CENTRO DE INVESTIGACIÓN Y TECNOLOGÍA AGROALIMENTARIA DE ARAGÓN

# Technical basis for integrated pasture management: a participative approach

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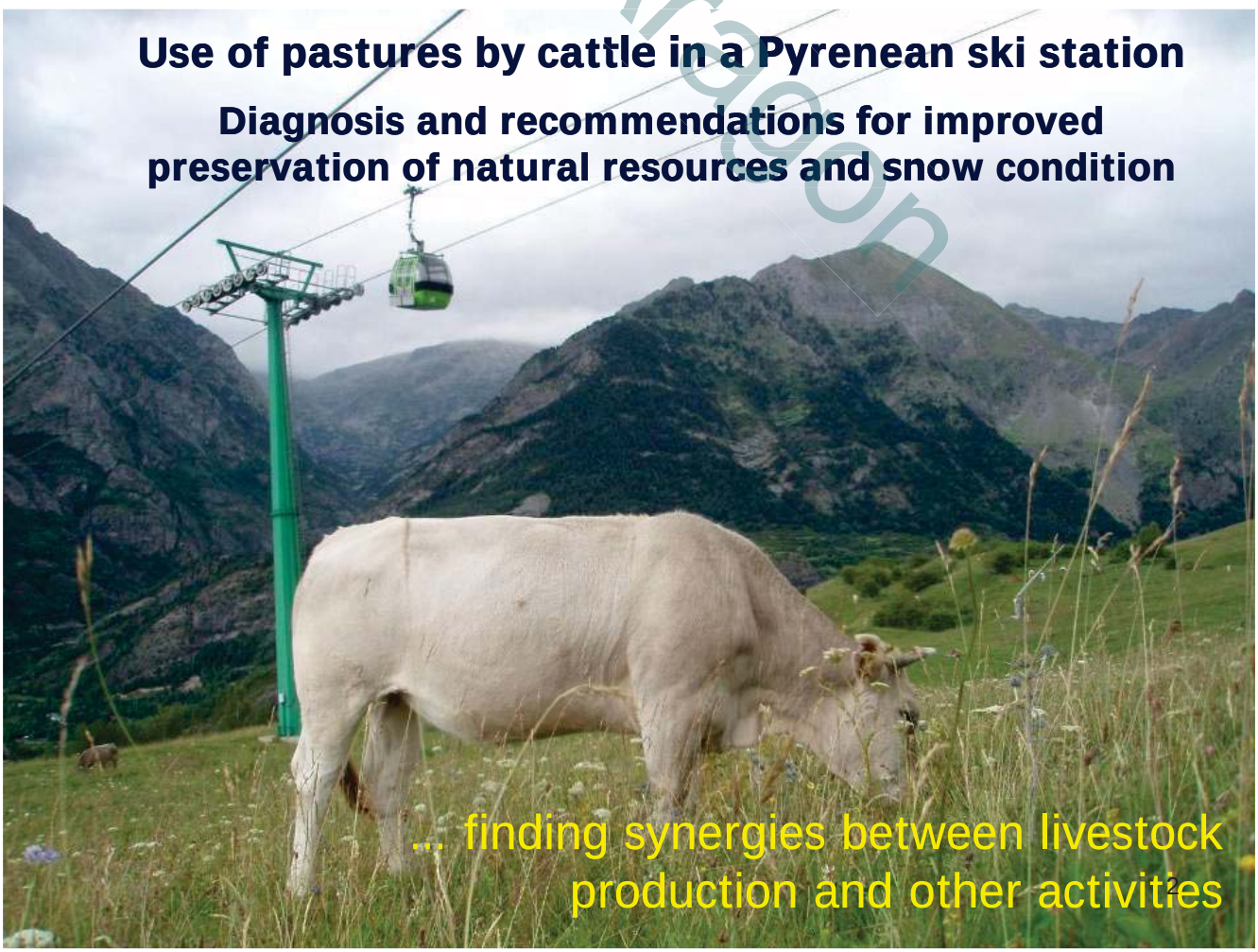


