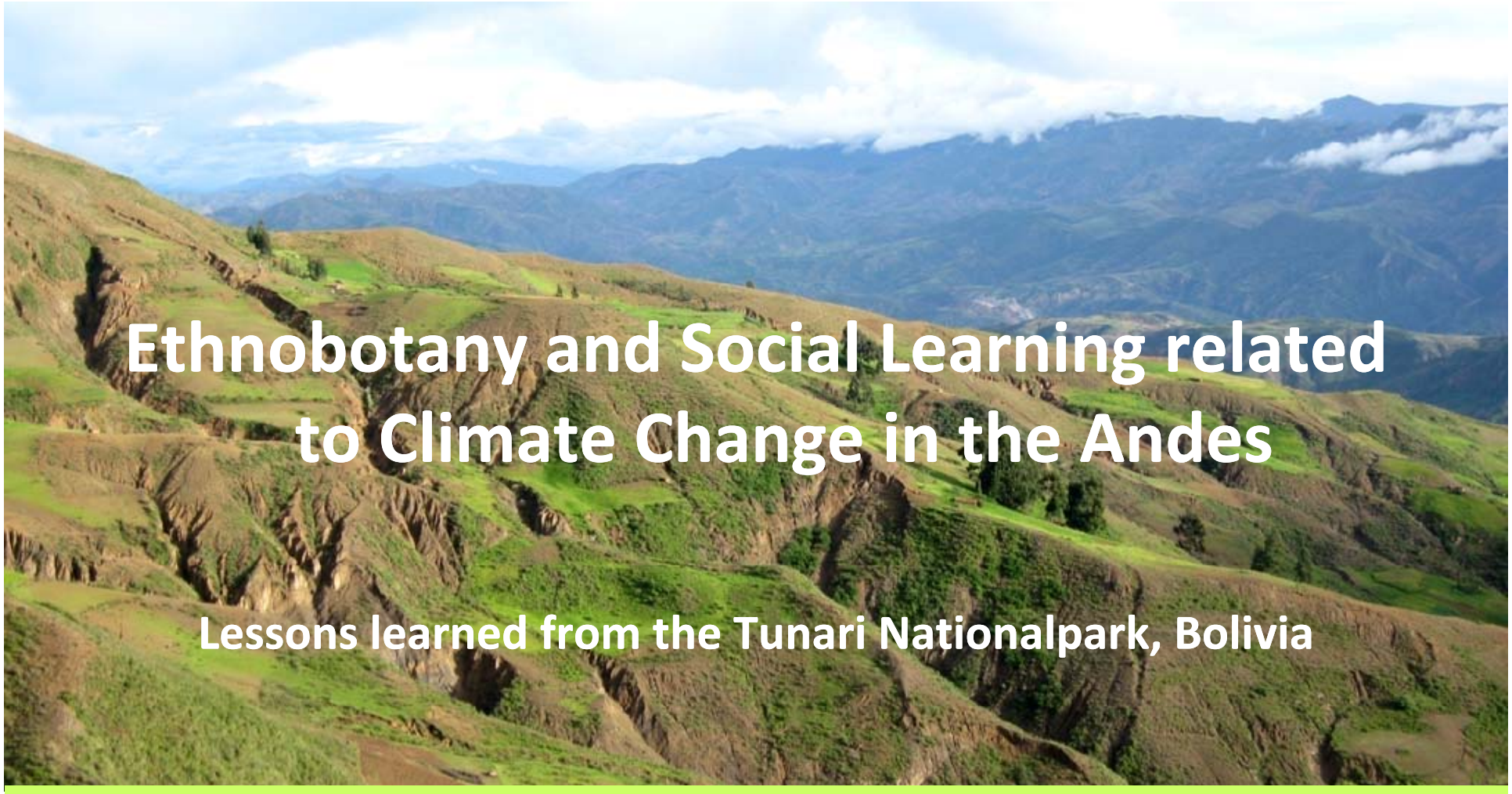

Ethnobotany and Social Learning related to Climate Change in the Andes

Lessons learned from the Tunari Nationalpark, Bolivia

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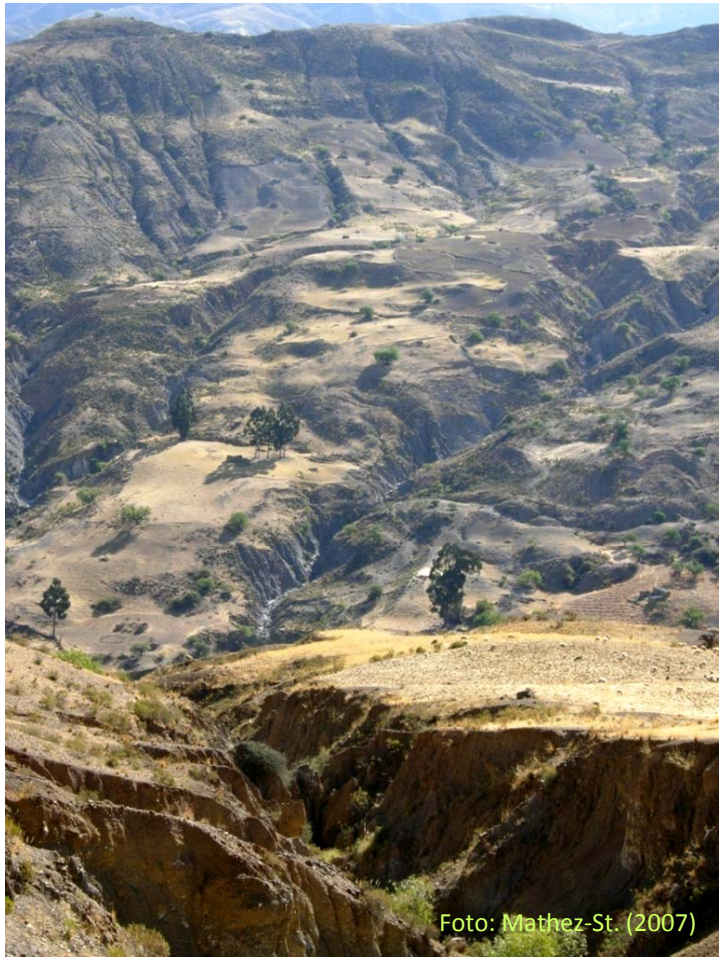
Overview

