour cultivation, mulching),
- ***vegetative*** (eg tree planting, hedge barriers, grass strips),
- ***structural*** (eg graded banks or bunds, level bench terrace),
- ***management*** (eg land use change, area closure, rotational grazing).

Combinations of above measures which are complimentary and thus enhance each other are part of a SLM Technology.

Criteria for identification and examples of technologies are given in the Questionnaire on SLM Technologies "basic" on page QT1 and QT7.

The **questionnaire on SLM Approaches (QA):** QA addresses the questions of **how** implementation was achieved and **who** achieved it. It is also made up of three main parts: 1. General information; 2. Specification of SLM Approach; 3. Analysis of SLM Approach

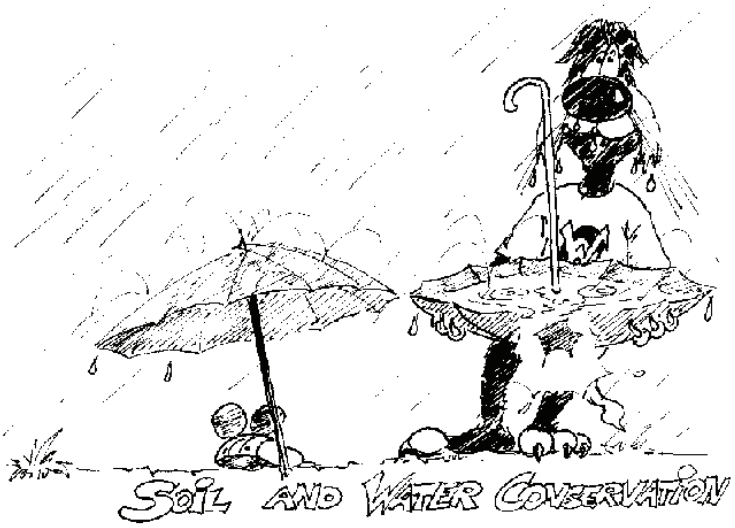
A **SLM Approach** defines the ways and means used to promote and implement a SLM Technology and to support it in achieving more sustainable soil and water use. A 'SLM Approach' - as defined by WOCAT - refers to a particular land conservation activity, be it an official project/programme, an indigenous system, or changes in a farming system towards more sustainable soil and water use. A SLM Approach consists of the following elements: ***All participants*** (policy-makers, administrators, experts, technicians, land users, i.e. actors at all levels), ***inputs*** *and* ***means*** (financial, material, legislative, etc.), and ***know-how*** (technical, scientific, practical). An approach may include different ***levels of intervention***, from the individual farm, through the community level, the extension / advisory system, the regional or national administration, or the policy level, to the international framework. Besides conservation activities introduced through projects or programmes, WOCAT includes indigenous conservation measures and spontaneous adoptions or adaptations of SLM Technologies. ***In the case of a project, we restrict ourselves to those elements within the project that are directly or indirectly relevant to land conservation.***

The **questionnaire on the SLM Map (QM):** QM addresses the question of **where** problems and their treatments occur. It is split up into: 1. General information; 2. Land use; 3. Soil degradation; 4. Soil and water conservation; 5. Soil productivity
The three questionnaires (QT, QA and QM) complement each other. The information obtained from the questionnaires will provide an information base / database for the development and evaluation of SLM. The analysis and evaluation process is based on this information and on the knowledge provided by core groups of conservation specialists and the world community of conservation implementers at large.

The basic questionnaire and the modules

WOCAT has developed a modular questionnaire system in order to meet the needs of different user groups. The "basic questionnaires" on technologies and approaches contain the key questions on sustainable land management (SLM), they are the foundation of the WOCAT methodology.

The framework is flexible and open for additional topics (not covered in the standardised WOCAT questionnaires): further modules can thus be added according to specific interests and needs, e.g. modules on "Biodiversity", "Carbon sequestration", etc. The realisation of additional modules depends on the initiative of interested partners, who can count on the collaboration of WOCAT.



Please read these notes before filling out the questionnaire!

- It is recommended that the questionnaire be filled in by a **team of conservation specialists** with different backgrounds and experiences who are familiar with the details of the SLM Technology (technical, financial, socio-economic).
- **Don't let the number of pages in this questionnaire discourage you!** In some places the information will be simple to obtain, but in other sections there may be no hard data available. In this latter case, we ask you to provide a best estimate, based on your professional judgment.
- **Shaded parts** in the questionnaire are questions to be filled in, **not shaded parts** are explanations or examples.
- Fill all questions. If information is not available or if certain questions are not applicable always indicate "n/a". Please note that throughout the document the following is valid:

☑ ***Square boxes must be ticked!*** *If 'Several answers possible' is not indicated tick only one box!*
Make use of the specify/remark/comments column or line as much as possible!

◯ ***Circles always require ranking!*** *It is possible to give more than one option the same rank, but not necessarily all circles need to be given a number. Use only ranks 1, 2 or 3!*

1 = very important / large extent
2 = important / medium extent
3 = less important / little extent

- **Make use of existing documents and seek advice from other conservation specialists and land users as much as possible in order to improve the quality of the data. Use this questionnaire as an evaluation tool for your SLM activities. Remember that the quality of the results entirely depends on the quality of your answers.**
- If you do not have enough space for answers, use the empty pages at the end of the questionnaire. Please make a footnote in the questionnaire to indicate the exact question number. Please also attach good technical **drawings, photographs descriptions**, references, etc.
- One questionnaire has to be filled out for each approach. Do not forget to give this questionnaire a code (see cover page of this document and page QA 1).
- An approach should be linked with one (or several) SLM Technology (ies).
- A Questionnaire on Technologies and a corresponding Questionnaire on Approaches together describe a case study within a selected area
- Please fill out the questionnaire **carefully and legibly**.
- **Please enter the information in the WOCAT online database,** see www.wocat.net/databs.asp

Contents

PART 1: GENERAL INFORMATION

1.1 Contributing conservation specialist(s)

If several conservation specialists are involved, write the name of the main resource person and his / her institution below and add the other person(s) details in the Annex (page QT 49).

Last name / surname: ..... First name(s): ..... female ☐ male ☐

Current institution and address:

Name of institution: .....

Address of institution: .....

Postal Code: ..... City: .....

State or District: ..... Country: .....

Tel: ..... Fax: ..... E-mail: .....

Permanent address: .....

Postal Code: ..... City: .....

State or District: ..... Country: .....

Please confirm that institutions, projects, etc. referred to, have no objections to the use and dissemination of this information by WOCAT.

Date: ..... Signature: .....

1.2 Brief identification of SLM Technology (see definition, page i)

Country: .....

Technology code: | | | | | | | |

Technology code: boxes 1-3: country code; boxes 4-6: consecutive number; will be defined when entering questionnaire information in the database

1.2.1 Common name of SLM Technology: .....

.....

Do not use generic names but be more specific to ensure that the technology can be distinguished from similar ones (easier identification).

1.2.2 Local or other name(s) (with language) .....

.....

Criteria for the identification and delineation of a technology or a system of technologies:

*A **single SLM technology** should cover a homogeneous set of natural (bio-physical) and human (socio-economic) conditions, hence should not be applied for instance to very dissimilar climatic or altitudinal zones or slope categories or to very dissimilar conditions of land tenure.*

Main criteria for a natural (bio-physical) environment:

- *only one of the following land use types: cropland (separate annual, perennial, tree/shrub crops), grazing land (extensive, intensive grazing), forest/woodland, mixed or other land*
- *only one or a clearly defined combination of the following measures: agronomic, vegetative, structural, management*
- *one or a combination of two adjacent climatic zones: humid, subhumid, semi-arid, arid*
- *one or a combination of two adjacent slope categories: flat, gentle, moderate, rolling, hilly, steep, very steep*
- *one or a combination of two soil texture classes: sand, loam, clay*
- *one or a combination of two soil depth categories: shallow, medium, deep*

Main criteria for a human (socio-economic) environment:

- *a defined level of mechanisation: hand tools, animal-drawn implements, motorised*
- *a defined production system: self supply (subsistence), mixed, or market-oriented (commercial)*
- *a defined level of inputs (costs) that are required*
- *a defined system of land ownership / land use rights*

*A single technology can consist of one or a **combination of land conservation measures** (agronomic, vegetative, structural or management measures). Example: Terraces combined with grass strips and contour ploughing.*

1.2.3 Is the technology described in this questionnaire part of a technology system (eg in a watershed)?

Yes ☐ No ☐

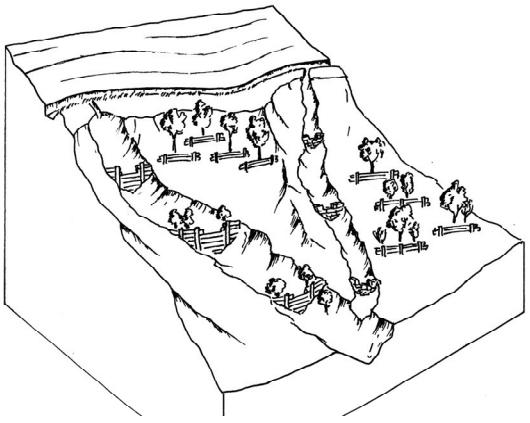
If yes, fill a questionnaire for each technology plus the module "Technology system"

Technology system:

- *various interrelated technologies, working as a system, i.e. the impact aimed at can only be achieved by joint functioning of all technologies*
- *the different technologies are often positioned in a sequence in the landscape (toposequence, defined by waterflow; up-/downstream), eg in a watershed / catchment*
- *often a combination of technologies covering an area (eg mulching, terracing) with technologies situated along drainage lines / waterways (eg check dams, sediment traps, water dams)*

Examples

Graded bund and ditch below with drainage channels. Excess water needs to be drained and channelled without causing damage. Anjeni, Ethiopia. (Photo: Hans Hurni)



Gully control and catchment protection with integrated measures such as cut-off drains, wooden check dams, stone check dams and staggered structures for tree planting. Cochabamba, Bolivia. (Drawing: Mats Gurtner)

1.2.4 To understand properly the implementation of the SLM Technology, the associated SLM Approach needs to be described. Indicate the approach (or approaches) described in the WOCAT Questionnaire on SLM Approaches' (QA).

Name of SLM Approach:	Author:	Questionnaire code:
1.	.....	QA _ _ _ | _ _ _
2.	.....	QA _ _ _ | _ _ _

1.3 Area information

1.3.1 Define the area in which the SLM Technology has been applied

State / Province: ..... Region / Subregion: ……..

Total SLM Technology area: ..... km^2

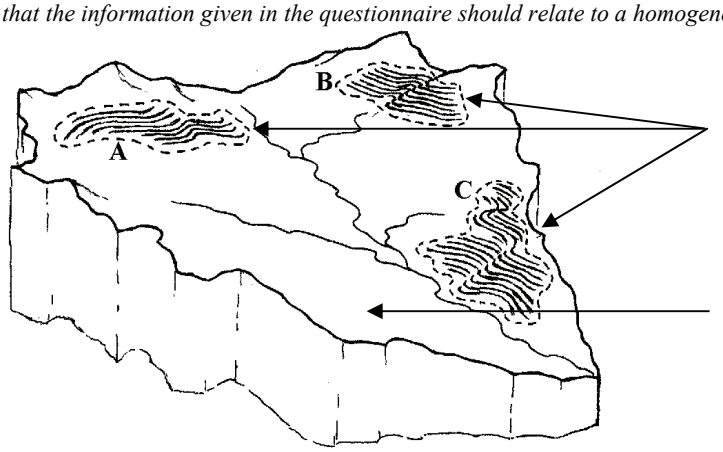
If precise area is not known, indicate approximately.

< 0.1 km^2 (10 ha)	☐	100 km^2 - 1,000 km^2	☐
0.1 - 1 km^2	☐	1,000 km^2 - 10,000 km^2 -	☐
1 - 10 km^2	☐	> 10,000 km^2	☐
10 - 100 km^2	☐		

Comments: .....
.....
.....
.....

☑ ***Square boxes must be ticked!*** *If 'Several answers possible' is not indicated tick only one box!*
Make use of the specify/remark/comments column or line as much as possible!

SLM Technology area: *The area where SLM Technology is already implemented. It includes both the area occupied by conservation measures and the additional area protected by them (eg the area between structures or vegetation strips). Limit to the area for which you have detailed information or particular knowledge (based on research / projects). Also remember that the information given in the questionnaire should relate to a homogeneous area as defined in 'criteria for technology' QT 2).*



A, B and C: Areas where SLM Technology (described in this questionnaire) is applied

A + B + C =
*Total **SLM Technology area***

Area where the described SLM Technology is not applied

1.3.2 Provide the coordinates in latitude and longitude of the center of the conservation area.

It is also possible to indicate boundary points to delineate the conservation area or provide a GoogleEarth .kmz file (containing a 'placemark' or a 'polygon').

Centre latitude: _____ Centre longitude: _____

Outline boundary points or GoogleEarth file: _____
_____
_____

GoogleEarth: download free version from http://earth.google.com/

PART 2: SPECIFICATION OF SLM TECHNOLOGY

2.1 Description

Give a definition and a concise description of the technology. See also criteria for the boundaries of a technology on page QT3.

2.1.1 **Definition of technology** (in one sentence)

.....

.....

Definition of technology is very important as it determines whether anyone searching the database will read further. It contains key characteristics (key words) of the technology.

2.1.2 Provide an extended summary of the technology with its main characteristics

Make sure that the description contains the key characteristics / distinct features of the technology, purpose, establishment / maintenance activities and inputs, most important conditions regarding natural / human environment) this summary has to provide a comprehensive / concise picture of the technology to outsiders. After having gone through the whole questionnaire come back and revise / complement this section. Try to fill the grey shaded space but do not exceed…

Description: .....

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Purpose:.....

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Establishment / maintenance activities and inputs: .....

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Natural / human environment: .....

