



UNIL-FGSE Workshop  
3 Dec 2013, Lausanne

# Impacts of out-migration on land management in mountain areas

**Schwilch G., Jaquet S., Liniger HP**, Centre for Development and Environment CDE, University of Bern, Switzerland

**Sudmeier-Rieux K., Penna I., Jaboyedoff M.**, Centre for Research on Terrestrial Environment CRET, University of Lausanne, Switzerland

**Kaenzig R.**, Institute of Geography, University of Neuchâtel, Switzerland



# Impacts of out-migration on land management in mountain areas

## Table of Content

1. Introduction
2. Research project and questions
3. Research methodology
4. Findings and outcomes
5. Conclusions and outlook

# Mountain land use

e.g. Nepal



e.g. Tajikistan



B. Wolgramm



S. Jaquet



# Land degradation

e.g. Switzerland

e.g. Morocco



G. Schwilch



G. Schwilch







# Land degradation affects livelihoods



G. Schwilch



HP. Liniger



# Outmigration



B. Wolfram



B. Wolfram

B. Wolfram



K. Sudmeier-Rieux

# Research Project

## SUSTAINABLE LAND MANAGEMENT IN MOUNTAIN REGIONS OF BOLIVIA AND NEPAL IN THE CONTEXT OF OUTMIGRATION, CLIMATE CHANGE AND DISASTER RISK REDUCTION

- > Funded by the Swiss Network for International Studies SNIS, based in Geneva
- > Duration: 2 years (2013-2014)
- > 2 study areas:
  - Quillacollo District of Bolivia
  - Panchase area of Western Nepal
- > 7 institutes/NGO's involved





## Research questions

- > how land management in mountains is being affected by outmigration (and in the context of natural hazards and climate change)
- > which measures are needed to increase resilience of livelihoods and land management practices
- > **understanding of the resilience** of managed land resources in order to enhance adaptation to environmental and socio-economic variability, and
- > **evidence of the impact of Sustainable Land Management (SLM)** on the mitigation of environmental threats



# Sustainable Land Management (SLM)



**SLM is defined** as the use of land and water resources, including **soils, water, animals and plants**, for the **production** of goods to meet **changing human needs**, while simultaneously ensuring the **long-term** productive potential of these resources and the maintenance of their **environmental functions**.



G. Schwilch



- > economically viable
- > socially acceptable
- > ecologically compatible

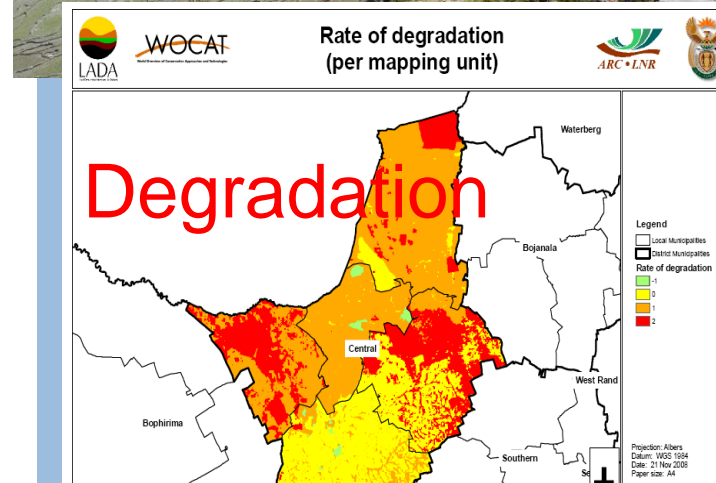
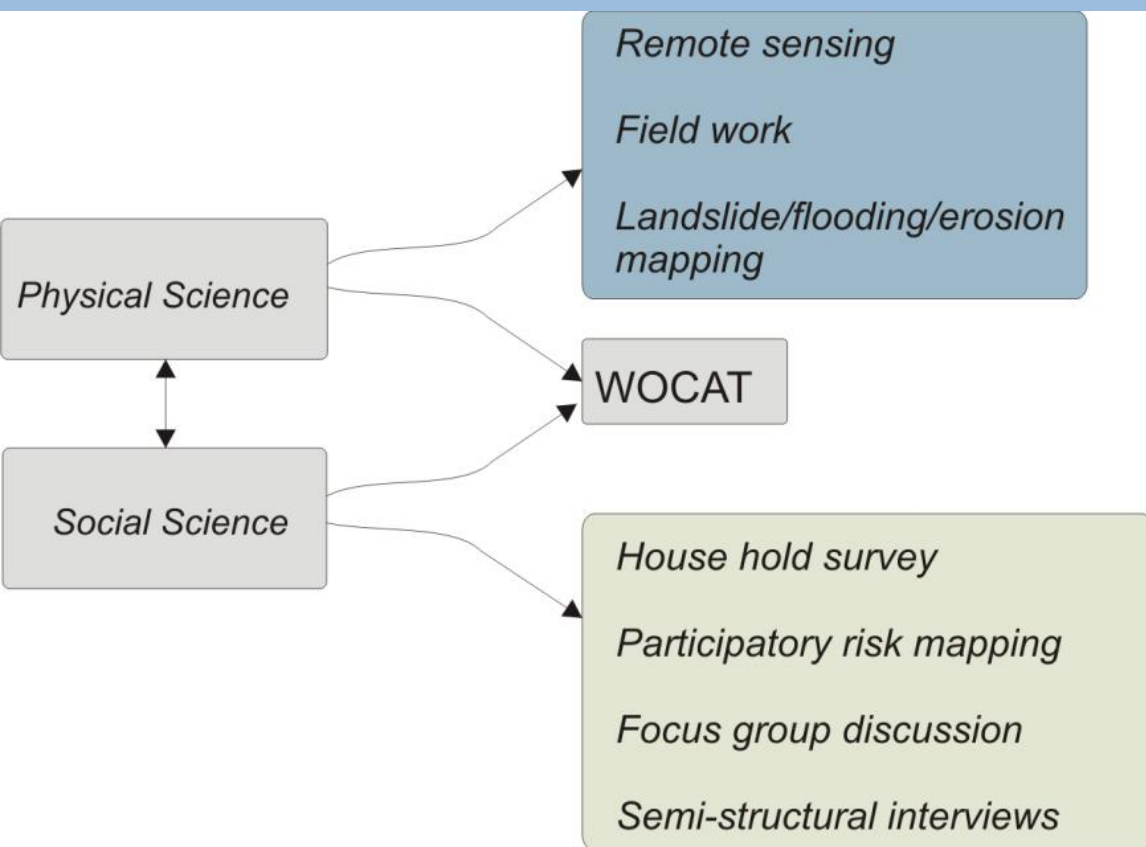


# SLM for Climate change adaptation & mitigation, desertification and biodiversity





# Methodology







Schweizerische Eidgenossenschaft  
Confédération suisse  
Confederazione Svizzera  
Confederaziun svizra

Swiss Agency for Development  
and Cooperation SDC



$u^b$

$u^b$   
UNIVERSITÄT  
BERN

CDE  
CENTRE FOR DEVELOPMENT  
AND ENVIRONMENT

## WORLD OVERVIEW OF CONSERVATION APPROACHES AND TECHNOLOGIES

- > Building on existing **wealth of knowledge**
- > Understanding **local adaptations** and **innovations**
- > Assessing **SLM impacts**
- > Providing **options for spreading**