1. Climate change in the Andes
2. Mitigation and adaptation to climate change
3. Ethnobotanical case study
4. Social learning

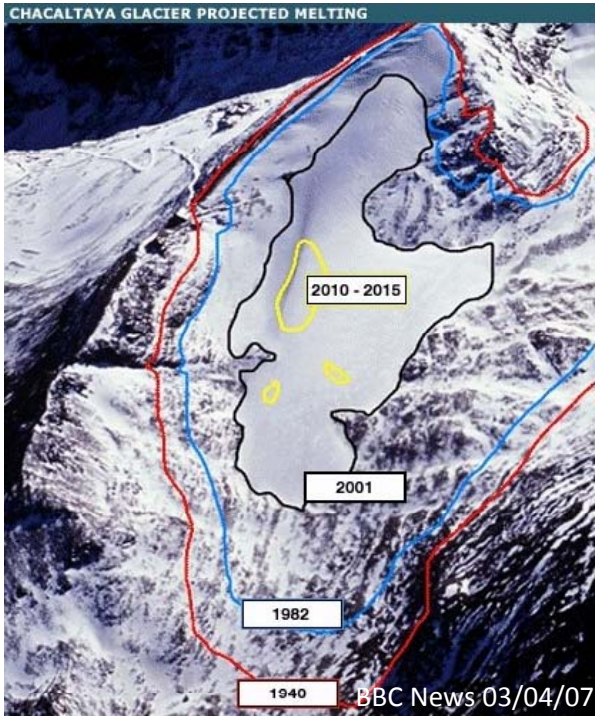


Temperature ↑
(~ 0.1°C/decade)

Precipitation ↓ ↑

Inter-annual variability ↑
Temperature and precipitation; related to ENSO phenomenon

Glacier retreats and disappearance
Lack of glacial water-resource buffer



(Vuille et al. 2008)

Livelihood vulnerability

Decreasing water supply during dry season

Increasing weather extremes and seasonal variability

Impact on agro-pastoral productivity

Severe effects on smallholder farmers due to high reliance on environmental factors and low adaptive capacity

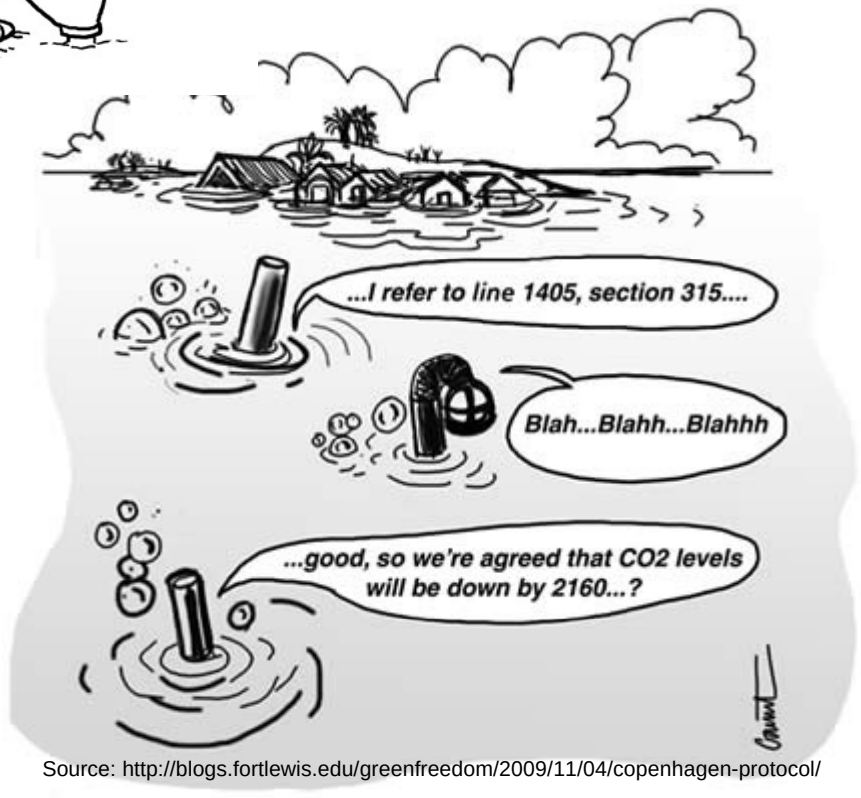
(Mark et al. 2010)

"In the past, it was colder, but now there is more heat. The rainy season has changed and rainfall, too. It rained in August and September, but now it doesn't rain anymore. Rainfalls were softer, but now they are stronger, which leads to increasing erosion. There is less production due to the change of rainfalls."