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2.1.3 Provide photos showing an overview and details of the technology:

Provide at least two photos. Explanation (description) is required for each photo submitted!
Photos should be of high quality. Highest possible resolution is required for digital photos.
Photos should match the description given in 2.1.2 and should not contradict the technical drawing in 2.4.
Where appropriate, photos should depict the before and after or with and without conservation measures situation (Example).
Good photos are crucial for understanding and illustrating the main feature of the technology.

Explanation of photo:

Description: .....

.....

.....

Location: ..... Distr./Prov./State: ..... Date: .....

Author: ..... Address: .....

Provide the same information for each photo submitted!

***Example**: Detailed view of a forward sloping terrace with grass strip on the riser, Anjeni, Ethiopia. ..... (Photos: Hanspeter Liniger) .....*

***Example**: grazing land management. Area closure allows the regeneration of natural vegetation (left). Area not protected (right), Australia. (Photos: Hanspeter Liniger)*

2.2 Purpose and classification

2.2.1 Specify the major land use problems related to soil, water and vegetation in the area (without land conservation):

In your opinion: .....

.....

From the land users' point of view: .....

.....

Land user *(definition): the person / entity who implements / maintains land conservation, including individual small/large scale farmers, cooperatives, industrial companies (eg mining), government institutions (eg state forest), etc*

2.2.2 Characterisation and purpose of the technology

2.2.2.1 **On which land use type is the technology applied?**

Land use type: ..... Subcategory: .....

If land use has changed due to the implementation of the technology, indicate land use type before and after:
Original land use (before implementation of SLM technology): .....
Current land use (after implementation of SLM technology): .....

Use the land use types listed below. Further details on land use (including irrigation, etc. will be dealt with in sections 2.8.8 (cropland and mixed land), 2.8.9 (grazing land), 2.8.10 (forest), 2.8.11 (other land)

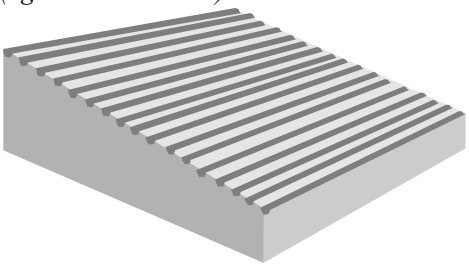
Land use: *human activities which are directly related to land, making use of its resources or having an impact upon it.*
Land cover: *Vegetation (natural or planted) or man-made structures (buildings, etc.) that cover the earth's surface.*

Land use type	***Subcategory***
Cropland: *Land used for cultivation of crops (field crops, orchards).*	• ***Annual cropping:*** *land under temporary / annual crops usually harvested within one, maximally within two years (eg maize, paddy rice, wheat, vegetables, fodder crops)* • ***Perennial (non-woody) cropping:*** *land under permanent (not woody) crops that may be harvested after 2 or more years, or only part of the plants are harvested (eg sugar cane, banana, sisal, pineapple)* • ***Tree and shrub cropping:*** *permanent woody plants with crops harvested more than once after planting and usually lasting for more than 5 years (eg orchards / fruit trees, coffee, tea, grapevines, oil palm, cacao, coconut, fodder trees)*
Grazing land: *Land used for animal production*	• ***Extensive grazing land:*** *grazing on natural or semi-natural grasslands, grasslands with trees / shrubs (savannah vegetation) or open woodlands for livestock and wildlife* • ***Intensive grazing/ fodder production:*** *improved or planted pastures for grazing/ production of fodder (for cutting and carrying: hay, leguminous species, silage etc) not including fodder crops such as maize, cereals. These are classified as annual crops (see above)*
Forests / woodlands: *land used mainly for wood production, other forest products, recreation, protection.*	• ***Natural:*** *forests composed of indigenous trees, not planted by man* • ***Plantations, afforestations:*** *forest stands established by planting or/and seeding in the process of afforestation or reforestation* • ***Other:*** *eg selective cutting of natural forests and incorporating planted species*
Mixed: *mixture of land use types within the same land unit.*	• ***Agroforestry:*** *cropland and trees* • ***Agro-pastoralism****: cropland and grazing land (including seasonal change between crops and livestock)* • ***Agro-silvopastoralism:*** *cropland, grazing land and trees (including seasonal change between crops and livestock)* • ***Silvo-pastoralism:*** *forest and grazing land* • ***Other:*** *other mixed land*
Other:	• ***Mines and extractive industries*** • ***Settlements, infrastructure networks:*** *roads, railways, pipe lines, power lines* • ***Waterways, drainage lines*** • ***Other: wastelands, deserts, glaciers, swamps, recreation areas, etc***

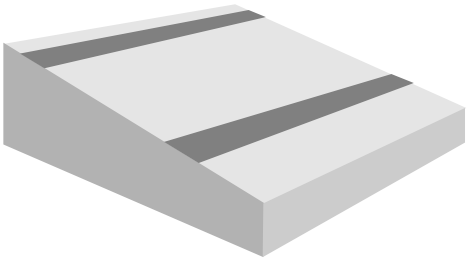
2.2.2.2 **Which conservation measures does the technology consist of?**
Note: circles always require ranking; Important: check definitions below

agronomic measures	◯	(eg mulching, contour cultivation)
vegetative measures	◯	(eg grass strip, wind-breaks, reforestation)
structural measures	◯	(eg terrace, bunds, banks, etc.)
management measures	◯	(eg land use change, area closure, rotational grazing)

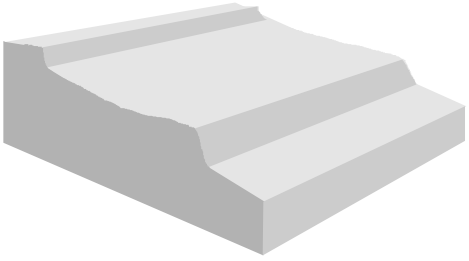
Land conservation measures – the constituents of a SLM Technology
Conservation measures fall into four categories: agronomic, vegetative, structural and management measures. Measures are components of SLM technologies. Each technology is made up of one or – very commonly - a combination of measures: For instance, terraces – a typical structural measure – are often combined with other measures, such as grass on the risers for stabilisation and fodder (vegetative measure), or contour ploughing (agronomic measure).



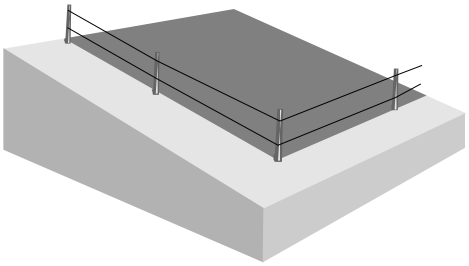
Agronomic measures *such as conservation agriculture, manuring / composting, mixed cropping, contour cultivation, mulching, etc.*
- *are usually associated with annual crops*
- *are repeated routinely each season or in a rotational sequence*
- *are of short duration and not permanent*
- *do not lead to changes in slope profile*
- *are normally independent of slope*



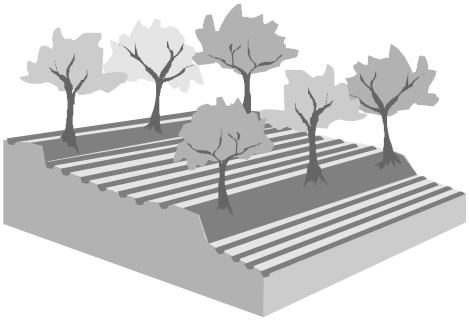
Vegetative measures *such as grass strips, hedge barriers, windbreaks, agroforetry etc.*
- *involve the use of perennial grasses, shrubs or trees*
- *are of long duration*
- *often lead to a change in slope profile*
- *are often aligned along the contour or against the prevailing wind direction*
- *are often spaced according to slope*



Structural measures *such as terraces, banks, bunds, constructions, palisades, etc*
- *often lead to a change in slope profile*
- *are of long duration or permanent*
- *are carried out primarily to control runoff, wind velocity and erosion and to harvest rainwater*
- *often require substantial inputs of labour or money when first installed*
- *are often aligned along the contour / against prevailing wind direction*
- *are often spaced according to slope*
- *involve major earth movements and / or construction with wood, stone, concrete, etc.*



Management measures *such as land use change, area closure, rotational grazing, etc.*
- *involve a fundamental change in land use*
- *involve no agronomic and structural measures*
- *often result in improved vegetative cover*
- *often reduce the intensity of use*



Combinations *in conditions where different measures are complementary and thus enhance each other's effectiveness.*
Any combinations of the above measures are possible, eg:
- ***structural:*** *terrace with*
- ***vegetative:*** *grass and trees with*
- ***agronomic:*** *ridges*

2.2.2.3 **Which of the following goals does the technology pursue (stage of intervention)?**

prevention of land degradation ◯
mitigation / reduction of land degradation ◯
rehabilitation / reclamation of denuded land ◯

◯ ***Circles always require ranking!*** *It is possible to give more than one option the same rank, but not necessarily all circles need to be given a number. Use only ranks 1, 2 or 3!*

1 = very important / large extent
2 = important / medium extent
3 = less important / little extent

2.2.2.4 **Which types of land degradation are mainly addressed by the technology?**

Select the types from the list below

..... ◯
..... ◯
..... ◯
..... ◯

Degradation types (for detailed explanations refer to www.wocat.net:

W: Soil erosion by water

Wt	*loss of topsoil / surface erosion: even removal of top soil, sheet and interrill erosion*
Wg	*gully erosion / gullying*
Wm	*mass movements*
Wr	*riverbank erosion*
Wc	*coastal erosion*
Wo	*offsite degradation effects: deposition of sediments, downstream flooding, siltation of reservoirs and waterways, and pollution of water bodies with eroded sediments*

E: Soil erosion by wind

Et	*loss of topsoil: uniform displacement*
Ed	*deflation and deposition: uneven removal of soil material*
Eo	*offsite degradation effects: covering of the terrain with windborne sand particles from distant sources ("overblowing")*

C: Chemical soil deterioration

Cn	*fertility decline and reduced organic matter content (not caused by erosion): eg leaching, soil fertility mining, nutrient oxidation and volatisation (N)*
Ca	*acidification: lowering of the soil pH*
Cp	*soil pollution: contamination of the soil with toxic materials*
Cs	*salinisation / alkalinisation: a net increase of the salt content of the (top) soil leading to a productivity decline*

P: Physical soil deterioration

Pc	*compaction: deterioration of soil structure by trampling or the weight and/or frequent use of machinery*
Pk	*sealing and crusting: clogging of pores with fine soil material and development of a thin impervious layer at the soil surface obstructing the infiltration of rainwater*
Pw	*waterlogging: effects of human induced hydromorphism (excluding paddy fields)*
Ps	*subsidence of organic soils, settling of soil*
Pu	*loss of bio-productive function due to other activities (eg construction, mining, roads, etc)*

B: Biological degradation

Bc	*reduction of vegetation cover: increase of bare / unprotected soil*
Bh	*loss of habitats: decreasing vegetation diversity (fallow land, mixed systems, field borders), increased fragmentation of habitats*
Bq	*quantity / biomass decline: reduced vegetative production for different land use*
Bf	*detrimental effects of fires (includes cold / hot fires): on forest (eg slash and burn), bush, grazing and cropland (burning of residues)*
Bs	*quality and species composition /diversity decline: loss of natural species, land races, palatable perennial grasses; spreading of invasive, salt-tolerant, unpalatable, species / weeds*
Bl	*loss of soil life: decline of soil macro-organisms and micro-organisms in quantity and quality*
Bp	*increase of pests / diseases, loss of predators: reduction of biological control*

H: Water degradation

Ha	*aridification: decrease of average soil moisture content*
Hs	*change in quantity of surface water: change of the flow regime (flood, /peak flow, low flow, drying up of rivers and lakes)*
Hg	*change in groundwater / aquifer level: lowering of groundwater table due to over-exploitation or reduced recharge of groundwater; or increase of groundwater table resulting in waterlogging and/or salinisation*
Hp	*decline of surface water quality: increased sediments and pollutants in fresh water bodies due to point pollution and land-based pollution*
Hq	*decline of groundwater quality: due to pollutants infiltrating into the aquifers*
Hw	*reduction of the buffering capacity of wetland areas: to cope with flooding and pollution*

2.2.2.5 **What were the main causes of land degradation (identified in 2.2.2.4)**

a) **Direct causes**		Comments
crop management	◯	.....
deforestation / removal of natural vegetation / forest fires	◯	.....
over-exploitation of vegetation	◯	.....
overgrazing	◯	.....
industrial activities, and mining	◯	.....
urbanisation and infrastructure development	◯	.....
natural causes / disasters (droughts, floods, storms, etc.)	◯	.....
discharges leading to point contamination of surface and ground water resources	◯	.....
causes leading to non-point contamination of surface and ground water resources	◯	.....
disturbance of the water cycle	◯	.....
over abstraction of water (irrigation)	◯	.....
climate change	◯	.....
other (specify)	◯	.....
b) **Indirect causes**		Comments
population density	◯	.....
land tenure	◯	.....
poverty / wealth	◯	.....
labour availability	◯	.....
inputs and infrastructure: (roads, markets, distribution of water points, other, …	◯	.....
education, access to knowledge and support services	◯	.....
war and conflicts	◯	.....
governance / institutional	◯	.....
other (specify)	◯	.....
other (specify)	◯	.....

Causes of degradation

Various types of human activities and natural causes may lead to soil degradation. The emphasis in the degradation inventory is on human-induced degradation, but sometimes natural degradation also necessitates measures to be taken (For definitions refer to Annex 5).

