

Resilience Assessment Tool

For land management
systems in
Mediterranean
drylands

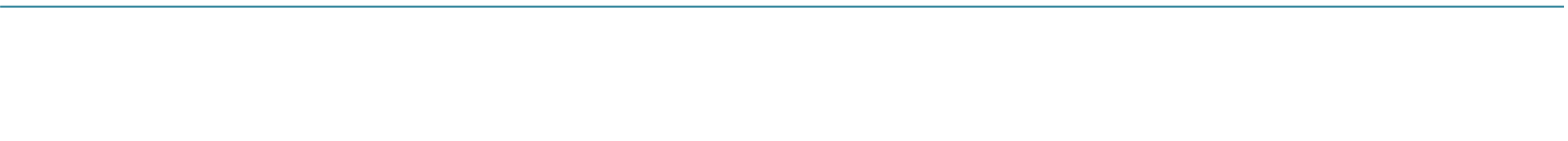


This questionnaire allows documenting and assessing the resilience of a land management system (defined as an area managed under the same combination of management practices), and the potential of land management practices in preventing or reversing catastrophic shifts in the ecosystem.

To answer the question in of the “Tool for Resilience Assessment” you can use:

- scientific data concerning the degradation of landscape, vegetation, soil, water and fauna and external shocks
- Description of land management practices and approaches derived from the WOCAT technology questionnaire, the WOCAT approach questionnaire and the WOCAT Mapping tool.
- Opinion of land users, land managers and local experts on the state of the environment, the ecosystem services provided, the future evolution of the system
- Scenarios of future evolution of the socioeconomic system and the environment

Resilience Assessment Tool



Introduction

What is a land management system?

This questionnaire is meant to evaluate the state and the resilience of a land management system defined as **an area under a unique combination of management practices implemented for a specific objective**.

Normally, a land management system corresponds to **one area, with one land use / cover**. For example: "*Pinus halepensis* afforestation managed with selective clearing and firebreaks for landscape conservation and controlling soil erosion" (Land use classification: Fp-Plantations)

However, a land management system **can be composed of different land uses / covers** if they are all managed by the same actors and with the same objectives. For example: "*Grazing system managed with seasonal grazing management and fodder cultivation for milk and meat production*" (Land uses include Ge-Extensive grazing GI-Intensive grazing and Ca-Cropland for fodder production).

If the same management practices are applied on **small portions of land** within an area, with the same objectives and by the same or comparable actors, they can be considered as one land management system. For examples: "*Riverbank management with multispecific shrub plantation and dry walls to prevent soil erosion, reduce risk of floods and increase diversity of vegetation*".

It is strongly advised to identify the boundaries of the land management system on the field, and to document them using a GIS based software (Qgis, ARCGis, GoogleEarth, Googlemaps)

How should the resilience of the land management system be assessed?

The Resilience Assessment Tool is meant to be **applied by a land management expert** (scientist, local advisor, conservation expert...) **in consultation with a diverse group of stakeholders**: land users, land managers, local administrators and other stakeholders, and using all the available scientific data and knowledge related to the area.

The amount of **scientific** (derived from studies, articles and projects) **vs. experience knowledge** (derived from stakeholder consultation) may vary, but both should be considered within each section of the questionnaire. Existing documents and advices from other SLM specialists and land users should be used as much as possible in order to **improve the quality of the data**. The quality of the results entirely depends on the quality of your answers.

Except where specifically stated, all the questions aim to **assess the state and resilience of the system at the present day**, regardless of the time the land management practice where first implemented.

Instructions

How to complete the printed version of the questionnaire?

- Write your answers in the **grey areas** such as the one below



- Use the circles to score how much you value a certain property, pressure or factor with a number ranging from 1 (Very important) to 4 (less important). Only relevant and **important elements should be scored!** If a factor or property is not relevant or important for your system **it should be left blank!**
- Use the boxes to select the appropriate answer.
- Add quantitative data, explanations and other details that could help us understand your answers in the **“Specify /Comment”** section
- Complete question 2.2 by directly **distributing the table to at least 10-15 stakeholders** related with the land management system. The table (in the layout presented in annex 1 should be translated beforehand into the language of the stakeholders using a clear and simple wording. A version in your language might already be available! Please consult the CASCADE dropbox folder or enquire with the author for further information about it

How to upload the results?

A form is available at the following URL: <https://goo.gl/lxjTzW> to facilitate entering the data from the questionnaire, and will provide an automated result page for further discussion and dissemination. Refer to the CASCADE dropbox folder or directly to the authors for more information.

For any question or clarification contact:

Matteo Jucker Riva, Centre for Development and Environment, University of Bern

Email: matteo.jucker@cde.unibe.ch skype: giucher.cant

Contents:

1.	General information on the land management system	1
1.2.	Identification of the land management system	1
1.3.	Name of the land management system:	2
1.3.1.	Which management practices are implemented withinin the land management system?	2
2.	Scope of the land management system	3
2.1.	What are the functions or services the land management system should provide?.....	3
2.2.	Which properties of the environment are to be maintained or restored?.....	5
2.2.1.	Vegetation	5
2.2.2.	Soil and water:.....	5
2.2.3.	Fauna:	6
2.2.4.	Landscape:	7
3.	Evolution of the land management system.....	8
3.1.	What pressures can have a negative impact on the system?	8
3.2.	What external factors enable land management?.....	9
3.3.	How do you foresee the evolution of the land management system in the next 10 years?	10
3.3.1.	Conditions for a positive evolution of the land management system in the next 10 years ...	11
3.3.2.	What activities /changes in land management could improve the state and functionality of the system?	11
4.	Influence of external shocks and disturbances	14
4.1.	Type and frequency of shocks and disturbances affecting the land management system	14
4.1.1.	Can the shock or disturbance cause permanent change in the land management system?..	15
4.1.2.	Under what conditions does the shock or disturbance cause permanent change?	16
4.2.	Effectiveness of land management in preventing, mitigating or restoring the land management system after a shock.....	18
4.2.1.	Does the land management prevent shocks or disturbances?	18
4.2.2.	Does the land management mitigate shocks or disturbances?	20
4.2.3.	Does land management help recover/restore the system after a shock?	21
4.3.	How resilient are the land management practices to shocks and disturbances?	23
4.3.1.	What is the impact of shocks and disturbances on the effectiveness of land management?	23
4.3.2.	What additional land management practices could be used to prevent, mitigate or restore the land management system?	25
5.	Details about the land management system.....	27
5.1.	Description of land management system.....	27
5.1.1.	Average annual rainfall:.....	27
5.1.2.	Agro-climatic zone:.....	27

Resilience Assessment Tool

5.1.3.	Landforms:.....	27
5.1.4.	Which land use type constitutes the land management system?	28
5.1.5.	Previous land use type(s) in the last 100 year:.....	29
5.1.6.	Who owns the land and what are the land and water use rights?	29
5.1.7.	Who is managing the land management system?	29
5.2.	Description of land management practices	30
5.2.1.	Short description of the land management practices.....	30
5.2.2.	Which measures does the land management consist of?.....	30
5.3.	What are the inputs needed for the implementation and maintenance of land management practices?.....	32
5.3.1.	Inputs for initial establishment:	32
5.3.2.	Inputs and timing of maintenance activities:	33
5.3.3.	What are the main benefits of the land management?.....	34
5.3.4.	What are the main disadvantages of the land management?	36
5.4.	How does landscape influence the effectiveness of land management?.....	39
5.4.1.	Impact of aspect/orientation on the effectiveness of land management practices.....	39
5.4.2.	Impact of slope steepness on the effectiveness of land management practices	40
5.4.3.	Impact of land use history on the effectiveness of land management practices	40
Annex 1:	Questionnaire on the perception of environmental properties.	43

1. General information on the land management system

1.1. Contributing expert

“Contributing expert” refers to the person completing the questionnaire.

If more than 1 expert is involved, write the name of the main resource person and his / her institution below and add the other person(s) details below.

Surname	First name(s):	female <input type="checkbox"/>
.....	.....	male <input type="checkbox"/>
Current institution and country:		
Name of institution:		
	Country:	.....
E-mail:	Other contact information:	
	
Name and affiliation of other contributing specialists:		
	

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

Date: Signature:

1.2. Identification of the land management system

1.2.1. Brief identification of the land management system:

“Country” refers to the location of the land management system; “code” to the consecutive identifier of the technology.

For example: Country: Spain Code: SPA-001

Country:	Code
-----------------------	-------------------

1.3. Name of the land management system:

The name given to the land management system should reflect the land use, the management and its main objectives

For example: Pine forest under firebreak and selective clearing management for ecosystem conservation and soil protection

Name of the Land Management System:

.....

1.3.1. Which management practices are implemented within the land management system?

Indicate here the main land management practices/ Technologies and approaches implemented in the land management system. When possible indicate the reference to the WOCAT Technology or Approach database. The management practices/Technologies are the physical practices in the field that control land degradation and / or enhance productivity. The approaches are the ways and means of support that help to introduce, implement, adapt, and promote those technologies on the ground, such as laws, projects, community organizations

For example:

Name of Land management Technology	Country code and no.
<i>Selective forest clearing to prevent large forest fires</i>	<i>QT SPA | 010</i>
<i>Cleared strip network for fire prevention</i>	<i>QT SPA | 011</i>
Name of land management approaches	Country code and no.
<i>Plan of preventive silviculture within a forest intervention area (ZAU)</i>	<i>A_SPA | 002en</i>

Name of land management practices	WOCAT Technology database reference
	Country code and no.
1)	QT ___ | ___
2)	QT ___ | ___
3)	QT ___ | ___
Name of land management approaches	Country code and no.
1)	QA ___ | ___
2)	QA ___ | ___

2. Scope of the land management system

In this section we evaluate the services that the land users/managers demand from the land management system and the specific environmental properties that are considered important to provide those services.

Information to complete this section should be gathered by consulting directly at least 10-15 stakeholders from different categories: land users, land managers, local administrators, env. advisors, scientists and others. Question 2.1 and 2.1.1 should be answered by group discussion or by aggregating the opinion of the stakeholders. Question 2.2 should be distributed directly to the stakeholders, in the layout presented in annex 1.