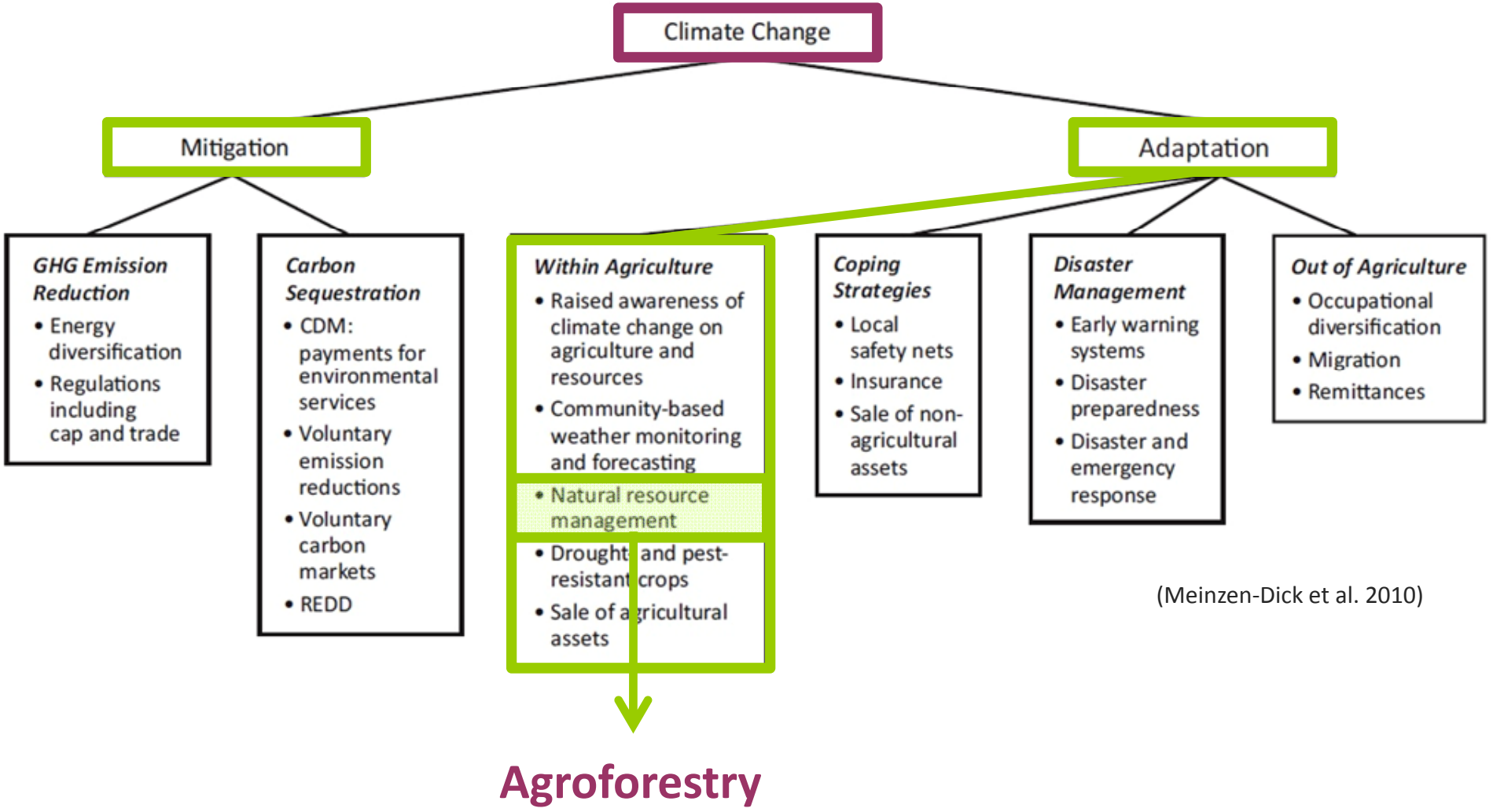
(R. Claros, Community of Tres Cruces, Bolivia)

(Source: Chris Madden)

"I'm working with my therapist to help me with climate change anxiety."



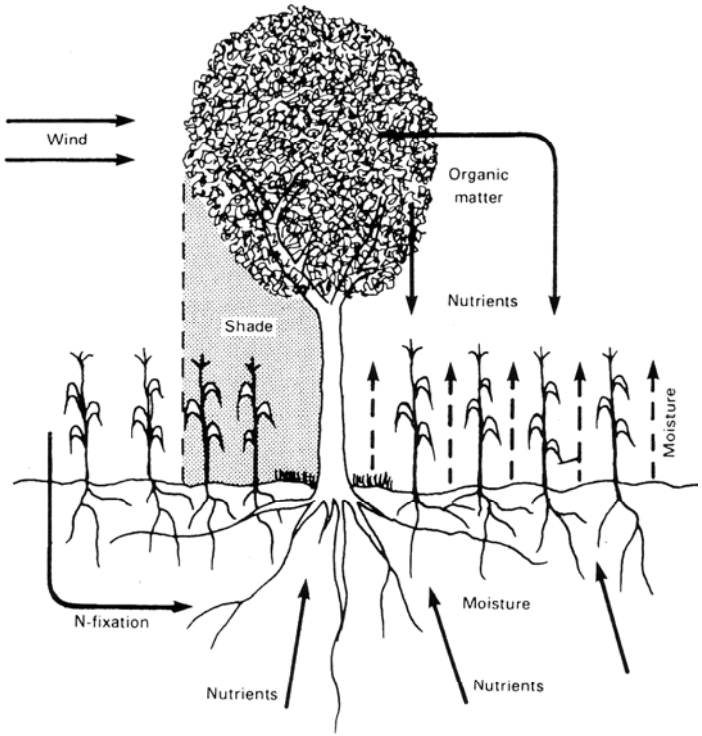
Source: http://blogs.fortlewis.edu/greenfreedom/2009/11/04/copenhagen-protocol/



(Meinzen-Dick et al. 2010)

Agroforestry

Agroforestry



Young (1997)