A common global platform for SLM

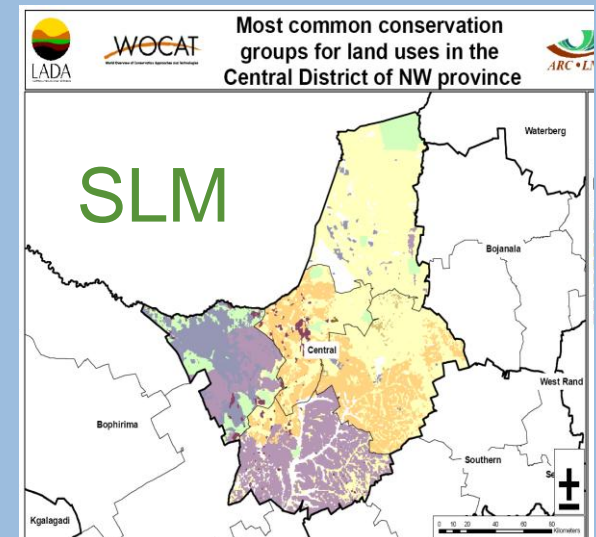
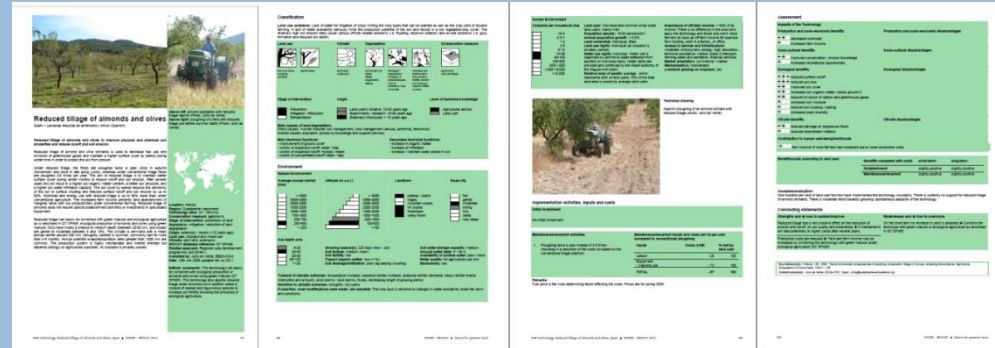


HP- Liniger



# WOCAT methodology

1. **SLM technologies and approaches already applied** in the study sites of Nepal and Bolivia.
2. **Spatial overview** of the distribution and characteristics of land degradation and conservation/SLM activities at the study site level by producing maps.
3. **Effectiveness and impact** of existing SLM technologies and approaches and their **resilience** considering CC and migration.



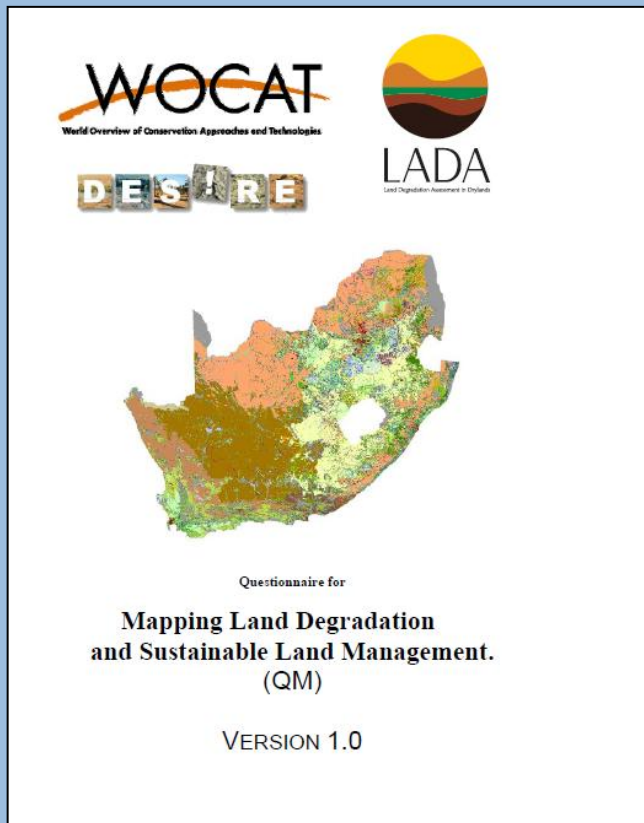


# Mapping questionnaire & database

«Participatory expert assessment»



G. Schwilch



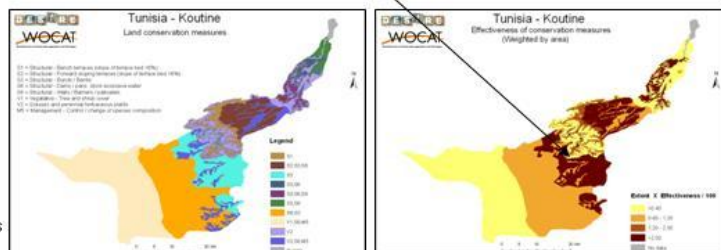
 A screenshot of the WOCAT MAP database interface. The header shows the WOCAT logo and the text "LADA World Overview of Conservation Approaches and Technologies". The main section is titled "Map Data Management". It displays a message: "128 mapping unit id's found matching your search criteria." Below this, there are fields for "Country:" (Spain) and "Base map edition:" (guadalentin\_2009). There are also dropdown menus for "Select a mapping unit", "Sub-division 1:", "Land use system:", "Mapping unit id:", "Order by:", and "Sort order:". A "Search" button is at the bottom. The footer shows "List of mapping unit id's".



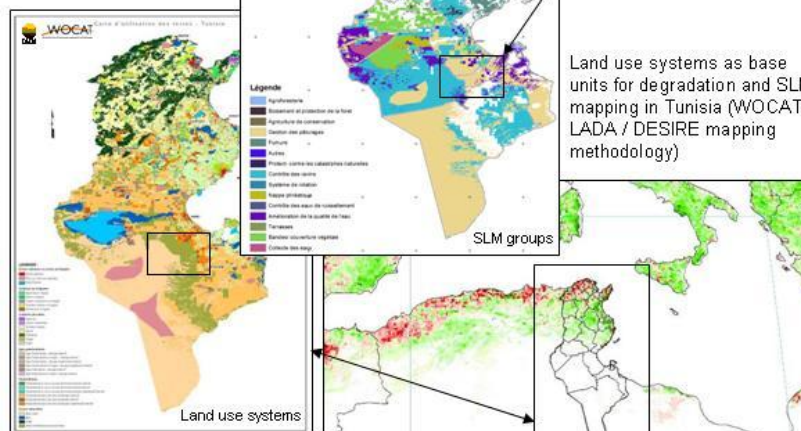


WOCAT SLM Technology and Approach documentation of water harvesting, e.g. Jessour, LADA local level assessment; DESIRE test implementation & monitoring.