2.1. What are the functions or services the land management system should provide?

Indicate the most important services and functions that land users demand from the land management system (Attention: include also those services that are not currently provided by the land management system, but that are desired by the stakeholders) . In the State column, indicate if these are provided in satisfactory way (maintain) or they have to be increased (restore). If necessary, indicate the category of people that demand a specific service/function in the comment/specify section. To complete this section information can be derived from the WOCAT Technology (section 3.1) and from the WOCAT mapping questionnaire (section i). For example:

Service code or description:	State of services / functions		Specify/comment
S1- Recreation	Maintain	X	The area is used for hunting by local people and for sightseeing and hiking by tourists
	Restore	<input type="checkbox"/>	
E5- above ground biodiversity	Maintain	<input type="checkbox"/>	Restoration of typical dry Mediterranean forest with seeder and resprouter species (resprouter species are considered not enough at the moment)
	Restore	X	

A list of possible services/functions is proposed as guidance in the table below:

P	Productive services:	E	Ecological services :	S	Socio cultural services:
(P1)	Animal and plant productivity (quantity and quality), including timber and biomass for energy	(E1)	regulation of excessive water (eg water logging)	(S1)	Recreation(e.g tourism, sports)
(P2)	water (quantity and quality) for human, animal and plant consumption	(E2)	regulation of scarce water and its availability eg during dry seasons	(S2)	Cultural services(e.g maintaining traditional landscape)
(P3)	land available for production (area of land for production per person)	(E3)	reduced erosion	(S3)	Conflict mitigation
(P4)	Others	(E4)	soil formation	(S4)	Others
		(E5)	above ground biodiversity		
		(E6)	greenhouse gas absorption (CO2, methane, etc.)		
		(E7)	micro-climate regulation (wind, shade, temperature, humidity)		
		(E8)	Protection from extreme events (fires, drought, floods, etc.)		
		(E9)	Others		

Service code or description:	State of services / functions		Specify/comment
.....	Maintain	<input type="checkbox"/>
.....	Restore	<input type="checkbox"/>
.....	Maintain	<input type="checkbox"/>
.....	Restore	<input type="checkbox"/>

Resilience Assessment Tool

<i>Service code or description:</i>	<i>Services State</i>	<i>Specify/comment</i>
.....	Maintain <input type="checkbox"/>
.....	Restore <input type="checkbox"/>
.....	Maintain <input type="checkbox"/>
.....	Restore <input type="checkbox"/>
.....	Maintain <input type="checkbox"/>
.....	Restore <input type="checkbox"/>
.....	Maintain <input type="checkbox"/>
.....	Restore <input type="checkbox"/>
.....	Maintain <input type="checkbox"/>
.....	Restore <input type="checkbox"/>
.....	Maintain <input type="checkbox"/>
.....	Restore <input type="checkbox"/>
.....	Restore <input type="checkbox"/>
.....	Maintain <input type="checkbox"/>

2.1.1. Importance of services/functions

Indicate here how land users/managers value the different type of services/functions demanded from the land management system. Score the importance of service/function category with a number ranging between 1 (most important) and 4 (least important). Only evaluate the category of service/function of the services reported in question 2.1. If different opinions emerge from the stakeholder group report them in Specify/comment section

Category of service/function	Importance	Specify/comment
P Productive services:	<input type="radio"/>
E Ecological services :	<input type="radio"/>
S Socio cultural services:	<input type="radio"/>

2.2. Which properties of the environment are to be maintained or improved?

Submit directly this question to the stakeholders (layout provided in Annex 1) previously translated in their language with a clear and simple wording. Refer to annex 1 for further indications. The table is presented here only to facilitate explanation and discussion between experts and stakeholders. A specific online form has been created to facilitate results submission: <https://goo.gl/lhGPo6>

2.2.1. Vegetation

<i>Environmental property</i>	<i>Importance</i>	<i>State of environmental property</i>	<i>Comment / Specify :</i>
Presence of a mixture of grasses, shrubs and trees (complex vegetation structure)	○	Maintain <input type="checkbox"/>
		Improve <input type="checkbox"/>
High number of different species (vegetation diversity)	○	Maintain <input type="checkbox"/>
		Improve <input type="checkbox"/>
Presence of a specific plant or group (e.g resprouters, palatables):	○	Maintain <input type="checkbox"/>
		Improve <input type="checkbox"/>
Continuity of vegetation canopy/cover	○	Maintain <input type="checkbox"/>
		Improve <input type="checkbox"/>
Discontinuity of vegetation canopy or low biomass density (to reduce fire risk or disease spreading)	○	Maintain <input type="checkbox"/>
		Improve <input type="checkbox"/>
Low presence of alien/ dangerous species (specify)	○	Maintain <input type="checkbox"/>
		Improve <input type="checkbox"/>
High biomass density (overall vegetation including dead material)	○	Maintain <input type="checkbox"/>
		Improve <input type="checkbox"/>
Other (Specify)	○	Maintain <input type="checkbox"/>
		Improve <input type="checkbox"/>

2.2.2. Soil and water:

<i>Environmental property</i>	<i>Importance</i>	<i>State of environmental property</i>	<i>Comment / Specify :</i>
High soil cover (including vegetation, litter, rocks and mosses)	○	Maintain <input type="checkbox"/>
		Improve <input type="checkbox"/>
Low soil erosion	○	Maintain <input type="checkbox"/>
		Improve <input type="checkbox"/>

Resilience Assessment Tool

<i>Environmental property</i>	<i>Importance</i>	<i>State of environmental property</i>		<i>Comment / Specify :</i>
	<input type="radio"/>	Improve	<input type="checkbox"/>
	<input type="radio"/>	Maintain	<input type="checkbox"/>
High soil organic matter	<input type="radio"/>	Improve	<input type="checkbox"/>
	<input type="radio"/>	Maintain	<input type="checkbox"/>
High soil moisture	<input type="radio"/>	Improve	<input type="checkbox"/>
	<input type="radio"/>	Maintain	<input type="checkbox"/>
Favourable soil structure	<input type="radio"/>	Improve	<input type="checkbox"/>
	<input type="radio"/>	Maintain	<input type="checkbox"/>
Good soil drainage/infiltration	<input type="radio"/>	Improve	<input type="checkbox"/>
	<input type="radio"/>	Maintain	<input type="checkbox"/>
Low surface runoff	<input type="radio"/>	Improve	<input type="checkbox"/>
	<input type="radio"/>	Maintain	<input type="checkbox"/>
Availability/ protection of springs / water sources	<input type="radio"/>	Improve	<input type="checkbox"/>
	<input type="radio"/>	Maintain	<input type="checkbox"/>
Other (Specify)	<input type="radio"/>	Improve	<input type="checkbox"/>

2.2.3. Fauna:

<i>Environmental property</i>	<i>Importance</i>	<i>State of environmental property</i>		<i>Comment / Specify :</i>
Soil fauna	<input type="radio"/>	Maintain	<input type="checkbox"/>
	<input type="radio"/>	Improve	<input type="checkbox"/>
	<input type="radio"/>	Maintain	<input type="checkbox"/>
Birds	<input type="radio"/>	Improve	<input type="checkbox"/>
	<input type="radio"/>	Maintain	<input type="checkbox"/>
Wild grazers	<input type="radio"/>	Improve	<input type="checkbox"/>
	<input type="radio"/>	Maintain	<input type="checkbox"/>
Domestic grazers	<input type="radio"/>	Improve	<input type="checkbox"/>
	<input type="radio"/>	Maintain	<input type="checkbox"/>
Predators	<input type="radio"/>	Improve	<input type="checkbox"/>

2.2.4. Landscape:

<i>Environmental property</i>	<i>Importance</i>	<i>State of environmental property</i>		<i>Comment / Specify :</i>
Presence of different habitats, landscape heterogeneity	○	Maintain	<input type="checkbox"/>
		Improve	<input type="checkbox"/>
Connectivity between healthy areas	○	Maintain	<input type="checkbox"/>
		Improve	<input type="checkbox"/>
Presence of one specific habitat/land use/land cover(specify)	○	Maintain	<input type="checkbox"/>
		Improve	<input type="checkbox"/>
Other (Specify)	○	Maintain	<input type="checkbox"/>
		Improve	<input type="checkbox"/>

Do not complete here

3. Evolution of the land management system

In this section we want to assess, at the best possible approximation, how the land management system will evolve in the future, considering the pressures that can degrade the system and the external factors that enable land management. To complete this question you can rely on future scenarios and scientific data about trends, information from the WOCAT Technology Questionnaire (section 2.2.2.5) and the WOCAT Mapping Questionnaire (column “e”) and also the perception of stakeholders.

3.1. What pressures can have a negative impact on the system?

Indicate what pressures cause a degradation of the land management system. Their importance in the present situation should be scored in the circles under the column “Importance” with a number ranging from 1 (very important) to 4 (less important). Give an estimation of how pressures will change in the next 10 years. For example:

Pressure	Importance	Is the pressure increasing, stable or decreasing?			Comment / Specify :
		Increasing	Stable	Decreasing	
Overgrazing	1	X	<input type="checkbox"/>	<input type="checkbox"/>	The number of animals per farmer and the amount of farmers per area has increased in the last 5 years and it is thought to continue on this trend

Pressure	Importance	Is the pressure increasing, stable or decreasing?			Comment / Specify :
		Increasing	Stable	Decreasing	
Unsustainable soil management	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Deforestation / removal of natural vegetation (incl. forest fires)	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Overgrazing	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Industrial activities and mining	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Urbanisation and infrastructure development	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Discharges (point contamination of water)	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Pressure	Importance	Is the pressure increasing, stable or decreasing?			Comment / Specify :
		Increasing	Stable	Decreasing	
Disturbance of water cycle (infiltration / runoff)	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Over abstraction of water (for irrigation, industry, etc.)	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other pressures (specify)	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3.2. What external factors enable land management?