2.2.2.6 **How does the technology combat land degradation (technical functions)?**

control of raindrop splash		◯
control of dispersed runoff:	retain / trap	◯
	impede / retard	◯
control of concentrated runoff:	retain / trap	◯
	impede / retard	◯
	drain / divert	◯
reduction of slope angle		◯
reduction of slope length		◯
improvement of ground cover		◯
increase of surface roughness		◯
improvement of surface structure (crusting, sealing)		◯
improvement of topsoil structure (compaction)		◯
improvement of subsoil structure (hardpan)		◯
stabilisation of soil (eg by tree roots against land slides)		◯
increase in organic matter		◯
increase in nutrient availability (supply, recycling,…)		◯
increase of infiltration		◯
increase / maintain water stored in soil		◯
increase of groundwater level, recharge of groundwater		◯
water harvesting / increase water supply		◯
water spreading		◯
improvement of water quality, buffering/filtering water		◯
sediment retention / trapping, sediment harvesting		◯
reduction in wind speed		◯
increase of biomass (quantity)		◯
promotion of vegetation species and varieties (quality, eg palatable fodder)		◯
control of fires		◯
reduction of dry material (fuel for wild fires)		◯
spatial arrangement and diversification of land use		◯
others (specify)		◯
.....		◯

2.3 Status

2.3.1 How has the technology been developed?

	several answers possible *rank according to importance*	traditional (>50 years)	10-50 years	recent (<10 years)
through land user's initiative (innovation, traditional)	◯	☐	☐	☐
through experiments / research	◯	☐	☐	☐
externally / introduced through project	◯	☐	☐	☐
other (specify): ……..	◯	☐	☐	☐

Comments (eg. precise years) .....

.....

*The terms **traditional / indigenous / existing / local** refer to the farmer's own practices. They cover practices in use ever since as well as the ones developed more recently by innovative farmers in response to changing circumstances. Use other when the technology does not fit any of the given categories and specify which and why it does not fit.*

2.3.2 What level of technical knowledge is required for the implementation of the technology?

	low	moderate	high
field staff / agricultural advisor	☐	☐	☐
land user	☐	☐	☐

2.4 Technical drawing

Please provide a comprehensive and detailed drawing (with dimensions) of the SLM Technology and indicate technical specifications, measurements, spacing, gradient, etc., in the box below. It has to match the description given in 2.1.2 and complements the photograph in 2.1.3. Keep the drawing simple and schematic. The technical drawing is crucial for the understanding of the Technology! If the box is not sufficient, use the extra pages at the end of the questionnaire.

Explanation of drawing:

Description: .....

.....

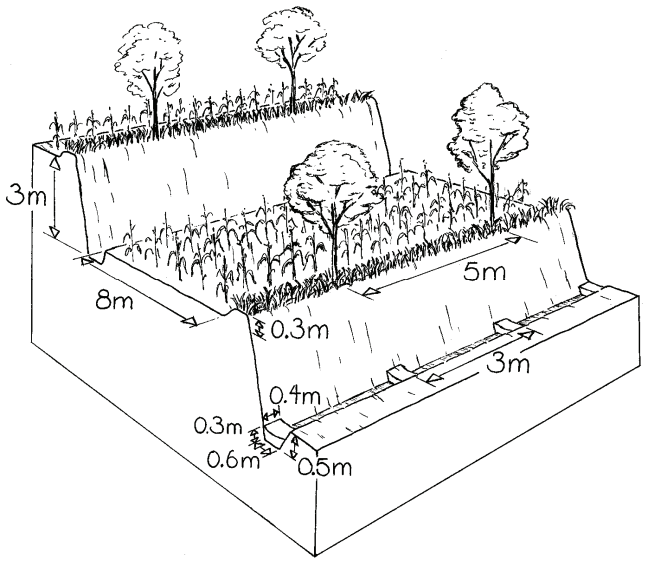
.....

Location: ..... Distr./Prov./State: ..... Date: .....

Author: ..... Address: .....

.....

.....



***Example**: Technical drawing indicating technical specifications, dimensions, spacing*

2.5 Technical specifications, implementation activities, inputs and costs

- *Indicate what inputs would cost today.*
- *Calculate costs for a typical (most common) situation within your conservation area.*
- *Indicate all conservation-related costs (to land users, projects, etc.) of the technology that are additional to the costs of ordinary field operations*
- *In case the ordinary field operations have changed / are part of the technology (eg conservation agriculture) describe all activities.*
- *Exclude costs for awareness creation, planning, training, research, and financial / material support (these will be addressed in Approach questionnaire 2.3.2.2)*
- *Activities/costs preferably should be indicated per area (per hectare) to guarantee comparability between different technologies. Include not only the area which is directly covered by conservation measures (eg the area that is covered with stone walls, tree lines, ditches) but also for the area that is indirectly affected / protected by the conservation measures.*
- *Where necessary, costs can alternatively be calculated per unit (other than ha) such as per entity (eg dam) or per length (eg meter grass strip, meter tone line)*
- *Give US dollar equivalent costs where possible.*
- *A distinction is made between <u>establishment costs</u> (construction, initiation) and <u>recurrent annual costs</u> (maintenance, etc)*
- *It may be very difficult to determine the costs of a conservation technology. Nevertheless, we ask you to give the best estimate you can!*

If you have indicated only one category in question 2.2.2.2 (on land conservation measures), answer the questions in <u>one</u> of the following sections which corresponds to that category. If you have indicated more than one category in question 2.2.2.2, fill out each corresponding section.

2.5.1 Specifications of agronomic conservation measures

If in question 2.2.2.2 you have described the SLM Technology as an agronomic measure, fill out the following section, otherwise go to 2.5.2.

2.5.1.1 Type and layout of agronomic measures

Refer to your drawings in question 2.4. See example below.

Several answers possible		material / species	quantity / density *	remarks (eg alignment / layout)
Vegetation / soil cover:				
better crop cover	☐	.....	.....	.....
early planting	☐	.....	.....	.....
relay cropping	☐	.....	.....	.....
mixed cropping / intercropping	☐	.....	.....	.....
contour planting / strip cropping	☐	.....	.....	.....
cover cropping	☐	.....	.....	.....
retaining more vegetation cover	☐	.....	.....	.....
mulching	☐	.....	.....	.....
temporary trashlines	☐	.....	.....	.....
other (specify)	☐	.....	.....	.....
Organic matter / soil fertility:				
green manure	☐	.....	.....	.....
legume inter-planting	☐	.....	.....	.....
manure / compost / residues	☐	.....	.....	.....
mineral (inorganic) fertilizers	☐	.....	.....	.....
soil conditioners (lime, gypsum)	☐	.....	.....	.....
rotations / fallows	☐	.....	.....	.....
other (specify)	☐	.....	.....	.....
Soil surface / subsurface:				
breaking crust / sealed surface	☐	.....	.....	.....
breaking compacted topsoil	☐	.....	.....	.....
zero tillage / no-till	☐	.....	.....	.....
minimum tillage	☐	.....	.....	.....
non-inversion tillage	☐	.....	.....	.....
contour tillage	☐	.....	.....	.....
contour ridging	☐	.....	.....	.....
furrows (drainage, irrigation)	☐	.....	.....	.....
pits	☐	.....	.....	.....
breaking compacted subsoil	☐	.....	.....	.....
deep tillage / double digging	☐	.....	.....	.....
other (specify)	☐	.....	.....	.....

* *quantity / density: t/ha or plants per ha*

Types of agronomic land conservation measures (for more definitions refer to www.wocat .net):

Better crop cover: selecting crops with higher ground cover, increasing plant density, etc.

Relay cropping: specific form of mixed cropping / intercropping in which a second crop is planted into an established stand of a main crop. The second crop develops fully after the main crop is harvested.

Cover cropping: planting close-growing crops (usually annual legumes), mainly to protect the soil, between perennials or in the period between seasons for annual crops.

Removing less vegetation cover: eg cutting less grass, leaving a volunteer crop.

Trashlines: line of crop residues / weeds laid out along the contour to act as a barrier to runoff and erosion. May be allowed to rot and dug into the ground to improve fertility (in this case, it is used as a 'mobile compost strip'), or can provide the basis for a permanent structure.

Mulching: spreading of organic (or other) materials on the surface of the soil around crops to reduce moisture loss, reduce erosion, inhibit weed growth, etc.:

Green manure: a crop grown to be ploughed / incorporated into the ground to increase organic matter content, thereby improving fertility and reducing erodibility.

***Rotations*:** the practice of alternating the annual crops grown on a specific field in a planned pattern or sequence in successive crop years so that crops of the same species or family are not grown repeatedly without interruption on the same field, practiced to replenish soil, and curb pests and diseases.

Zero tillage/no-till: a system where crops are planted into the soil without primary tillage.

Breaking compacted subsoil (hard pans): eg deep ripping, subsoiling. Deep ripping of soil with a tine or similar tool, normally to break a hard pan and / or to improve drainage and infiltration.

Double digging: hand digging the soil up to twice as deep as normally in order to improve drainage, infiltration and rooting characteristics.

2.5.1.2 Activities, inputs and costs for agronomic measures

see explanations under 2.5

Initial investment

Input	Quantity	Total costs local currency	Total costs US$	% borne by land user	No. of parties (sharing)	life-span of product (eg 2 years)

Agronomic measures are per definition recurrent activities which are repeated each season. However, some of them require an initial investment, eg. for special machinery.

Maintenance / recurrent activities

Activity	Timing/ frequency *	Input *select from list below*	Quantity	Unit** (ha, m, dam)	Total costs local currency	Total costs US$	% borne by land user
1.							
2.							
3.							

Activity	Timing/ frequency *	Input *select from list below*	Quantity	Unit** (ha, m, dam)	Total costs local currency	Total costs US$	% borne by land user
4.							
5.							

Timing: time, at which activity is carried out, eg after harvest of crops, before onset of rains, etc.
Frequency: eg annually, each cropping season, etc.
** ***Unit*****:** preferably hectares (ha) and if not possible, entity (dam) or length (eg. meter of stone line)

Inputs:

Labour[1]	*Equipment*	*Materials*	*Agricultural*
- person days	*- machine hours[2]* *- animal traction (hours)* *- tools* *- other (specify)*	*- stone (m3)* *- wood (m3)* *- earth (m3)* *- other (specify)*	*- seeds (kg)* *- seedlings (No.)* *- fertilizer (kg)* *- biocides (kg)* *- compost / manure (kg)* *- other (specify)*

[1] The labour cost should be based on the total person days, be they paid or voluntary. To calculate the US $ Equivalent first indicate daily wage and then multiply the daily wage with the number of person days.
[2] Machine hours: calculation should be based on hiring costs; -- include costs of operation and depreciation

Specify machinery / tools: .....
.....

*Provide **further relevant information** on the agronomic measures in Annex T3*

Example: **Activities, inputs and costs for agronomic measures**

Maintenance / recurrent activities

Activity	Timing/ frequency *	Input *select from list below*	Quantity	Unit** (ha, m, dam)	Total costs local currency	Total costs US$	% borne by land user
1.Direct seeding/fertilizer (N/P) banding using no-till drill	*Early Nov.*	*labour*	*8*			*80*	*100*
		equipment	*6*			*60*	*0*
		fertilizer	*130 kg*	*ha*		*30*	*0*
2.Leave fields to fallow for 18 months, apply herbicide if needed		*labour*	*1*			*10*	
		equipment	*1*			*10*	
		herbicide		*ha*		*40*	*0*

2.5.2 Specifications of vegetative conservation measures

If in question 2.2.2.2 you have described the SLM Technology as a vegetative measure, fill out the following section, otherwise go to 2.5.3. Refer to your drawings in question 2.4. See example below.
see explanations under 2.5

2.5.2.1 Type and alignment / layout of vegetative measures

Several answers possible				between rows / strips / blocks*[2]		within rows / strips / blocks (between plants)	
vegetative measures :		material *[1]	number of plants per ha	vertical interval (m)	spacing (m)	interval (m)	width (m)
aligned : -contour	☐	.....	……	.....	.....	.....	.....
-graded strips *[3]	☐	.....	……	.....	.....	.....	.....
-against wind	☐	.....	……	.....	.....	.....	.....
-along boundary	☐	.....	……	.....	.....	.....	.....
-linear	☐	.....	……	.....	.....	.....	.....
scattered / dispersed	☐	.....	.....	.....	.....	.....	.....
in blocks	☐	.....	.....	.....	.....	.....	.....
others (specify)							
.....	☐	.....	.....	.....	.....	.....	.....
.....	☐	.....	.....	.....	.....	.....	.....
.....	☐	.....	.....	.....	.....	.....	.....

*[1] material (vegetative):
Combinations possible

	Specify species and if planted/seeded or naturally reg.:
T : trees / shrubs (eg Acacia, .perennial fodder and browse spp.)	.....
F : fruit trees / shrubs (eg mango, apple, berries, grapes)	.....
C : perennial crops (eg coffee, tea, alfalfa)	.....
G : grass	.....
O : other	.....

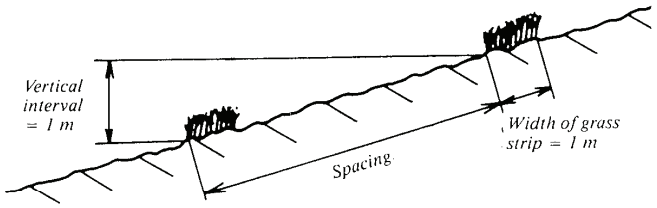
*[2] Indicate slope (which determines the spacing indicated above) : ..... %
(add more details on slope / spacing on QT56)

If the original slope has changed as a result of the technology (see also 2.3.6), the slope today is …..... %

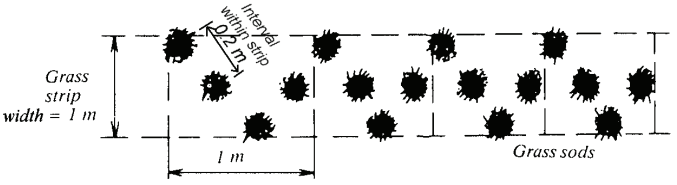
*[3] Indicate the gradient along the rows / strips ..... %

Specifications:

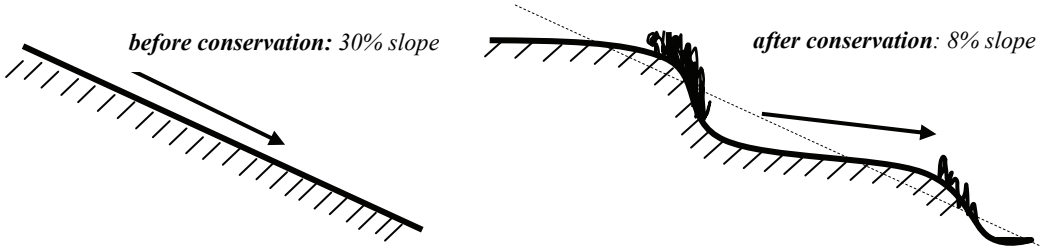
Cross-section:



View from top:



- *Grass strips are planted along the contour or along a cut-off drain.*
- *Spacing with a vertical interval of 1 meter means that on a 3 % slope, grass strips will be 33 m apart, and on a 15 % slope, only 7 m apart, which is, however, still sufficient for ploughing between the strips.*



2.5.2.2 **Activities, inputs and costs for vegetative measures**

Initial establishment

Activity	Timing	Input *select from list below*	Quantity	Unit* (ha, m, dam)	Total costs local currency	Total costs US$	% borne by land user
1.							
2.							
3.							
4.							
5.							

