Spatiotemporal availability and management obstacles of pastoral resources in the transhumance system of the Mgoun region, Southern Morocco

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Outline

- Introduction
  - Study area
  - Land use
- Pastoral resources
  - Biomass assessment
    - Test site level
    - Landscape level
- Pastoral management
  - Spatial pattern of pastoral land use
  - Understanding local grazing systems for better decision making
- Conclusions
- Outlook

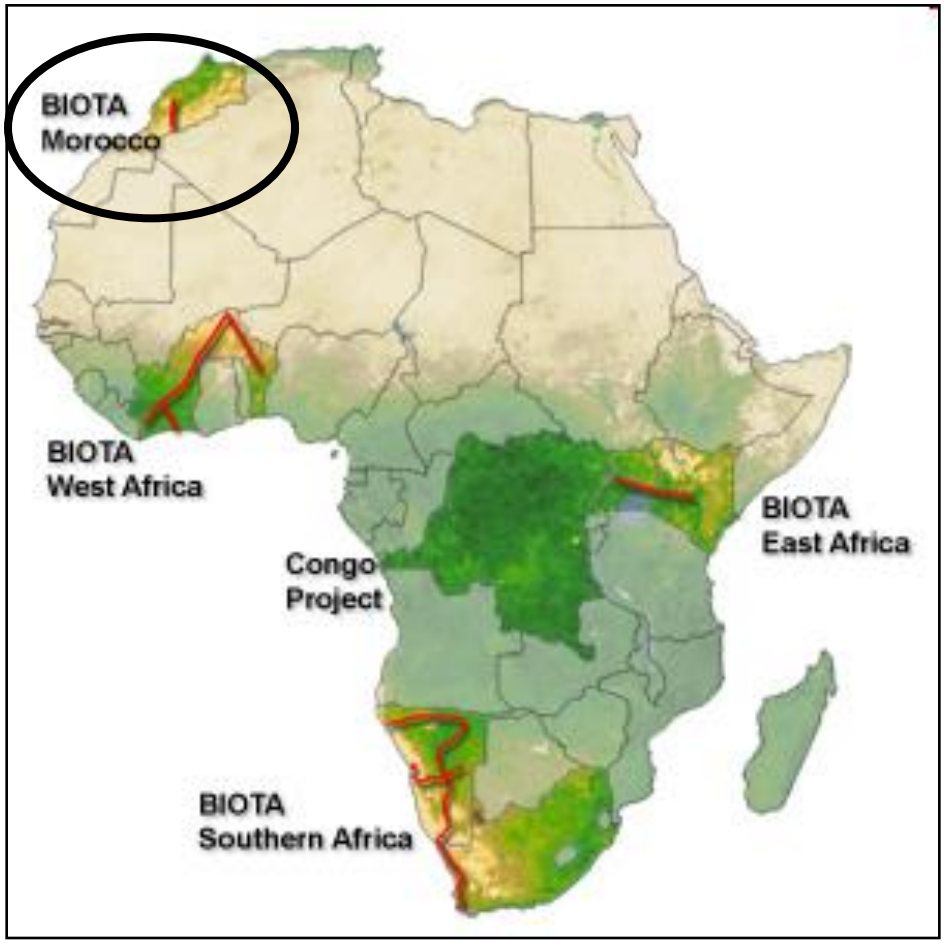
Introduction:

- **Problem statement**: proper rangeland management rely on the availability of information related to the availability of resources and the needs of users.

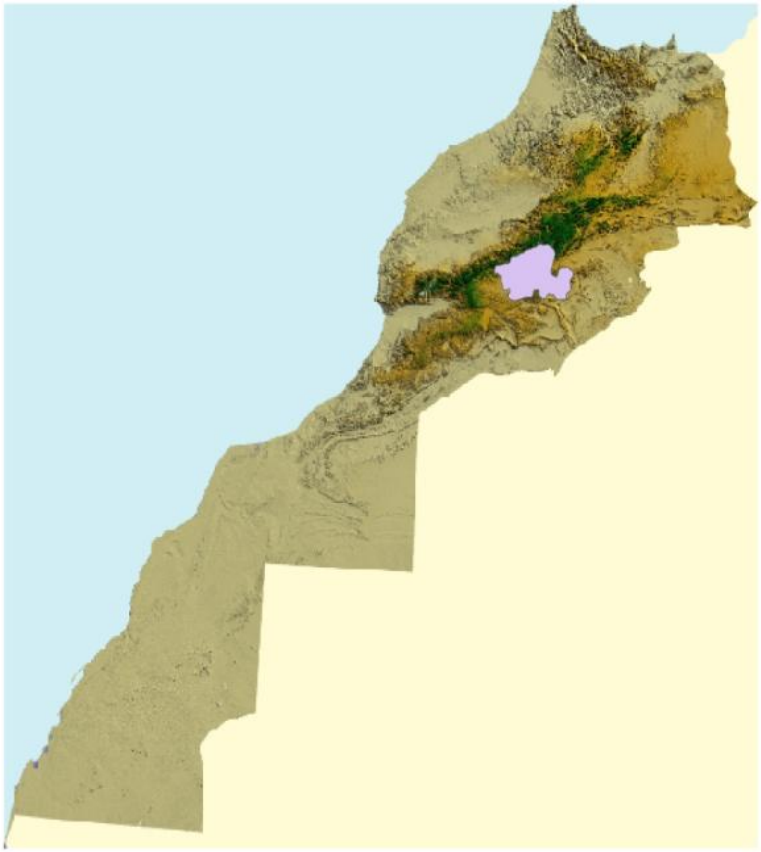
- **Objectives:**
- assess spatiotemporal availability of resources (forage),
- Understand local grazing systems : distribution and movements of the herds over the space and through time
- Confrontation of these two components match together
- Use all these information for decision making in term of rangeland management on a sustainable base

Study area:

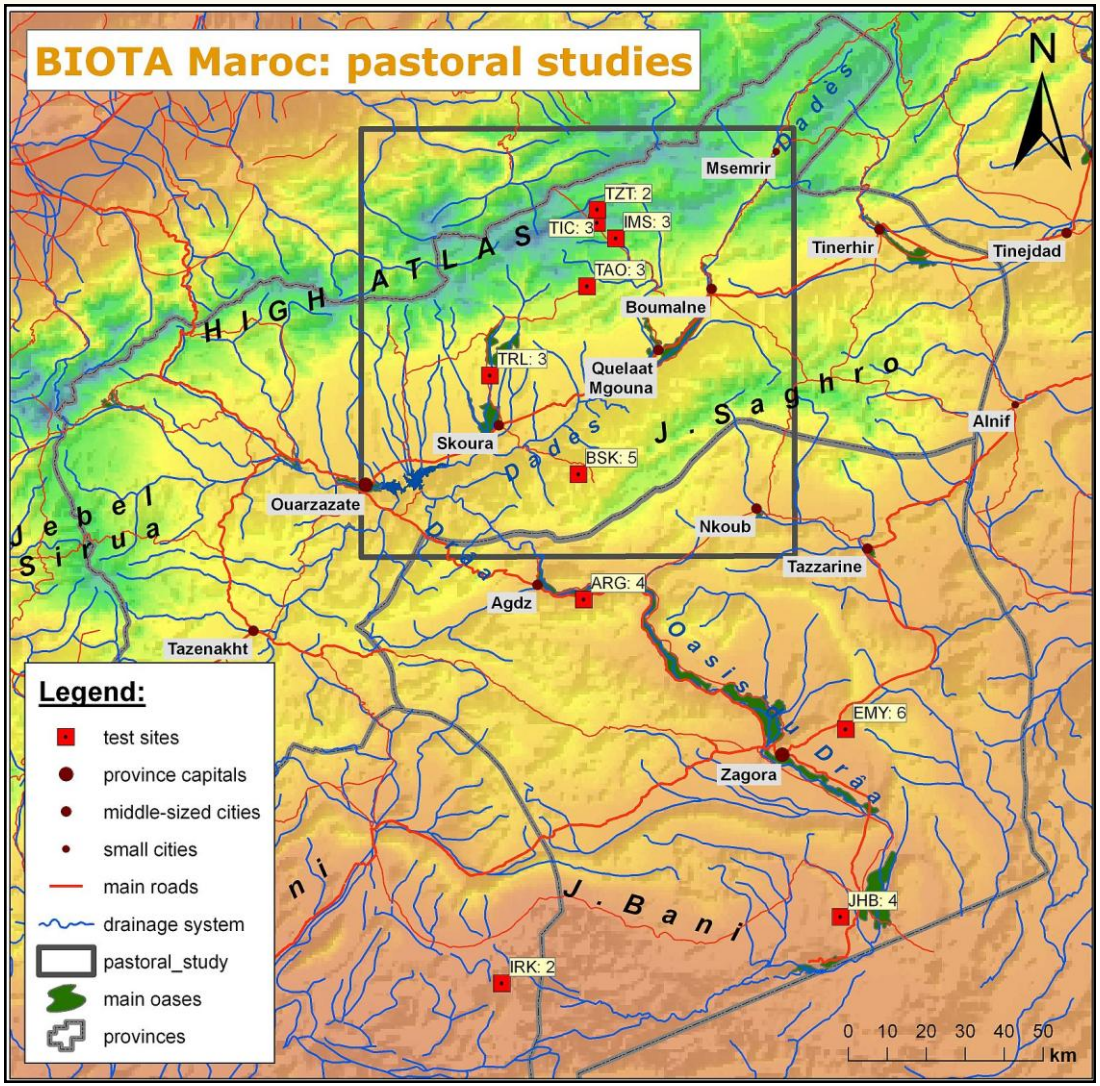
- Part of the Mediterranean biome, which holds a high biodiversity.
- Morocco has the highest ratio species richness/surface of land in the Mediterranean, followed by Spain and Turkey
- More than 41 % of the endemic plants in Morocco are rare or threatened
- Transition zone between Euro-Mediterranean and Saharan biomes