Indicate what external factors allow land users/managers to implement the land management. Assess their future evolution following the same method of the previous question (3.1)

Ext. factor	Importance	Is the ext. factor increasing, stable or decreasing?			Comment / Specify :
		Increasing	Stable	Decreasing	
Subsidies for land use activity (agriculture, farming, tourism and others)	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Subsidies for land management or nature conservation	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Market prices of goods produced from the land (e.g. wood, cheese or meat, honey, energy, etc.)	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A specific land use activity (e.g. olive orchards for fodder production)	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Affordable energy price	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Presence of infrastructures (e.g. roads)	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Ext. factor	Importance	Is the ext. factor increasing, stable or decreasing?			Comment / Specify :
		Increasing	Stable	Decreasing	
Laws and regulations prescribing land management	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Land tenure (specify if public, private or community owned)	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cooperation and community organization	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3.3. How do you foresee the evolution of the land management system in the next 10 years?

Give a general assessment of the present state and the future evolution of the land management system considering the changes in pressure and in the factors enabling management (questions 3.1 and 3.2) and without considering external shocks or disturbances such as wildfires, droughts or floods. Evaluate the present state through a number: (1) Very adequate; (2) Quite adequate; (3) Inadequate; (4) Very inadequate. Add details about the foreseen evolution of the land management system in the Comment / Specify section.

	Present state	Future evolution			Comment / Specify :
		Increasing	Stable	Decreasing	
Provision of services/functions	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Effectiveness of management	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3.3.1. Conditions for a positive evolution of the land management system in the next 10 years

Describe in your own words, the conditions necessary to reach or maintain an adequate level of services /functions, without considering external shocks or disturbances such as wildfires, droughts or floods. You can include the pressures and factors examined in the previous section. For example:

The land management system will provide adequate services/functions if:
The average amount of rainfall remains higher than 500 mm/year. The subsidies for land management are maintained or increased and the price of timber does not fall below 10 euros / cubic meter

The land management system will provide adequate services/functions if:

.....

.....

.....

.....

.....

.....

3.3.2. What activities /changes in land management could improve the state and functionality of the system?

Describe here what activities, land management practices and changes in land use could improve the system in terms of provision of services /functions (e.g to increase productivity) or efficiency of land management practice. The answer to this question should largely include the view of different stakeholders and not be limited to nature /resources conservation. For example: Touristic valorization of the area, ameliorating fences to ensure conservation, machinery to reduce labor for milking, increased maintenance of firebreaks, education of land users....

The land management system will provide adequate services/functions if:

.....

.....

.....

.....

.....

.....

Knowledge and sources used in section 3: Evolution of land management systems

The following questions allow understanding what type of knowledge was used to answer the questions of the previous section. They should be answered only by the expert(s) compiling the questionnaire. The answer should focus specifically on section 3, disregarding the other parts of the questionnaires.

What sources of scientific knowledge were used to complete section 3?

Include in this answer scientific papers, studies, official documents such as management plans, scenarios, forestry archives and others.

Main sources of scientific knowledge	Publication year
.....
.....
.....
.....

Which stakeholders were consulted to complete section 3?

Give information on the people that have been consulted to complete this section

Category of stakeholder	Number of stakeholders per category	
Land users /owners	<input type="checkbox"/> Less than 2	<input type="checkbox"/> 5 to 7
	<input type="checkbox"/> 2 to 5	<input type="checkbox"/> More than 7
Local administrators (municipality, local and regional government)	<input type="checkbox"/> Less than 2	<input type="checkbox"/> 5 to 7
	<input type="checkbox"/> 2 to 5	<input type="checkbox"/> More than 7
Advisors or land managers (forestry service, nature conservation, agricultural advisors)	<input type="checkbox"/> Less than 2	<input type="checkbox"/> 5 to 7
	<input type="checkbox"/> 2 to 5	<input type="checkbox"/> More than 7
Scientists and land management experts	<input type="checkbox"/> Less than 2	<input type="checkbox"/> 5 to 7
	<input type="checkbox"/> 2 to 5	<input type="checkbox"/> More than 7
Other stakeholders (specify category):.....	<input type="checkbox"/> Less than 2	<input type="checkbox"/> 5 to 7
	<input type="checkbox"/> 2 to 5	<input type="checkbox"/> More than 7

What other sources of information were used to complete section 3?

Include here all other sources of information that were not included in the previous questions. Specify the type of information/data used (e.g. measured data, newspaper publication....)

Description of other information sources	Type of data /information
.....
.....
.....
.....

How important was each information source to complete section 3?

Assign a value of importance to each category with a number between 1(very important and 4 (less important)

Scientific knowledge Stakeholders' knowledge Other sources

4. Influence of external shocks and disturbances

Shocks and disturbances can degrade the land management system in a dramatic and permanent way, and they often require a specific management strategy to prevent or recover from degradation. In this section we analyze the occurrence of different types of shocks and disturbance along with their impact and potential mitigation/recovery strategies.

Shocks and disturbances to be considered are those that occur in the region in which the land management system is located (i.e. with the same natural and human environment) and that could affect the land management system in a negative way.

4.1. Type and frequency of shocks and disturbances affecting the land management system

Assess the negative impact of a shock or disturbance on the functions/services provided by the land management system through a number ranging from 1 (very important) to 4 (less important). Report the average frequency of a shock or disturbance in the region of the land management system by selecting the appropriate category. Indicate the year of the last shock or disturbance that affected the land management system

Type Shock or disturbance	Impact	Frequency of shock or disturbance (in the region)					Year of last shock (in the land management system)
		Once per year or less	Between 1 and 5 years	Between 5 and 10 years	Between 10 and 30 years	More than 30 years	
Drought	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fire	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pests/diseases	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Torrential rainfall	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Flood	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wind storm	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (Specify)	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4.1.1. Can the shock or disturbance cause permanent change in the land management system?

Indicate if the shock or disturbances can cause a permanent degradation (the land management system will not recover without specific intervention within 30 years). Only consider the shocks and disturbances identified as relevant in question (4.1). Specify which property of the environment can be affected by this permanent degradation. Refer to the indicators below as guidance to evaluate the impact of shocks

Vegetation		Soil	Water	Fauna	Landscape
Presence of grasses, shrubs and trees (complex vegetation structure)	Continuity of vegetation canopy/cover	Soil cover (including vegetation, litter, rocks and mosses)	Low runoff	Soil fauna	Presence of different habitats, landscape heterogeneity
Number of different species(vegetation structure)	Discontinuity of vegetation canopy or low biomass density (to reduce fire risk or disease spreading)	Low soil erosion	High water infiltration capacity	Birds	Connectivity between healthy areas
Presence of a specific plant or group(e.g resprouters, palatables):	Low presence of alien/ dangerous species (specify)	Presence and thickness of litter	Acquifer recharge	Wild grazers	Presence of one specific habitat/land use/land cover(specify)
	High biomass density (overall vegetation including dead material)	Soil organic matter		Domestic grazers	
		Soil moisture		Predators	

Type Shock or disturbance	Environmental property affected by permanent change					Specify / Comment
	Vegetation	Soil	Water	Fauna	Landscape	
Drought	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fire	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pests / diseases	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Torrential rainfall	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Flood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wind storm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (specify)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4.1.2. Under what conditions does the shock or disturbance cause permanent change?

Describe the characteristics of the shock or disturbance that can cause permanent degradation in the land management system. When possible refer to quantitative values in the intensity, frequency or duration of the shock.

Type of shock or disturbance: <i>Fire</i>	<p>Threshold conditions for permanent degradation:</p> <p><i>If more than 3 fires occur within 20 years, there will be no pine seeds to regenerate the forest after the fire</i></p>
--	---

Type of shock or disturbance:	<p>Threshold conditions for permanent change:</p> <p>.....</p> <p>.....</p> <p>.....</p>
Type of shock or disturbance:	<p>Threshold conditions for permanent change:</p> <p>.....</p> <p>.....</p> <p>.....</p>
Type of shock or disturbance:	<p>Threshold conditions for permanent change:</p> <p>.....</p> <p>.....</p> <p>.....</p>

4.1.3. Describe the impact of permanent change on the provision of services/functions

For each disturbance that can determine a permanent change in the land management system, describe the changes in the provision of services/functions caused by a permanent change in the environment. Indicate the negative ones (decrease in the provision of a certain service) and also the positive one (increase in the provision of a certain service/function). For example:

Type of shock or disturbance: <i>Fire</i>	<p>Change in productive services:</p> <p>Services that will decrease: <i>With the loss of the trees, the forest area will lose value for timber production/logging,</i></p> <p>Services that will increase: <i>The vegetation will be more favorable for honey production and hunting</i></p> <p>Change in ecological functions:</p> <p>Services that will decrease: <i>The shrubland vegetation will be more fire prone, increasing the risk of fire. Mitigation of floods and erosion will also be reduced</i></p> <p>Change in socio-cultural services:</p> <p>Services that will decrease: <i>The forest has an important aesthetic value for the local land users</i></p> <p>Services that will increase: <i>the area will be more attractive for tourism and leisure</i></p>
--	--

Resilience Assessment Tool

As guidance, refer to the list of services/functions below:

<i>P</i> <i>Productive services:</i>	<i>E</i> <i>Ecological services :</i>	<i>S</i> <i>Socio cultural services:</i>
<i>(P1) Animal and plant productivity (quantity and quality), including timber and biomass for energy</i> <i>(P2) water (quantity and quality) for human, animal and plant consumption</i> <i>(P3) land available for production (area of land for production per person)</i> <i>(P4) Others</i>	<i>(E1) regulation of excessive water (eg water logging)</i> <i>(E2) regulation of scarce water and its availability eg during dry seasons</i> <i>(E3) reduced erosion</i> <i>(E4) soil formation</i> <i>(E5) above ground biodiversity</i> <i>(E6) greenhouse gas absorption (CO2, methane, etc.)</i> <i>(E7) micro-climate regulation (wind, shade, temperature, humidity)</i> <i>(E8) Protection from extreme events (fires, drought, floods, etc.)</i> <i>(E9) Others</i>	<i>(S1) Recreation(e.g tourism, sports)</i> <i>(S2) Cultural services(e.g maintaining traditional landscape)</i> <i>(S3) Conflict mitigation</i> <i>(S4) Others</i>

	<p>Change in productive services: Services that will decrease:</p> <p>.....</p> <p>Services that will increase</p> <p>.....</p>
Type of shock or disturbance:	<p>Change in ecological services: Services that will decrease:</p> <p>.....</p> <p>Services that will increase</p> <p>.....</p>
	<p>Change in socio-cultural services: Services that will decrease:</p> <p>.....</p> <p>Services that will increase</p> <p>.....</p>