Adaptation strategy

Large soil volume exploration: water and nutrient availability

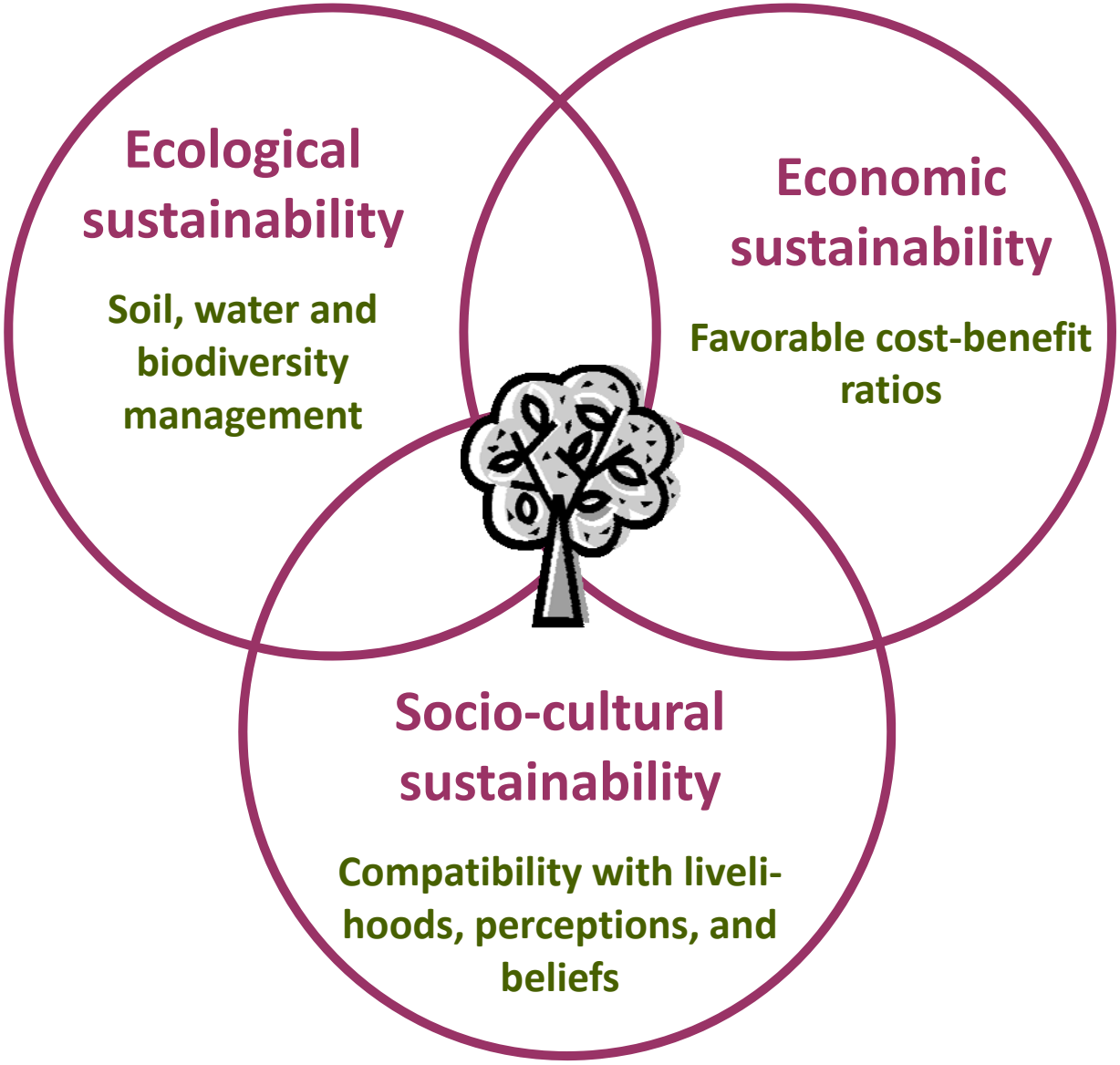
Increased soil porosity: runoff and erosion control, water infiltration and retention

High evapotranspiration rates: aerated soil conditions

(Verchot et al. 2007)

Risk-management by diversified production

(Bellow et al. 2008)


Ecological sustainability
Soil, water and biodiversity management
Economic sustainability
Favorable cost-benefit ratios
Socio-cultural sustainability
Compatibility with liveli-hoods, perceptions, and beliefs

Objectives

Identification of most promising local woody species for agroforestry

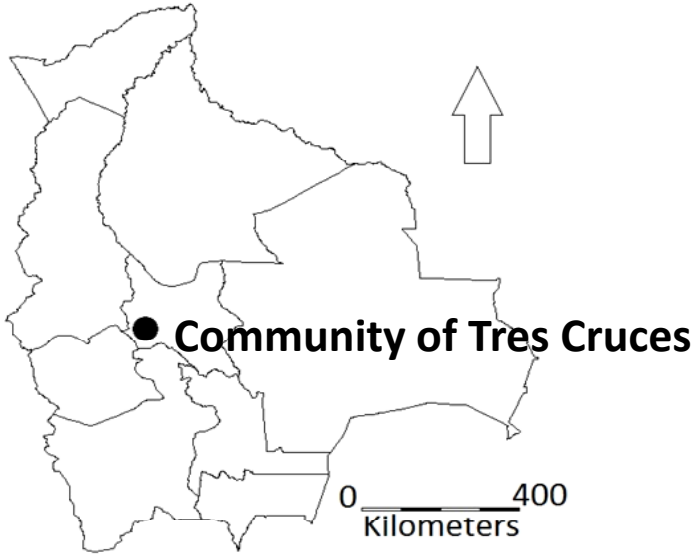
1) Which socio-ecological factors control species' perceived usefulness?

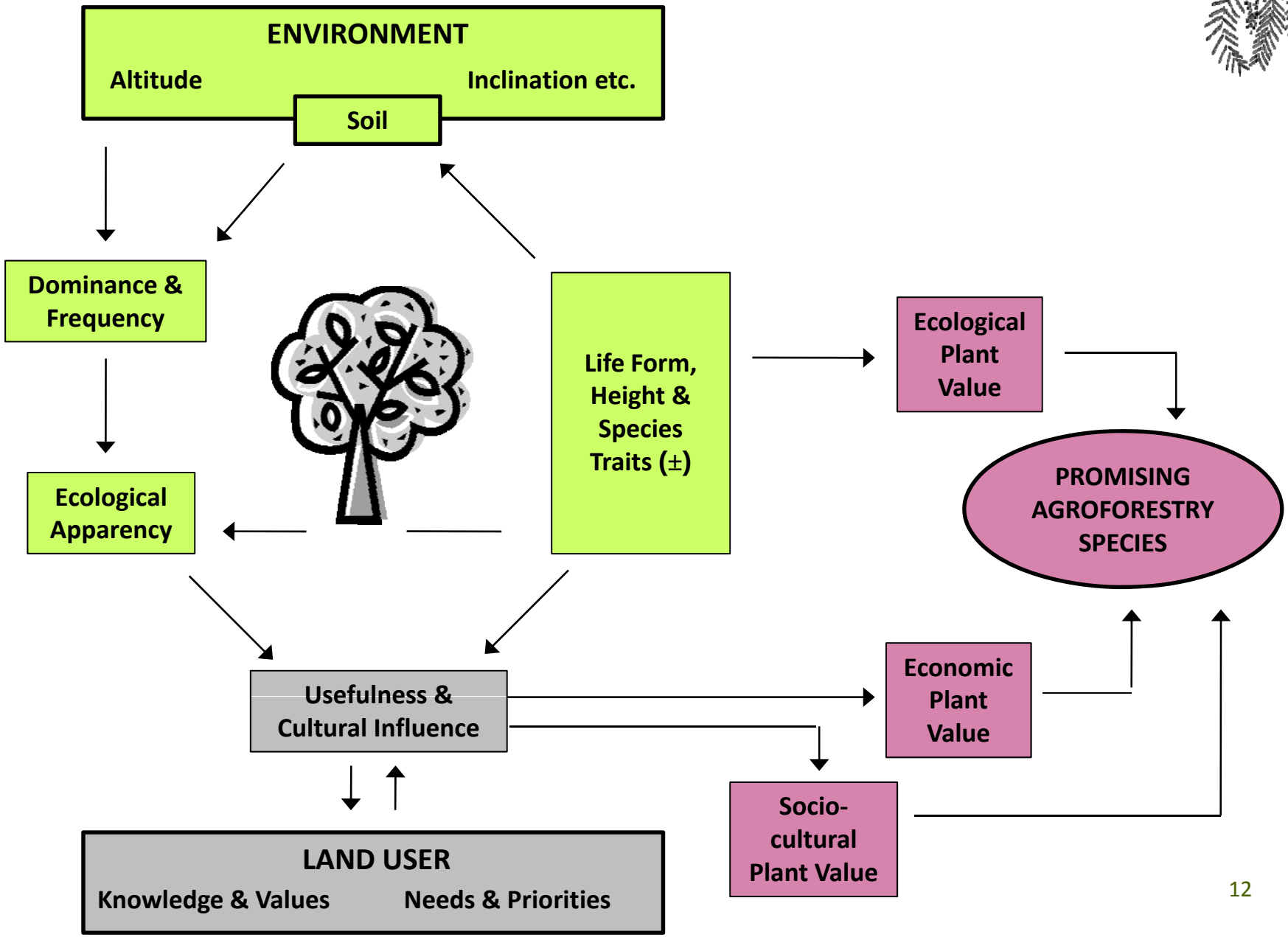
2) Which local woody species provide high ecological, economic, and socio-cultural values?