SLM measures and their effectiveness in the Zeuss-Koutine watershed. SLM mapping identifies several effective traditional water harvesting systems

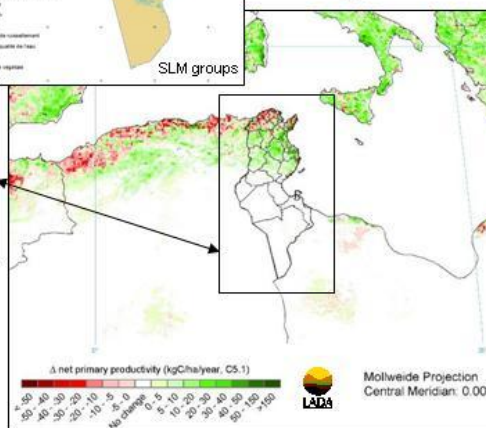


Watershed assessment



Global assessment

Change in net primary productivity 1981 – 2006 (NDVI analysis)  
E.g. 'no change' where traditional water harvesting in Zeuss-Koutine



## Integration of methods and scales:

- > global, unified approach to the assessment and monitoring of SLM
- > monitor progress of SLM upscaling

Schwilch G., Bestelmeyer B, Bunning S., Critchley W., Herrick J., Kellner K., Liniger H.P., Nachtergaele F., Ritsema C.J., Schuster B., Tabo R., van Lynden G., Winslow M. 2011. **Experiences in Monitoring and Assessment of Sustainable Land Management.** *Land Degradation & Development* 22: 214-225. Doi 10.1002/ldr.1040



**Land Use System (LUS)**

Type

Area trend

Intensity trend

**Degradation per LUS**

Type

Extent (area)

Degree

Rate

Impact on ecosystem  
services (type and level)

Direct causes

Indirect causes

Recommendation

**Conservation/SLM per LUS**

Name / Group / Measure

Extent (area)

Effectiveness

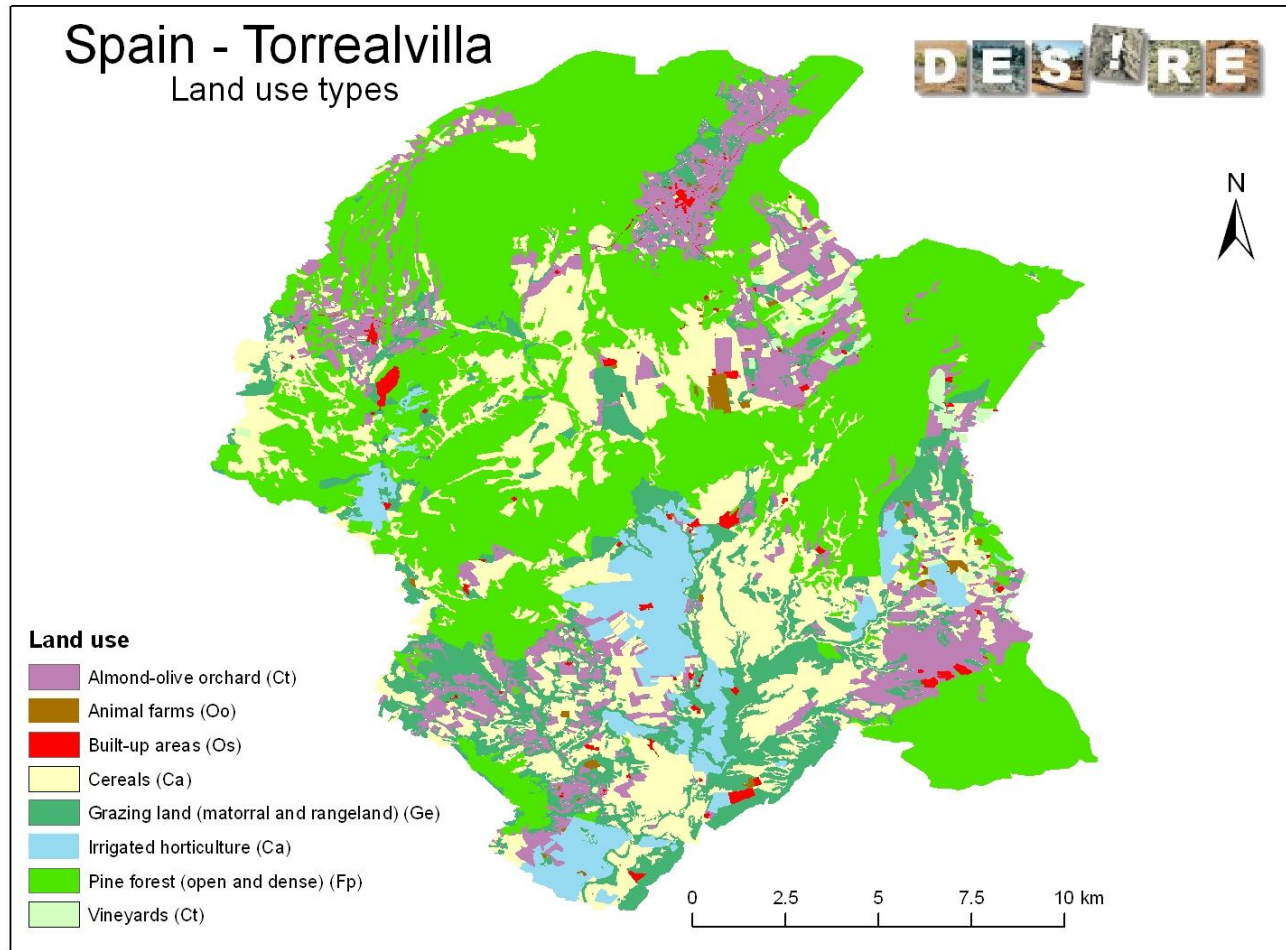
Effectiveness trend

Impact on ecosystem  
services (type and level)