	<p>Change in productive services: Services that will decrease:</p> <p>.....</p> <p>Services that will increase</p> <p>.....</p>
Type of shock or disturbance:	<p>Change in ecological services: Services that will decrease:</p> <p>.....</p> <p>Services that will increase</p> <p>.....</p>
	<p>Change in socio-cultural services: Services that will decrease:</p> <p>.....</p>

.....
 Services that will increase

Change in productive services:
 Services that will decrease:

 Services that will increase

Change in ecological services:
 Services that will decrease:

 Services that will increase

Change in socio-cultural services:
 Services that will decrease:

 Services that will increase

Type of shock or disturbance:

4.2. Effectiveness of land management in preventing, mitigating or restoring the land management system after a shock

4.2.1. Does the land management prevent shocks or disturbances?

Land management can play a role in the occurrence of shocks and disturbances, by reducing or preventing the conditions for a shock to happen. Report here how the land management practices influence the probability of a shock occurring in the land management system. Only consider the shocks and disturbances identified as relevant in question (4.1). Specify the conditions for the management to be effective in the Specify/comment section. Report the land management practices in the same order used for question 1.3.1. For example:

Influence of land management practices on probability of shock or disturbance	
Land management practice 1 name: <i>Firebreak network</i>	
Type of shock or disturbance: <i>Wildfire</i>	<input type="checkbox"/> strong increase in probability of shock
	<input type="checkbox"/> increase
	<input type="checkbox"/> negligible
	<input checked="" type="checkbox"/> decrease
	<input type="checkbox"/> strong decrease in probability of a shock
Specify / Comment	<i>Firebreaks are effective in reducing the spread of fire if the microclimatic conditions are not extreme</i>

<i>Influence of land management practices on probability of shock or disturbance</i>			
<i>Land management practice 1 name:</i>	<i>Land management practice 2 name:</i>	<i>Land management practice 3 name:</i>	
.....	
.....	
<input type="checkbox"/> strong increase in probability of shock	<input type="checkbox"/> strong increase in probability of shock	<input type="checkbox"/> strong increase in probability of shock	<i>Type of shock or disturbance:</i>
<input type="checkbox"/> increase	<input type="checkbox"/> increase	<input type="checkbox"/> increase	
<input type="checkbox"/> negligible	<input type="checkbox"/> negligible	<input type="checkbox"/> negligible	
<input type="checkbox"/> decrease	<input type="checkbox"/> decrease	<input type="checkbox"/> decrease	
<input type="checkbox"/> strong decrease in probability of a shock	<input type="checkbox"/> strong decrease in probability of a shock	<input type="checkbox"/> strong decrease in probability of a shock	
.....	
<i>Specify / Comment</i>	.....	.....	.....
.....

<i>Influence of land management practices on probability of shock or disturbance</i>			
<i>Land management practice 1 name:</i>	<i>Land management practice 2 name:</i>	<i>Land management practice 3 name:</i>	
.....	
.....	
<input type="checkbox"/> strong increase in probability of shock	<input type="checkbox"/> strong increase in probability of shock	<input type="checkbox"/> strong increase in probability of shock	<i>Type of shock or disturbance:</i>
<input type="checkbox"/> increase	<input type="checkbox"/> increase	<input type="checkbox"/> increase	
<input type="checkbox"/> negligible	<input type="checkbox"/> negligible	<input type="checkbox"/> negligible	
<input type="checkbox"/> decrease	<input type="checkbox"/> decrease	<input type="checkbox"/> decrease	
<input type="checkbox"/> strong decrease in probability of a shock	<input type="checkbox"/> strong decrease in probability of a shock	<input type="checkbox"/> strong decrease in probability of a shock	
.....	
<i>Specify / Comment</i>	.....	.....	.....
.....

<i>Influence of land management practices on probability of shock or disturbance</i>			
<i>Land management practice 1 name:</i>	<i>Land management practice 2 name:</i>	<i>Land management practice 3 name:</i>	
.....	
.....	
<input type="checkbox"/> strong increase in probability of shock	<input type="checkbox"/> strong increase in probability of shock	<input type="checkbox"/> strong increase in probability of shock	<i>Type of shock or disturbance:</i>
<input type="checkbox"/> increase	<input type="checkbox"/> increase	<input type="checkbox"/> increase	
<input type="checkbox"/> negligible	<input type="checkbox"/> negligible	<input type="checkbox"/> negligible	
<input type="checkbox"/> decrease	<input type="checkbox"/> decrease	<input type="checkbox"/> decrease	
<input type="checkbox"/> strong decrease in probability of a shock	<input type="checkbox"/> strong decrease in probability of a shock	<input type="checkbox"/> strong decrease in probability of a shock	
.....	
<i>Specify / Comment</i>	.....	.....	.....
.....

4.2.2. Does the land management mitigate shocks or disturbances?

Land management can mitigate the effects of a shock or disturbance if they can reduce the resulting degradation. Here we assess the effect of land management only on the resulting degradation, without considering the effect on prevention or recovery. Follow the indications provided for the previous question (4.2.1)

Influence of land management practices on the degradation associated with a shock or disturbance			
	Land management practice 1 name:	Land management practice 2 name:	Land management practice 3 name:

Type of shock or disturbance:	<input type="checkbox"/> strong mitigation	<input type="checkbox"/> strong mitigation	<input type="checkbox"/> strong mitigation
	<input type="checkbox"/> mitigation	<input type="checkbox"/> mitigation	<input type="checkbox"/> mitigation
	<input type="checkbox"/> negligible mitigation	<input type="checkbox"/> negligible mitigation	<input type="checkbox"/> negligible mitigation
	<input type="checkbox"/> Increased degradation	<input type="checkbox"/> Increased degradation	<input type="checkbox"/> Increased degradation
	<input type="checkbox"/> Strong increase of degradation	<input type="checkbox"/> Strong increase of degradation	<input type="checkbox"/> Strong increase of degradation
Specify / Comment	.....	.....	.....

Influence of land management practices on the degradation associated with a shock or disturbance			
	Land management practice 1 name:	Land management practice 2 name:	Land management practice 3 name:

Type of shock or disturbance:	<input type="checkbox"/> strong mitigation	<input type="checkbox"/> strong mitigation	<input type="checkbox"/> strong mitigation
	<input type="checkbox"/> mitigation	<input type="checkbox"/> mitigation	<input type="checkbox"/> mitigation
	<input type="checkbox"/> negligible mitigation	<input type="checkbox"/> negligible mitigation	<input type="checkbox"/> negligible mitigation
	<input type="checkbox"/> increased degradation	<input type="checkbox"/> increased degradation	<input type="checkbox"/> increased degradation
	<input type="checkbox"/> Strong increase of degradation	<input type="checkbox"/> Strong increase of degradation	<input type="checkbox"/> Strong increase of degradation
Specify / Comment	.....	.....	.....

<i>Influence of land management practices on the degradation associated with a shock or disturbance</i>			
	<i>Land management practice 1 name:</i>	<i>Land management practice 2 name:</i>	<i>Land management practice 3 name:</i>

<i>Type of shock or disturbance:</i>	<input type="checkbox"/> strong mitigation	<input type="checkbox"/> strong mitigation	<input type="checkbox"/> strong mitigation
	<input type="checkbox"/> mitigation	<input type="checkbox"/> mitigation	<input type="checkbox"/> mitigation
	<input type="checkbox"/> negligible mitigation	<input type="checkbox"/> negligible mitigation	<input type="checkbox"/> negligible mitigation
	<input type="checkbox"/> increased degradation	<input type="checkbox"/> increased degradation	<input type="checkbox"/> increased degradation
	<input type="checkbox"/> strong increase of degradation	<input type="checkbox"/> strong increase of degradation	<input type="checkbox"/> strong increase of degradation
<i>Specify / Comment</i>	...............	...............	...............

4.2.3. Does land management help recover/restore the system after a shock?

Land management can help the system to recover/restore after a shock. In this question we assess the impact of land management after the shock. Impact of restoration actions such as reforestation should be included in this question and specified under the Specify/comment section.

<i>Influence of land management practices on the recovery after a shock or disturbance</i>			
	<i>Land management practice 1 name:</i>	<i>Land management practice 2 name:</i>	<i>Land management practice 3 name:</i>

<i>Type of shock or disturbance:</i>	<input type="checkbox"/> regeneration prevented	<input type="checkbox"/> regeneration prevented	<input type="checkbox"/> regeneration prevented
	<input type="checkbox"/> regeneration decreased or delayed	<input type="checkbox"/> regeneration decreased or delayed	<input type="checkbox"/> regeneration decreased or delayed
	<input type="checkbox"/> negligible	<input type="checkbox"/> negligible	<input type="checkbox"/> negligible
	<input type="checkbox"/> increased or faster regeneration	<input type="checkbox"/> increased or faster regeneration	<input type="checkbox"/> increased or faster regeneration
	<input type="checkbox"/> full regeneration ensured	<input type="checkbox"/> full regeneration ensured	<input type="checkbox"/> full regeneration ensured
<i>Specify / Comment</i>	...............	...............	...............

<i>Influence of land management practices on the recovery after a shock or disturbance</i>			
	<i>Land management practice 1 name:</i>	<i>Land management practice 2 name:</i>	<i>Land management practice 3 name:</i>

Type of shock or disturbance:	<input type="checkbox"/> regeneration prevented	<input type="checkbox"/> regeneration prevented	<input type="checkbox"/> regeneration prevented
	<input type="checkbox"/> regeneration decreased or delayed	<input type="checkbox"/> regeneration decreased or delayed	<input type="checkbox"/> regeneration decreased or delayed
	<input type="checkbox"/> negligible	<input type="checkbox"/> negligible	<input type="checkbox"/> negligible
	<input type="checkbox"/> increased or faster regeneration	<input type="checkbox"/> increased or faster regeneration	<input type="checkbox"/> increased or faster regeneration
	<input type="checkbox"/> full regeneration ensured	<input type="checkbox"/> full regeneration ensured	<input type="checkbox"/> full regeneration ensured
Specify / Comment	.....	.....	.....