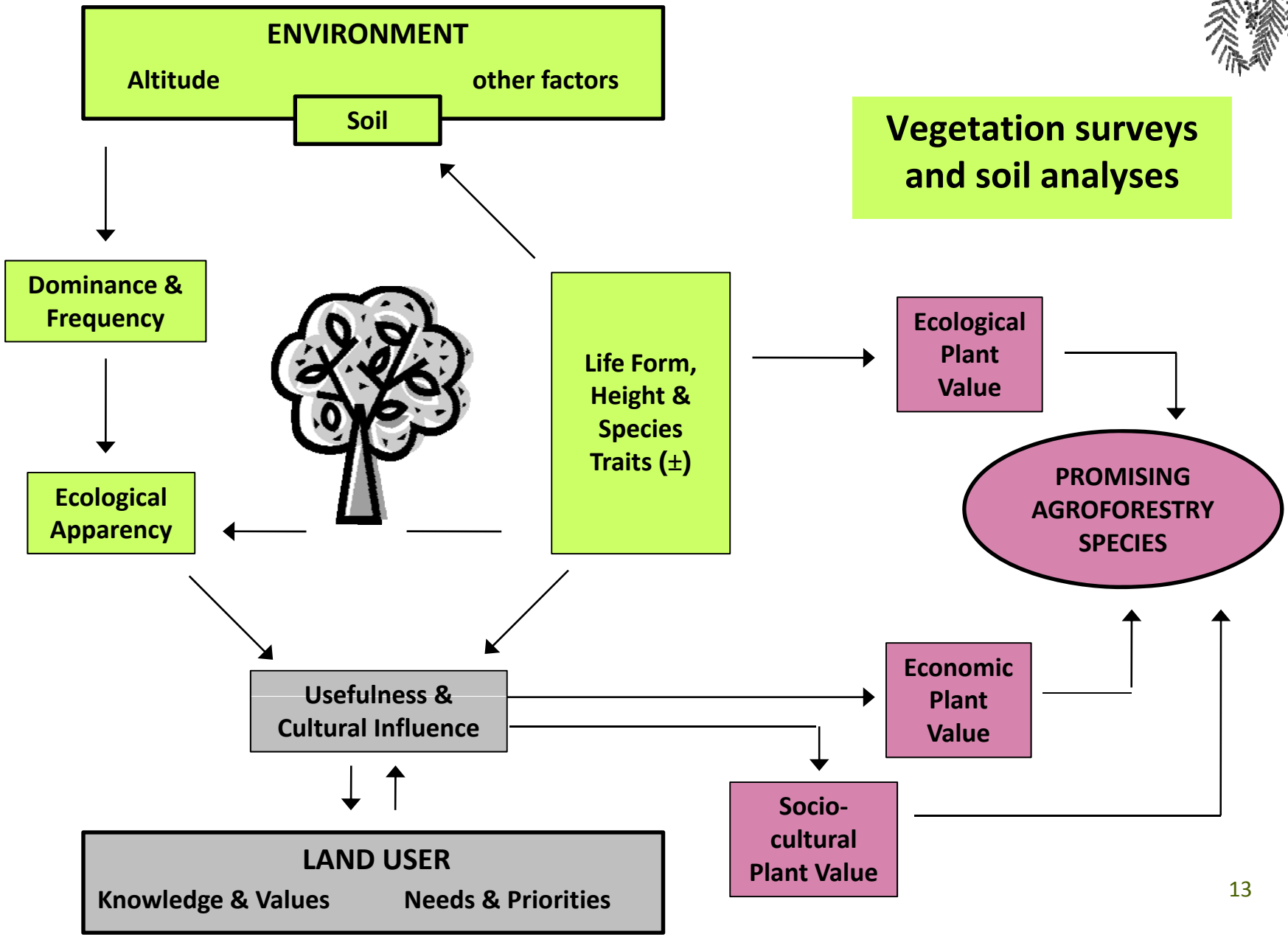

Foto: Brandt (2008)

Case study area

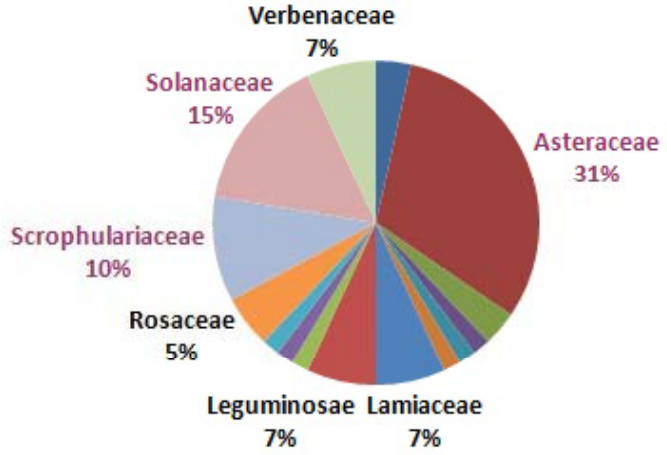
Fotos: Mathez-St. (2007)