Degradation addressed



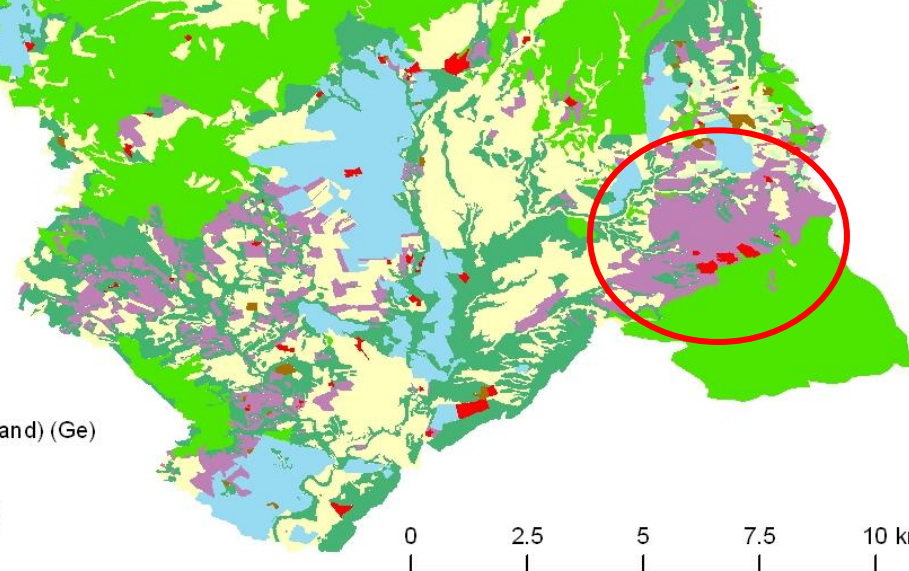
# Land use as base map





### Land use

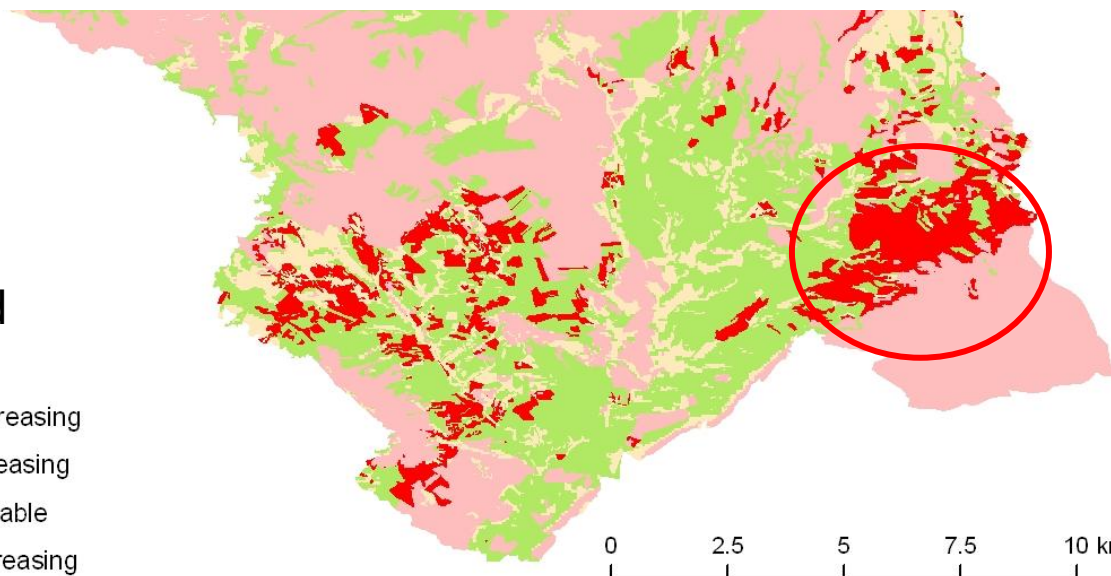
- Almond-olive orchard (Ct)
- Animal farms (Oo)
- Built-up areas (Os)
- Cereals (Ca)
- Grazing land (matorral and rangeland) (Ge)
- Irrigated horticulture (Ca)
- Pine forest (open and dense) (Fp)
- Vineyards (Ct)



### Area trend

#### Legend

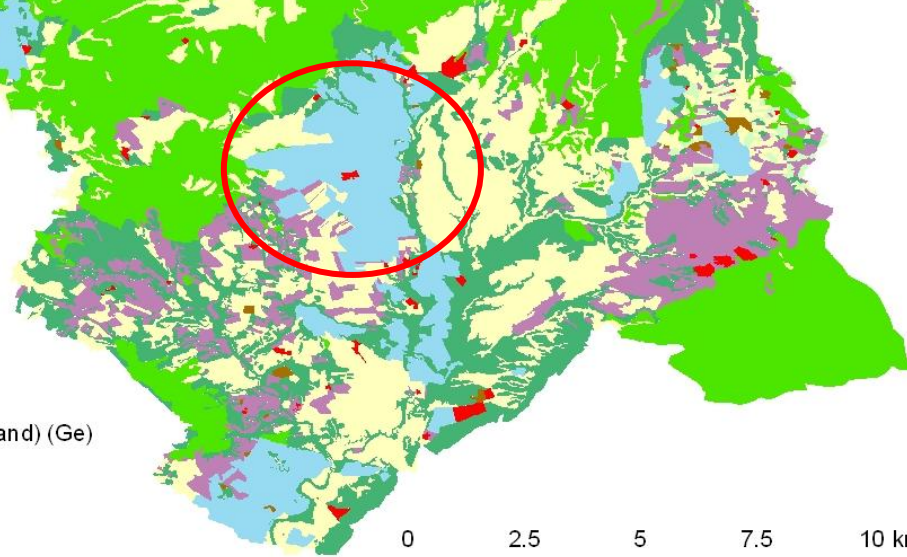
- Rapidly increasing
- Slowly increasing
- Remains stable
- Slowly decreasing





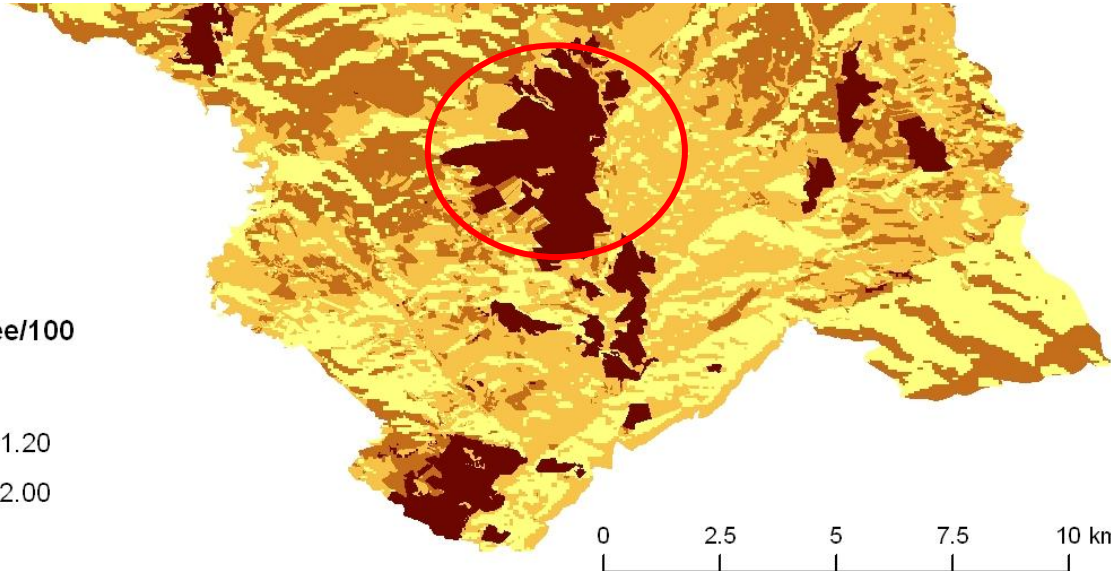
### Land use

- Almond-olive orchard (Ct)
- Animal farms (Oo)
- Built-up areas (Os)
- Cereals (Ca)
- Grazing land (matorral and rangeland) (Ge)
- Irrigated horticulture (Ca)
- Pine forest (open and dense) (Fp)
- Vineyards (Ct)