<i>Influence of land management practices on the recovery after a shock or disturbance</i>			
	<i>Land management practice 1 name:</i>	<i>Land management practice 2 name:</i>	<i>Land management practice 3 name:</i>

Type of shock or disturbance:	<input type="checkbox"/> regeneration prevented	<input type="checkbox"/> regeneration prevented	<input type="checkbox"/> regeneration prevented
	<input type="checkbox"/> regeneration decreased or delayed	<input type="checkbox"/> regeneration decreased or delayed	<input type="checkbox"/> regeneration decreased or delayed
	<input type="checkbox"/> negligible	<input type="checkbox"/> negligible	<input type="checkbox"/> negligible
	<input type="checkbox"/> increased or faster regeneration	<input type="checkbox"/> increased or faster regeneration	<input type="checkbox"/> increased or faster regeneration
	<input type="checkbox"/> full regeneration ensured	<input type="checkbox"/> full regeneration ensured	<input type="checkbox"/> full regeneration ensured
Specify / Comment	.....	.....	.....

4.3. How resilient are the land management practices to shocks and disturbances?

Assess the consequences of a shock or disturbance on the effectiveness of land management practices (i.e will the land management practice still provide benefits after a shock?) and what is needed to restore their effectiveness. Only consider the shocks and disturbances identified as relevant in question (4.1)

4.3.1. What is the impact of shocks and disturbances on the effectiveness of land management?

Describe the consequences of a shock on the effectiveness of land management. Consider in the evaluation the overall benefits of the land management practice and not only in relation to shocks and disturbances.

Land management practice 1.					
Name:					
Type Shock or disturbance	<i>Is fully effective</i>	<i>Effectiveness is reduced</i>	<i>Does not provide any benefits</i>	<i>Has negative impacts</i>	Specify / Comment
Drought	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fire	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pests/diseases	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Torrential rainfall	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Flood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wind storm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (specify)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Land management practice 2.					
Name:					
Type Shock or disturbance	<i>Is fully effective</i>	<i>Effectiveness is reduced</i>	<i>Does not provide any benefits</i>	<i>Has negative impacts</i>	Specify / Comment
Drought	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fire	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pests/diseases	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Land management practice 2.(continued)					
Name:					
Type Shock or disturbance	<i>Is fully effective</i>	<i>Effectiveness is reduced</i>	<i>Does not provide any benefits</i>	<i>Has negative impacts</i>	Specify / Comment
Torrential rainfall	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Flood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wind storm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (specify)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Land management practice 3					
Name:					
Type Shock or disturbance	<i>Is fully effective</i>	<i>Effectiveness is reduced</i>	<i>Does not provide any benefits</i>	<i>Has negative impacts</i>	Specify / Comment
Drought	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fire	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pests/diseases	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Torrential rainfall	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Flood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wind storm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (specify)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4.3.2. What additional land management practices could be used to prevent, mitigate or restore the land management system?

Indicate here additional management practices that could be used to prevent or mitigate a shock or disturbance, or to increase chances of recovery after these events. Indicate which shocks or disturbances are targeted by the additional technology and, if possible, indicate an example in the WOCAT database. For example:

Description of additional land management practice	Targeted shock(s) or disturbance(s)	WOCAT identifier (if possible)	Aim
Natural mulching: Using wood and leaves to cover the soil after a fire to reduce soil erosion	Wildfire	T_POR003en	<input type="checkbox"/> Prevent
			<input checked="" type="checkbox"/> Mitigate
			<input type="checkbox"/> Restore

Name or description of additional land management practice	Targeted shock(s) or disturbance(s)	WOCAT identifier (if possible)	Aim
.....	<input type="checkbox"/> Prevent
.....	QT.....	<input type="checkbox"/> Mitigate
.....	<input type="checkbox"/> Restore
.....	<input type="checkbox"/> Prevent
.....	QT.....	<input type="checkbox"/> Mitigate
.....	<input type="checkbox"/> Restore
.....	<input type="checkbox"/> Prevent
.....	QT.....	<input type="checkbox"/> Mitigate
.....	<input type="checkbox"/> Restore
.....	<input type="checkbox"/> Prevent
.....	QT.....	<input type="checkbox"/> Mitigate
.....	<input type="checkbox"/> Restore

Knowledge and sources used in section 4: External shocks and disturbances

The following questions allow understanding what type of knowledge was used to answer the questions of the previous section. They should be answered only by the expert(s) compiling the questionnaire. The answer should focus specifically on section 4, disregarding the other parts of the questionnaires.

What sources of scientific knowledge were used to complete section 4?

Include in this answer scientific papers, studies, official documents such as management plans, scenarios, forestry archives and others.

Main sources of scientific knowledge	Publication year
.....
.....
.....

Which stakeholders were consulted to complete section 4?

Include in this answer scientific papers, studies, official documents such as management plans, scenarios, forestry archives and others.

Category of stakeholder	Number of stakeholders per category	
Land users /owners	<input type="checkbox"/> Less than 2	<input type="checkbox"/> 5 to 7
	<input type="checkbox"/> 2 to 5	<input type="checkbox"/> More than 7
Local administrators (municipality, local and regional government)	<input type="checkbox"/> Less than 2	<input type="checkbox"/> 5 to 7
	<input type="checkbox"/> 2 to 5	<input type="checkbox"/> More than 7
Advisors or land managers (forestry service, nature conservation, agricultural advisors)	<input type="checkbox"/> Less than 2	<input type="checkbox"/> 5 to 7
	<input type="checkbox"/> 2 to 5	<input type="checkbox"/> More than 7
Scientists and land management experts	<input type="checkbox"/> Less than 2	<input type="checkbox"/> 5 to 7
	<input type="checkbox"/> 2 to 5	<input type="checkbox"/> More than 7
Other stakeholders (specify category):.....	<input type="checkbox"/> Less than 2	<input type="checkbox"/> 5 to 7
	<input type="checkbox"/> 2 to 5	<input type="checkbox"/> More than 7

What other sources of information were used to complete section 4?

Include here all other sources of information that were not included in the previous question. Specify the type of information/data used (e.g. measured data, newspaper publication....)

Description of other information sources	Type of data /information
.....
.....
.....

How important was each information source to complete section 4?

Assign a value of importance to each category with a number between 1(very important and 4 (less important)

Scientific knowledge	<input type="radio"/>	Stakeholders' knowledge	<input type="radio"/>	Other sources	<input type="radio"/>
----------------------	-----------------------	-------------------------	-----------------------	---------------	-----------------------

5. Details about the land management system

This section aims at describing the general features of a land management system by considering the natural environment, the human environment and the management practices. The information to complete the section can be derived from the WOCAT Technology questionnaire, the WOCAT approach questionnaire or the WOCAT mapping tool and do not need to be completed on the field. If the WOCAT questionnaire were not previously completed, sections from 5.1 and 5.2 can be completed using maps and descriptions of the area in which land management system is located, section 5.3 and 5.4 can be completed by discussing with land users/managers.

5.1. Description of land management system

This section allows describing the natural and human environment of the land management system. The information to answer the following questions can be extracted from the WOCAT questionnaire (section 2.7 and 2.8).

5.1.1. Average annual rainfall:	5.1.2. Agro-climatic zone:
< 250 mm <input type="checkbox"/>	humid <input type="checkbox"/>
250-500 mm <input type="checkbox"/>	subhumid <input type="checkbox"/>
500-750 mm <input type="checkbox"/>	semi-arid <input type="checkbox"/>
750-1000 mm <input type="checkbox"/>	arid <input type="checkbox"/>
1000-1500 mm <input type="checkbox"/>	5.1.3. Landforms:
1500-2000 mm <input type="checkbox"/>	plateau / plains <input type="checkbox"/>
2000-3000 mm <input type="checkbox"/>	ridges <input type="checkbox"/>
3000-4000 mm <input type="checkbox"/>	mountain slopes <input type="checkbox"/>
> 4000 mm <input type="checkbox"/>	hill slopes <input type="checkbox"/>
	foot slopes <input type="checkbox"/>
	valley floors <input type="checkbox"/>

5.1.4. Which land use type constitutes the land management system?

Indicate the main land use type according to the classification below. If relevant, add other land use types in order of extension. For example:

Most common land use type: Fp: Plantations	Other land use type: 2) Fn: Natural forests; 3) Ge: extensive grazing land
--	---

Categories of land use type:

Land use type	Subcategory of land use type
Cropland: Land used for cultivation of crops (field crops, orchards).	<ul style="list-style-type: none"> • Ca: Annual cropping: land under temporary / annual crops usually harvested within one, maximally within two years (eg maize, paddy rice, wheat, vegetables, fodder crops) • Cp: 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) • Ct: 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	<ul style="list-style-type: none"> • Ge: Extensive grazing land: grazing on natural or semi-natural grasslands, grasslands with trees / shrubs or open woodlands for livestock and wildlife • Gi: Intensive grazing/ fodder production: improved or planted pastures for grazing/production of fodder (for cutting and carrying: hay, leguminous species, silage etc) notincluding 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.	<ul style="list-style-type: none"> • Fn: Natural forests: composed of indigenous trees, not planted by man • Fp: Plantations, afforestations: forest stands established by planting or/and seeding in the process of afforestation or reforestation • Fo: Other: eg selective cutting of natural forests and incorporating planted species
Mixed: mixture of land use types within the same land unit.	<ul style="list-style-type: none"> • Mf: Agroforestry: cropland and trees • Mp: Agro-pastoralism: cropland and grazing land (including seasonal change between crops and livestock) • Ma: Agro-silvopastoralism: cropland, grazing land and trees (including seasonal change between crops and livestock) • Ms: Silvo-pastoralism: forest and grazing land • Mo: Other: other mixed land
Other:	<ul style="list-style-type: none"> • Oi: Mines and extractive industries • Os: Settlements, infrastructure networks: roads, railways, pipe lines, power lines • Ow: Waterways, drainage lines, ponds, dams • Oo: Other: wastelands, deserts, glaciers, swamps, recreation areas, etc

	Other land use type(s): 2).....;
Most common land use type:	3).....;
.....	4).....;

5.1.5. Previous land use type(s) in the last 100 year:

Indicate the previous land use type(s), if it has changed in the last hundred years from the most recent one. Complete as indicated per previous question adding the indication of how many years ago the land use changed. For example:

Most common land use type: Ca: Annual cropping
Approximate date of change: 60 (in years before present) **Other land use type:** 2) Gi: intensive grazing;

Most common land use type:

Approximate date of change:..... (in years before present) **Other past land use type:** 2).....;
 3).....;
 4).....;

5.1.6. Who owns the land and what are the land and water use rights?

<i>Land ownership</i>	<i>Rights: Land use rights</i>	<i>Water use rights (if relevant)</i>
state	<input type="radio"/> open access (unorganised)	<input type="radio"/>
company	<input type="radio"/> communal (organised)	<input type="radio"/>
communal / village	<input type="radio"/> leased	<input type="radio"/>
group	<input type="radio"/> individual	<input type="radio"/>
individual, not titled	<input type="radio"/> other (specify):	<input type="radio"/>
individual, titled	<input type="radio"/>	
other (specify):.....	<input type="radio"/>	

5.1.7. Who is managing the land management system?

Score the relevant categories of stakeholders with a number that goes from 1(very important) to 4(less important). Specify relevant detail such as type of company or name of community organization in the "Comments" section.