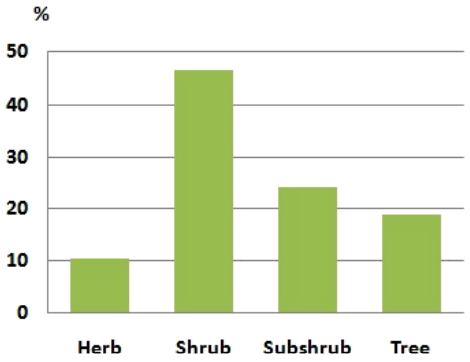


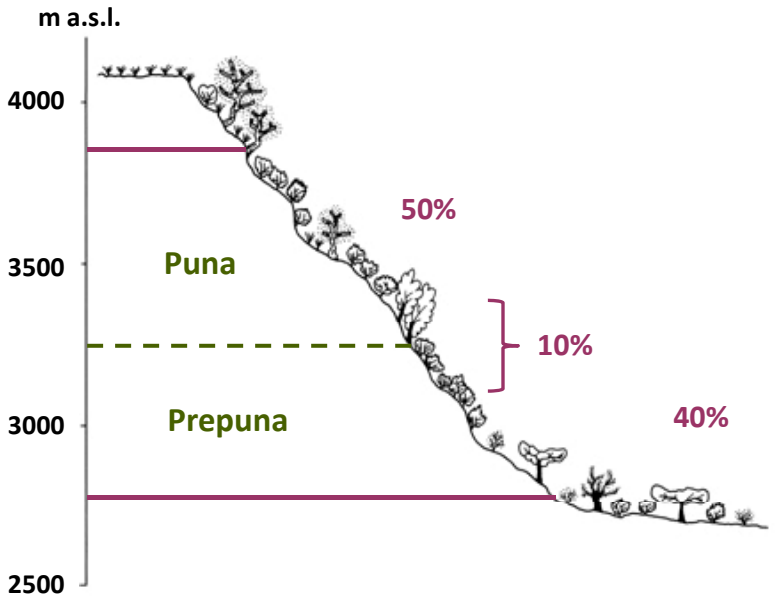

ENVIRONMENT
Altitude
Inclination etc.
Soil
Dominance & Frequency
Life Form, Height & Species Traits (±)
Ecological Plant Value
Ecological Apparency
PROMISING AGROFORESTRY SPECIES
Usefulness & Cultural Influence
Economic Plant Value
Socio-cultural Plant Value
LAND USER
Knowledge & Values
Needs & Priorities


ENVIRONMENT
Altitude
other factors
Soil
Vegetation surveys and soil analyses
Dominance & Frequency
Life Form, Height & Species Traits (±)
Ecological Plant Value
Ecological Apparency
PROMISING AGROFORESTRY SPECIES
Usefulness & Cultural Influence
Economic Plant Value
Socio-cultural Plant Value
LAND USER
Knowledge & Values
Needs & Priorities

Floristic composition of woody species



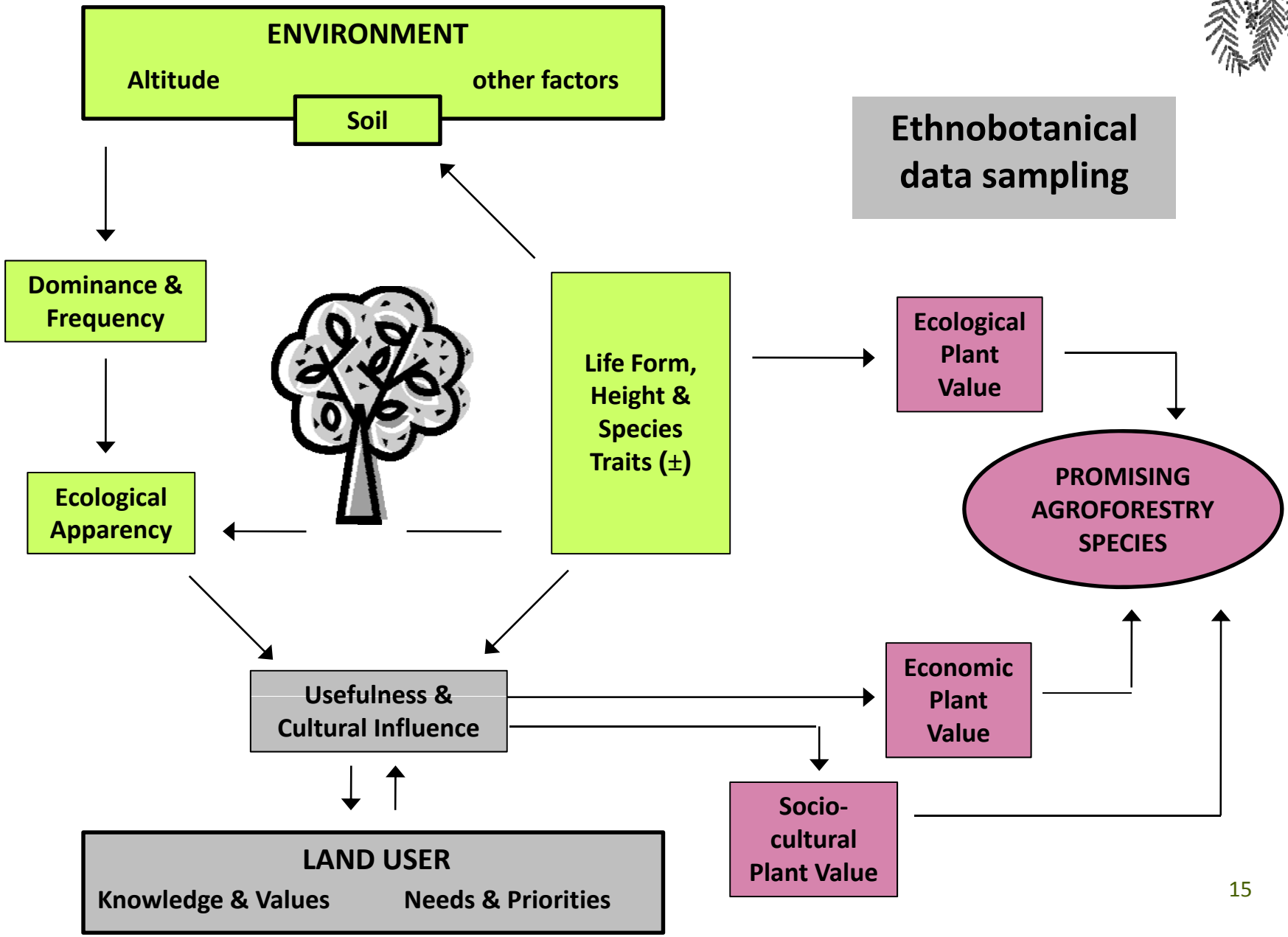




Baccharis dracunculifolia

Cestrum parqui

Fotos: Brandt (2006)