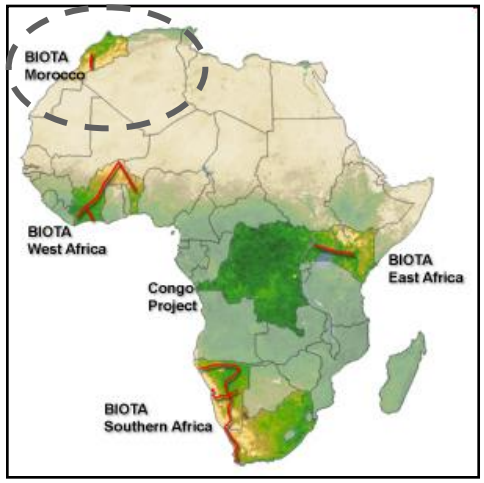


- High and Anti Atlas are the main source for water as well as food for human and animal
- the topographic diversity influences the vegetation distribution and the seasonal variability of the pastoral resources (phytomasse)
- for thousands of years, transhumance was established as a intelligent and sustainable adaptation to this spatiotemporal variability.

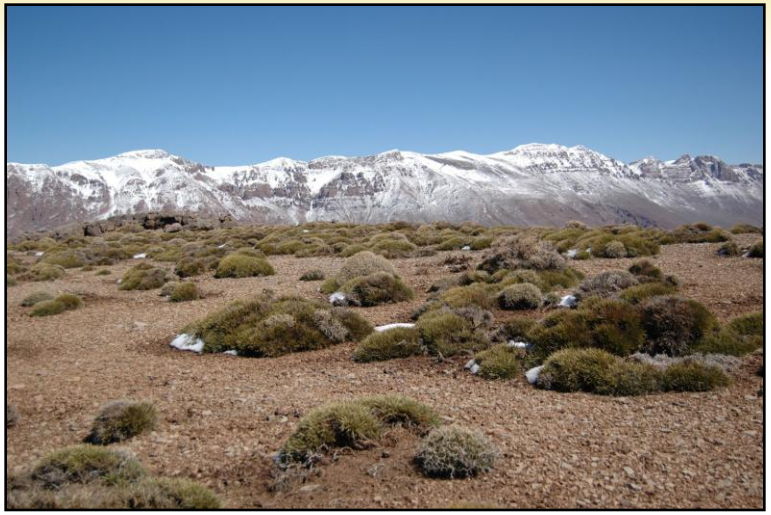


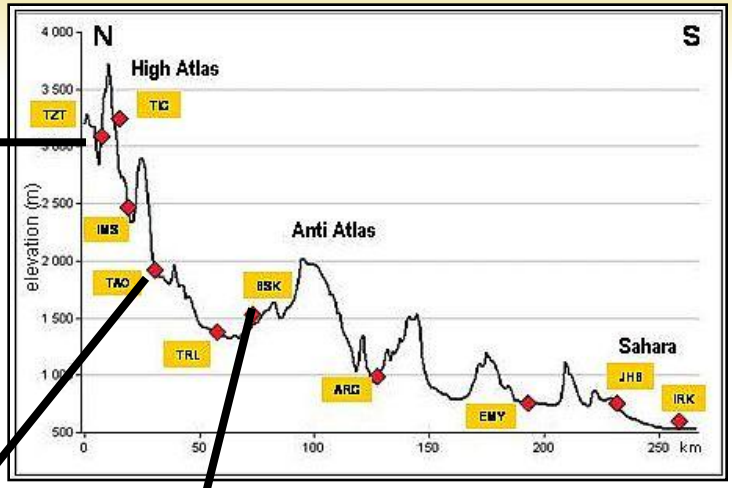
Study area:

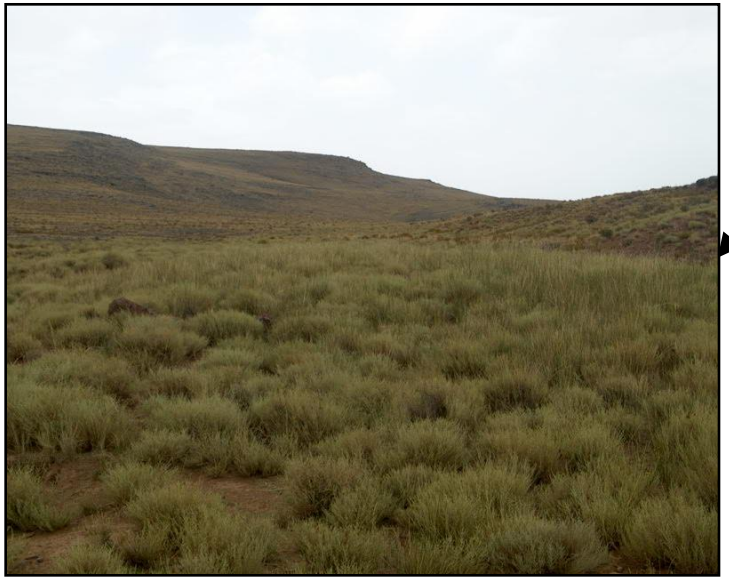

BIOTA Maroc: pastoral studies
N
HIGH ATLAS
Dadès
Msemrir
TZT: 2
TIC: 3
IMS: 3
TAO: 3
Tinerhir
Tinejdad
Boumalne
TRL: 3
Quelaat Mgouna
Skoura
BSK: 5
Dadès
J. Saghro
Alnif
Ouarzazate
Nkoub
Jebel Sirua
Tazzarine
ARG: 4
Agdz
Oasis
Tazenakht
EMY: 6
Zagora
Drâa
J. Bani
JHB: 4
IRK: 2
Legend:
test sites
province capitals
middle-sized cities
small cities
main roads
drainage system
pastoral_study
main oases
provinces
0 10 20 30 40 50
km


BIOTA Morocco
BIOTA West Africa
Congo Project
BIOTA East Africa
BIOTA Southern Africa

Study area:




N
S
High Atlas
Anti Atlas
Sahara
elevation (m)
4 000
3 500
2 500
2 000
1 500
500
0
50
100
150
200
250 km
TZT
TIC
IMS
TAO
TRL
BSK
ARG
EMY
JHB
IRK