Individual/household	<input type="checkbox"/>	groups / community / cooperative	<input type="checkbox"/>	employee (company, government)	<input type="checkbox"/>
Small scale land users	<input type="checkbox"/>	medium scale land users	<input type="checkbox"/>	large scale land users	<input type="checkbox"/>
Leaders / privileged	<input type="checkbox"/>	common / average land users	<input type="checkbox"/>	disadvantaged land users	<input type="checkbox"/>
Mainly women	<input type="checkbox"/>	mainly men	<input type="checkbox"/>	mixed	<input type="checkbox"/>

5.2. Description of land management practices

5.2.1. Short description of the land management practices

Describe here the land management practices that are implemented in the land management system (as indicated in question 1.3.1) and their impacts. Information to complete this question can be derived from the WOCAT technology questionnaire.

Land management practice 1

.....

.....

.....

Land management practice 2

.....

.....

.....

Land management practice 3

.....

.....

.....

5.2.2. Which measures does the land management consist of?

Conservation measures fall into four categories: agronomic, vegetative, structural and management measures. Measures are components of land management practices. Each land management practice is made up of one or 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).

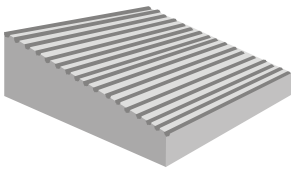
Specify the name of the land management practice in the same order used for question 1.3.1. Rank the relevant categories with a number that goes from 1(very important) to 4(less important). For example:

<i>Management practice 1</i>			
<i>Name: Selective clearing of forest</i>			
	<i>Ranking</i>	<i>Code(s)</i>	<i>Comment/ Specify</i>
<i>agronomic measures</i>	<i>2</i>	<i>A3</i>	<i>Mulching with wood derived from selective clearing</i>
<i>vegetative measures</i>	<i>1</i>	<i>V3</i>	<i>Clearing of fireprone or dense vegetation</i>

A categorisation of land use types is proposed below the question.

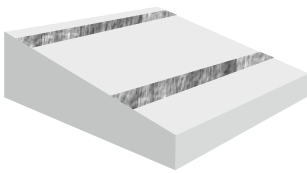
Land management practice 1			Land management practice 2			Land management practice 3		
Name:			Name:			Name:.....		
Importance	Code(s)	Comment/Specify	R Importance	Code(s)	Comment/Specify	R Importance	Code(s)	Comment/Specify
agronomic measures	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
vegetative measures	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
structural measures	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
management measures	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Codes for land conservation measures



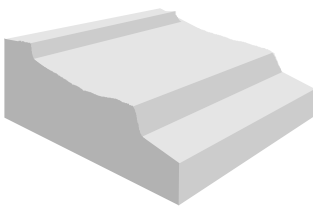
Agronomic measures such as conservation agriculture, manuring / composting, mixed cropping, contour cultivation, mulching, etc.

- 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, agroforestry 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.

Types of agronomic measures

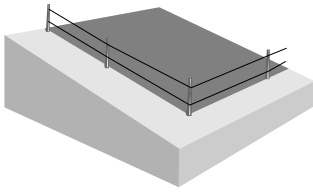
- A1:** Vegetation / soil cover
- A2:** Organic matter / soil fertility
- A3:** Soil surface treatment
- A4:** Subsurface treatment
- A5:** Others

Types of vegetative measures

- V1:** Tree and shrub cover
- V2:** Grasses and perennial herbaceous plants
- V3:** Clearing of vegetation (eg fire breaks/reduced fuel)
- V4:** Others

Types of structural measures

- S1:** Bench terraces (slope of terrace bed <6%)
- S2:** Forward sloping terraces (slope of terrace bed >6%)
- S3:** Bunds / banks
- S4:** Graded ditches / waterways (to drain and convey water)
- S5:** Level ditches / pits
- S6:** Dams / pans: store excessive water
- S7:** Reshaping surface (reducing slope)
- S8:** Walls / barriers / palisades
- S9:** Others



- 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

Types of management measures

- M1:** Change of land use type
- M2:** Change of management / intensity level
- M3:** Layout according to natural and human environment
- M4:** Major change in timing of activities
- M5:** Control / change of species composition (if annually or in a rotational sequence as done eg on cropland -> A1)
- M6:** Waste Management: includes recycling, re-use or reduce: includes both artificial and natural methods for waste management
- M7:** Others

5.3. What are the inputs needed for the implementation and maintenance of land management practices?

5.3.1. Inputs for initial establishment:

Indicate here the inputs needed for the initial establishment of each land management practice (i.e. the first time it is performed) according to the example and the indications below. Specify the name of the land management practice in the same order used for question 1.3.1. For example:

Land management practice 1	
Name: Selective clearing of forest	
Labour¹:	between 5 and 15 person/days
Tools²:	medium
Materials³:	none

¹**Labour** refers to the number of persons and the time needed to implement the land management practice. **Tools** refers to machines such as tractors, saw , tillers

²**Tools** refers to the machinery or tools needed to establish the land management practice. **Specialised** refers to costly machinery especially built for the task, not owned by the land users and requiring a specific expertise such as reapers, shredders, special tillers or heavy trucks. **Heavy** refers to machines and tools that are costly but are of more general use and are owned by at least some land users: tractors, trucks, electric saws and tillers. **Light** refers to simple tools of common use(saw, hand hoe, hammers) and small vehicles.

³**Materials** refers to the consumables that are used to implement the land management practice. **Custom-made** refers to costly or technological material that is usually made upon request or is difficult to find: seedlings from nurseries, specially built metal components, sensors, percolation pipes. **Medium** refers to construction or agricultural materials that are more common, but cannot be made by the land users such as: cement, bricks, chemical fertiliser, biocides. **Light** refers to materials that can be produced or gathered locally by the land users such as wood, seeds, compost, natural mulch.

Land management practice 1	Land management practice 2	Land management practice 3
Name:	Name:	Name:
Labour¹:	Labour¹:	Labour¹:
<input type="checkbox"/> more than 15 person/days <input type="checkbox"/> between 5 and 15 person/days <input type="checkbox"/> less than 5 person/days	<input type="checkbox"/> more than 15 person/days <input type="checkbox"/> between 5 and 15 person/days <input type="checkbox"/> less than 5 person/days	<input type="checkbox"/> more than 15 person/days <input type="checkbox"/> between 5 and 15 person/days <input type="checkbox"/> less than 5 person/days

Resilience Assessment Tool

<p>Tools²:</p> <p><input type="checkbox"/> specialized</p> <p><input type="checkbox"/> heavy</p> <p><input type="checkbox"/> light</p> <p><input type="checkbox"/> none</p> <p>Materials³:</p> <p><input type="checkbox"/> heavy</p> <p><input type="checkbox"/> medium</p> <p><input type="checkbox"/> light</p> <p><input type="checkbox"/> none</p> <p>Define unit</p> <p><input type="checkbox"/> Hectare</p> <p><input type="checkbox"/> Unit (dam, animal...)</p> <p><input type="checkbox"/> Linear meter</p> <p><input type="checkbox"/> Other.....</p>	<p>Tools²:</p> <p><input type="checkbox"/> Specialized</p> <p><input type="checkbox"/> medium</p> <p><input type="checkbox"/> light</p> <p><input type="checkbox"/> none</p> <p>Materials³:</p> <p><input type="checkbox"/> heavy</p> <p><input type="checkbox"/> medium</p> <p><input type="checkbox"/> light</p> <p><input type="checkbox"/> none</p> <p><input type="checkbox"/> Hectare</p> <p><input type="checkbox"/> Unit (dam, animal...)</p> <p><input type="checkbox"/> Linear meter</p> <p><input type="checkbox"/> Other.....</p>	<p>Tools²:</p> <p><input type="checkbox"/> intensive</p> <p><input type="checkbox"/> medium</p> <p><input type="checkbox"/> light</p> <p><input type="checkbox"/> none</p> <p>Materials³:</p> <p><input type="checkbox"/> heavy</p> <p><input type="checkbox"/> medium</p> <p><input type="checkbox"/> light</p> <p><input type="checkbox"/> none</p> <p><input type="checkbox"/> Hectare</p> <p><input type="checkbox"/> Unit (dam, animal...)</p> <p><input type="checkbox"/> Linear meter</p> <p><input type="checkbox"/> Other.....</p>
--	---	---

5.3.2. Inputs and timing of maintenance activities:

Indicate the labour, the tools and the material needed to maintain the effectiveness of each management practice by comparison with the establishment inputs (previous question).