* ***Unit:*** preferably hectares (ha) and if not possible, entity (dam) or length (eg meter of stone line)

Maintenance / recurrent activities

Activity	Timing/ frequency *	Input *select from list below*	Quantity	Unit** (ha, m, dam)	Total costs local currency	Total costs US$	% borne by land user
1.							
2.							
3.							
4.							
5.							

* ***Timing:*** time, at which activity is carried out, eg after harvest of crops, before onset of rains, etc.
Frequency: eg annually, each cropping season, etc.
*****Unit:*** preferably hectares (ha) and if not possible, entity (dam) or length (eg meter of stone line)

Inputs:

Labour[1]	*Equipment*	*Materials*	*Agricultural*
- person days	*- machine hours*[2]	*- stone (m3)*	*- seeds (kg)*
	- animal traction (hours)	*- wood (m3)*	*- seedlings (No.)*
	- tools	*- earth (m3)*	*- fertilizer (kg)*
	- other (specify)	*- other (specify)*	*- biocides (kg)*
			- compost / manure (kg)
			- other (specify)

[1] The labour cost should be based on the total person days, be they paid or voluntary. To calculate the US $ Equivalent first indicate daily wage and then multiply the daily wage with the number of person days.
[2] machine hours: calculation should be based on hiring costs; -- include costs of operation and depreciation

Specify machinery / tools: .....
.....

*Provide **further relevant information** on the vegetative measures in Annex T3.*
If vegetative measures are used to stabilise structures also fill out structural measures 2.5.3

Example: **Activities, inputs and costs for vegetative measures**

Initial establishment

Activity	Timing	Input *select from list below*	Quantity	Unit* (ha, m, dam)	Total costs local currency	Total costs US$	% borne by land user
1.Layout of contours with the use of an A-frame before land preparation, place wooden pegs along the contours	*during dry season*	*labour*	*1*			*3*	*100*
		Material: pegs				*4*	*100*
2.Initial ploughing along the contour: leaving unploughed strips		*labour*	*4*			*12*	*100*
		Animal traction	*32*			*40*	*100*
		Tools				*25*	*100*

2.5.3 Specifications of <u>structural</u> conservation measures

If in question 2.2.2.2 you have described the SLM Technology as a structural measure, fill out the following section, otherwise go to 2.5.4. Refer to your drawings in question 2.4. See example below.

2.5.3.1 **Type and alignment / layout of structures**

Several answers possible

structures	material *[1]	between structures *[2]		dimensions of each structure: ditches / pits / dams			bunds / banks / others*[3]		
	E, S, W, C, O	vertical interval (m)	spacing (m)	depth (m)	width (m)	length (m)	height (m)	width (m)	length (m)
diversion ditch / cut-off drain ☐	.....	.....	.....	.....	.....	.....	.....	.....	.....
waterway ☐	.....	.....	.....	.....	.....	.....	.....	.....	.....
spillway ☐	.....	.....	.....	.....	.....	.....	.....	.....	.....
dam / pan*[5] ☐	.....	.....	.....	.....	.....	.....	.....	.....	.....
wall / barrier *[3] ☐	.....	.....	.....	.....	.....	.....	.....	.....	.....
retention / infiltration ditch / pit, sediment / sand trap ☐	.....	.....	.....	.....	.....	.....	.....	.....	.....
terrace: forward sloping[2/4] ☐	.....	.....	.....	.....	.....	.....	.....	.....	.....
bench level *[4] ☐	.....	.....	.....	.....	.....	.....	.....	.....	.....
backward sloping *[2/4] ☐	.....	.....	.....	.....	.....	.....	.....	.....	.....
bund / bank: level ☐	.....	.....	.....	.....	.....	.....	.....	.....	.....
graded *[4] ☐	.....	.....	.....	.....	.....	.....	.....	.....	.....
semi-circular / V shaped	.....	.....	.....	.....	.....	.....	.....	.....	.....
trapezoidal ☐									
reshaping surface ☐	.....	.....	.....	.....	.....	.....	.....	.....	.....
other: ..... ☐	.....	.....	.....	.....	.....	.....	.....	.....	.....
other: ..... ☐	.....	.....	.....	.....	.....	.....	.....	.....	.....
other: ..... ☐	.....	.....	.....	.....	.....	.....	.....	.....	.....

*[1] Indicate construction material and specify:

Combinations possible	specify / comments
E: earth	.....
S: stone	.....
W: wood	.....
C: concrete	.....
O: other	.....

*[2] Indicate slope (which determines the spacing indicated above): ..... %
(add more details on slope / spacing in the annex)

If the original slope has changed as a result of the technology (see also 2.3.6), the slope (between the structures, see QT 17) today is ..... %

*[3] eg artificial windbreaks (palisades)

*[4] Indicate the lateral gradient along the structure: ..... %

*[5] capacity: ……m3; catchment area; if possible beneficial area (eg where water is applied, area where T. has an effect); area slopes of dam wall: inside……%, outside……%; dimensions of spillways: ……m; other specifications: …….

For water harvesting: the ratio between the area where the harvested water is applied and the total area from which water is collected is: **1 :** .....

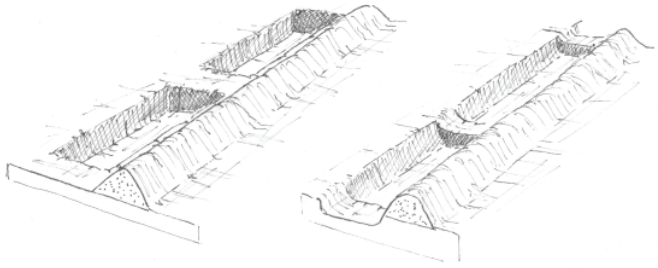
Is vegetation used for stabilisation of structures? no ☐ yes ☐

If yes, also fill out vegetative measures 2.5.2

Different types of structural conservation measures

Diversion ditch / cut-off drain: *a graded channel with a supportive ridge or bank on the lower side. It is constructed across a slope and designed to intercept surface runoff and convey it safely to an outlet or waterway.*

Waterways: *are needed to conduct runoff safely from hill slo*



Retention / infiltration ditches: *large ditches designed to catch and retain all incoming runoff and hold it until it infiltrates into the ground.*

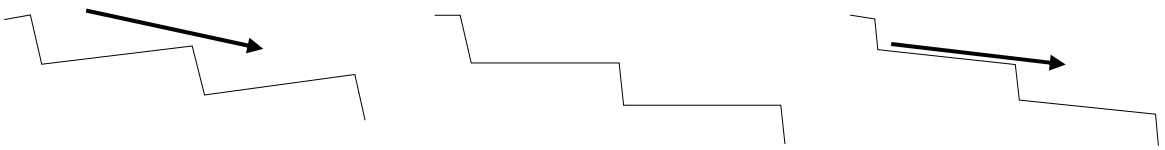
Pits: *planting holes (for example those used widely in the West African Sahel).*

Sediment / sand trap: *device (either an above ground barrier or a dam wall) built specifically to trap sand or sediments moving in the wind or in water flow.*

Dam / pan: *blockage of watercourse or excavation at a low spot of land to collect water for various purposes.*

Terraces: *involve a more or less permanent change in slope profile.*

before conservation: *25% slope* ***after conservation****: 8% slope*

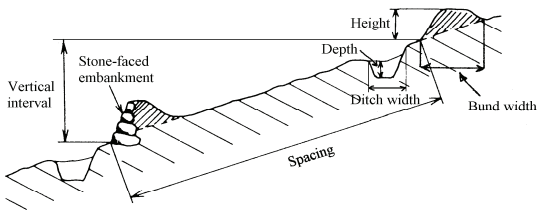


backward sloping bench terrace *level bench terrace* *forward sloping bench terrace*

Level bund / bank: *an embankment along the contour made of soil and / or stones with a basin at its upper or lower side. They often develop into forward sloping terraces.*
Graded bund: *same definition as for level bund, with the only difference that it is slightly graded (with a gradient of up to 1%) towards a waterway or river.*

Walls, barriers: *physical obstacles to movement of soil or sand, eg artificial windbreaks (palisades). Can be made from various materials.*

A cross-section of a bund and ditch: *semi-circular bunds:* *trapezoidal bunds:*



Example: **Type and alignment / layout of structures**

Several answers possible structures	material *[1]	between structures *[2]		dimensions of each structure: ditches / pits / dams			bunds / banks / others*[3]		
	E, S, W, C, O	vertical interval (m)	spacing (m)	depth (m)	width (m)	length (m)	height (m)	width (m)	length (m)
diversion ditch / cut-off drain ☑	*E, S*		*100*	*0,8*	*0,6*	*60*	*0,8*	*1,5*	*60*
waterway ☐	.....	.....	.....	.....	.....	.....	.....	.....	.....
retention / infiltration ditch / pit, sediment / sand trap ☐	.....	.....	.....	.....	.....	.....	.....	.....	.....
dam / pan ☐	.....	.....	.....	.....	.....	.....	.....	.....	.....
terrace: forward sloping*[2/4] ☑	*E, S*	*3*	*10*	*0,3*	*0,5*	*5*	*0,3*	*1,0*	*30*
bench level *[4] ☐	.....	.....	.....	.....	.....	.....	.....	.....	.....
backward sloping *[2/4] ☐	.....	.....	.....	.....	.....	.....	.....	.....	.....

*[1] Indicate construction material and specify:

Combinations possible

	specify / comments:
E: earth	*soil excavated from the ditches is used to build banks*
S: stone	*the cut-off drain is lined with stones, embankment with stones*
W: wood	.....

*[2] Indicate slope (which determines the spacing indicated above):..... *30*..... % (add more details on slope / spacing on QT47)
If the original slope has changed as a result of the technology the slope (between the structures, see QT18) today is .... *8*... %

*[3] eg artificial windbreaks (palisades)

*[4] Indicate the lateral gradient along the structure: ..... *0*..... %

For water harvesting: the ratio between the area where water is applied and the total area from which water is collected is: **1 :**

Is vegetation used for stabilisation of structures? no ☐ yes ☑

2.5.3.2 Activities, inputs and costs for structural measures

Initial construction

Activity	Timing	Input *select from list below*	Quantity	Unit* (ha, m, dam)	Total costs local currency	Total costs US$	% borne by land user
1.							
2.							
3.							
4.							
5.							

* ***Unit:*** preferably hectares (ha) and if not possible, entity (dam) or length (eg meter of stone line)

Maintenance / recurrent activities

Activity	Timing/ frequency *	Input *select from list below*	Quantity	Unit** (ha, m, dam)	Total costs local currency	Total costs US$	% borne by land user
1.							
2.							
3.							
4.							
5.							

Timing: *time, at which activity is carried out, eg after harvest of crops, before onset of rains, etc.*
Frequency: *eg annually, each cropping season, etc.*
****Unit:*** preferably hectares (ha) and if not possible, entity (dam) or length (eg meter of stone line)

Inputs:

Labour[1]	*Equipment*	*Materials*	*Agricultural*
- person days	*- machine hours[2]*	*- stone (m3)*	*- seeds (kg)*
	- animal traction (hours)	*- wood (m3)*	*- seedlings (No.)*
	- tools	*- earth (m3)*	*- fertilizer (kg)*
	- other (specify)	*- other (specify)*	*- biocides (kg)*
			- compost / manure (kg)
			- other (specify)

[1] The labour cost should be based on the total person days, be they paid or voluntary. To calculate the US $ Equivalent first indicate daily wage and then multiply the daily wage with the number of person days.
[2] Machine hours: calculation should be based on hiring costs; -- include costs of operation and depreciation.

Specify machinery / tools: .....
.....

*Provide **further relevant information** on the structural measures in Annex T3*

***Example*: Activities, inputs and costs for structural measures**

Initial construction

Activity	Timing	Input *select from list below*	Quantity	Unit* (ha, m, dam)	Total costs local currency	Total costs US$	% borne by land user
1. Farmers cut into the hillside with hoes and drag the soil down to form the risers and level terrace beds		*Labour*	*100*			*216*	*100*
		Tools				*5*	*100*
2.Risers are then stabilized and compacted by hoe		*Labour*	*25*			*54*	*100*
		Tools					

2.5.4 Specifications of management measures

If in question 2.2.2.2 you have described the SLM Technology as a management measure, fill out the following section, otherwise go to 2.6.If management measures include improved vegetation cover, fill also 2.5.2 specifications of vegetative conservation measures. Refer to your drawings in question 2.4. See example below.

2.5.4.1 Type of management

Several answers possible		specify:
change of land use type	☐	.....
change of land use practices / intensity level	☐	.....
layout change according to natural and human environment	☐	.....
major change in timing of activities	☐	.....
control / change of species composition	☐	.....
other	☐	.....