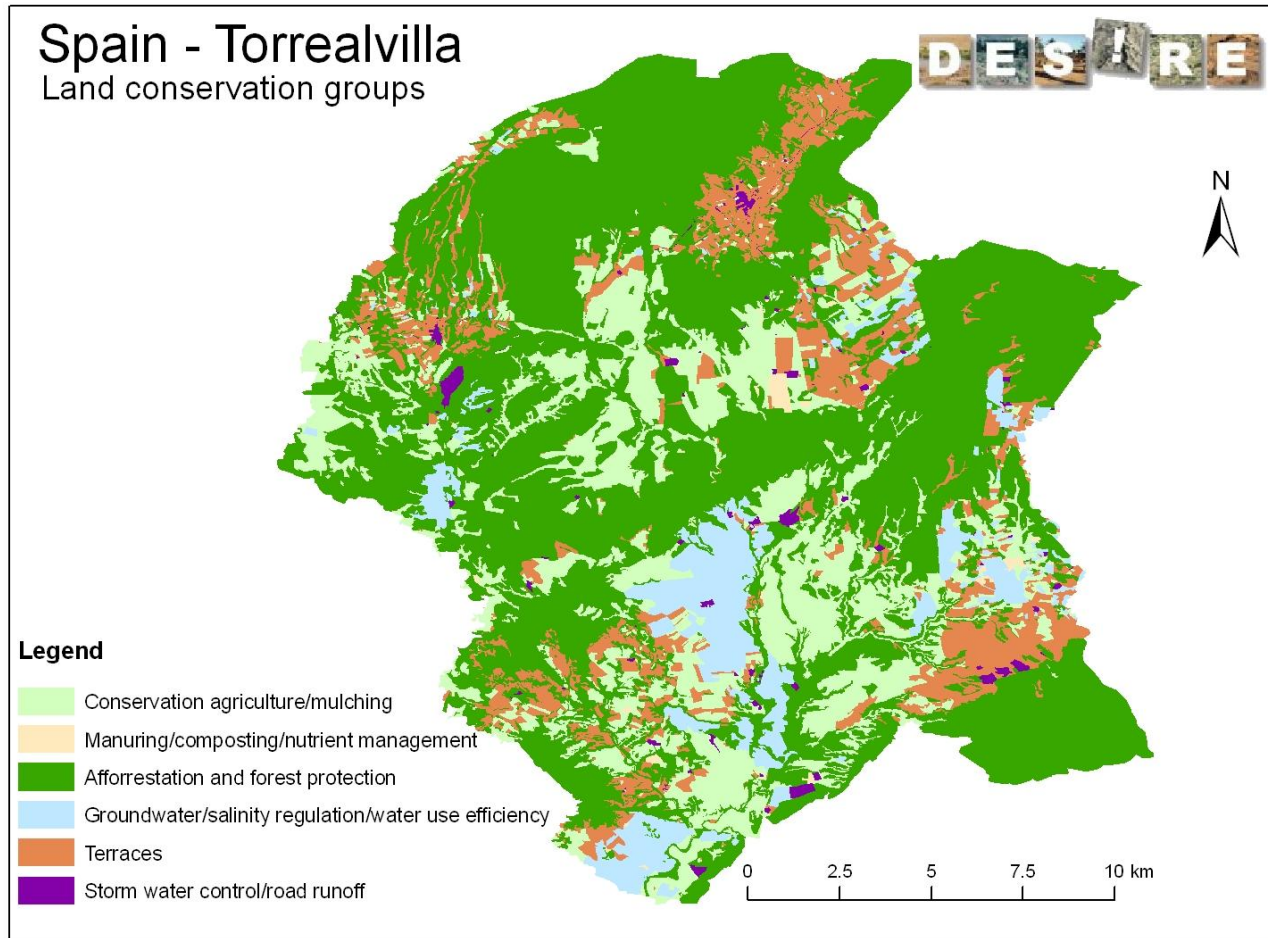


### Extent X Degree/100

- <0.4
- 0.40 - 1.20
- 1.20 - 2.00
- >2



# Sustainable Land Management (SLM)





# Impact on Ecosystem Services & Indicators

## P Productive Services & indicators

- (P1) production (of animal / plant quantity and quality including biomass for energy) and risk
- (P2) water (quantity and quality ) for human, animal and plant consumption
- (P3) land availability

## E Ecological services (regulating / supporting) & indicators

- (E1) water cycle: floods, storms, excessive rains
- (E2) water cycle: drought, dry season flow, availability of water
- (E3) organic matter status
- (E4) soil cover (vegetation, mulch, etc.)
- (E5) soil structure: surface (eg sealing and crusting) and subsoil affecting infiltration, water and nutrient holding capacity, salinity etc.
- (E6) nutrient cycle (N, P, K) and the carbon cycle (C)
- (E7) soil formation (including wind-deposited soils)
- (E8) biodiversity
- (E9) greenhouse gas emission
- (E10) (micro)-climate (wind, shade, temperature, humidity)

-3 : high negative impact  
-2 : negative impact  
-1 : low negative impact

## S Socio-cultural services and human well-being & indicators

- (S1) spiritual, aesthetic, cultural landscape and heritage value
- (S2) education and knowledge (including indigenous knowledge)
- (S3) conflicts
- (S4) food security, health and poverty
- (S5) net income
- (S6) private and public infrastructure (buildings, roads, dams, etc.)

1 : low positive impact  
2 : positive impact  
3 : high positive impact

# Findings and outcomes



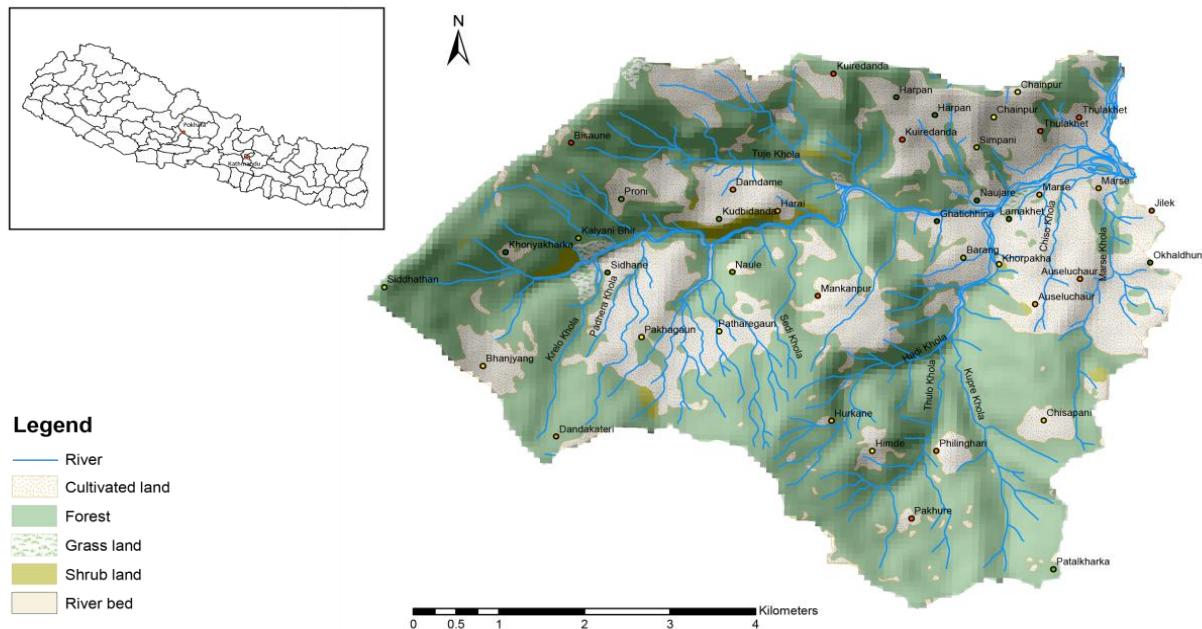
First results from Nepal and Bolivia  
field studies





## Nepal – research area

# Harpan River Watershed



### Kaski district stats:

Precipitation 5000mm/yr

Sub-tropical/ temperate/  
thick soils

850-2750 m.a.s.l.