# Livestock and ski… Symbiosis vs. Competence?

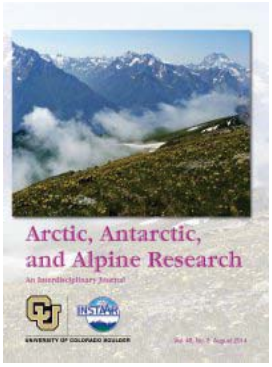
## Synergies

- **Livestock:** forage resources in high mountain ranges used for a large part of the grazing season

- **Ski resort:** pasture consumption avoids residual biomass during the winter and guarantees the stability of the snowpack during the winter



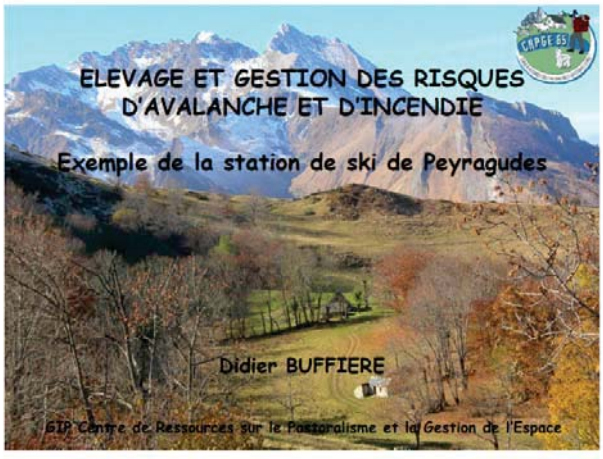



Mayer y Stöckli (2005).

"*Long-Term Impact of Cattle Grazing on Subalpine Forest Development and Efficiency of Snow Avalanche Protection".*

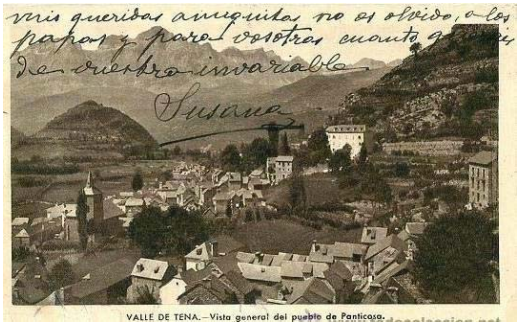
Arctic, Antarctic & Alpine Research, 37: 521-526.


Diffuser dans les Pyrénées des pratiques de revégétalisation écologiques

## *vs.* Competence

- competence for the use of resources such as land or labour
  (large reductions in animal census, particularly sheep)




5



## Technical basis for integrated pasture management in Panticosa ski station

1. Diagnosis of **current livestock farming systems** in the surroundings of Aramon-Panticosa ski resort
2. Analysis of **pasture productive potential and stocking capacity**
3. Study of **current patterns of space use by livestock** through the grazing season
4. Integration of results and **proposals for optimal management**

# Aramón-Panticosa ski station

Spanish Pyrenees, **297 ha** resort
Herd of 314 adult cows and their offspring
*(occasionally also mares and their foals)*
Grazing season of 71 d in 2011:
early summer 14/6 to 28/7
+ early autumn (30/9 to 27/10)

## 1. DIAGNOSIS OF CURRENT LIVESTOCK FARMING SYSTEMS

**Structured interview** to all farmers (10) whose herds used the ski station

- *labour*
- *herd size*
- *land use*
- *management*
- *technical performance*
- *attitudes and opinions*





### a) Production system

Similar farm management and performance to other close areas, except for:

- high **farmers' pluriactivity** associated with tourism
- increasing importance of **winter transhumance** out of the valley
  reduces dependence on purchased feedstuffs
  releases workload (available for other economic activities)

## b) Farm dynamics and objectives

**Continuity** ensured on a medium term, maybe low in the long run...

Farms **stable** in terms of size and management
few changes envisaged in the future
technical < economic objectives and family's quality of life





## b) Farmers' opinions and attitudes about tourism-ski

- the valley and their farming activity had benefitted from the ski resort
  - general improvement of socioeconomic conditions and infrastructures
  - alternative for diversification and capitalization of farming activity
- the ski resort profits from the ecosystem services provided by livestock