Types of management measures
Change of major land use type: *eg enclosure / resting, protection, change from cropland to grazing land, from forest to agroforestry, from grazing land to cropland, from grazing land to forest (afforestation), etc.*
Change of land use practices / intensity level: *eg change from grazing to cutting (for stall feeding), farm enterprise selection (degree of mechanisation, inputs, commercialisation), from mono-cropping to rotational cropping, from continuous cropping to managed fallow, from laissez-faire to managed, from random (open access) to controlled access (grazing land, forest land, eg access to firewood), from herding to fencing, adjusting stocking rates, staged / staggered use) to minimise exposure to degradation processes (eg staged excavation).*
Layout change according to natural environment and human environment/needs: *eg exclusion of natural waterways and hazardous areas, separation of grazing types, distribution of water points, salt-licks, livestock pens, dips (grazing land); increase of landscape diversity, forest aisle.* ***Major change in timing of activities:*** *eg land preparation, planting, cutting of vegetation.*
Control / change of species composition (not annually or in a rotational sequence: if annually or in a rotational sequence eg on cropland give details in 2.4.2.1): *eg reducing invasive species, selective clearing, encouraging desired / introducing new species, controlled burning (eg prescribed fires in forests / on grazing land)/ residue burning.*

2.5.4.2 Activities, inputs and costs for management measures

Initial establishment

Activity	Timing	Input *select from list below*	Quantity	Unit* (ha, m, dam)	Total costs local currency	Total costs US$	% borne by land user
1.							
2.							
3.							
4.							

Initial establishment

Activity	Timing	Input *select from list below*	Quantity	Unit* (ha, m, dam)	Total costs local currency	Total costs US$	% borne by land user
5.							

* ***Unit:*** preferably hectares (ha) and if not possible, entity (dam) or length (eg meter of stone line)

Maintenance / recurrent activities

Activity	Timing/ frequency *	Input *select from list below*	Quantity	Unit** (ha, m, dam)	Total costs local currency	Total costs US$	% borne by land user
1.							
2.							
3.							
4.							
5.							

**** Timing:*** *time, at which activity is carried out, eg after harvest of crops, before onset of rains, etc.*
Frequency: *eg annually, each cropping season, etc.*
****Unit:*** preferably hectares (ha) and if not possible, entity (dam) or length (eg meter of stone line)

Inputs:

Labour[1]	*Means / equipment*	*Materials*	*Agricultural*
- person days	*- machine hours[2]*	*- stone (m3)*	*- seeds (kg)*
	- animal traction (hours)	*- wood (m3)*	*- seedlings (No.)*
	- tools	*- earth (m3)*	*- fertilizer (kg)*
	- other (specify)	*- other (specify)*	*- biocides (kg)*
			- compost / manure (kg)
			- other (specify)

[1] The labour cost should be based on the total person days, be they paid or voluntary. To calculate the US $ Equivalent first indicate daily wage and then multiply the daily wage with the number of person days.
[2] machine hours: calculation should be based on hiring costs; -- include costs of operation and depreciation

Specify machinery / tools: .....
.....

*Provide **further relevant information** on the management measures in Annex T3.*

***Example*: Activities, inputs and costs for management measures**

Initial establishment

Activity	Timing	Input *select from list below*	Quantity	Unit* (ha, m, dam)	Total costs local currency	Total costs US$	% borne by land user
1. Introduction of social fencing system							
2. Construction of: a series of staggered contour trenches on slopes, stone/earth/wood check dams in gullies, graded stabilization channels which capture runoff,		*Labour*	*70*			*140*	*5*
		Machines				*70*	*0*
		Material				*5*	*0*
3. Construction earth dam wall for water harvesting and concrete pipelines for irrigation		*Labour*	*50*			*100*	*5*
		Machines				*55*	*0*
		Material				*20*	*0*
4. Enrichment planting of tree seedlings on bunds and hill slopes		*Labour*	*5*			*10*	*5*
		Seedlings				*50*	*0*

2.6 Overview of costs

In 2.5.1, 2.5.2, 2.5.3, 2.5.4 you indicated the costs for agronomic, vegetative, structural and management measures. Please add up the totals for the different inputs and insert them into the cost summary table below. For comparison reason, convert all costs into US$ per hectare. If still not possible specify unit (eg. dam)

Indicate exchange rate used: 1 US$ equals .....; **Name of local currency:** .....
Indicate daily wage cost of hired labour to implement conservation measures: .....US$ per person per day

2.6.1 Establishment and maintenance / recurrent costs

Average costs (in **US$)**

Inputs	**Establishment costs*[1]**		% of costs borne by land user	**Maintenance / recurrent costs (annual)**		% of costs borne by land user
	per unit	**per hectare**		**per unit**	**per hectare**	
Labour (person days) (voluntary and paid)	.....	.....	.....	.....	.....	.....
Equipment						
machine hours	.....	.....	.....	.....	.....	.....
animal traction (hours)	.....	.....	.....	.....	.....	.....
tools	.....	.....	.....	.....	.....	.....
other (specify):						
.....	.....	.....	.....	.....	.....	.....
Materials						
stone (m^3)	.....	.....	.....	.....	.....	.....
wood (m^3)	.....	.....	.....	.....	.....	.....
earth (m^3)	.....	.....	.....	.....	.....	.....
other (specify):						
.....	.....	.....	.....	.....	.....	.....
Agricultural						
seeds (kg)	.....	.....	.....	.....	.....	.....
seedlings (No.)	.....	.....	.....	.....	.....	.....
fertilizer (kg)	.....	.....	.....	.....	.....	.....
biocides (l or kg)	.....	.....	.....	.....	.....	.....
compost / manure (l or kg)	.....	.....	.....	.....	.....	.....
other (specify):						
.....	.....	.....	.....	.....	.....	.....
Others (specify):						
.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....
	Total *[2] =	..... US$	.....%	**Total *[2] =**	.....US$	.....%

*[1] Indicate duration of establishment phase: ..... month(s)
*[2] Indicate the total costs and percentage borne by land users even if you cannot give the details above!!!

2.6.2 Describe the most important factors affecting the costs (eg slope, soil depth, labour etc.)

.....

.....

.....

.....

Indicate for which situation the above costs in 2.6.1 were calculated (eg length of structure, wind breaks, grass strips, etc. per ha of land affected / protected), indicate the date for which the costs apply and give additional comments

.....

.....

.....

.....

.....

2.7 Natural environment

Give details of the natural (bio-physical) conditions where the SLM Technology is applied.

◯ ***Circles always require ranking!*** *It is possible to give more than one option the same rank.*
Use only ranks 1, 2 or 3 (1 = very important / large extent; 2 = important / medium extent; 3 = less important / little extent)
Make use of the specify/remark/comments column or line as much as possible!

	***Rank** according to areal extent (max. 2 circles per question)*	**Comments**
2.7.1 Average annual rainfall		Indicate average annual rainfall and seasonality (eg monsoon, winter-/ summer rains)/ length of dry periods if known.
< 250 mm	◯	.....
250-500 mm	◯	.....
500-750 mm	◯	.....
750-1000 mm	◯	.....
1000-1500 mm	◯	.....
1500-2000 mm	◯	.....
2000-3000 mm	◯	.....
3000-4000 mm	◯	.....
4000-5000 mm	◯	.....
> 5000 mm	◯	.....
2.7.2 Agro-climatic zone		
humid	◯	.....
subhumid	◯	.....
semi-arid	◯	.....
arid	◯	.....

Agro-climatic zone

- ***Humid:*** *length of growing period (LGP) > 270 days*
- ***Subhumid:*** *LGP 180 – 269 days*
- ***Semi-arid:*** *LGP 75 – 179 days*
- ***Arid:*** *LGP 0 – 74 days*

The length of growing period (LGP) is defined as the period when precipitation > 0.5 PET (potential evapotranspiration) and the temperature > 6.5° C.

2.7.3 Thermal climate classification		
tropics	◯	.....
subtropics	◯	.....
temperate	◯	.....
boreal	◯	.....
polar/arctic	◯	.....

Thermal climate classes *(all temperatures indicated as monthly mean temperatures corrected to sea level)*

- ***Tropics****: All months above 18° C*
- ***Subtropics****: One or more than one month below 18° C but above 5° C*
- ***Temperate****: At least 1 month with monthly mean temperatures below 5° C and 4 or more months above 10° C*
- ***Boreal****: At least one month below 5° C and more than one but below four months above 10° C*
- ***Polar / arctic:*** *All months below 10° C* *Source (FAO 2000)*

	Rank according to areal extent (max. 2 circles per question)	Comments
2.7.4 Altitudinal zonation		
0-100 m a.s.l.	◯	.....
100-500 m a.s.l.	◯	.....
500-1000 m a.s.l.	◯	.....
1000-1500 m a.s.l.	◯	.....
1500-2000 m a.s.l.	◯	.....
2000-2500 m a.s.l.	◯	.....
2500-3000 m a.s.l.	◯	.....
3000-3500 m a.s.l.	◯	.....
3500-4000 m a.s.l.	◯	.....
> 4000 m a.s.l.	◯	.....
2.7.5 Landforms		Indicate if technology is specifically applied in convex or concave situations
plateau / plains	◯	.....
ridges	◯	.....
mountain slopes	◯	.....
hill slopes	◯	.....
footslopes	◯	.....
valley floors	◯	.....

Landforms *(modified after ISRIC 1993):*

- ***Plateau / plains:*** *extended level land (slopes less than 8 %).*
- ***Ridges:*** *narrow elongated area rising above the surrounding area, often hilltops or mountain-tops.*
- ***Mountain slopes*** *(including major escarpments): extended area with altitude differences of more than 600 m per 2 km and slopes greater than 15 %.*
- ***Hill slopes*** *(including valley and minor escarpment slopes): altitude difference of less than 600 m per 2 km and slopes greater than 8 %.*
- ***Footslopes:*** *zone bordering steeper mountain / hill slopes on one side and valley floors / plains / plateaus on the other side.*
- ***Valley floors:*** *elongated strips of level land (less than 8 % slope), flanked by sloping or steep land on both sides.*

convex: *swell (diversion of water flow)*
concave: *depression (conversion of water flow)*

Some of the following 'environmental' conditions (questions 2.7.6. – 2.7.15) may change as a result of the SLM technology! However, ***describe the conditions without any impact of land conservation!***

2.7.6 Slopes on average

flat	(0-2 %)	◯	.....
gentle	(2-5%)	◯	.....
moderate	(5-8%)	◯	.....
rolling	(8-16%)	◯	.....
hilly	(16-30%)	◯	.....
steep	(30-60%)	◯	.....
very steep	(>60%)	◯	.....

Slope gradient conversion table:

Slope in percent	Slope in degrees
2 %	1 °
5 %	3 °
8 %	5 °
16 %	9 °
30 %	17 °
60 %	31 °
100 %	45 °

2.7.7 Soil depth on average

very shallow	(0-20 cm)	◯	.....
shallow	(20-50 cm)	◯	.....
moderately deep	(50-80 cm)	◯	.....
deep	(80-120 cm)	◯	.....
very deep	(>120 cm)	◯	.....

2.7.8 Soil fertility

very high	◯	.....
high	◯	.....
medium	◯	.....
low	◯	.....
very low	◯	.....

2.7.9 Topsoil organic matter

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

2.7.10 Soil drainage / infiltration

good	◯	.....
medium	◯	.....
poor (eg sealing /crusting)	◯	.....

2.7.11 Soil water storage capacity

very high	◯	.....
high	◯	.....
medium	◯	.....
low	◯	.....
very low	◯	.....

describe seasonal fluctuations

2.7.12 Ground water table
(estimated depth to water)

on surface	◯	.....
< 5 m	◯	.....
5 – 50 m	◯	.....
> 50 m	◯	.....

describe seasonal fluctuations

2.7.13 Availability of surface water

excess (eg flood)	◯	.....
good	◯	.....
medium	◯	.....
poor / none	◯	.....

describe seasonality and source (ground-/ surface water)

2.7.14 Water quality
(untreated)

good drinking water	◯	.....
poor drinking water	◯	.....
for agricultural use only	◯	.....
unusable	◯	.....

2.7.15 Biodiversity (species richness)

specify

high	◯	.....
medium	◯	.....
low	◯	.....

2.7.16 Number of growing seasons per year

1 ☐ 2 ☐ 3 ☐

growing period:	length in days (approximately)	from which month to which month:
longest	.....	.....
2nd longest	.....	.....

***Number of growing seasons per year**: A growing season is a period of time where there is sufficient rainfall and moisture in the soil as well as high enough temperatures to grow a crop. A growing season can have several crops following each other.*

2.8 Human environment and land use

Provide data for the land users who apply the technology

2.8.1 Land users applying the technology

Individual/household	☐	groups / community	☐	cooperation	☐	individual companies	☐	government	☐
Small	☐	medium	☐	large scale land users	☐				
Mainly women	☐	mainly men	☐	mixed	☐				
Leaders / privileged	☐	common / average land users	☐	marginalized land users	☐				

2.8.2 Population density

< 10 persons/km^2	☐	100-200 persons/km^2	☐
10-50 persons/km^2	☐	200-500 persons/km^2	☐
50-100 persons/km^2	☐	> 500 persons/km^2	☐

2.8.3 Annual population growth (incl. migration)

negative	☐	specify ..... %
< 0.5 %	☐	
0.5 % -1 %	☐	
1 % -2 %	☐	
2 % -3 %	☐	
3 % -4 %	☐	
> 4 %	☐	specify ..... %

2.8.4 Who owns the land and what are the land and water use rights?

rank according to areal extent (max. 2 circles per question)

Land ownership		**Rights:**	**Land use rights**	**Water use rights***
state	◯	open access (unorganised)	◯	◯
company	◯	communal (organised)	◯	◯
communal / village	◯	leased	◯	◯
group	◯	individual	◯	◯
individual, not titled	◯	other (specify):	◯	◯
individual, titled	◯			
other (specify):.....	◯			
.....				

Comments: .....

.....