ENVIRONMENT
Altitude
other factors
Soil
Ethnobotanical data sampling
Dominance & Frequency
Life Form, Height & Species Traits (±)
Ecological Plant Value
Ecological Apparency
PROMISING AGROFORESTRY SPECIES
Usefulness & Cultural Influence
Economic Plant Value
Socio-cultural Plant Value
LAND USER
Knowledge & Values
Needs & Priorities


NUESTRA COMUNIDAD
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DEMETRI MERIDA
NESTOR PERIZ
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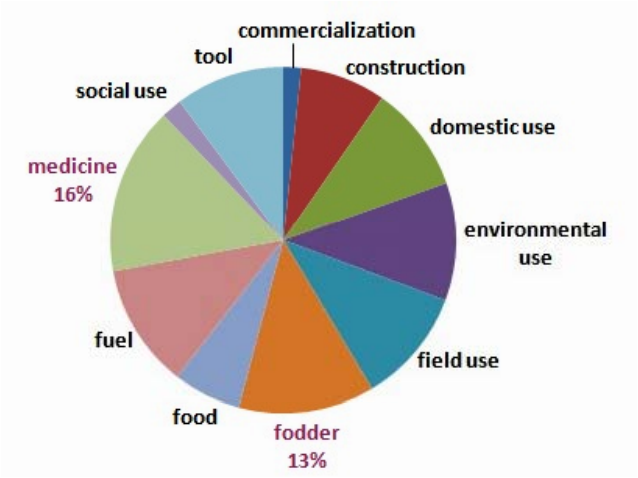
UNIDAD EDUCATIVA
TRES CRUCES
GESTION 2007



Fotos: Mathez-St., Brandt (2007)

Traditional Phenological Knowledge

Indirect plant use (e.g. environmental, cultural)

High dependence on natural resources and weather events
→ adaptation on dynamic conditions

Indication of soil- and climatic conditions

Based on experimentation and knowledge transmission

(Fujimoto 2009, Turner & Clifton 2009)

Traditional Phenological Knowledge

Andean cosmovision: reciprocal interactions of humans and environment

Interpretation of dynamic conditions; adaptation of agricultural agenda/practices; food security

Common plants (incl. weeds); 17 phytoindicators (46 total)

(Aguilar 1997)

Fotos: Mathez-St., Brandt (2007)

Fotos: Brandt (2006)

Foto: Brandt (2007)

ENVIRONMENT

Altitude | other factors | Soil

Principal components analysis (PCA)

Post-hoc linear regression analysis

Dominance & Frequency

Life Form, Height & Species Traits (±)

Ecological Plant Value

Ecological Apparency

PROMISING AGROFORESTRY SPECIES

???

???

Usefulness & Cultural Influence

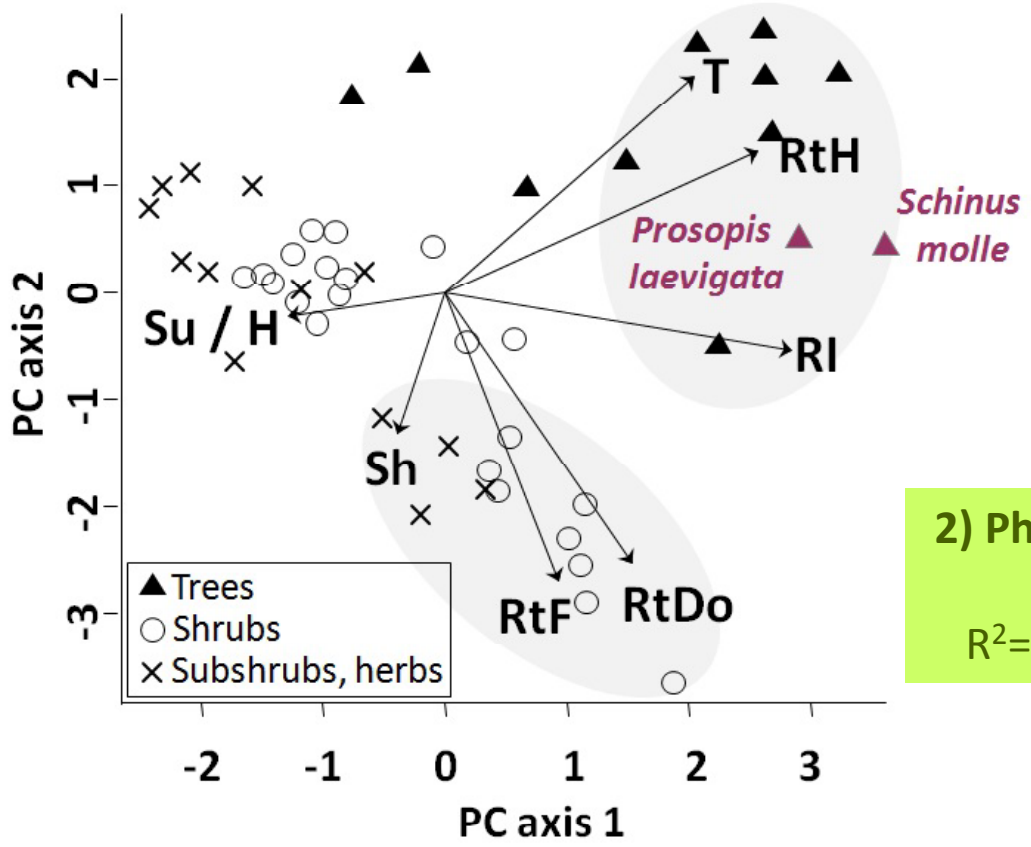
Economic Plant Value

Socio-cultural Plant Value

LAND USER

Knowledge & Values | Needs & Priorities

Significant factors for usefulness



1) Plant height and timber availability !
R^2=0.53, p<0.001

2) Phytosociological factors !
R^2=0.34, p<0.001

Quantitative assessment of plant values

ENVIRONMENT

Altitude | other factors

Soil

Dominance & Frequency

Ecological Apparency

Life Form, Height & Species Traits (±)