Land use: pastoral land use on over 93 % of the province Ouarzazate

sheep

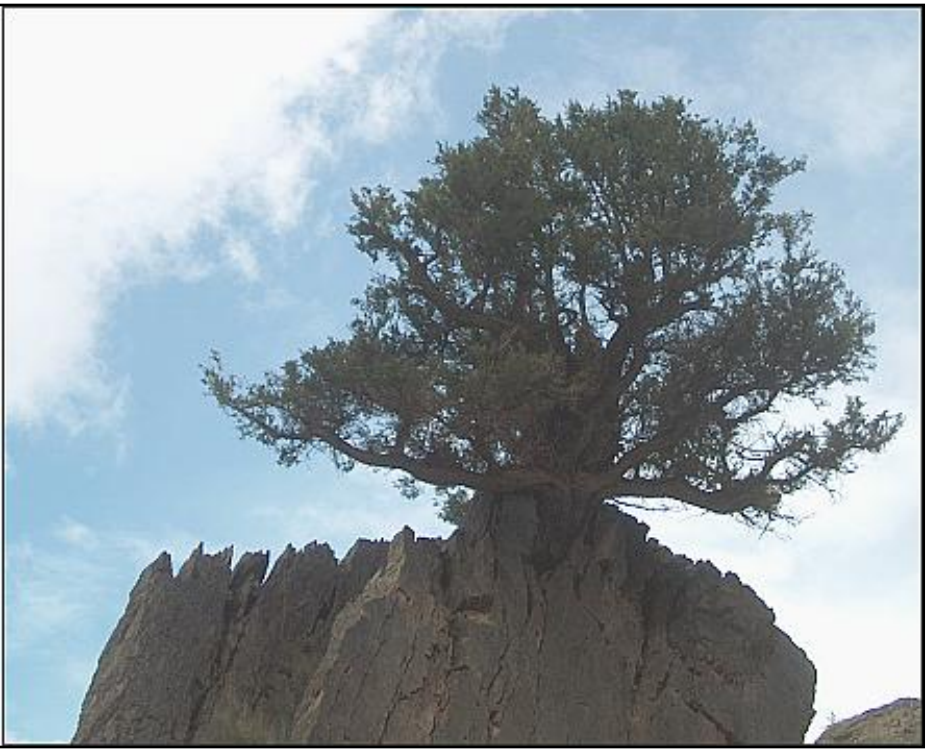
goats

equids

dromedaries

Land use: wood gathering

Land use: overuse leads to degradation



Land use: Regression of traditional conservative land use practices (transhumance)

High Atlas

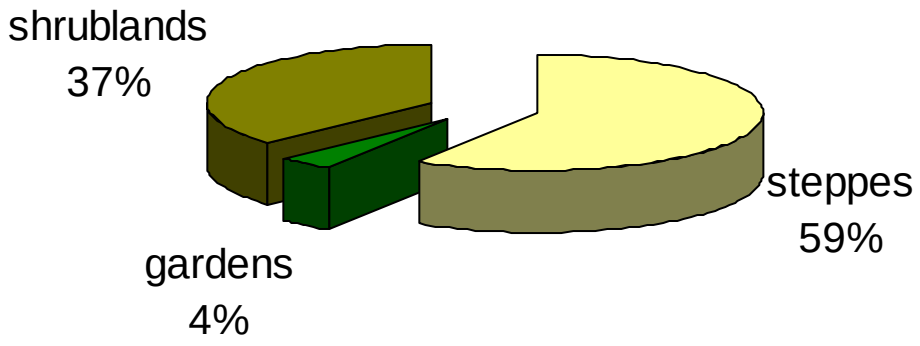
Land use: wood gathering

Case study: Ait Toumert valley (9 villages)

Total wood consumption: 2.5 kg / pers x day

cooking	bath	heating	**total**
2.1 kg	0.3 kg	0.1 kg	**2.5 kg**

Origin of firewood:



Land use: wood gathering

Communal level: *Ighil n'Oumgoun*

population (2004) :	19 182
area:	105 700 ha
total wood consumption:	17 338 t/yr

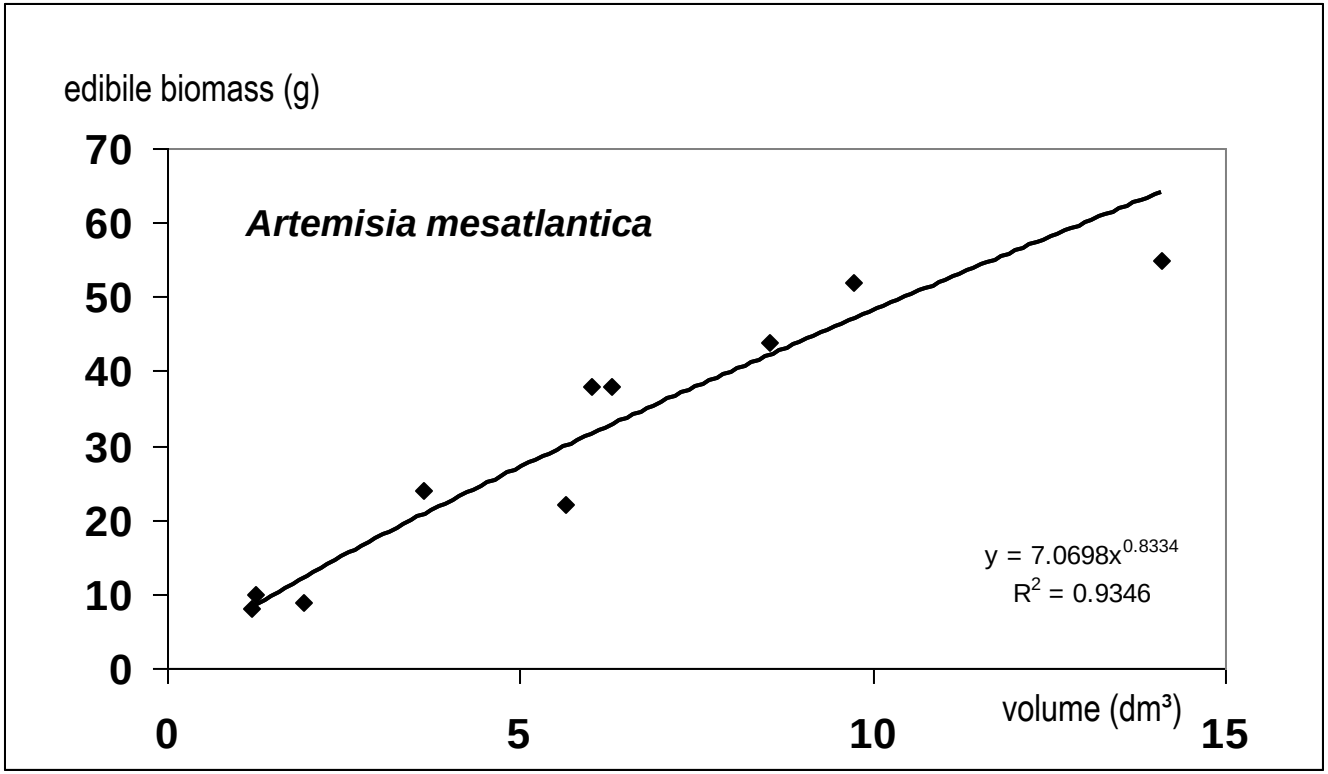
wood extraction ~ 200kg /ha x yr

- Pastoral resources assessment:
  - Measuring of total biomass per area
  - Spatial upscaling of biomass estimations to landscape level (modeling)
  - Estimation of animal requirements (goats, sheep)
  - Determination of carrying capacity for sheep and goats (modeling)

Pastoral resources: biomass estimations

case study: test site Taoujgalt (TAO)

- harvest of sample-individuals for volume – biomass functions
- volume biomass relatic
- differentiation of edibl