* if water use rights are relevant

Land ownership *is the type of land possession, while land use rights refer to the access to land.*

Land use rights / water use rights:

- *Open access: means free for all.*
- *Communal (organised): means subject to community-agreed management rules.*
- *Leased: right to use land for a limited period of time against payment (contract).*
- *Individual: right of use by single user.*

2.8.5 Level of wealth:

	How wealthy are the land users **who apply the SLM Technology**? *(rank and specify)*	What % of the land users in the region fall into the following categories?	What % of the total land area does each category own?
very rich	◯	.....%	.....%
rich	◯	.....%	.....%
average	◯	.....%	.....%
poor	◯	.....%	.....%
very poor	◯	.....%	.....%
		100%	100%

Wealth: *For classification in your area please use local instead of international standards.*

2.8.6 How significant is off-farm income for the land users who apply the SLM Technology?

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

Specify (eg compared to land users who have not implemented conservation measures): .....

.....

.....

Off-farm income: *income other than from the use of cropland, grazing land, forest and mixed land (eg business, trade, manufacturing, industry).*

2.8.7 Access to services and infrastructure:

	low	moderate	high
health	☐	☐	☐
education	☐	☐	☐
technical assistance	☐	☐	☐
employment (eg off-farm)	☐	☐	☐
market	☐	☐	☐
energy	☐	☐	☐
roads & transport	☐	☐	☐
drinking water and sanitation	☐	☐	☐
financial services	☐	☐	☐
other (specify): ……..	☐	☐	☐

2.8.8 <u>For cropland and cropland mixed with another land use type:</u> under which of the following conditions is the technology applied?

If technology is not applied on cropland (incl. mixed land), go to question 2.8.9.

2.8.8.1 **Market orientation of production system**

		comments
subsistence (self-supply)	◯	.....
mixed (subsistence and commercial)	◯	.....
commercial / market	◯	.....
other:	◯	.....
other:	◯	.....

Is production subsidised? no ☐ yes, little ☐ yes, moderately ☐ yes, highly ☐

Subsidy: *a subsidy is an instrument used by the state or by private actors to reduce the costs of a product or increase the returns from a particular activity (Kerr, 1994). It may be provided in cash or in kind and usually serves a specific purpose.*

2.8.8.2 **How is land cultivation performed?**

		comments
manual labour	◯	.....
animal traction	◯	.....
mechanised	◯	.....

2.8.8.3 **Type of cropping system and major crops**

		major cash crop	major food crop	other
annual cropping	◯	.....	.....	.....
perennial (non-woody) cropping	◯	.....	.....	.....
tree/shrub cropping	◯	.....	.....	.....
mixed (different land use types on same land unit, eg agroforestry, agropastoralism):				
specify:.....	◯	.....	.....	.....
specify:.....	◯	.....	.....	.....
Other, specify:	◯	.....	.....	.....

For definitions see page QT 7

Water supply:

rainfed ◯ post-flooding ◯ mixed rainfed - irrigated ◯ full irrigation ◯

Rainfed: *crop(s) establishment and development is completely determined by rainfall.*
Post-flooding: *after rainwater has naturally flooded the field (eg in Wadis, river banks), the water infiltrated into the soil is used intentionally as a water reserve for crop cultivation. The crop(s) use(s) this water reserve for establishment.*
Mixed rainfed – irrigated: *the application of a limited amount of water to the crop when rainfall fails to provide sufficient water for plant growth, to increase and stabilise yield; the additional water alone is inadequate for crop production.*
Full irrigation: *any of several means of an artificial regular supply of water, in addition to rain, to the crop(s).*

Livestock:

Is livestock temporally grazing on crop residues: no ☐ yes little ☐ yes ☐

If considered important also fill in section 2.8.9 (mixed system)

2.8.8.4 **Size of cropland per household**

		comments
< 0.5 ha	◯	.....
0.5-1 ha	◯	.....
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	◯	.....
>10,000ha	◯	.....

Size of cropland: all cultivated area used per household, not just where technology is applied

*Provide **further relevant information** about the cropland systems (eg trends in agronomic or vegetative practices) in Annex T3.*

2.8.9 For grazing land and grazing land mixed with another land use type: under which of the following conditions is the technology applied?

If technology is not applied on grazing land (including mixed land), go to question 2.8.10. For definitions of land use types see page QT7

2.8.9.1 **Market orientation of production system**

		comments
subsistence (self-supply)	◯	.....
mixed (subsistence and commercial)	◯	.....
commercial / market	◯	.....
other:	◯	.....
other:	◯	.....

Is production subsidised? no ☐ yes, little ☐ yes, moderately ☐ yes, highly ☐

***Subsidy:** a subsidy is an instrument used by the state or by private actors to reduce the costs of a product or increase the returns from a particular activity (Kerr, 1994). It may be provided in cash or in kind and usually serves a specific purpose.*

2.8.9.2 **Type of grazing system**

		main livestock* species / secondary livestock species
extensive grazing land:		
- nomadism	◯	.....
- semi-nomadism / pastoralism	◯	.....
- ranching	◯	.....
intensive grazing land		
- cut-and-carry/zero grazing	◯	
- improved pasture	◯	
mixed: (eg agro-pastoralism, silvo-pastoralism)	◯	
specify:	◯	.....

* if wildlife is major part of the grazing system list species

Comments: ……
……

Extensive grazing land: *grazing on natural or semi-natural grasslands, grasslands with trees / shrubs (savannah vegetation) or open woodlands for livestock and wildlife.*

- ***Nomadism:*** *people move with animals.*
- ***Semi-nomadism / pastoralism:*** *animal owners have a permanent place of residence where supplementary cultivation is practiced. Herds are moved to distant grazing grounds.*
- ***Ranching:*** *grazing within well-defined boundaries, movements cover smaller distances and management inputs are higher compared to semi-nomadism.*

Intensive grazing land: *grass production on improved or planted pastures, including cutting for fodder material (for livestock production*).

- ***Cut-and-carry/zero grazing:*** *Carrying fodder to animals confined to a stall / shed or another restricted area; in zero grazing systems the livestock are not permitted to graze at any time*
- ***Improved pasture:*** *pasture that is sown with a mixture of introduced grasses and legumes (can be fertilized and/or inoculated with rhizobia to fix nitrogen). (http://www.environment.gov.au/soe/2001/land/glossary.html)*
- *Definitions for mixed land: see page QT7*

Water supply:

rainfed ◯ post-flooding ◯ mixed rainfed - irrigated ◯ full irrigation ◯

2.8.9.3 Livestock density

< 1 LU/km^2	☐	25-50 LU /km^2	☐
1-10 LU /km^2	☐	50-100 LU /km^2	☐
10-25 LU /km^2	☐	> 100 LU /km^2	☐

Livestock unit (LU) is a standardized animal unit obtained by multiplying total number of animals with a conversion factor that takes into account 'feed requirements' per animal.

2.8.9.4 **Size of grazing land per household**

		comments
< 0.5 ha		
0.5-1 ha	◯	.....
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	◯	.....
>10,000ha	◯	.....

Size of grazing land: all grazing area used per household, not just where technology is applied

*Provide **further relevant information** about the grazing land system and livestock production (eg trends in use of area closure, stall feeding, herd ownership etc.) in Annex T3.*

2.8.10 <u>For forest / woodland</u>: under which of the following conditions is the technology applied?

If technology is not applied on forest / woodland, go to question 2.8.11; For definitions of land use types see page QT7
***Agroforestry systems** are treated under the previous cropland or grazing land sections.*

2.8.10.1 **Market orientation of production system**

		comments
subsistence (self-supply)	◯	.....
mixed (subsistence and commercial)	◯	.....
commercial / market	◯	.....
other (specify)	◯	.....
other (specify)	◯	.....

Is production subsidised? no ☐ yes, little ☐ yes, moderately ☐ yes, highly ☐

***Subsidy:** a subsidy is an instrument used by the state or by private actors to reduce the costs of a product or increase the returns from a particular activity (Kerr, 1994). It may be provided in cash or in kind and usually serves a specific purpose.*

2.8.10.2 **Type of forest / woodland uses**

		problems / comments (eg cutting frequency)
selective felling of (semi-) natural forests	◯	.....
clear felling of (semi-)natural forests	◯	.....
plantation forestry	◯	.....
shifting cultivation	◯	.....
other (specify)	◯	.....
other (specify)	◯	.....

2.8.10.3 **For what purpose do land users use forests and woodlands?**

timber	◯
fuelwood	◯
fruits and nuts	◯
grazing / browsing	◯
other forest products / uses (honey, medical, etc.)	◯
nature conservation / protection	◯
recreation / tourism	◯
protection against natural hazards	◯
other (specify)	◯

2.8.10.4 **Size of forest / woodland area per household**

		comments
< 0.5 ha		
0.5-1 ha	◯	.....
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	◯	.....
> 10,000ha	◯	.....

Size of forest / woodland: all forest area / woodland used per household, not just where technology is applied

*Provide **further relevant information** about the forest / woodlands (including trends in management, replanting etc.) in Annex T3.*

2.8.11 For <u>other land</u>: under which of the following conditions is the technology applied?

If technology is not applied on other land, go to question 2.9

2.8.11.1 **What are the types of other land and what are their major management constraints?**

		specify	major constraints
mines and extractive industries	◯	.....	.....
settlement / urban	◯	.....	.....
infrastructure network (roads, railways, pipe lines, power lines)	◯	.....	.....
wastelands / deserts / glaciers / swamps	◯	.....	.....
recreation	◯	.....	.....
other (specify):			
.....	◯	.....	.....
.....	◯	.....	.....

Definitions: page QT7

*Provide **further relevant information** about other land (eg trends in use etc.) in Annex T3.*

PART 3: ANALYSIS OF THE SLM TECHNOLOGY

Many criteria can be used for the analysis of land conservation. In Part 3 selected criteria are presented, but additional analysis could be done based on Part 2.

3.1 Impacts: benefits and disadvantages

3.1.2 Indicate the <u>on-site benefits</u> the technology has shown. *Tick and quantify / specify if possible.*

Negligible, little, medium *and* ***high*** *are arbitrary terms.* ***Negligible*** *can mean „no significant benefit" or even a disadvantage. In case of a disadvantage provide details in 3.1.4 and 3.1.5.*
Make use of the specify/remarks/comments column to show evidence and justify your selection as much as possible. 10% increase (eg of yield) might be judged as a great improvement, nevertheless tick the category little (5-20%), and use "specify / comments" to explain.
Only indicate quantity (before/after) if impacts are measured / based on surveys

Several answers possible	**negligible (0-5%)**	**little (5-20%)**	**medium (20-50%)**	**high (>50%)**	**quantify** (indicate unit) **before conserv.**	**quantify** (indicate unit) **after conserv.**	**specify / comments**
3.1.2.1 **Production and socio-economic benefits**							
increased crop yield	☐	☐	☐	☐	.....	.....	.....
increased fodder production	☐	☐	☐	☐	.....	.....	.....
increased fodder quality	☐	☐	☐	☐	.....	.....	.....
increased animal production	☐	☐	☐	☐	.....	.....	.....
increased wood production	☐	☐	☐	☐	.....	.....	.....
reduced risk of production failure	☐	☐	☐	☐	.....	.....	.....
reduced risk towards adverse events (droughts, floods and storms)	☐	☐	☐	☐	.....	.....	.....
increased drinking / household water availability / quality	☐	☐	☐	☐	.....	.....	.....
increased water availability / quality for livestock	☐	☐	☐	☐	.....	.....	.....
increased irrigation water availability / quality	☐	☐	☐	☐	.....	.....	.....
reduced demand for irrigation water	☐	☐	☐	☐	.....	.....	.....
reduced expenses for inputs	☐	☐	☐	☐	.....	.....	.....
increased farm income	☐	☐	☐	☐	.....	.....	.....
diversification of income sources	☐	☐	☐	☐	.....	.....	.....
increased production area (new land under cultivation / use)	☐	☐	☐	☐	.....	.....	.....
decreased labour constraints	☐	☐	☐	☐	.....	.....	.....
eased farm operations	☐	☐	☐	☐	.....	.....	.....
increased product diversification	☐	☐	☐	☐	.....	.....	.....
others (specify):	☐	☐	☐	☐	.....	.....	.....
.....	☐	☐	☐	☐	.....	.....	.....
.....	☐	☐	☐	☐	.....	.....	.....
.....	☐	☐	☐	☐	.....	.....	.....

☑ ***Square boxes must be ticked!*** *If 'Several answers possible' is not indicated tick only one box!*
Make use of the specify/remark/comments column or line as much as possible!