Ecological Plant Value

PROMISING AGROFORESTRY SPECIES

Usefulness & Cultural Influence

Economic Plant Value

Socio-cultural Plant Value

LAND USER

Knowledge & Values | Needs & Priorities

Kewiña *(Polylepis subtusalbida*) - Puna > 3600 m

Molle *(Schinus molle)* - Prepuna < 3200 m

T'ola *(Baccharis dracunculifolia*) – Puna + Prepuna < 3900 m

Fotos: Brandt (2004, 2007)

Thaqo, algarrobo (*Prosopis laevigata*) – Prepuna < 3200 m


???
Durazno (*Prunus persica*) < 3300 m
Eucalipto (*Eucalyptus globulus*) < 3700 m
Fotos: Brandt (2004, 2007)

Agroforestry

↑

„**Sustainable (development)** meets the needs of the present without compromising the ability of future generations to meet their own needs.“

(World Commission on Environment and Development, Brundtland-Report, 1987)

Interpretation & Application

WHO & HOW?

Understanding → | ← **Action**

Science → **Policy** → **Practice**

Instructions for action

Adoption & application

Science !!!

Values, perceptions, interests, experience

Traditional knowledge
Practical experiences
???

(Rist 2011)

Theory of Communicative Action
(J. Habermas)

Understanding ⟷ Action

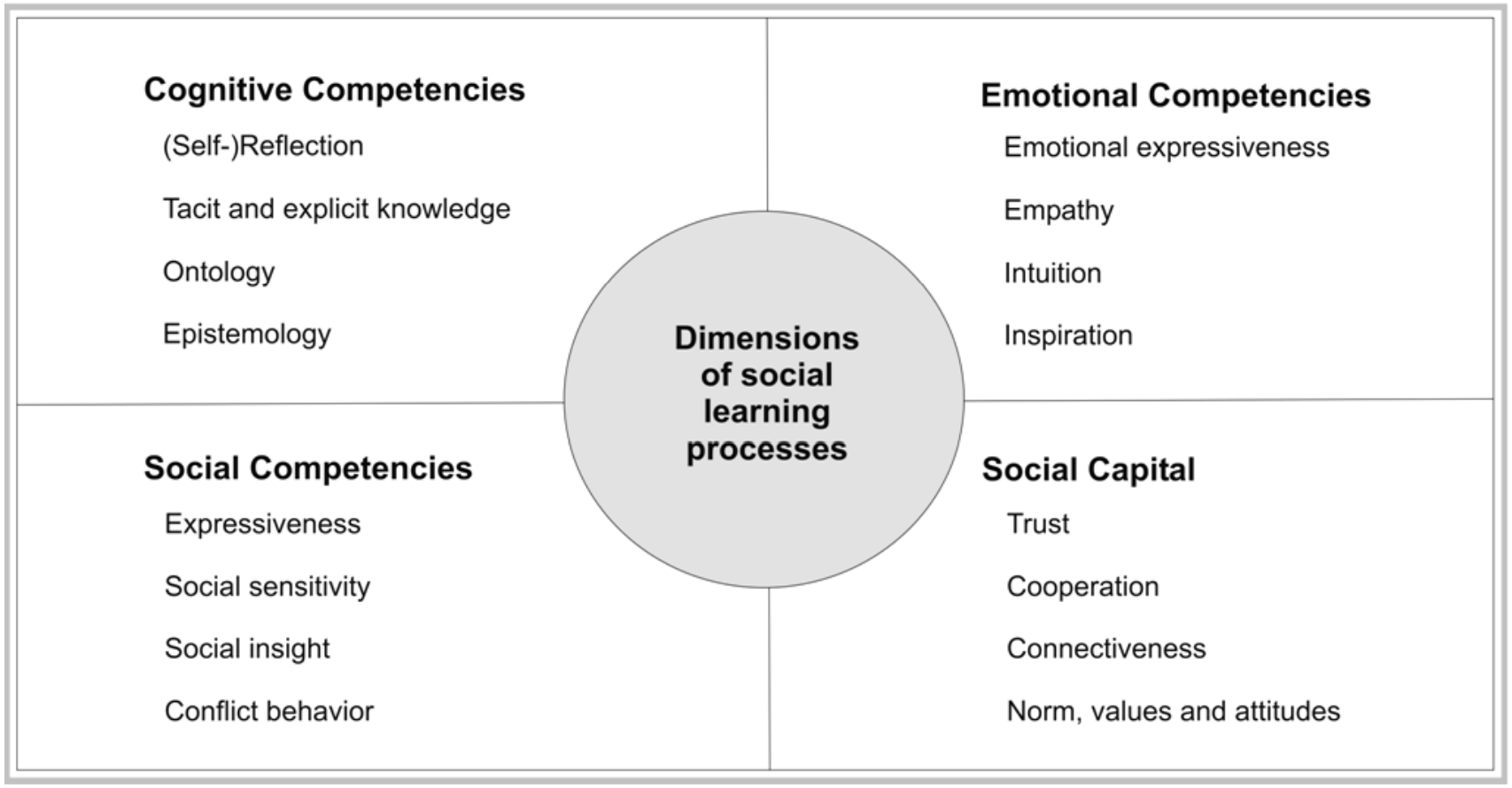
Horizontal communication

Mutual understanding

Collective/social learning

(Rist 2011)

“It was hard to come to mutual understanding…”



(Rist et al. 2006)

Collective/social learning

Long-term process

Reflection and communication about current situation

Definition of aims and strategies for more sustainable practices

Support of local autonomy and self-determination !!!

(Rist 2011)

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Comunidad de Tres Cruces, Tapacarí, Cochabamba, Bolivia

¡ Muchas gracias !

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