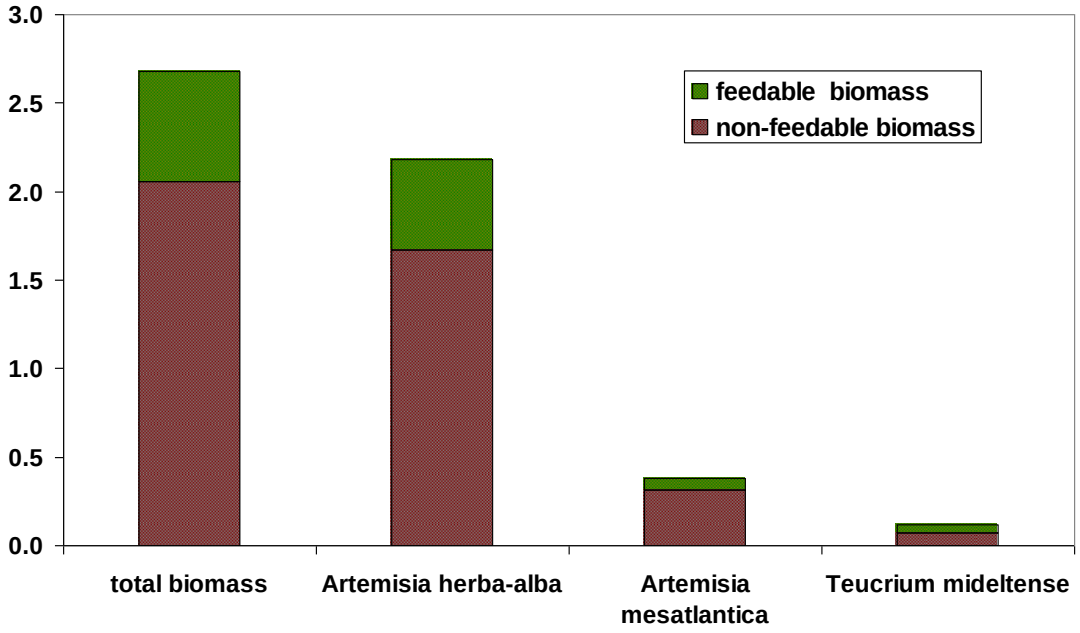
Pastoral resources: biomass estimations

- differentiation of edible and non-edible biomass
- calculation of total biomass per area

total biomass: 2677 kg / ha

(edible: 23.1 %)

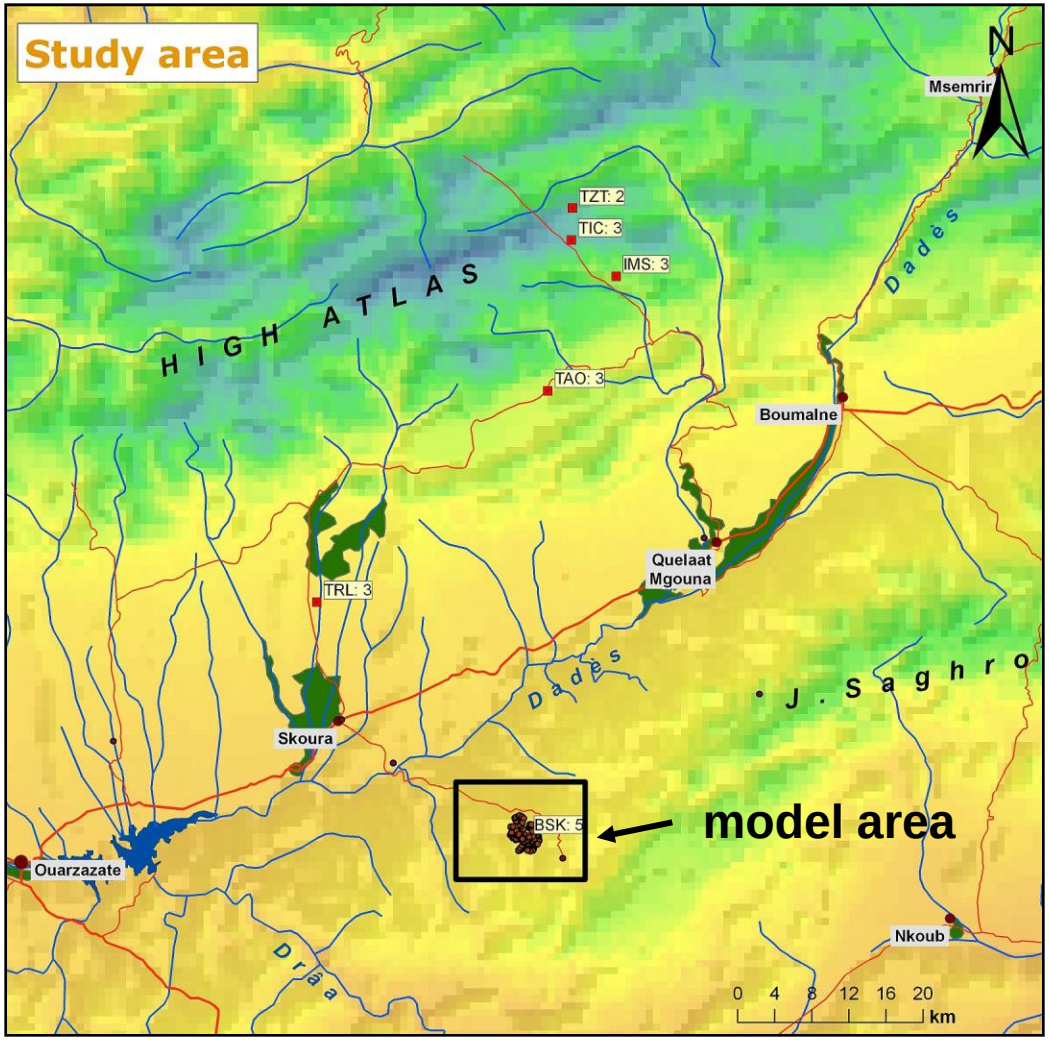
(wood consumption: 200 kg / ha yr)



Pastoral resources: Spatial upscaling of biomass estimations

case study:
test site Bou Skour (BSK):

- biomass sampling on 10m² (n=124)
- biomass distribution according to site factors
- regression models
- upscaling to landscape level

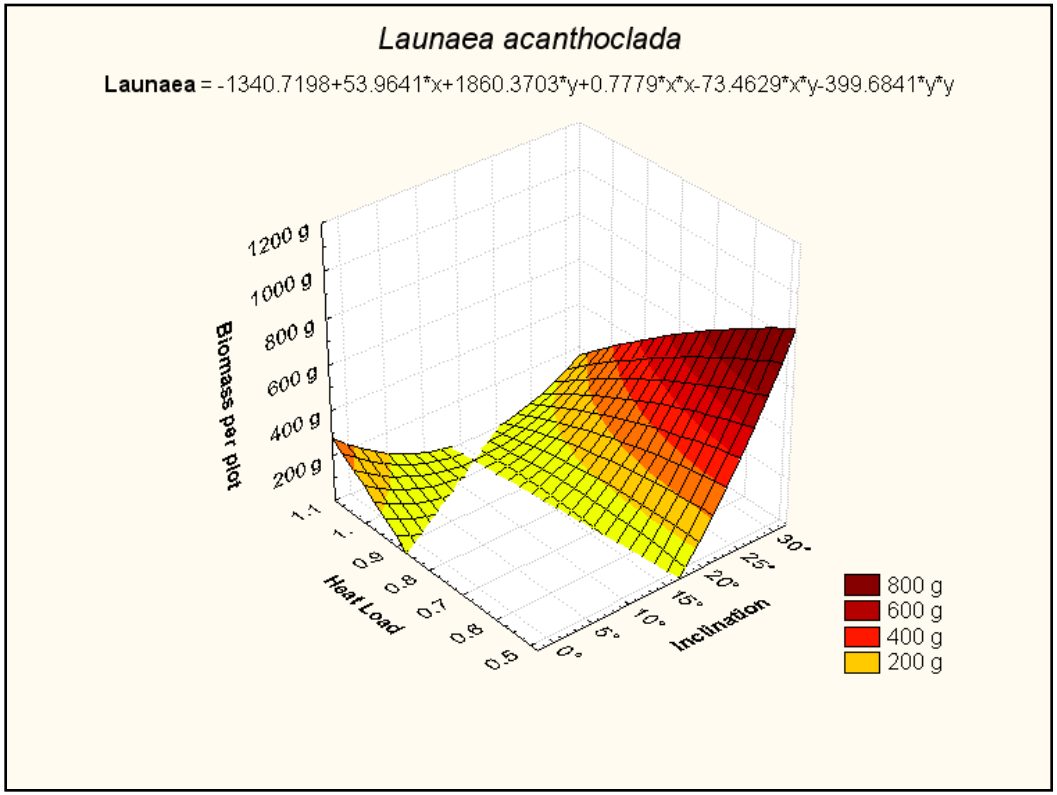


Pastoral resources: spatial upscaling

Biomass distribution of *Launaea acanthoclada* according to environmental factors (e.g. heat load, inclination)

highest phytomass of Launaea observed in situations with northern exposure and high inclination

