Can global grassland regions be a backbone of sustainable food production?

A case study roadmap

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Background:
The «feed-no-food» narrative

- Grassland as the largest agricultural land resource, with a one-option-only use
- Grassland-based production has a better human-edible energy conversion ratio. Berton et al., 2020, Agricultural systems
- Grassland-based production is feasible. Leiber et al., 2017, animal; Gazzarin et al., 2011, Agrarforschung Schweiz
- Scenario of a grassland-based animal production for global human population. Schader et al., 2015, J Royal Society Interface

FAOSTAT, 2011
Background

We have an issue with global grassland productivity

Global land use, food protein production and emissions by livestock

Feed sources

Grassland

Arable crops, potentially edible

Inputs (mio ha)

1945

320

170

38

36

240

250

Outputs (mio t protein)

Ruminants

Poultry / Porc

Main emissions

Methane

Ammonia / Nitrous oxide / bioactive nitrogen compounds

Data compiled from Mottet et al., 2017, Global Food Security
Background

Overstocked and underutilised: Example Tibetan Plateau in China

Fig. 1. Map showing the subject area of the Tibetan plateau in Asia.
Overstocked and underutilised:

Example Tibetan Plateau in China

Photo: F. Leiber
Overstocked and underutilised: Example Tibetan Plateau in China

![Bar chart showing changes in the area of bare-land degraded grassland between 1986 and 2006 in seven counties within the Qinghai province (Maqin, Zeku, Xinghai, Dari, Zaduo, Qumalai and Maduo) in the headwater area of Yangtze and Yellow rivers (data from Ma 2007).]
Background

Overstocked and underutilised:
Example Yssik-kul region, Kyrgyzstan

Photo: F. Leiber
Background

European mountain regions:
Understocked, underutilized and encroached

Photo: E. Hiltbrunner
Background

European mountain regions: Extensively stocked and “just maintained”?

Estimated protein yields per ha alpine summer pasture per season

- Dairy cows
  - <80 kg
- Suckler beef
  - <20 kg
- Fattening
  - <30 kg

(FiBL preliminary model, assumed 2t biomass/ha)

System nitrogen retention (% of intake)

- Dairy cows
  - 22-26
- Suckler beef
  - 6-9

(Estermann et al., 2001, Animal Research)
What do grassland regions deliver to the rest of the world?
And what could be their potential?
If loss of productivity and loss of ecofunctions of grasslands go hand in hand – can they turn back hand in hand?

Need for regional case studies / pilot projects
- Identify the socioeconomic measures
- Identify the practical measures
- Demonstrate such turns
- Quantify potential productivity margins
- Estimate the costs for a turn
A case study in Yssik-kul region, Kyrgyzstan

Increasing productivity and family incomes by shifting pasture/land use

- From sheep to dairy cows
- From chaos to rotation
- From one cut (late July) to two cuts (June and August)
Dairy Plants in Issyk-Kul region of KR.

Cheese export to Kasachstan, Russia and China (grassland feeds cities...)

Cash-flow to families
A case study in Yssik-kul region, Kyrgyzstan

- Severe overstocking
- Lack of pasture management
- Lack of animal species differentiation
- Problems with winter feed production/quality
A case study in Yssik-kul region, Kyrgyzstan

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- Poverty
- Traditions
- Unsolved loss of structures even 30 years after the end of the Soviet Union
- Lack of investments

Productivity of the regions is hardly above subsistence, and grassland swards and soils are lost with high dynamics.

Hardly anyone other than farmers themselves is nourished and at the same time the land is ruined for long terms.
First pasture management project 2016-2019 (part of an IFC/worldbank project)

Training and individual advisory in feeding, breeding, and veterinary treatments

Introducing electric fences for
- Separating animal species/categories
- Rotational pasture management
- Protecting winter feed from grazing herds/flocks
Pasture Altynbek

Protein concentration Pasture Altynbek

Crude protein (g/100g DM)

Net Energy for Lactation (NEL) in Swards of Altynbek

Fibre (ADF) concentration Pasture Altynbek

Pasture Baigasy

Crude Protein in pastures Baigasy

Net Energy for Lactation (NEL) at Baigasy

Fibre (ADF) concentration in Baigasy Pastures
First pasture management project 2016-2019

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First pasture management project 2016-2019

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FiBL
First pasture management project 2016-2019

Main success:
› Impulse.
  › 3 farmers completely changed from sheep to dairy cows
  › Two cooperatives were founded in order to lower the risks
  › More than 70 farmers in the region started using fences
Development of a case study in Yssik-kul region

› **Three sites (villages)**
  › Each is either a cooperative or the whole community engaged

› **Investments/interventions**
  › Pasture management: fencing systems
  › Winter feed production: basic technology for cutting, collecting, large hay barns with air-drying system (roof-heated)

› **Contract**
  › Investments for collaboration
  › -> infrastructure will be financed from Europe, therefore 5-years obligation to use it as agreed:
  › Separation of animal species
  › Managed grazing
  › At least two cuts per year
The guiding questions for a Case study in the Yssik-kul region followed by a team of local scientists, local PhD students and Swiss scientists/advisors

**Socioeconomic questions**
- **How large is the potential margin of animal protein productivity per ha?**
- What impulse is necessary to move the situation?
- **At which cost can the situation be moved?**
- How will society change?

**Agro-Ecological questions**
- What impact have the measures on sward composition, sward stability, sward yields?
- What impact have the measures on animal health, productivity and grassland conversion?

Feed these data into global models
How, if this would be just one knot in a global net of pilot/case projects to elevate sustainable grassland productivity?

Thank you for your time! reach me at florian.leiber@fibl.org