Several answers possible	**negligible (0-5%)**	**little (5-20%)**	**medium (20-50%)**	**high (>50%)**	**quantify** (indicate unit) **before conserv.**	**quantify** (indicate unit) **after conserva.**	**specify / comments**
3.1.2.2 **Socio-cultural benefits**							
improved cultural opportunities (eg spiritual, aesthetic, others)	☐	☐	☐	☐	.....	.....	.....
increased recreational opportunities	☐	☐	☐	☐	.....	.....	.....
community institution strengthening	☐	☐	☐	☐	.....	.....	.....
national institution strengthening	☐	☐	☐	☐	.....	.....	.....
improved conservation / erosion knowledge	☐	☐	☐	☐	.....	.....	.....
conflict mitigation	☐	☐	☐	☐	.....	.....	.....
improved food security / self-sufficiency (reduced dependence on ext. support)	☐	☐	☐	☐	.....	.....	.....
improved health	☐	☐	☐	☐	.....	.....	.....
others (specify):	☐	☐	☐	☐	.....	.....	.....
	☐	☐	☐	☐	.....	.....	.....
	☐	☐	☐	☐	.....	.....	.....
.....	☐	☐	☐	☐	.....	.....	.....
3.1.2.3 **Ecological benefits**							
increased water quantity	☐	☐	☐	☐	.....	.....	.....
increased water quality	☐	☐	☐	☐	.....	.....	.....
improved harvesting / collection of surface runoff	☐	☐	☐	☐	.....	.....	.....
increased soil moisture	☐	☐	☐	☐	.....	.....	.....
reduced evaporation	☐	☐	☐	☐	.....	.....	.....
reduced of surface runoff	☐	☐	☐	☐	.....	.....	.....
improved excess water drainage	☐	☐	☐	☐	.....	.....	.....
recharge of groundwater table/aquifer	☐	☐	☐	☐	.....	.....	.....
reduced hazard towards adverse events (drought, floods, storms, …)	☐	☐	☐	☐	.....	.....	.....
reduced wind velocity	☐	☐	☐	☐	.....	.....	.....
improved soil cover	☐	☐	☐	☐	.....	.....	.....
increased biomass / above ground C	☐	☐	☐	☐	.....	.....	.....
increased nutrient cycling / recharge	☐	☐	☐	☐	.....	.....	.....
increased soil organic matter/ C sequestration	☐	☐	☐	☐	.....	.....	.....
reduced emission of carbon and greenhouse gases	☐	☐	☐	☐	.....	.....	.....
reduced soil loss	☐	☐	☐	☐	.....	.....	.....
reduced soil crusting/sealing	☐	☐	☐	☐	.....	.....	.....

reduced soil compaction	☐	☐	☐	☐	.....	.....	.....
reduced salinity	☐	☐	☐	☐	.....	.....	.....
increased animal diversity	☐	☐	☐	☐	.....	.....	.....
increased plant diversity	☐	☐	☐	☐	.....	.....	.....
reduced invasive alien species	☐	☐	☐	☐	.....	.....	.....
increased beneficial species (predators, earthworms, pollinators)	☐	☐	☐	☐	.....	.....	.....
increased biological pest / disease control	☐	☐	☐	☐	.....	.....	.....
increased / maintained habitat diversity	☐	☐	☐	☐	.....	.....	.....
others (specify):	☐	☐	☐	☐	.....	.....	.....
	☐	☐	☐	☐	.....	.....	.....
	☐	☐	☐	☐	.....	.....	.....
	☐	☐	☐	☐	.....	.....	.....

3.1.2.4 **Other benefits (specify):**

energy generation	☐	☐	☐	☐	.....	.....	.....
.....	☐	☐	☐	☐	.....	.....	.....
.....	☐	☐	☐	☐	.....	.....	.....
.....	☐	☐	☐	☐	.....	.....	.....

3.1.3 Indicate <u>off-site benefits</u> (if any). *Tick and quantify / specify if possible.*

Several answers possible

On-site: *concerns the actual area where the SLM Technology is applied.*
Off-site: *concerns the adjacent area or areas further away from the area where the SLM Technology is applied.*

Several answers possible	**negligible (0-5%)**	**little (5-20%)**	**medium (20-50%)**	**high (>50%)**	**quantify** (indicate unit) **before conserv.**	**quantify** (indicate unit) **after conserv.**	**specify / comments**
increased water availability (groundwater, springs)	☐	☐	☐	☐	.....	.....	.....
reduced downstream flooding	☐	☐	☐	☐	.....	.....	.....
increased stream flow in dry season / reliable and stable low flows	☐	☐	☐	☐	.....	.....	.....
reduced downstream siltation	☐	☐	☐	☐	.....	.....	.....
reduced groundwater / river pollution	☐	☐	☐	☐	.....	.....	.....
improved buffering / filtering capacity (by soil, vegetation, wetlands)	☐	☐	☐	☐	.....	.....	.....
reduced wind transported sediments	☐	☐	☐	☐	.....	.....	.....
reduced damage on neighbours' fields	☐	☐	☐	☐	.....	.....	.....
reduced damage on public/ private infrastructure	☐	☐	☐	☐	.....	.....	.....
others (specify):	☐	☐	☐	☐	.....	.....	
.....	☐	☐	☐	☐	.....	.....	.....
.....	☐	☐	☐	☐	.....	.....	.....
.....	☐	☐	☐	☐	.....	.....	.....

3.1.4 Indicate the <u>on-site disadvantages</u> the technology has shown. *Tick and quantify / specify if possible.*

Several answers possible	**negligible (0-5%)**	**little (5-20%)**	**medium (20-50%)**	**high (>50%)**	**quantify** (indicate unit) **before conserv.**	**quantify** (indicate unit) **after conserv.**	**specify / comments**
3.1.4.1 Production and socio-economic disadvantages							
reduced crop production	☐	☐	☐	☐	.....	.....	.....
reduced fodder production	☐	☐	☐	☐	.....	.....	.....
reduced fodder quality	☐	☐	☐	☐	.....	.....	.....
reduced animal production	☐	☐	☐	☐	.....	.....	.....
reduced wood production	☐	☐	☐	☐	.....	.....	.....
increased risk of crop failure	☐	☐	☐	☐	.....	.....	.....
decreased drinking water availability / quality	☐	☐	☐	☐	.....	.....	.....
decreased irrigation water availability / quality	☐	☐	☐	☐	.....	.....	.....
increased demand for irrigation water	☐	☐	☐	☐	.....	.....	.....
increased expenses for agricultural inputs	☐	☐	☐	☐	.....	.....	.....
decreased farm income	☐	☐	☐	☐	.....	.....	.....
increased economic inequity	☐	☐	☐	☐	.....	.....	.....
loss of land (decreased production area)	☐	☐	☐	☐	.....	.....	.....
increased labour constraints	☐	☐	☐	☐	.....	.....	.....
reduced product diversification	☐	☐	☐	☐	.....	.....	.....
hindered farm operations	☐	☐	☐	☐	.....	.....	.....
others (specify):	☐	☐	☐	☐	.....	.....	.....
.....	☐	☐	☐	☐	.....	.....	.....
.....	☐	☐	☐	☐	.....	.....	.....
3.1.4.2 Socio-cultural disadvantages							
loss of cultural opportunities	☐	☐	☐	☐	.....	.....	.....
loss of recreational opportunities	☐	☐	☐	☐	.....	.....	.....
socio-cultural conflicts	☐	☐	☐	☐	.....	.....	.....
decreased food security/self-sufficiency	☐	☐	☐	☐	.....	.....	.....
increased health problems	☐	☐	☐	☐	.....	.....	.....
others (specify):	☐	☐	☐	☐	.....	.....	.....
.....	☐	☐	☐	☐	.....	.....	.....
.....	☐	☐	☐	☐	.....	.....	.....
.....	☐	☐	☐	☐	.....	.....	.....

3.1.4.3 Ecological disadvantages

decreased water quantity	☐	☐	☐	☐	.....	.....	.....
decreased water quality	☐	☐	☐	☐	.....	.....	.....
decreased soil moisture	☐	☐	☐	☐	.....	.....	.....
increased evaporation	☐	☐	☐	☐	.....	.....	.....
increased surface water run off	☐	☐	☐	☐	.....	.....	.....
waterlogging	☐	☐	☐	☐	.....	.....	.....
lowering of ground water table	☐	☐	☐	☐	.....	.....	.....
decreased soil cover	☐	☐	☐	☐	.....	.....	.....
increased wind velocity	☐	☐	☐	☐	.....	.....	.....
decreased soil organic matter	☐	☐	☐	☐	.....	.....	.....
increased soil sealing / compaction	☐	☐	☐	☐	.....	.....	.....
increased salinity	☐	☐	☐	☐	.....	.....	.....
increased competition (water, sunlight, nutrients)	☐	☐	☐	☐	.....	.....	.....
increased soil erosion (locally)	☐	☐	☐	☐	.....	.....	.....
reduced biodiversity / crop diversity	☐	☐	☐	☐	.....	.....	.....
increased habitat fragmentation	☐	☐	☐	☐	.....	.....	.....
increased niches for pests (birds, slugs, rodents, etc.)	☐	☐	☐	☐	.....	.....	.....
others (specify):	☐	☐	☐	☐	.....	.....	.....
.....	☐	☐	☐	☐	.....	.....	.....
.....	☐	☐	☐	☐	.....	.....	.....
.....	☐	☐	☐	☐	.....	.....	.....

3.1.4.4 Other disadvantages (specify):

.....	☐	☐	☐	☐	.....	.....	.....
.....	☐	☐	☐	☐	.....	.....	.....
.....	☐	☐	☐	☐	.....	.....	.....
.....	☐	☐	☐	☐	.....	.....	.....

3.1.5 Indicate <u>off-site disadvantages</u> (if any). *Tick and quantify / specify if possible.*

Several answers possible	**negligible (0-5%)**	**little (5-20%)**	**medium (20-50%)**	**high (>50%)**	**quantify** (indicate unit) **before conserv.**	**quantify** (indicate unit) **after conserv.**	**specify / comments**
increased downstream flooding	☐	☐	☐	☐	.....	.....	.....
reduced river flows	☐	☐	☐	☐	.....	.....	.....
reduced sediment yields	☐	☐	☐	☐	.....	.....	.....
increased groundwater / river pollution	☐	☐	☐	☐	.....	.....	.....
decreased buffering / filtering capacity (by soil, vegetation, wetlands)	☐	☐	☐	☐	.....	.....	.....
increased damage on neighbors' fields	☐	☐	☐	☐	.....	.....	.....
increased damage on public/ private infrastructure	☐	☐	☐	☐	.....	.....	.....
others (specify):	☐	☐	☐	☐	.....	.....	.....
.....	☐	☐	☐	☐	.....	.....	.....
.....	☐	☐	☐	☐	.....	.....	.....
.....	☐	☐	☐	☐	.....	.....	.....
.....	☐	☐	☐	☐	.....	.....	.....

3.1.7 Has the technology contributed to improve livelihood and human well-being (eg education, health)?

no ☐ yes, little ☐ yes, moderately ☐ yes, greatly ☐

Specify / comments: .....

.....

.....

3.2 Economic analysis

3.2.1 How do the benefits compare with the <u>establishment costs</u> (from land users' perspective!)?

	very negative	negative	slightly negative	neutral / balanced	slightly positive	positive	very positive
short-term returns:	☐	☐	☐	☐	☐	☐	☐
long-term returns:	☐	☐	☐	☐	☐	☐	☐

3.2.2 How do the benefits compare with the <u>maintenance / recurrent costs</u> (from land users' perspective!)?

	very negative	negative	slightly negative	neutral / balanced	slightly positive	positive	very positive
short-term returns:	☐	☐	☐	☐	☐	☐	☐
long-term returns:	☐	☐	☐	☐	☐	☐	☐

Short term: 1 - 3 years; **long term:** 10 year

3.3 Acceptance or adoption

*We differentiate between **acceptance with external support** and **spontaneous adoption** (the voluntary adoption of a technology without external support). If no external support was provided, go to 3.3.2. **Technical guidance** is not considered as incentive.*
***External support**: financial / material support from government or private organisations*

3.3.1 Acceptance with external support

If no external support were used, go to 3.3.2

3.3.1.1 **How many land users who have implemented the technology have done it <u>with external support</u> (eg food-for-work, payment, subsidised machinery)?**

..... % of land user families that have applied the SLM Technology*

..... number of land user families

..... % of area stated in 1.3.1*

Specify / comments: .....
.....
.....

*** together with 3.3.2.1 this has to add up to 100%, as only those land users who have implemented the technology are considered*

3.3.2 Spontaneous adoption

*We define **spontaneous adoption** as the voluntary implementation of a technology without external support other than technical guidance.*

3.3.2.1 **How many land users who have implemented the technology have done it wholly voluntarily, <u>without any external support other than technical guidance</u>?**

..... % of land user families that have applied the SLM Technology*

..... number of land user families

..... % of area stated in 1.3.1*

Specify / comments: .....
.....
.....

*** Note: together with 3.4.1.1 this has to add up to 100%, as only those land users who have implemented the technology are considered*

3.3.2.2 **Adoption trend**

Is there a trend towards (growing) spontaneous adoption of the technology?

no ☐ yes, little ☐ yes, moderate ☐ yes, strong ☐

Comments: .....
.....
.....
.....

3.4 Concluding statements

3.4.1 List the major strengths / advantages of the technology and how they can be sustained / enhanced

Give a concluding statement about the technology.

Strengths / advantages	How can they be sustained / enhanced?
in your opinion	
1)	.....
.....	.....
.....	.....
2)	.....
.....	.....
.....	.....
3)	.....
.....	.....
.....	.....
4)	.....
.....	.....
.....	.....
5)	.....
.....	.....
.....	.....
in the land users' view	
1)	.....
.....	.....
.....	.....
2)	.....
.....	.....
.....	.....
3)	.....
.....	.....
.....	.....
4)	.....
.....	.....
.....	.....
5)	.....
.....	.....
.....	.....

3.4.2 List the major <u>weaknesses / disadvantages</u> of the technology and how they can be overcome

Weaknesses / disadvantages	**How can they be overcome?**
in your opinion	
1)	.....
.....	.....
.....	.....
2)	.....
.....	.....
.....	.....
3)	.....
.....	.....
.....	.....
4)	.....
.....	.....
.....	.....
5)	.....
.....	.....
.....	.....
in the land users' view	
1)	.....
.....	.....
.....	.....
2)	.....
.....	.....
.....	.....
3)	.....
.....	.....
.....	.....
4)	.....
.....	.....
.....	.....
5)	.....
.....	.....
.....	.....

ANNEX T1

List the names of other contributing conservation specialists who assisted in filling out this questionnaire. Note that on QT 1 the main responsible person needs to be indicated.

Last name / surname	First name(s)	Institution, address, fax, tel., e-mail
.....	.....	.....
		.....
		.....
.....	.....	.....
		.....
		.....
.....	.....	.....
		.....
		.....

Available documentation

List all useful *references, reports, technical manuals, videos, training materials, etc.* and *contacts* (individuals or projects with address) that relate to the technology you have described:

References / reports: title, author, year	where available / costs
.....	.....
.....	.....
.....	.....
.....	.....
.....	.....
.....	.....
.....	.....
.....	.....