Regression model for *Launaea acanthoclada*



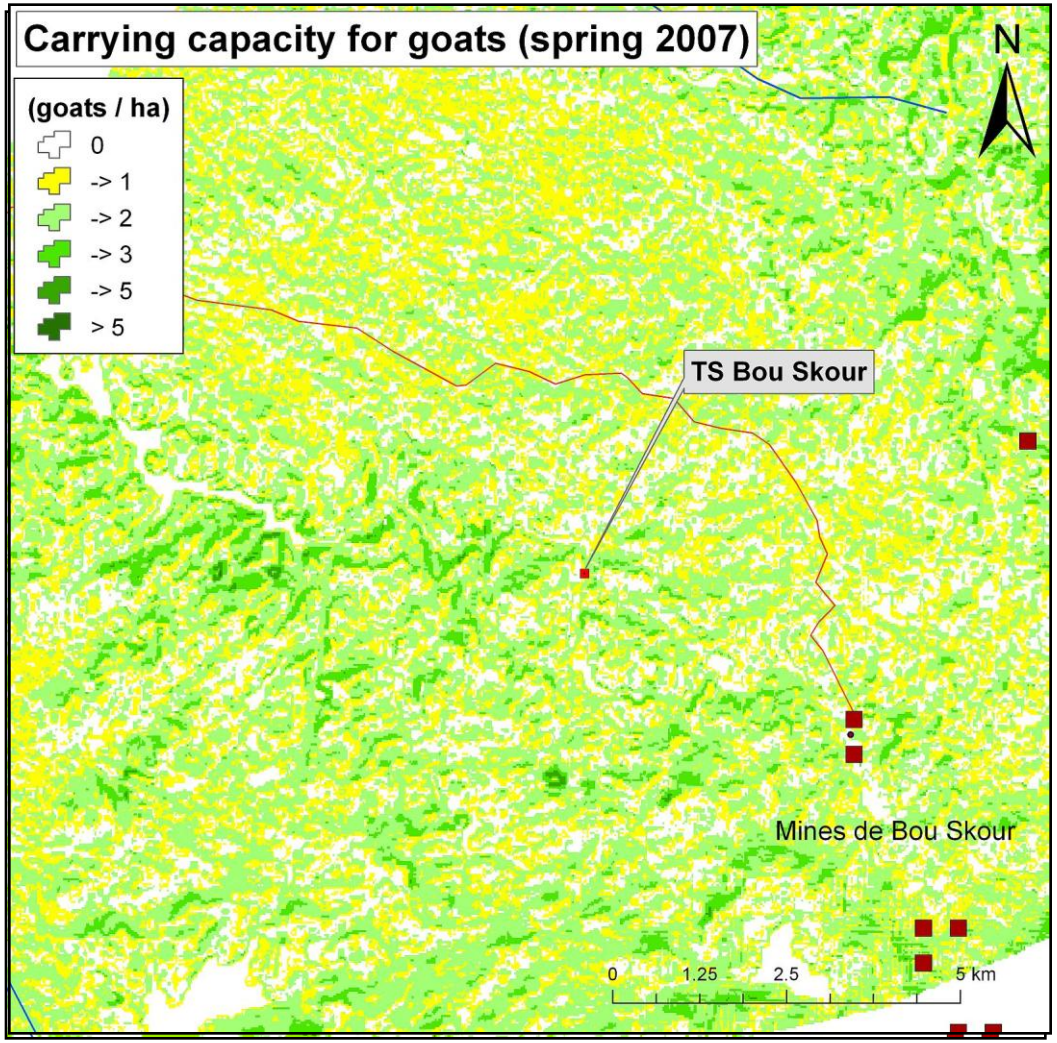
Pastoral resources: spatial upscaling (based on the Digital Elevation Model)

Spatial model for *Launaea acanthoclada*:

Summation over dominant species (5 dwarf shrubs , 5 annuals) integrating temporal variability

Calculation of animal requirements (goats, sheep)

Result: carrying capacity for sheep and goats in spring



- Pastoral management
  - Spatial pattern of pastoral land use
  - Tracking of seasonal migrations with ARGOS-collars
  - Tracking of sedentary flocks with GPS-collars
  - Land use modeling

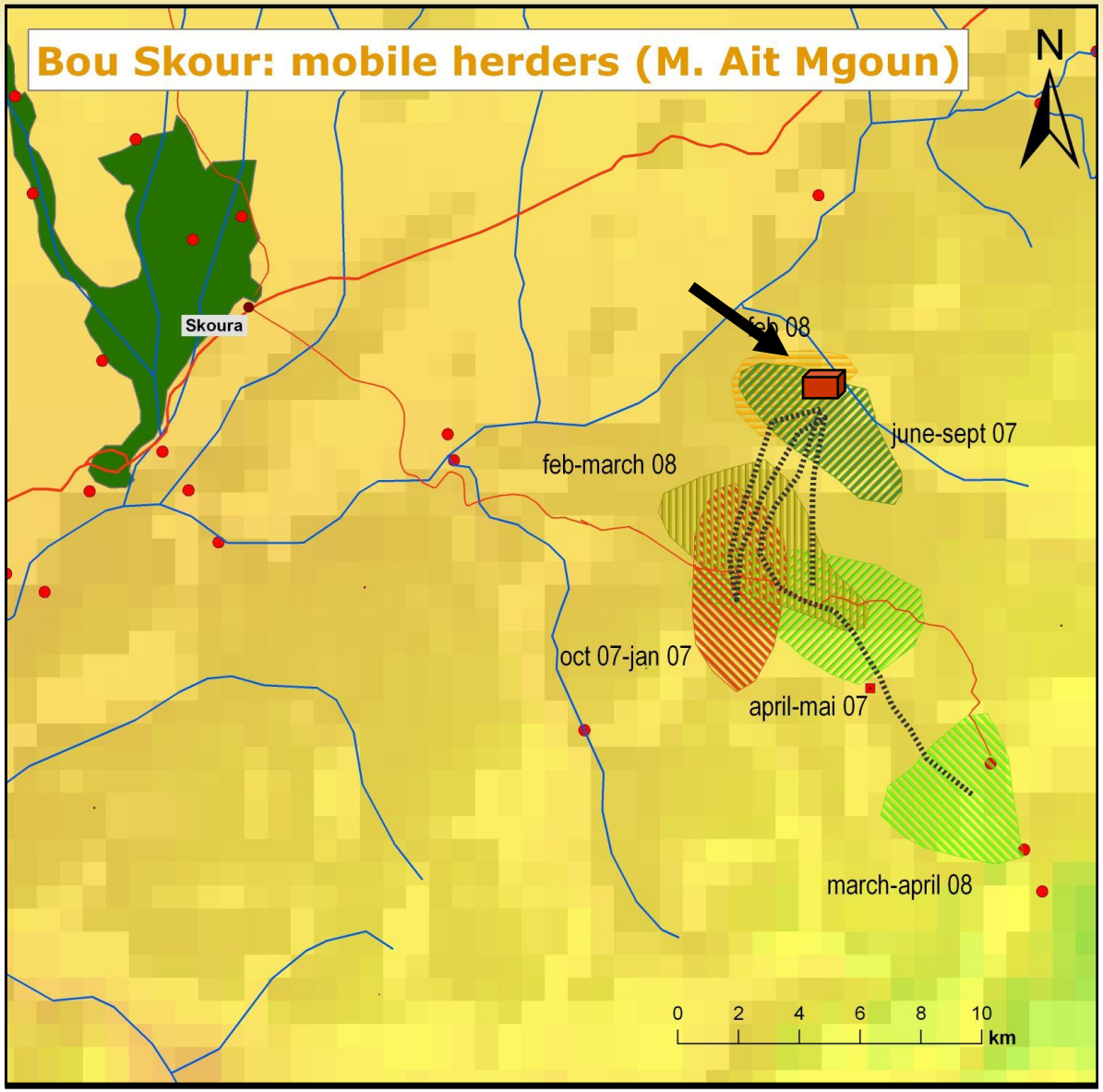
Pastoral management: tracking experiments

Tracking of seasonal migrations with ARGOS-collars:

- 3 transhumant flocks
- 3 fractions (Ait Mgoun, Ait Toumert, Ait Zekri)