**SYMBIOSIS**

## Livestock as a tool for environmental management

- Adequate and sustainable pasture use

  - vegetation community: intensity / season
  - expected positive outcome for concurring land uses





## Livestock as a tool for environmental management

- Adequate and sustainable pasture use

  - vegetation community: intensity / season
  - expected positive outcome for concurring land uses

- Free ranging herds

  - site preferences depend on biotic and abiotic factors

    *amount and quality of available herbage, slope, water, salt, mineral supply, roads, fences, shade, wind exposure*

  - patterns may change during the grazing season

→ Determine pasture productive potential & stocking capacity

→ Study actual pasture use by livestock through the grazing season

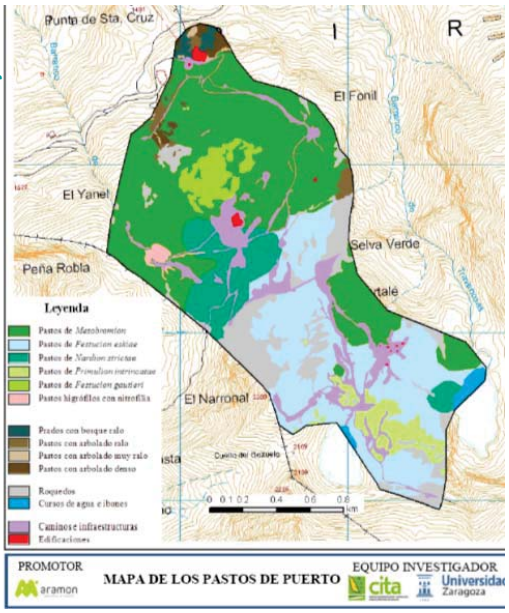
→ Suggest correcting measures where needed

## 2. ANALYSIS OF PASTURE PRODUCTIVE POTENTIAL & STOCKING CAPACITY

### a) Pasture types and distribution

- Photographic interpretation [http://sitar.aragon.es](http://sitar.aragon.es)
- Field research – inventaries, GPS

**ArcGis 9.3**




- Soil use
- Phytosociological classification

**227 ha grazable (76% area)**

| | | | |
|---|---|---|---|
| *Bromion erecti* | 37% | roads/ski tracks and buildings | 10% |
| *Festucion eskiae* | 22% | hygronitrophylous pastures | 1% |
| *Nardion strictae* | 8% | dense forest pastures | 2% |
| *Festucion gautieri* | 3% | open forest pastures | 1% |
| bare rock areas | 11% | | |