Contact person / institution:

Last name / surname	First name(s)	Institution, address, fax, tel., e-mail
.....	.....	.....
		.....
		.....
.....	.....	.....
		.....
		.....
.....	.....	.....
		.....
		.....

ANNEX T2

Your judgment of the SLM Technology questionnaire

I liked: .....

.....

I disliked: .....

.....

I suggest: .....

.....

Did the questionnaire help you in evaluation and analysis of land conservation activities?
(rate 1 = very little ... to 5 = very much)
rate: .....

Comments:

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

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.....

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.....

.....

ANNEX T3

Additional information (please always make proper reference to particular questions and page numbers!)

Additional information (please always make proper reference to particular questions and page numbers!)

ANNEX T4

WOCAT SLM Technologies categorisation system

H.P. Liniger, D. Cahill, W. Critchley, G.v. Lynden, G. Schwilch, D.B. Thomas

Principles of newly proposed system:
- Hierarchical system consisting on 3 types of information: (1) land use, (2) degradation type(s) addressed and (3) conservation measure(s)
- Each of the 3 types is subdivided into main types and subtypes

1. Land use:

Main types and subtypes (as defined in QT: p. ET4):

C: Cropland:

Ca: annual cropping
Cp: perennial cropping
Ct: tree and shrub cropping

G: Grazing land:

Ge: extensive grazing
Gi: intensive grazing

F: Forest / woodland:

Fn: natural
Fp: plantations, afforestation
Fo: other (eg selective cutting of natural forests and incorporating planted species)

M: Mixed land:

Mf: agroforestry (cropland and forest)
Mp: agropastoralism (cropland and grazing land)
Ma: agrosilvopastoralism (cropland, grazing land and forest)
Ms: silvopastoralism (forest and grazing land)
Mo: other

O: Other land:

Oi: mines and extractive industries
Os: settlements, infrastructure network (roads, railways, pipe lines, power lines)
Ow: Waterways, drainage lines
Oo: others: wastelands, deserts, glaciers, swamps, recreation areas, etc.

If subcategories cannot be differentiated, just indicate the main type with a "–" instead of a letter: eg: C-, G-, F-, etc.

2. Degradation type addressed

W: Soil erosion by water

- Wt loss of topsoil / surface erosion: even removal of top soil, sheet and interrill erosion
- Wg gully erosion / gullying
- Wm mass movements
- Wr riverbank erosion
- Wc coastal erosion
- Wo offsite degradation effects: deposition of sediments, downstream flooding, siltation of reservoirs and waterways, and pollution of water bodies with eroded sediments

E: Soil Wind erosion by wind

- Et loss of topsoil: uniform displacement
- Ed deflation and deposition: uneven removal of soil material
- Eo offsite degradation effects: covering of the terrain with windborne sand particles from distant sources ("overblowing")

C: Chemical soil deterioration

- Cn fertility decline and reduced organic matter content (not caused by erosion): eg leaching, soil fertility mining, nutrient oxidation and volatisation (N)
- Ca acidification: lowering of the soil pH
- Cp soil pollution: contamination of the soil with toxic materials
- Cs salinisation / alkalinisation: a net increase of the salt content of the (top)soil leading to a productivity decline

P: Physical soil deterioration

- Pc compaction: deterioration of soil structure
- Pk sealing and crusting: clogging of pores with fine soil material and development of a thin impervious layer at the soil surface obstructing the infiltration of rainwater
- Pw waterlogging: effects of human induced hydromorphism (excluding paddy fields)
- Ps subsidence of organic soils, settling of soil
- Pu loss of bio-productive function due to other activities (eg construction, mining, etc)

B: Biological degradation

- Bc reduction of vegetation cover: increase of bare / unprotected soil
- Bh loss of habitats: decreasing vegetation diversity (fallow land, mixed systems, field borders)
- Bq quantity / biomass decline: reduced vegetative production for different land use
- Bf detrimental effects of fires (includes cold / hot fires): on forest (eg slash and burn), bush, grazing and cropland (burning of residues)
- Bs quality and species composition /diversity decline: loss of natural species, land races, palatable perennial grasses; spreading of invasive, salt-tolerant, unpalatable, species / weeds
- Bl loss of soil life: decline of soil macro-organisms and micro-organisms in quantity and quality
- Bp Increase of pests / diseases, loss of predators: reduction of biological control.

H: Water degradation

- Ha aridification: decrease of average soil moisture content
- Hs change in quantity of surface water: change of the flow regime (flood, /peak flow, low flow, drying up of rivers and lakes)
- Hg change in groundwater / aquifer level: lowering of groundwater table due to over-exploitation or reduced recharge of groundwater; or increase of groundwater table resulting in waterlogging and/or salinisation
- Hp decline of surface water quality: increased sediments and pollutants in fresh water bodies due to point pollution and land-based pollution
- Hq decline of groundwater quality: due to pollutants infiltrating into the aquifers
- Hw reduction of the buffering capacity of wetland areas: to cope with flooding and pollution

If subcategories are not specified, a -" should be added instead of a letter.

If subcategories are not specified, a -" should be added instead of a letter.

3. **Conservation measure** (as defined in QT E6)

Main types and subtypes (as defined in QT: p. ET6):

M: Overall Management:

M1: Change of land use type:
- enclosure / resting
- protection
- change from crop to grazing land, from forest to agroforestry, from grazing land to cropland, etc.

M2: Change of land use practices / intensity level:
- from grazing to cutting (for stall feeding)
- farm enterprise selection: degree of mechanisation, inputs, commercialisation
- from mono-cropping to rotational cropping
- from continuous cropping to managed fallow
- from "laissez-faire" (unmanaged) to managed, from random (open access) to controlled access (grazing land forest land eg access to firewood), from herding to fencing
- adjusting stocking rates
- staged use to minimise exposure (eg staged excavation)

M3: Layout according to natural and human environment:
- exclusion of natural waterways and hazardous areas
- separation of grazing types
- distribution of water points, salt-licks, livestock pens, dips (grazing land)

M4: Major change in timing of activities:
- land preparation
- planting
- cutting of vegetation

M5: Control / change of species composition (not annually or in a rotational sequence: if annually or in a rotational sequence as done eg on cropland -> A1)
- reduction of invasive species
- selective clearing
- encouragement of desired species
- controlled burning / residue burning

A: Agronomic / soil management

A1: Vegetation / soil cover
- better soil cover by vegetation (selection of species, higher plant density, replacing annual with perennial crops)
- early planting (cropland)
- relay cropping
- mixed cropping / intercropping
- contour planting / strip cropping
- cover cropping
- retaining more vegetation cover (removing less vegetation cover)
- mulching (actively adding vegetative / non-vegetative material or leaving it on the surface)
- temporary trash lines (and in A2 as "mobile compost strips")
- others

A2: Organic matter / soil fertility
- legume inter-planting (crop and grazing land; induced fertility)
- green manure (cropland)
- applying manure / compost / residues (organic fertilisers), including "mobile compost strips" (trash lines)
- applying mineral fertilizers (inorganic fertilizers)
- applying soil conditioners (eg use of lime or gypsum)
- rotations / fallows (associated with M)
- others

A3: Soil surface treatment
- breaking crust / sealed surface
- breaking compacted top soil: ripping, hoeing, ploughing, harrowing
- conservation tillage: zero tillage, no till, minimum tillage, non-inversion tillage and other tillage with reduced disturbance of the top soil
- contour tillage
- contour ridging (crop and grazing land), done annually or in rotational sequence
- furrows (drainage, irrigation)
- pits, redone annually or in rotational sequence
- others

A4: Subsurface treatment
- breaking compacted subsoil (hard pans): deep ripping, "subsoiling", …
- deep tillage / double digging
- others

V: Vegetative

V1: Tree and shrub cover
- dispersed (in annual crops or grazing land): eg Faidherbia, Grevillea, Sesbania
- aligned (in annual crops or grazing land): eg live fences, hedges, barrier hedgerows, alley cropping
  Subcategories:
  - on contour
  - graded
  - along boundary
  - linear
  - against wind
- in blocks
  Subcategories:
  - woodlots
  - perennial crops (tea, sugar cane, coffee, banana)
  - perennial fodder and browse species

    Further subcategories for dispersed, aligned and in blocks:
    - natural reseeding
    - reseeding
    - planting

V2: Grasses and perennial herbaceous plants
- dispersed
- aligned (grass strips)
  Subcategories:
  - on contour
  - graded
  - along boundary
  - linear
  - against wind
  - in blocks

    Further subcategories for dispersed, aligned and in blocks:
    - natural reseeding
    - reseeding
    - planting

S: Structural:

Structures constructed with soil or soil enforced with other materials (S1-S7) or entirely from other materials such as stone, wood, cement, others (S-8)

S1: bench terraces (<6%)
- level (incl. rice paddies)
- forward sloping /outward sloping
- backward sloping / back-sloping / reverse

S2: forward sloping terraces (>6%)

S3: bunds / banks
- level
  - tied
  - non-tied
- graded
  - tied
  - non-tied
- semi-circular
- v-shaped
- trapezoidal
- others

S4: graded ditches / waterways (to drain and convey water)
- cut-off drains
- waterways
- spillways

S5: level ditches / pits
- infiltration, retention
- sediment / sand traps

S6: dams / pans: store excessive water

S7: reshaping surface (reducing slope, …) / top soil retention (eg in mining storing top soil and re-spreading

S8: walls / barriers / palisades, (constructed from wood, stone concrete, others, not combined with earth)

S9: others

Often there are combinations: list them according to priorities: eg Ge/Wt/A3V2

Annex 5

Causes of degradation

Direct

Crop management: *improper management of cultivated cropland. This includes a wide variety of practices, such as missing or insufficient maintenance of erosion control measures, shortening of the fallow period in shifting cultivation, inappropriate irrigation, inappropriate application of fertilizer / manure, inappropriate use of heavy machinery, etc.*

Deforestation and removal of natural vegetation: *extensive removal of natural vegetation (usually primary or secondary forest), due to large-scale commercial forestry, urban development, conversion to other land uses (agriculture, industry), road construction, forest fires, etc. Deforestation is often followed by agricultural activities that may cause further degradation (see "crop management").*

Over-exploitation of vegetation for domestic use: *in contrast to "deforestation and removal of natural vegetation", this causative factor does not necessarily involve the (nearly) complete removal of "natural" vegetation, but rather degeneration of the remaining vegetation, thus leading to insufficient protection against erosion. It includes activities such as excessive gathering of fuel wood, fodder, (local) timber, fencing material, removal of fodder, etc.*

Overgrazing: *usually leads to a decrease in plant cover, a change to lower quality fodder, and/or soil compaction. This may in turn cause reduced soil productivity and water or wind erosion. It includes excessive numbers of livestock, trampling along animal paths, etc.*

Industrial activities and mining: *this category includes all adverse effects arising from industrialisation and extractive activities. It includes release of airborne pollutants, mining, waste deposition, etc.*

Urbanisation and infrastructure development: *settlements and roads often cause considerable runoff and erosion, as well as other types of degradation. Side-activities with degradation effects, such as (urban) recreation, are also included in this factor.*

Natural causes: *many occurrences of erosion and other degradation types are not caused by human activities, eg natural landslides in steep mountain areas, damage by strong wind in deserts, etc. Although WOCAT places the emphasis on human-induced degradation, natural causes may be indicated as well. However, soils that have unfavourable characteristics by nature (or since a considerable period of time), such as sandy desert soils or natural saline soils, are not considered as degraded. They include extreme topography / relief, excess winds and rains, floods, droughts, etc.*

Discharges leading to point contamination of surface and ground water resources: *includes discharge of effluents, waste water, improper sanitation, etc.*

Causes leading to non-point contamination of surface and ground water resources: *includes excessive application of fertilizers, pesticides, etc, washing out / leaching of pollutants from the land, etc.*

Disturbance of the water cycle*: leading to accelerated changes in the water level of ground water aquifers, lakes and rivers (improper recharge of surface and ground water) due to lower infiltration rates / increased surface runoff, etc.*

Over abstraction of water (irrigation): *mainly for agriculture / irrigation due to growing irrigation demand, decreasing water use efficiency, etc*

Climate change: *long-term influence on land degradation due to change of rainfall patterns, change in temperature, etc*

Indirect causes

population density: *density of population can be a driving force for degradation. High population density may trigger or enhance degradation, eg by competing for scarce resources or ecosystem services, but a low population density may also lead to degradation for instance where it leads to a lack of labour force.*

land tenure: *poorly defined tenure security / access rights may lead to land degradation, as individual investments in maintenance and enhancement can be captured by others and land users do not feel "owner" of the maintenance investments. Tenure systems are particular important factors when conservation practices have a long lag between investment and return, such as terracing and tree planting.*

poverty / wealth: *poor people cannot afford to invest in resource conserving practices, so instead they continue to use inappropriate farming practices (such as ploughing up hillsides and overgrazing), which again will lead to increased land degradation and worsen poverty. It needs to be assessed whether poverty plays a role in land degradation.*

labour availability: *shortage of rural labour (eg through migration, prevalence of diseases) can lead to an abandoning of traditional resource conservation practices such as terrace maintenance. Off-farm employment opportunities may on the other hand help to alleviate pressure on production resources, in a sense that land users can invest more in conservation infrastructure as income increases.*

inputs and infrastructure *(roads, markets, distribution of water points, etc): inaccessibility to, or high prices for key agricultural inputs such as fertilizers, may render it difficult or unprofitable to preserve soil fertility or water resources. Access to markets and prices. Good infrastructure may improve this. On the other hand: a road through a forest can lead to overexploitation and degradation.*

education, access to knowledge and support services: *investing in human capital is one of the keys in reducing poverty (and thus land conservation practices). Educated land users are more likely to adopt new technologies. Land users with education often have higher returns from their land. Education also provides off-farm labour opportunities.*

war and conflicts: *leading to reduced options to use the land*

governance / institutional: *laws and enforcements, organization, collaboration and support*

other (specify): .....