109.7 pers/km<sup>2</sup>

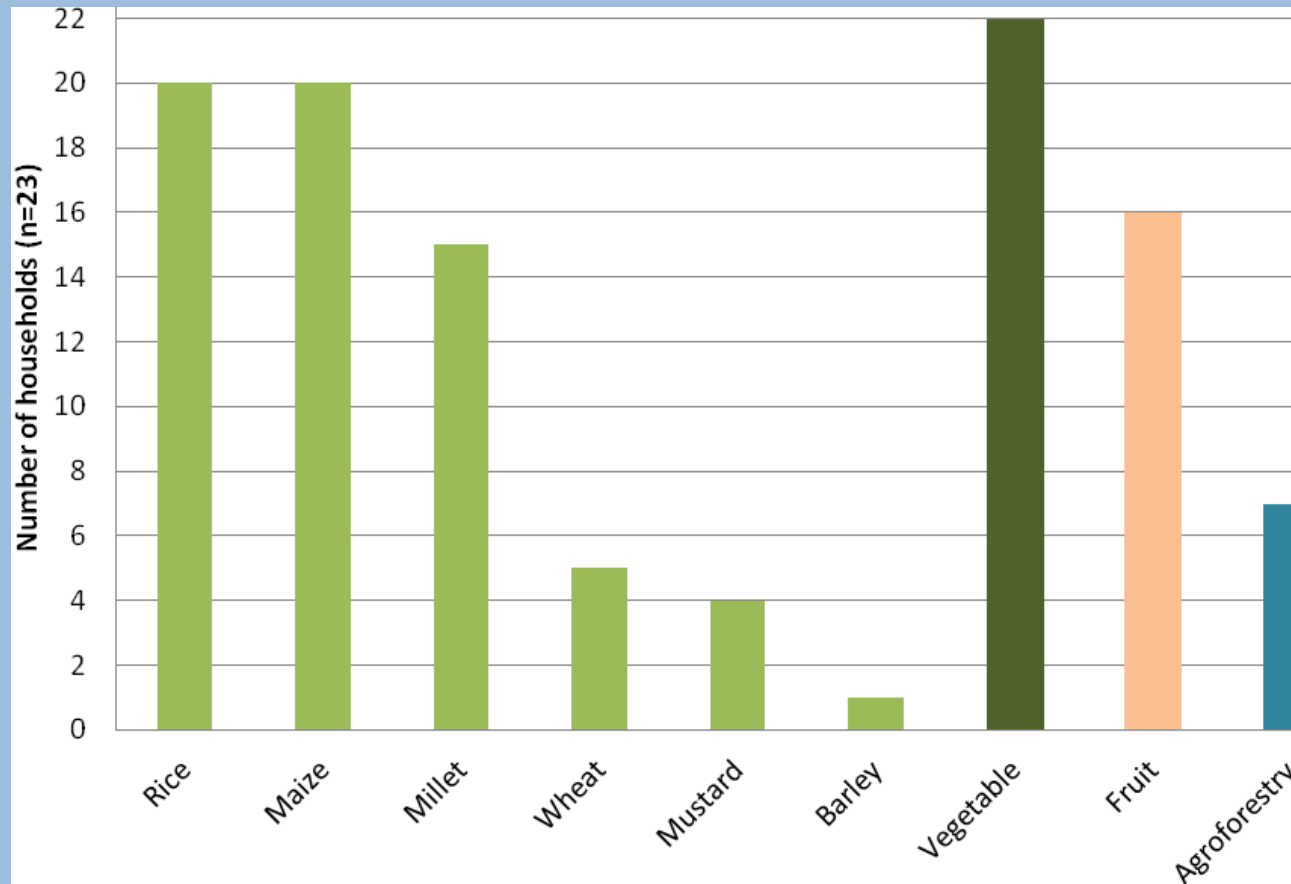
HH size: 5.3 persons

Literacy rate: 82%

Source: VDC Profile CBS, 2011

Major cropping: rice, maize, millet, vegetables, fruits

# Nepal: land use





# Nepal: land degradation

- > Soil erosion by water: mass movements, landslides, floods
- > Biological degradation: reduction of vegetation cover, decline of species diversity and quality
- > Fertility decline

Rainfall triggered landslide (2-3 years ago)



Scarp



Lateral detachment



Buried agricultural terraces

# Nepal: SLM

- > Community forestry
- > Vegetable farm
- > Coffee plantation (agroforestry)