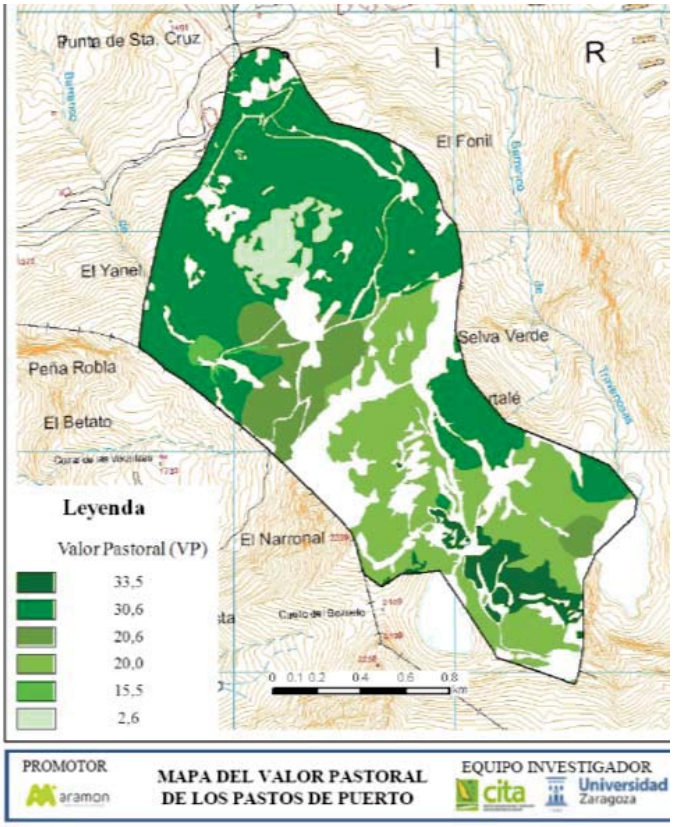
Pastos de *Mesobromion*

Pastos de *Nardion strictae*

Pastos de *Festucion eskiae*

Pastos de *Festucion gautieri*

## b) Pastoral value and stocking capacity




- **Pastoral value** (0-100)
  of each community:
  *% of a given species * specific index of each*

- **Stocking capacity** (LU/ha)
  - Pasture productivity and Pastoral Value
  - Total area of each pasture type
  - Animal requirements

Stocking capacity
1.24 LU/ha during the summer
(total: 282 LU)



15

## 3. STUDY OF ACTUAL PASTURE USE BY LIVESTOCK THROUGH THE GRAZING SEASON

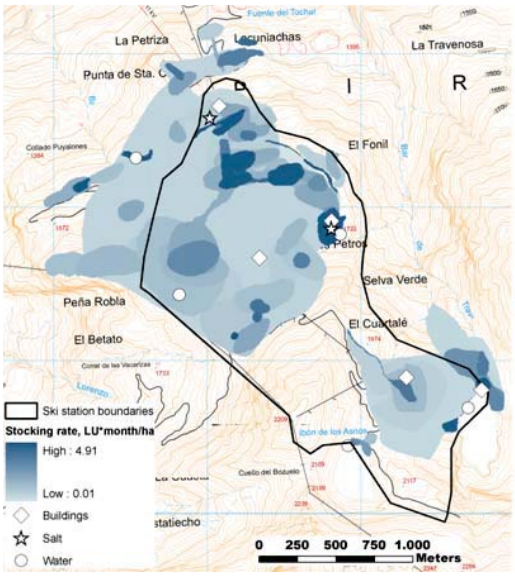
Weekly observation:

- scan-sampling at 30-min intervals during daylight
- no. heads, activity, position… on-site recorded on a map
- transfer to Geographic Information System (ArcGis Desktop 9.3)
- biotic & abiotic characteristics of each pasture polygon

16

## Calculations

- For each grazed polygon in the ski station (n=217):
  - stocking rate (LU*month/ha)
  - vegetation type, pastoral value
  - altitude, slope, exposure
  - distance roads, buildings, water, salt
- Same for non-grazed vegetation types / land use polygons (n=73)
- For each pasture type/land use category:
  - Ivlev's electivity index (+1 to -1)




*Distribution of stocking rate, buildings, salt and water points*

## Comparisons

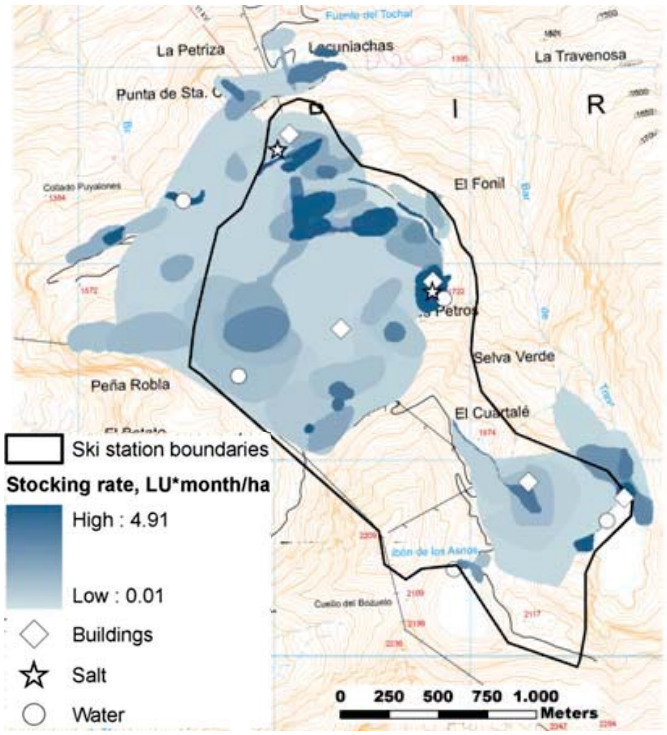
- Abiotic factors in grazed vs. non-grazed areas
- Correlations among stocking rate and abiotic factors
- Space use in summer vs. autumn