Land management practice 1	Land management practice 2	Land management practice 3
<p>Name:</p> <p>Labour:</p> <p><input type="checkbox"/> more than initial establishment</p> <p><input type="checkbox"/> same as initial establishment</p> <p><input type="checkbox"/> less than initial establishment</p> <p><input type="checkbox"/> no maintenance is needed</p> <p>Tools:</p> <p><input type="checkbox"/> more than initial establishment</p> <p><input type="checkbox"/> same as initial establishment</p> <p><input type="checkbox"/> less than initial establishment</p> <p><input type="checkbox"/> none</p> <p>Materials:</p> <p><input type="checkbox"/> more than initial establishment</p> <p><input type="checkbox"/> same as initial establishment</p> <p><input type="checkbox"/> less than initial establishment</p> <p><input type="checkbox"/> no maintenance is needed</p> <p>Frequency of maintenance activity</p> <p><input type="checkbox"/> more than 20 years</p> <p><input type="checkbox"/> between 10 and 20 years</p> <p><input type="checkbox"/> between 5 and 10 years</p> <p><input type="checkbox"/> between 2 and 5 years</p> <p><input type="checkbox"/> each year or less</p> <p><input type="checkbox"/> no maintenance is needed</p>	<p>Name:</p> <p><input type="checkbox"/> more than initial establishment</p> <p><input type="checkbox"/> same as initial establishment</p> <p><input type="checkbox"/> less than initial establishment</p> <p><input type="checkbox"/> no maintenance is needed</p> <p><input type="checkbox"/> more than initial establishment</p> <p><input type="checkbox"/> same as initial establishment</p> <p><input type="checkbox"/> less than initial establishment</p> <p><input type="checkbox"/> none</p> <p><input type="checkbox"/> more than initial establishment</p> <p><input type="checkbox"/> same as initial establishment</p> <p><input type="checkbox"/> less than initial establishment</p> <p><input type="checkbox"/> no maintenance is needed</p> <p><input type="checkbox"/> more than 20 years</p> <p><input type="checkbox"/> between 10 and 20 years</p> <p><input type="checkbox"/> between 5 and 10 years</p> <p><input type="checkbox"/> between 2 and 5 years</p> <p><input type="checkbox"/> each year or less</p> <p><input type="checkbox"/> no maintenance is needed</p>	<p>Name:</p> <p><input type="checkbox"/> more than initial establishment</p> <p><input type="checkbox"/> same as initial establishment</p> <p><input type="checkbox"/> less than initial establishment</p> <p><input type="checkbox"/> no maintenance is needed</p> <p><input type="checkbox"/> more than initial establishment</p> <p><input type="checkbox"/> same as initial establishment</p> <p><input type="checkbox"/> less than initial establishment</p> <p><input type="checkbox"/> none</p> <p><input type="checkbox"/> more than initial establishment</p> <p><input type="checkbox"/> same as initial establishment</p> <p><input type="checkbox"/> less than initial establishment</p> <p><input type="checkbox"/> no maintenance is needed</p> <p><input type="checkbox"/> more than 20 years</p> <p><input type="checkbox"/> between 10 and 20 years</p> <p><input type="checkbox"/> between 5 and 10 years</p> <p><input type="checkbox"/> between 2 and 5 years</p> <p><input type="checkbox"/> each year or less</p> <p><input type="checkbox"/> no maintenance is needed</p>

5.4. Benefits and disadvantages of land management practices

Indicate here the main benefits and disadvantages of the land management practice. Base your evaluation on all available sources, including the opinion of land users / managers. Information to complete these questions can be extracted from the WOCAT technology questionnaire

5.4.1. What are the main benefits of the land management?

Indicate here the main benefits of the land management practices from the indicators proposed in the table below. Add maximum 3 benefits for each section. For example:

Land management practice 1	
Name: <i>Selective clearing of forest</i>	
1)Increased wood production	<input type="checkbox"/> negligible <input type="checkbox"/> little <input checked="" type="checkbox"/> medium <input type="checkbox"/> high
2)Reduced fire risk	<input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input checked="" type="checkbox"/> high

Benefits of land management:

Production and socio-economic benefit	Ecological benefits		Offsite benefits	Socio-cultural benefits
<ul style="list-style-type: none"> • increased crop yield • increased fodder production • increased fodder quality • increased animal production • increased wood production • reduced risk of production failure • increased drinking / household water availability / quality • increased water availability / quality • for livestock • increased irrigation water availability / quality • reduced demand for irrigation water • reduced expenses on agricultural inputs • increased farm income • diversification of income sources • increased production area (new land under cultivation / use) • decreased labour constraints • decreased workload • simplified farm operations • increased product diversification 	<ul style="list-style-type: none"> • increased water quantity • increased water quality • improved harvesting / collection of • water (runoff, dew, snow, etc) • increased soil moisture • reduced evaporation • reduced 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 	<ul style="list-style-type: none"> • increased soil organic matter/below ground C • reduced emission of carbon and • greenhouse gases • reduced soil loss • reduced soil crusting/sealing • reduced soil compaction • reduced salinity • reduced fire risk • 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 	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • improved cultural opportunities (eg. spiritual, aesthetic, others) • increased recreational opportunities • community institution strengthening • national institution strengthening • improved conservation / erosion • knowledge • conflict mitigation • improved situation of disadvantaged groups (gender, age, status, ethnicity etc) • improved food security / self-sufficiency • improved health • others (specify)

Resilience Assessment Tool

Land management practice 1	Land management practice 2	Land management practice 3
Name:	Name:	Name:
Production and socioeconomic benefits:		
1)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	1)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	1)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high
2)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	2)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	2)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high
3)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	3)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	3)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high
Ecological benefits:		
1)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	1)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	1)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high
2)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	2)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	2)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high
3)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	3)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	3)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high
Offsite benefits:		
1)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	1)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	1)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high
2)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	2)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	2)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high
3)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	3)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	3)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high

Resilience Assessment Tool

Socio-cultural benefits:

1).....	<input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	1).....	<input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	1).....	<input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high
2).....	<input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	2).....	<input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	2).....	<input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high
3).....	<input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	3).....	<input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	3).....	<input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high

5.4.2. What are the main disadvantages of the land management?

Indicate here the main disadvantages of the land management practices from the indicators proposed in the table below. Add maximum 3 disadvantages for each section/land management practice. Disadvantages of land management:

Production and socio-economic disadvantages	Ecological disadvantages	Offsite disadvantages	Socio-cultural disadvantages
<ul style="list-style-type: none"> • 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 on agricultural inputs • decreased farm income • increased economic inequity • loss of land (decreased production area) • increased labour constraints • reduced product diversification • hindered farm operations • Other(Specify) 	<ul style="list-style-type: none"> • decreased water quantity • decreased water quality • decreased soil moisture • increased evaporation • increased surface water runoff • lowering of ground water table • decreased soil cover • increased wind velocity • decreased soil organic matter • increased soil sealing / compaction • increased fire risk • increased competition (water,sunlight, nutrients) • increased soil erosion (locally) • reduced biodiversity / crop diversity • increased habitat fragmentation • increased niches for pests (birds,slugs, rodents, etc) • Other(Specify) 	<ul style="list-style-type: none"> • increased downstream flooding • reduced river flows • reduced sediment yields • increased groundwater / river pollution • decreased buffering / filtering capacity (by soil, vegetation, wetlands) • increased damage on neighbours' fields • increased damage on public/ private infrastructure • Other(Specify) 	<ul style="list-style-type: none"> • improved cultural opportunities (eg. spiritual, aesthetic, others) • increased recreational opportunities • community institution strengthening • national institution strengthening • improved conservation / erosion • knowledge • conflict mitigation • improved situation of disadvantaged groups (gender, age, status, ethnicity etc) • improved food security / self-sufficiency • improved health • others (specify)

Land management practice 1	Land management practice 2	Land management practice 3
Name:	Name:	Name:

Production and socioeconomic disadvantages:

1)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	1)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	1)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high
2)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	2)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	2)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high
3)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	3)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	3)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high

Resilience Assessment Tool

Ecological disadvantages:

1)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	1)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	1)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high
2)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	2)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	2)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high
3)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	3)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	3)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high

Offsite disadvantages:

1)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	1)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	1)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high
2)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	2)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	2)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high
3)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	3)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	3)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high

Socio-cultural disadvantages:

1)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	1)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	1)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high
2)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	2)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	2)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high
3)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	3)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high	3)..... <input type="checkbox"/> negligible <input type="checkbox"/> little <input type="checkbox"/> medium <input type="checkbox"/> high

5.5. How does landscape influence the effectiveness of land management?

Landscape plays an important role in drylands, affecting the soil, the water availability and the vegetation and by result the technical possibilities for land management. Describe here how the different land management practices are influenced by landscape characteristics. Only the questions that are relevant for the specific land management system should be completed.

5.5.1. Impact of aspect/orientation on the effectiveness of land management practices

Indicate the land management practices in the same order used for question 1.3.1. Indicate how the different land management practices are influenced by aspect/orientation according to the following scoring: (1)Best situation, (2)Land management benefits are reduced, (3) disadvantages are increased or implementation is more costly/difficult, (4)Land management does not provide benefits or implementation is not possible. Indicate reasons and details in the Specify/comment section. For example:

	Land management practice 1	
Aspect / Orientation	Name: Afforestation with Pinus Halepensis	
North exposed	1	
East exposed	1	
South exposed	3	
West exposed	2	
Specify/ Comment	<p style="text-align: center;"><i>Survival of Pinus Halepensis seedlings is highly dependent on soil humidity. In south exposed areas afforestation has been attempted but has largely failed on southern exposed areas, while, although more difficult it has partially succeeded on western exposed sloped</i></p>	

Aspect / Orientation	Land management practice 1 Name:	Land management practice 2 Name:	Land management practice 3 Name:
North exposed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
East exposed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
South exposed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
West exposed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Or:			
Aspect/ Orientation is not relevant	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Specify/ Comment

5.5.2. Impact of slope steepness on the effectiveness of land management practices

Complete the question following instructions provided by question 5.5.1, with reference to slope steepness.

	<i>Land management practice 1</i>	<i>Land management practice 2</i>	<i>Land management practice 3</i>
<i>Slope steepness</i>	Name:	Name:	Name:
Flat areas (0-8%)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gentle slope (8-15%)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Moderate slope (15-30%)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Steep slope (more than 30%)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Or:			
Slope steepness is not relevant	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Specify/ Comment	.........................	.........................	.........................