S. Jaquet

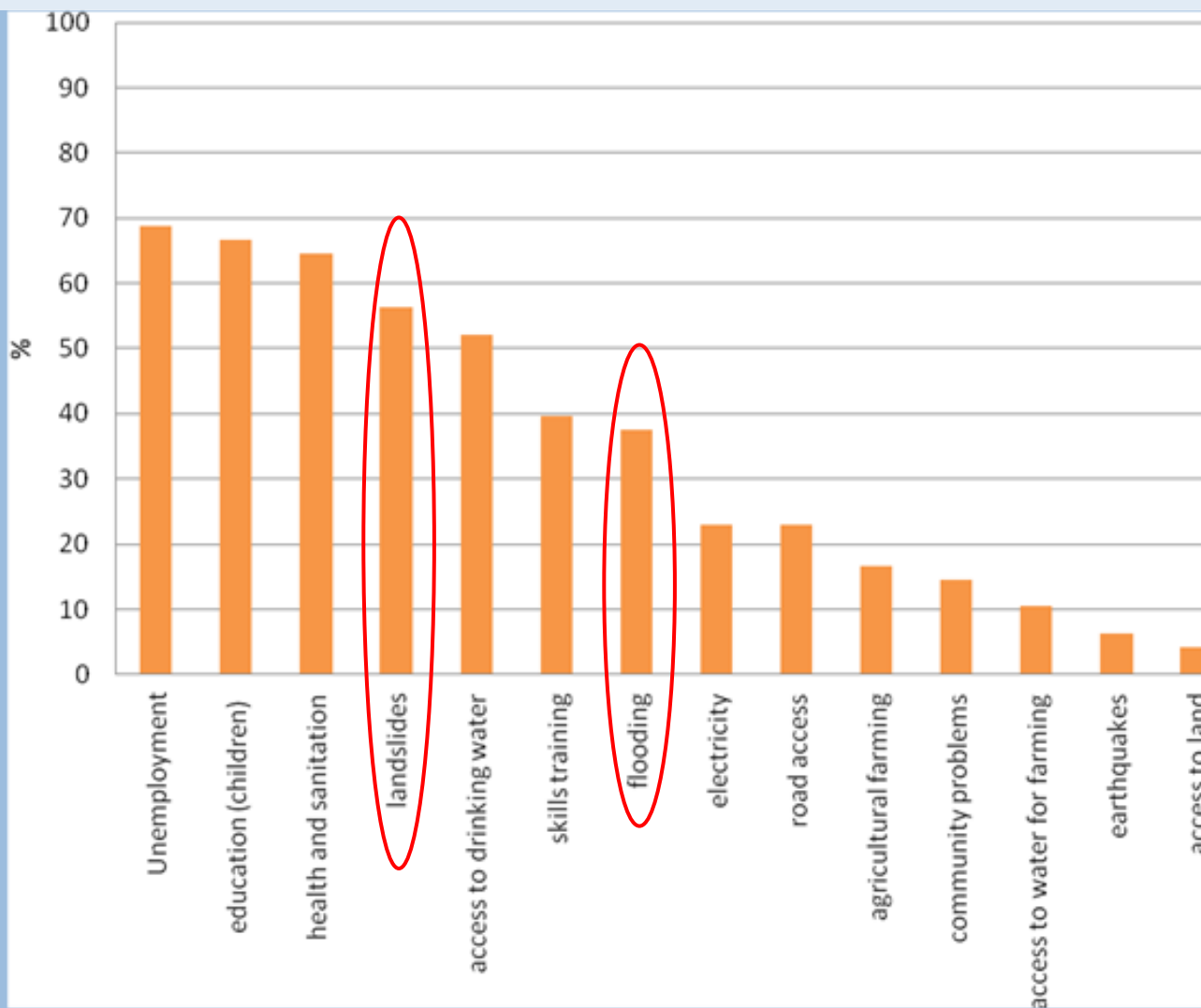


# Nepal – migration and land management

- > High number of men living abroad  
-> significant remittances transferred home
- > Women left behind -> women overburdened with additional male work, traditionally not allowed (roofing, ploughing)
- > Land abandonment: opportunities for lower caste groups to gain access to cropping  
-> lack of agricultural knowledge?
- > Increased soil erosion?



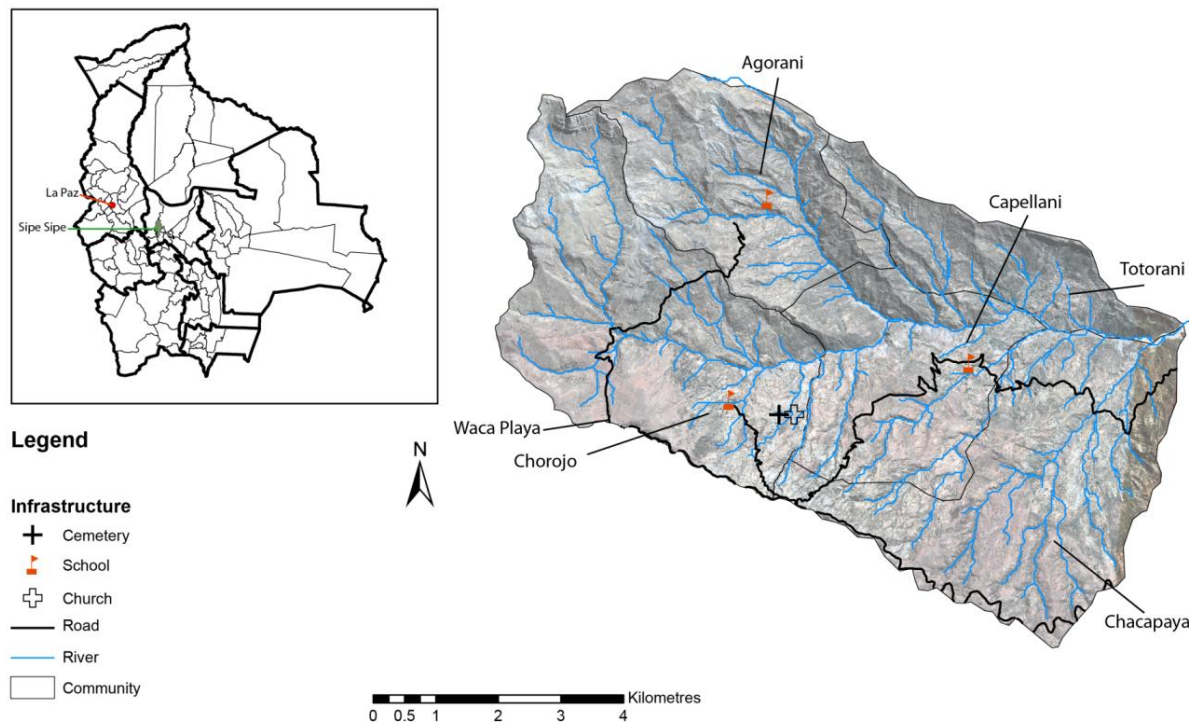
# Nepal: main concerns of respondents





# Bolivia – research location

Jatun Mayu watershed



Jatun Mayu stats:

Precipitation 600 mm/yr

Semi-arid/ thin soils

2700 - 4565 m.a.s.l.