# Results

- Livestock used 190 ha (**64% of the total area**)
  stocking rate of 0.646 LU*month/ha
  during 2.3 months




282 LU/ski station/summer
=
pasture stocking capacity

animal censuses
adjusted
to pasture offer

*Distribution of stocking rate*

- Livestock grazed on 189 ha (64% of the total area)

- They rejected 36% of the available area:
  - areas of lower **pastoral value**
  - with higher **slope**
  - at higher **altitude**
  - farther from **salt areas**
  - farther from **infrastructures**
  - not limited by distance from water

| | Grazed | | Non-grazed | Sign. |
|---|---|---|---|---|
| Altitude, m | 1695 | < | 1895 | *** |
| Slope, % | 16 | < | 23 | *** |
| Aspect, º from N | 254 (S) | ≠ | 156 (NW) | *** |
| Distance to salt, m | 461 | < | 1004 | *** |
| Distance to water, m | 442 | > | 381 | * |
| Distance to buildings, m | 237 | < | 402 | *** |
| Distance to roads, m | 63 | < | 88 | ** |
| Pastoral value, points | 24.3 | > | 16.4 | *** |





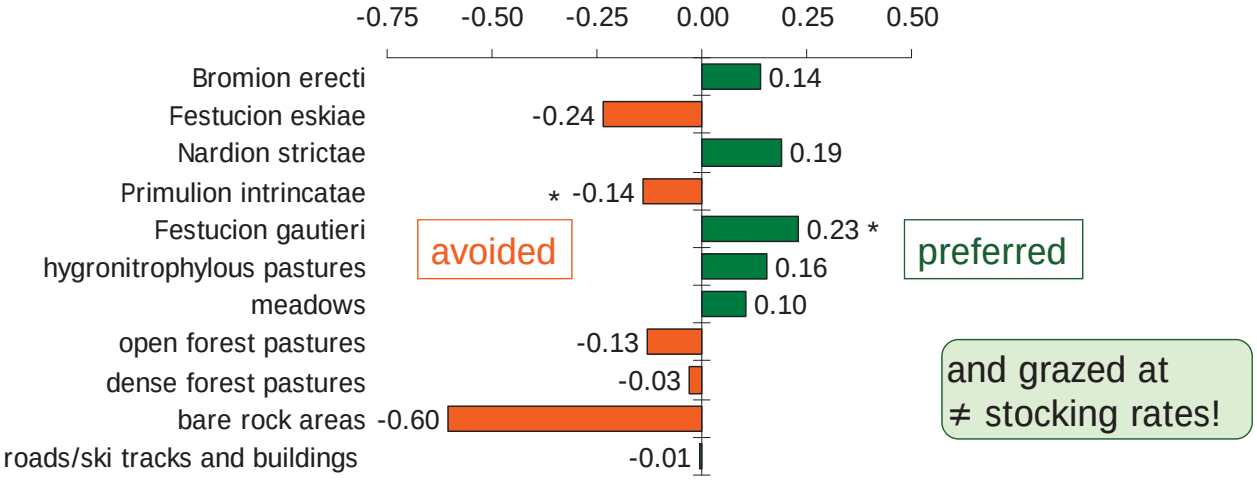
Pastos de *Mesobromion*

Pastos de *Nardion strictae*

Pastos de *Festucion eskiae*

Pastos de *Festucion gautieri*

- **Ivlev's electivity index**: pasture type / land use category




## Preference for different pasture types

- positive selection for meadows, *Mesobromion, Caricion nigrae, Nardion strictae,* and *Festucion gautieri pastures* (and areas close to buildings and infrastructures)
- negative selection for rocky areas, forests, *Festucion eskiae* and *Primulion intrincatae* pastures