5.5.3. Impact of land use history on the effectiveness of land management practices

Indicate if previous land use history has an impact on the land management effectiveness

	<i>Land management practice 1</i>	<i>Land management practice 2</i>	<i>Land management practice 3</i>
<i>Slope steepness</i>	Name:	Name:	Name:
<i>Cropland with terraces</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<i>Cropland without terraces</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<i>Grazing land</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<i>Afforestation</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<i>Natural vegetation /non used land</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<i>Burnt areas</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Or:			
<i>Aspect/ Orientation is not relevant</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Specify/ Comment	.........................	.........................	.........................

5.5.4. Impact of other landscape variable(s)

Add other landscape/environmental variables that influence the effectiveness of land management practices. Indicate only the variables that change within the land management system and have a clear impact on land management practices. Indicate impact on land management practice with a number between 1 (Land management benefits are reduced) and 4(Land management does not provide benefits or implementation is not possible) For example:

Landscape /environmental variable	Variation within the land management system	Impact on Land management practices		
		Land management practice 1 Name: <i>afforestation</i>	Land management practice 2 Name: <i>firebreaks</i>	Land management practice 3 Name: <i>Selective clearing</i>
<i>Soil type</i>	<i>Soil is clayish and thick in the valley bottom, while sandy and rocky on the slopes</i>	4	<input type="radio"/>	2

Landscape /environmental variable	Variation within the land management system	Impact on Land management practices		
		Land management practice 1 Name:	Land management practice 2 Name:	Land management practice 3 Name:
.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Knowledge and sources used in section 5: Details on the land management system

The following questions allow understanding what type of knowledge was used to answer the questions of the previous section. They should be answered only by the expert(s) compiling the questionnaire. The answer should focus specifically on section 5, disregarding the other parts of the questionnaires.

What sources of scientific knowledge were used to complete section 5?

Include in this answer scientific papers, studies, official documents such as management plans, scenarios, forestry archives and others.

Main sources of scientific knowledge	Publication year
.....
.....
.....

Which stakeholders were consulted to complete section 5?

Include in this answer scientific papers, studies, official documents such as management plans, scenarios, forestry archives and others.

Category of stakeholder	Number of stakeholders per category	
Land users /owners	<input type="checkbox"/> Less than 2	<input type="checkbox"/> 5 to 7
	<input type="checkbox"/> 2 to 5	<input type="checkbox"/> More than 7
Local administrators (municipality, local and regional government)	<input type="checkbox"/> Less than 2	<input type="checkbox"/> 5 to 7
	<input type="checkbox"/> 2 to 5	<input type="checkbox"/> More than 7
Advisors or land managers (forestry service, nature conservation, agricultural advisors)	<input type="checkbox"/> Less than 2	<input type="checkbox"/> 5 to 7
	<input type="checkbox"/> 2 to 5	<input type="checkbox"/> More than 7
Scientists and land management experts	<input type="checkbox"/> Less than 2	<input type="checkbox"/> 5 to 7
	<input type="checkbox"/> 2 to 5	<input type="checkbox"/> More than 7
Other stakeholders (specify category):.....	<input type="checkbox"/> Less than 2	<input type="checkbox"/> 5 to 7
	<input type="checkbox"/> 2 to 5	<input type="checkbox"/> More than 7

What other sources of information were used to complete section 5?

Include here all other sources of information that were not included in the previous question. Specify the type of information/data used (e.g. measured data, newspaper publication....)

Description of other information sources	Type of data /information
.....
.....
.....
.....

How important was each information source to complete section 5?

Assign a value of importance to each category with a number between 1(very important and 4 (less important)

Scientific knowledge	<input type="radio"/>	Stakeholders' knowledge	<input type="radio"/>	Other sources	<input type="radio"/>
----------------------	-----------------------	-------------------------	-----------------------	---------------	-----------------------

Annex 1: Questionnaire on the perception of environmental properties.

The questionnaire presented in the next page should be distributed directly to 10-15 stakeholders pertaining to different categories (see question 1.4 in the next page) related to the assessed land management system. To enhance the quality of the responses follow the indications below:

Before meeting the stakeholders:

- 1) The expert or the person(s) that will contact the stakeholder should translate the questionnaire in the language of the stakeholders using a clear and simple wording*

Upon meeting the stakeholders, before distributing the questionnaire:

- 2) Explain the aim of the questionnaire (i.e. allowing scientists and external expert to gain a better knowledge of what they value of their environment / area) and remind that the questionnaire is anonymous and confidential*
- 3) Explain how stakeholders should complete each column of section 2*

After having distributed the questionnaire to the stakeholders:

- 4) Encourage any demand for further clarification on how to complete the questionnaire and the meaning of the environmental properties*

To facilitate results submission, a specific online form has been created: <https://goo.gl/lhGPo6>



Which properties of the environment should be maintained or restored?

The following table will allow us to understand better how you value your environment, and what properties should be improved or maintained.

All the information you provide us will be treated anonymously and communicated only in an aggregated form. Please follow the instructions below and don't hesitate to ask for further clarification.

We thank you for your cooperation!

1. General information on the responder:

1.1. Age Category

Below 30	<input type="checkbox"/>
30 to 50	<input type="checkbox"/>
50 to 70	<input type="checkbox"/>
More than 70	<input type="checkbox"/>

1.2. Gender

Male	<input type="checkbox"/>	Female	<input type="checkbox"/>
------	--------------------------	--------	--------------------------

1.3. Profession:

.....

1.4. How are you related with the area examined?

I am a land owner	<input type="checkbox"/>
I am a land user (e.g farmer, pastoralist, forester...)	<input type="checkbox"/>
I advise land users in the area (forestry service, fire protection, public or private advisory,...)	<input type="checkbox"/>
I am an administrator in charge of the area (municipality, regional government)	<input type="checkbox"/>
I visit or use the area for sports or leisure	<input type="checkbox"/>
Other:.....	<input type="checkbox"/>

2. Which properties of the environment are to be maintained or improved?

Instructions:

- Write your answers in the grey areas such as the one below

--

- Under the column Importance, indicate in the circles ○ how much you value a certain property of the environment with a number ranging from 1 (Very important) to 4 (less important). Choose only the environmental properties that are relevant for you and your area. Does that are not important for you should be left blank!
- Under the column State select the appropriate box : indicate if you think that a certain environmental property is at satisfactory level (Maintain) or it should be improved (Improve)
- If you wish, specify further your answer under the Comment/ Specify column

2.1. Vegetation:

<i>Environmental property</i>	<i>Importance</i>	<i>State</i>		<i>Comment / Specify :</i>
Presence of a mixture of grasses, shrubs and trees (complex vegetation structure)	○	Maintain	<input type="checkbox"/>
		Improve	<input type="checkbox"/>
High number of different species (vegetation diversity)	○	Maintain	<input type="checkbox"/>
		Improve	<input type="checkbox"/>
Presence of a specific plant or group (e.g resprouters, palatables):	○	Maintain	<input type="checkbox"/>
		Improve	<input type="checkbox"/>
Continuity of vegetation canopy/cover	○	Maintain	<input type="checkbox"/>
		Improve	<input type="checkbox"/>
Discontinuity of vegetation canopy or low biomass density (to reduce fire risk or disease spreading)	○	Maintain	<input type="checkbox"/>
		Improve	<input type="checkbox"/>
Low presence of alien/ dangerous species (specify)	○	Maintain	<input type="checkbox"/>
		Improve	<input type="checkbox"/>
High biomass density (overall vegetation including dead material)	○	Maintain	<input type="checkbox"/>
		Improve	<input type="checkbox"/>
Other (Specify)	○	Maintain	<input type="checkbox"/>
		Improve	<input type="checkbox"/>

2.2. Soil and water:

<i>Environmental property</i>	<i>Importance</i>	<i>State</i>		<i>Comment / Specify :</i>
High soil cover (including vegetation, litter, rocks and mosses)	○	Maintain	<input type="checkbox"/>
		Improve	<input type="checkbox"/>
Low soil erosion	○	Maintain	<input type="checkbox"/>
		Improve	<input type="checkbox"/>
High soil organic matter	○	Maintain	<input type="checkbox"/>
		Improve	<input type="checkbox"/>
High soil moisture	○	Maintain	<input type="checkbox"/>
		Improve	<input type="checkbox"/>
Favorable soil structure	○	Maintain	<input type="checkbox"/>
		Improve	<input type="checkbox"/>
Good soil drainage/infiltration	○	Maintain	<input type="checkbox"/>
		Improve	<input type="checkbox"/>
Low surface runoff	○	Maintain	<input type="checkbox"/>
		Improve	<input type="checkbox"/>
Availability/ protection of springs / water sources	○	Maintain	<input type="checkbox"/>
		Improve	<input type="checkbox"/>
Other (Specify)	○	Maintain	<input type="checkbox"/>
		Improve	<input type="checkbox"/>

2.3. Fauna:

<i>Environmental property</i>	<i>Importance</i>	<i>State</i>		<i>Comment / Specify :</i>
High Soil fauna	○	Maintain	<input type="checkbox"/>
		Improve	<input type="checkbox"/>
High number of birds	○	Maintain	<input type="checkbox"/>
		Improve	<input type="checkbox"/>
High number of wild grazers	○	Maintain	<input type="checkbox"/>
		Improve	<input type="checkbox"/>
High number of domestic grazers	○	Maintain	<input type="checkbox"/>
		Improve	<input type="checkbox"/>
Low number of wild / domestic grazers	○	Maintain	<input type="checkbox"/>
		Improve	<input type="checkbox"/>
High number of predators	○	Maintain	<input type="checkbox"/>
		Improve	<input type="checkbox"/>
Other:.....	○	Maintain	<input type="checkbox"/>
		Improve	<input type="checkbox"/>

2.4. Landscape:

<i>Environmental property</i>	<i>Importance</i>	<i>State</i>		<i>Comment / Specify :</i>
Presence of different landscape elements and vegetation patters	○	Maintain	<input type="checkbox"/>
		Improve	<input type="checkbox"/>
Connectivity between healthy areas	○	Maintain	<input type="checkbox"/>
		Improve	<input type="checkbox"/>
Presence of one specific habitat/land use/land cover(specify)	○	Maintain	<input type="checkbox"/>
		Improve	<input type="checkbox"/>
Other:.....	○	Maintain	<input type="checkbox"/>
		Improve	<input type="checkbox"/>

Resilience Assessment Tool