Appr. 30 persons/km<sup>2</sup>

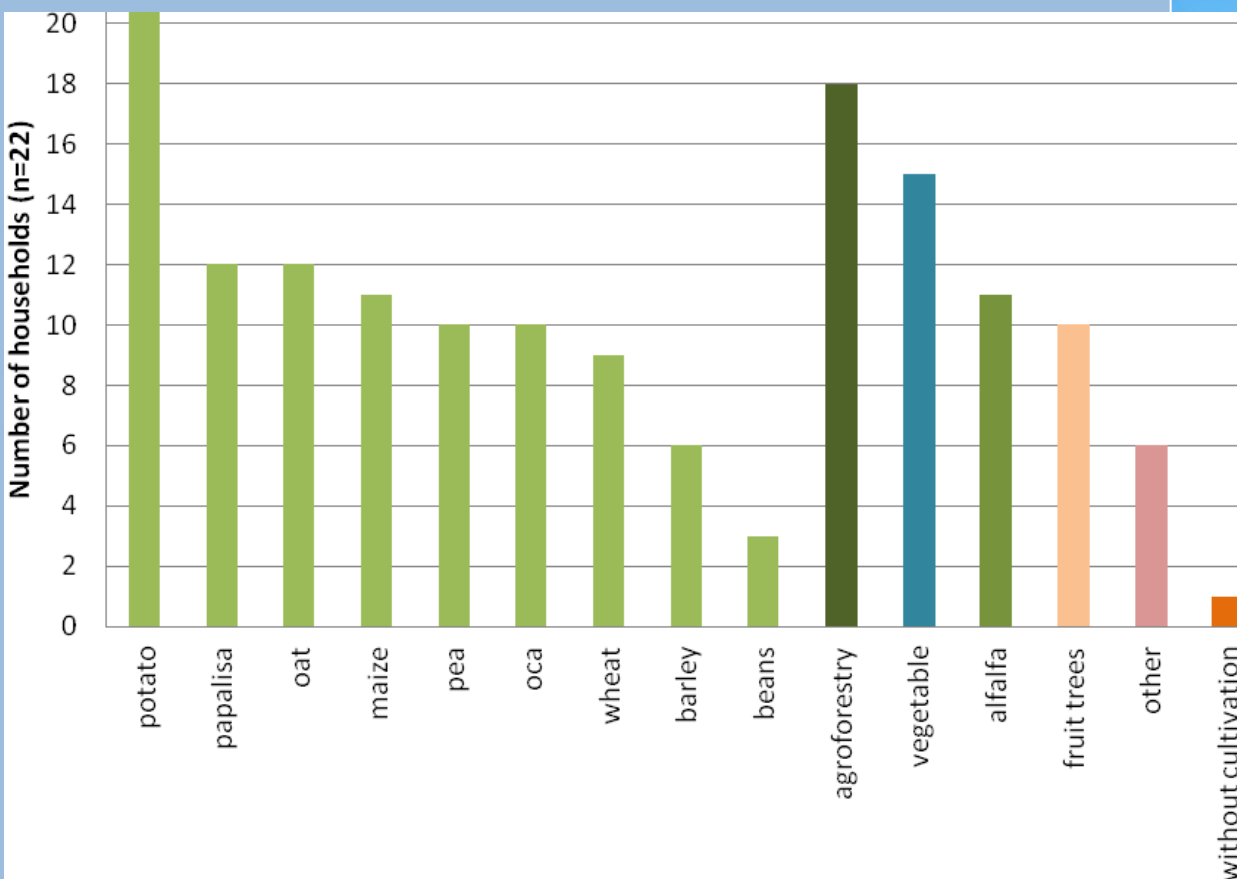
HH size: 3.8 - 4.5  
persons

Literacy rate: 78.1%

Source: Census, 2011

# Bolivia: land use

Anyoka community management



Alfalfa fodder production



## Bolivia: land degradation

Mainly soil erosion by water and wind: mass movements / landslides, loss of topsoil / surface erosion, gully erosion



I. Penna

Effects of gully development on agricultural lands and infrastructure



# Bolivia: SLM

- > Terraces
- > Gabion walls
- > Grass strips

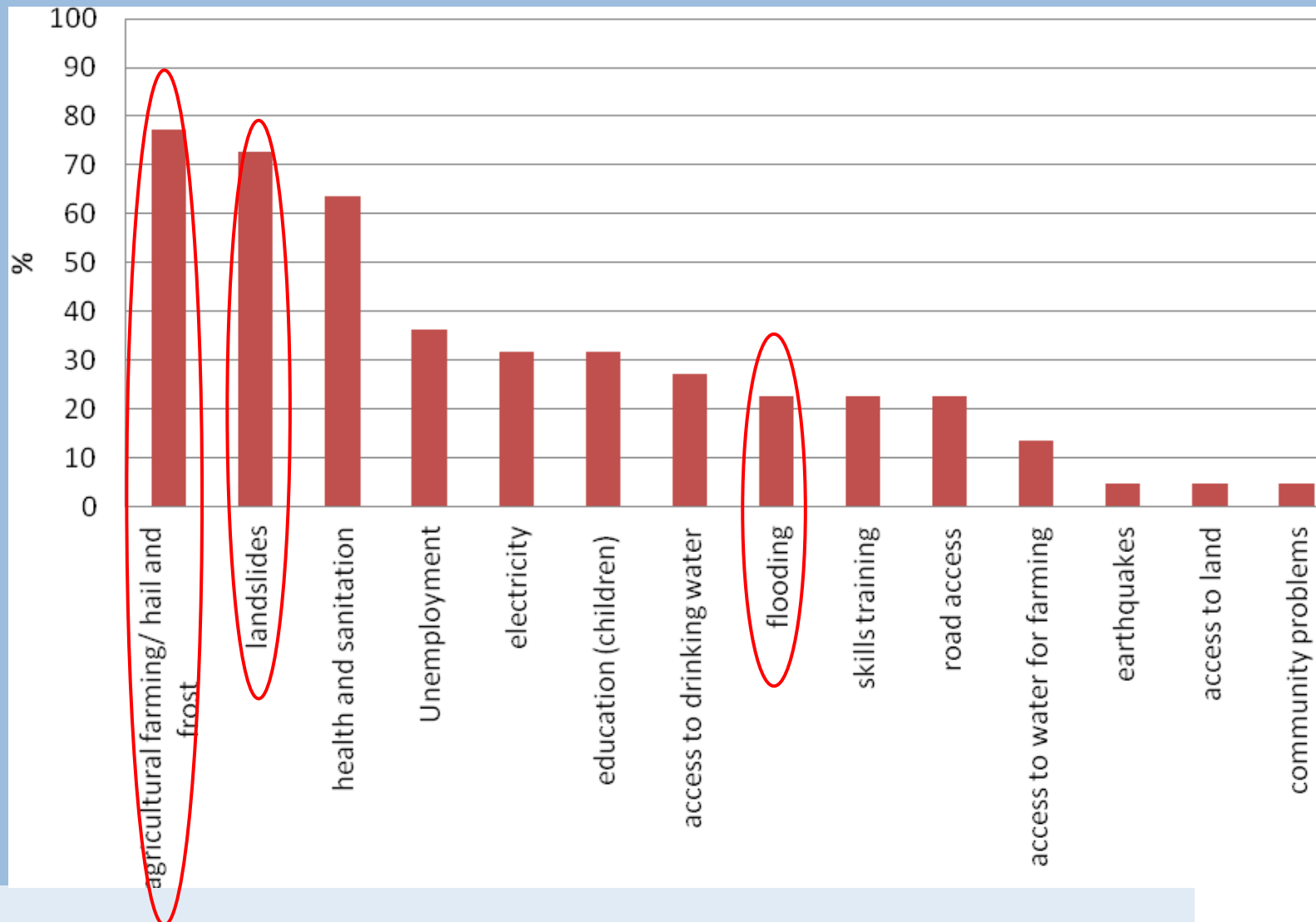




# Bolivia: migration and land management

- > Clear decrease of the labour force: entire families are migrating
- > Some families living in the valley below: ensure basic work on the land parcels -> less time for agriculture and land management
- > Temporary migration of men for some weeks to months during low season for cash
- > Consequences on overall land management and erosion are not yet clear (will be further explored)
- > Whether land is being abandoned is unclear (reluctance of people to speak about sensitive land tenure)

# Bolivia: main concerns of respondents





## Conclusions and outlook

In spite of differences, both study sites present similar issues

- > Natural and human induced active **land degradation** processes **affecting** the local **livelihood**
- > Outmigration **reducing labour force** and thus affecting land management
- > Outmigration and (changing) climate conditions challenging
  - the **traditional** management strategies,
  - the transfer of **knowledge** (key for adaptation),
  - and coping **capacity** against natural hazards

# Outlook

- > **Assess** and **map** Land Degradation (LD) and Sustainable Land Management (SLM) and its **impacts**
- > Further **explore the links** between migration, land degradation and sustainable land management -> link WOCAT mapping with livelihood data and visualisation tools
- > Understand the **vulnerability** and **resilience** of land management and livelihoods -> identify indicators
- > Identify **mitigation measures** in collaboration with stakeholders



# Thank you

[gudrun.schwilch@cde.unibe.ch](mailto:gudrun.schwilch@cde.unibe.ch)



HP. Liniger