21



avoided

*Festucion eskiae*

preferred

*Bromion erecti*

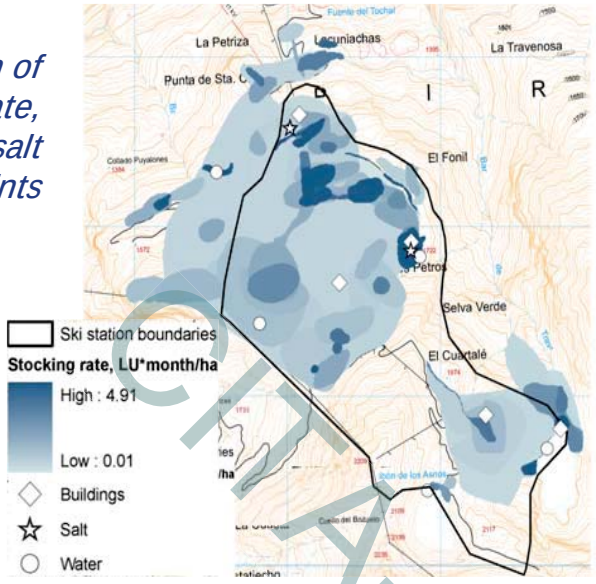
- different pastures grazed at different stocking rates
- preferences for pastures and topographical aspects changed throughout the grazing season

22

- Within grazed areas cattle distribution was not homogeneous: stocking rate related to pasture characteristics

| | r |
|---|---|
| Slope | - 0.23 |
| Distance to roads | - 0.32 |
| Distance to buildings | - 0.34 |
| Distance to salt | - 0.35 |
| Altitude | - 0.38 |
| Pastoral Value | - 0.38 * |

*Distribution of stocking rate, buildings, salt & water points*







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- Preferences changed throughout the grazing season

| | summer | | autumn | sign. |
|---|---|---|---|---|
| Stocking rate, LU*month/ha | 0.747 | > | 0.362 | ** |
| Polygon area, ha | 6.0 | < | 16.8 | ** |
| Distance to salt, m | 406 | < | 615 | *** |
| Distance to water, m | 482 | > | 329 | *** |
| Distance to buildings, m | 252 | > | 195 | * |
| Distance to roads, m | 61 | < | 149 | *** |
| Aspect, º from N | 270 (S) | > | 208 (SW) | *** |
| Altitude, m | 1672 | < | 1759 | ** |
| Slope, % | 16.6 | > | 14.4 | * |

different pastures... larger home range in the autumn

## 4. PROPOSALS FOR OPTIMAL MANAGEMENT

Comparison of actual use of each pasture type with advised management
*livestock performance, resource sustainability, stability of the snowpack*

- modifying temporal and spatial management
- providing infrastructures

Adequate:

- ***Bromion erecti*** pastures grazed according to recommendations at the start & end of grazing season
- ***Festucion eskiae*** and ***Festucion gautieri*** * pastures naturally avoided as suggested, to prevent from soil erosion




but...

- high quality ***Primulion*** pastures should be grazed through the summer
- ***Nardion*** pastures grazed only in early summer: should be grazed more intensely in the autumn

*(force use with salt in target areas or fencing access to others)*

- **hygronitrophylous pastures** by a leaking water trough in a plain: *place in steep areas + maintenance*

## Optimal SR to ensure a proper use of each vegetation type

- modifying temporal and spatial management
- providing infrastructures





# Conclusions

a) Farmers have adapted their traditional production systems to allow for pluriactivity related to tourism.
They are aware of the mutual benefits between the ski resort and grazing activities and prone to collaborate.

b) Current stocking rates are adjusted to pasture carrying capacity, although use of space is not homogeneous but conditioned by different biotic and abiotic factors