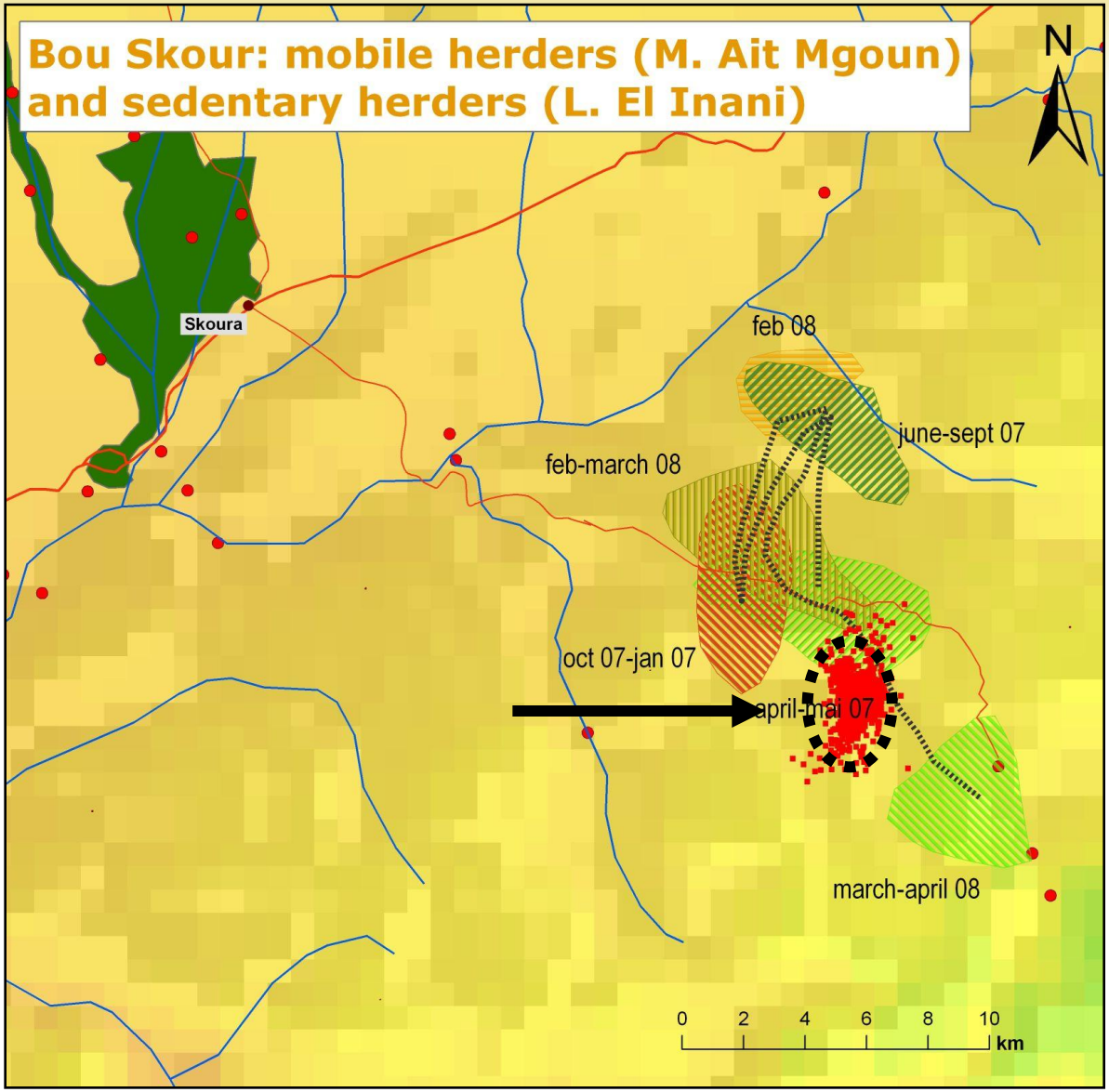
Pastoral management:

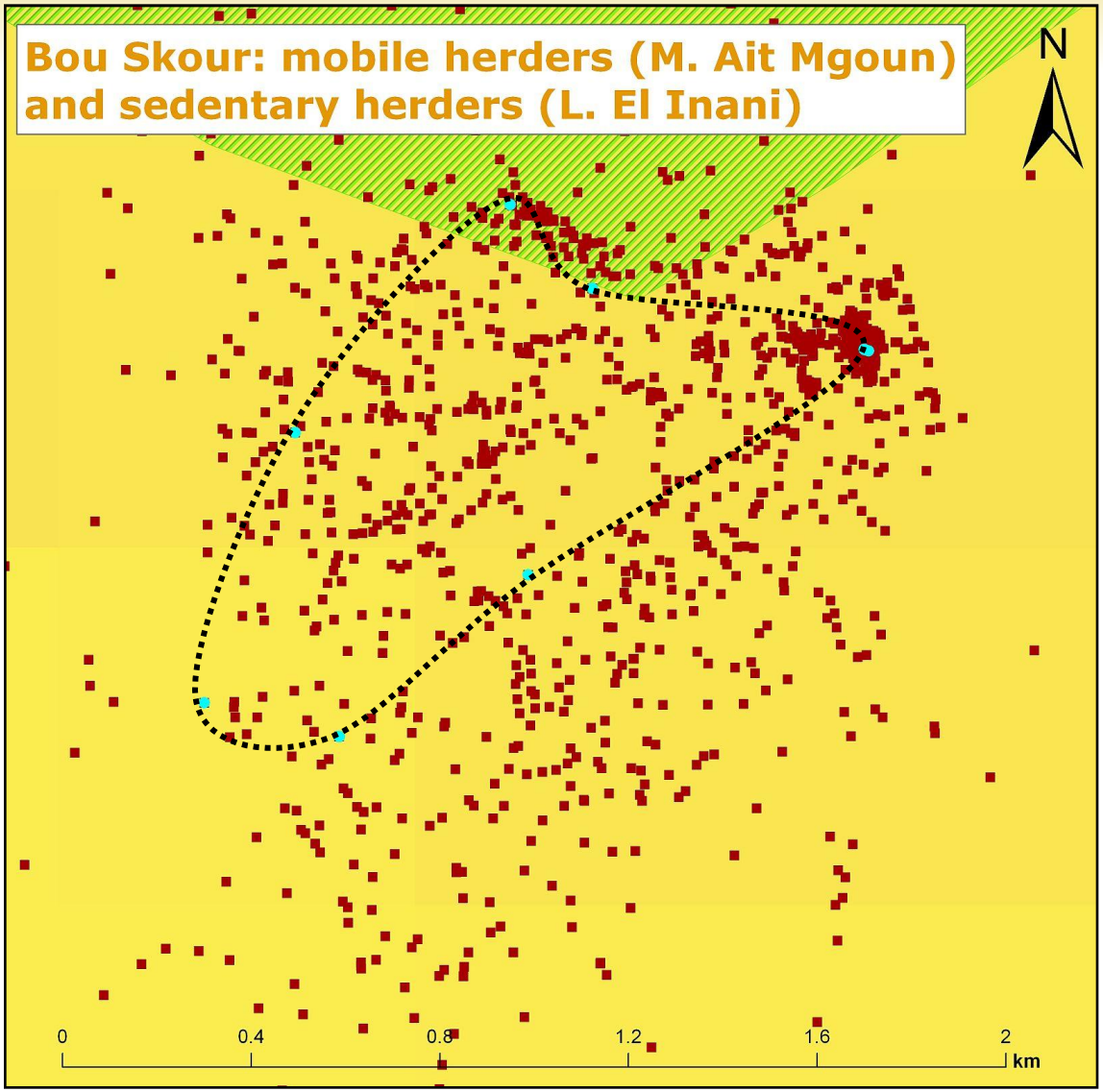
- case study M. Ait Mgoun, Bou Skour



Tracking of sedentary flocks with GPS-collars:

- case study L. El Inani, Bou Skour





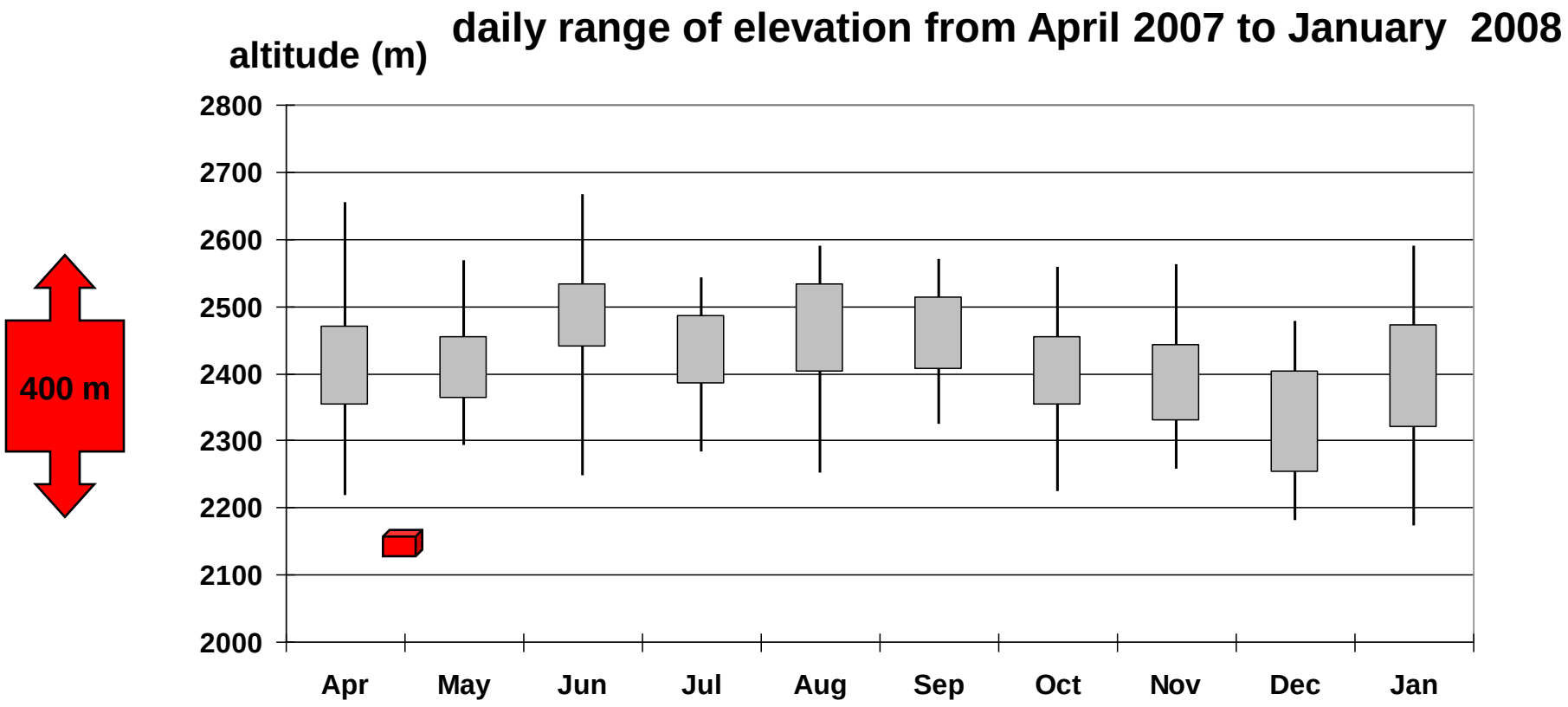
GPS - tracking of sedentary goats at Bou Skour:

- typical daily track: ~ 4 km
- mean range radius: < 3 km

..... track 27.9.2007

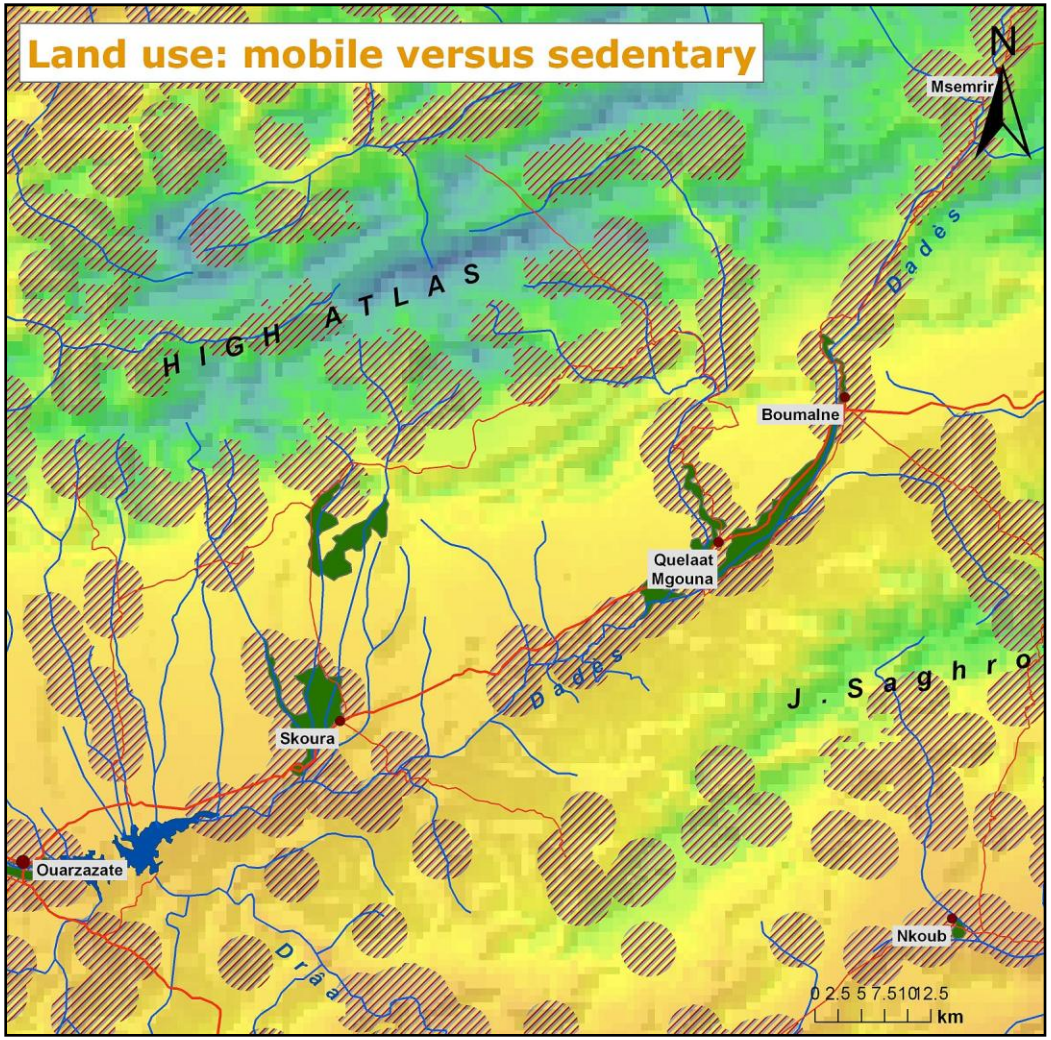
Tracking experiments: vertical variations

- daily altitudinal range: < 400 m
- small seasonal differences



Pastoral management: land use modeling

- 36 % of the area are used by sedentary herders
- 64% are accessible to mobile herders



Legend:

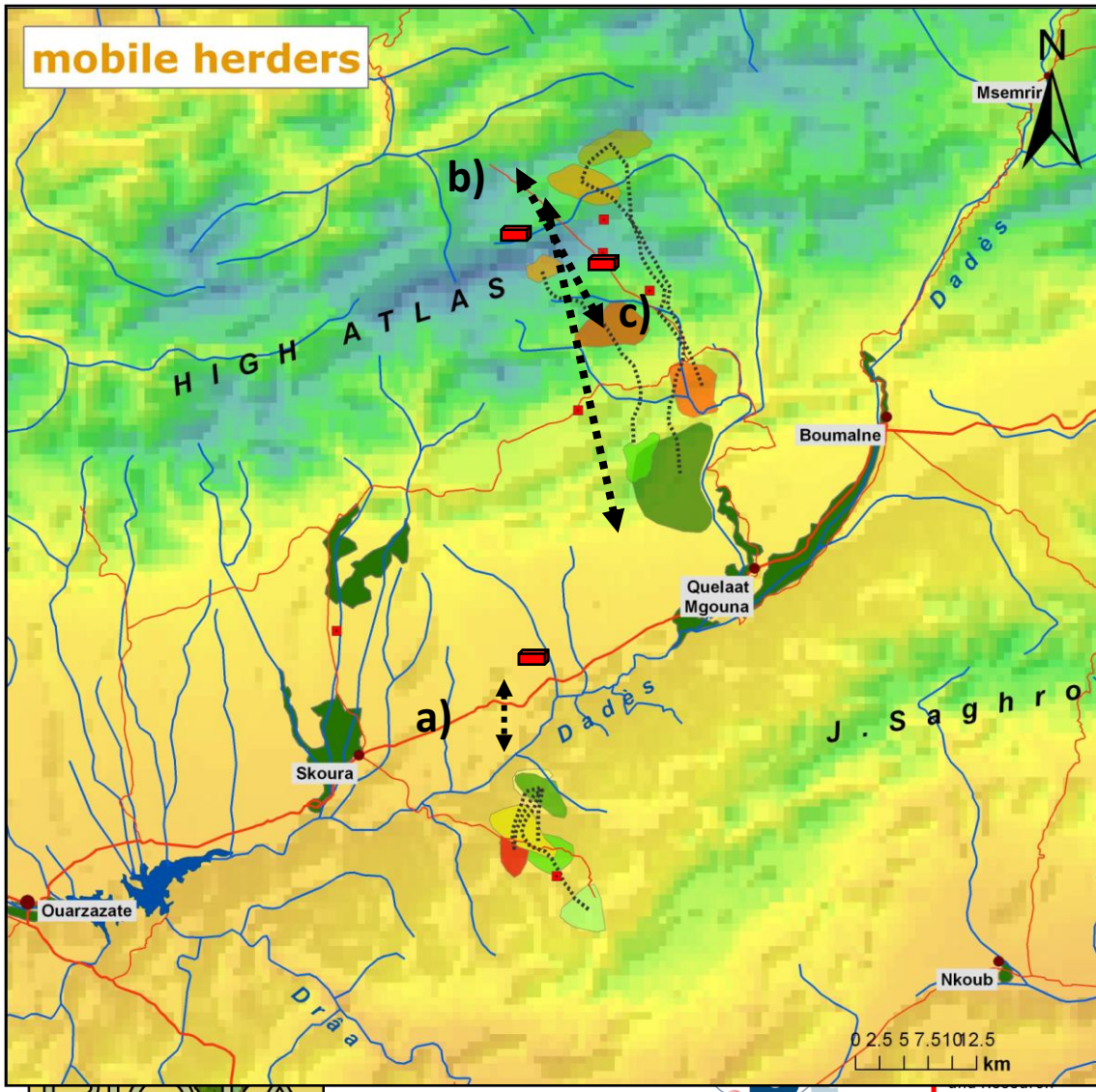
- mobile flocks (Argos)
- Village flocks (Collars)
- rangeland (sedentary flocks)
- **rangeland (mobile flocks)**

Pastoral management: Local grazing systems

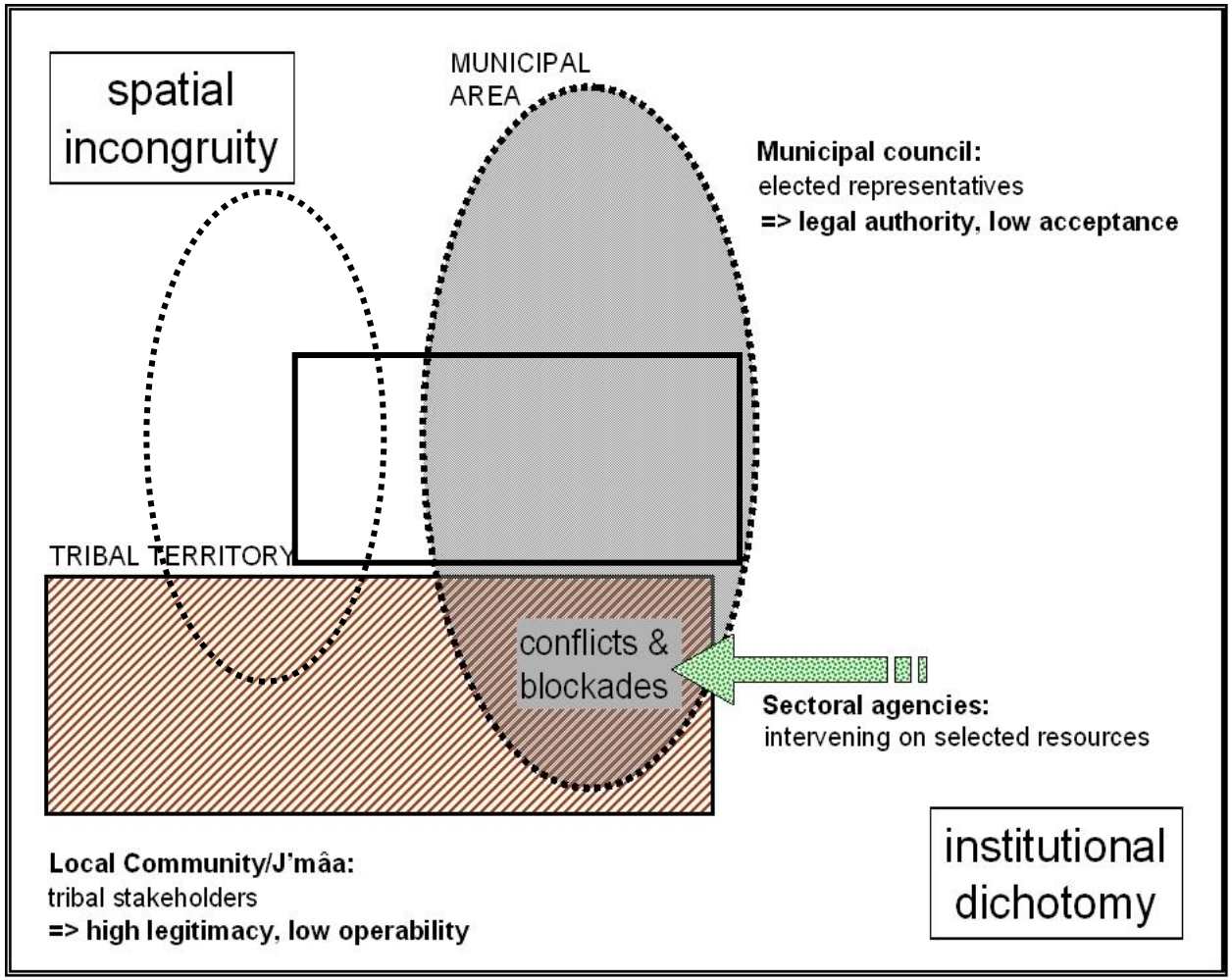
a) small scale movements (short amplitude).

b) movements from foothills into the High Atlas (medium amplitude)

c) migration from plains to the High Atlas (longer amplitude)



Pastoral management: institutional constraints



Pastoral management: decision making

Individual user decisions play an important role in actual patterns of mobile pastoral land use. They depend on a complex ponderation of costs, risks and benefits of mobility. Important factors are:

Resource availability:
- spatiotemporal fluctuations of available pastoral resources
- access to water and protected camp sites

Risk assessment:
- diseases
- weather
- conflicts

Cost assessment:
- transport costs / animal losses during migration vs. productivity benefits

Pastoral management: decision making

Convenience factors:

- housing
- education
- family relations
- access to market

Institutional constraints:

- ancestral territories
- decisions on land conversion (urbanisation, agriculture)
- borders

Conclusions:

- mobile pastoralism is an intelligent adaptation to spatio-temporal fluctuations in resource availability
- sedentary user compete with mobile pastoralists with for resources (fodder, fuel wood, land)
- the actual pressure on vegetation causes severe degradation
- the decision for or against mobility depends, at user level, on complex ponderations of costs, risks, benefits and perception of the future
- there is no simple strategy to encourage mobile pastoralism. Politics have to consider institutional constraints and convenience factors

Outlook

- expand models of pastoral productivity to the whole study area
- intensify mechanisms for model application in the field
- Integrate other factors into the model (rainfall variability)
- Methodological innovations to integrate other aspects like life history strategies of key species for proper management respecting principles of biodiversity conservation

THANK YOU