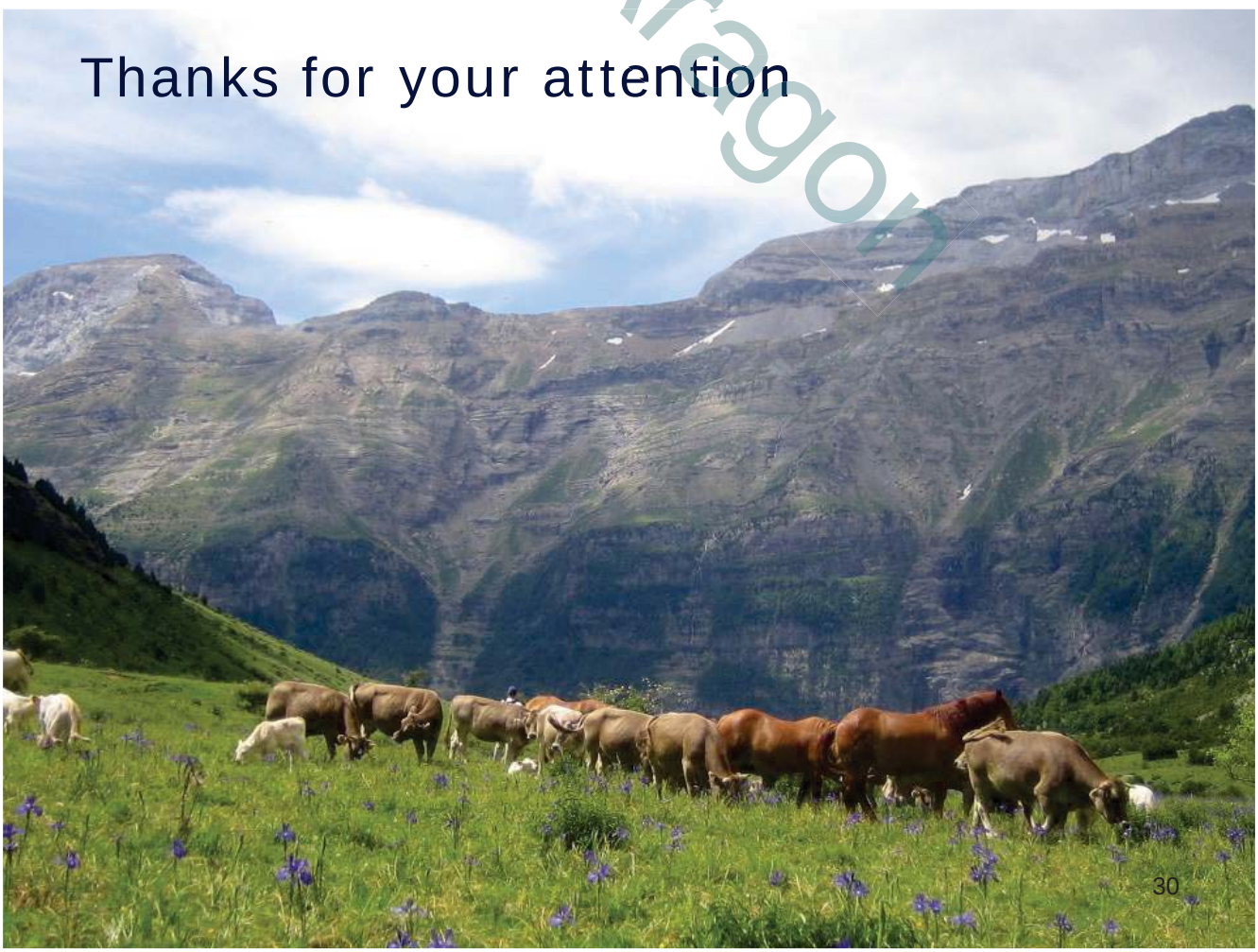
→ Some pastures are grazed according to recommendations for sustainable management, livestock performance and enhanced preservation of the snowpack

→ Proposals for a better use of some areas include modifying animal management and providing infrastructures

Mutual benefit for farmers and the ski resort
Interest of a participative management design


Can livestock be a tool for landscape preservation?
finding synergies...
efficient animal production
+ environmental services
29

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