

Adaptation strategies of breeders facing global change in harsh conditions

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Introduction

Global changes impact breed societies through complex and diverse factors such as global economics, climate change, management and degradation of rangelands, societal demands especially from youth, and new technologies including information and communication technologies. The main objective of this research developed by Livestock farming and local development network (LiFLod, <http://liflod.org/>) network is to better understand the mental models of local stakeholders for global change and adaptation strategies. Our hypothesis is that in harsh conditions breeders with diverse objectives adopt more or less similar strategies when faced with global change.

Methods

The three case studies

The research was developed in three contrasting pastoral contexts with harsh condition:

- The Qilian mountains located at the North-East of Tibetan Plateau, along the Silk Road in Central China. The winter and the beginning of spring are very cold, yet the breeds of yak, sheep and goats are well adapted. The feeding systems are based on the transhumance into the highlands during the summer. Reducing the rangeland degradation and, at the same time, increasing the productivity of the herds are the two main challenges for all the ethnicities with livelihoods based on livestock activity.
- The Bedouin area along the Mediterranean coast in North-Western Egypt, between the Nile delta and the border of Libya. Between 1995 and 2011, sheep and goats breeders faced a very strong drought with an average annual rainfall less than 140mm. Due to the

very weak productivity, and serious rangeland degradation, feeding systems are mainly based on agricultural by-products and concentrates.

- Southern Patagonia in Argentina. It is a cold and dry area, with an annual rainfall of 120-150 mm, slightly increasing towards the Western and Southern part, near the Andean cordillera. The main challenge is the low productivity of the rangeland which can not feed more than one or two sheep per 10 hectares.

Data collection and analysis

In each of the three contexts, a sample of 20-25 local stakeholders including farmers, traders, agents of development agencies, association leaders, representatives, local policymakers, and some not associated with the livestock sector were identified. The choice of the stakeholders was made after a large literature review by the local team in partnership with the local institutions interacting with the livestock sector.

Each stakeholder was interviewed by a research team of three-to-five scientists from complementary disciplines, especially human sciences and farming sciences. According to the discussion and mental models of each stakeholder, the research team had to answer the four following questions: (1) Long and short-term history of local livestock sector; (2) Main factors of change both on family and community scales; (3) Main challenges for livestock and agricultural sectors; and (4) Different scenarios for the future and main determinant factors. The report was written by the team immediately after the interviews in order to capture the stakeholder discussions, and share and integrate them into the conclusions in the report. The set of reports is the database for each context. The reports were analyzed individually, by stakeholder group, by context, and by combining these 3 databases.

Results

The first result is the perception of breeders about global change. It is a complex set of different factors. Some have negative impacts, whereas others have good effects on the livestock sector. For example, the high demand of animal products increases the price and offers better access to the market. It is easy to sell at a good price. On the other hand, the drought and instability of the prices, and strict norms in food safety and production processes have negative impacts on the livestock sector. Some factors, as the new social demands of local people, especially the young, have at the same time both positive and negative impacts because they require changes in farming and marketing systems, while helping to improve life conditions.

The second result is the common adaptation strategy to improve the efficiency of use of local resources. Facing new constraints and opportunities, breeders aim to maintain or increase herd productivity, adding in a first phase, appropriated practices, especially in feeding and water management. For example, to produce irrigated forage or use by-products for feed to compensate for lack of forage due to droughts or to take advantage of new markets. If insufficient or unsustainable, they are able to change their farming systems by adopting more sustainable alternatives in the short or long-term according to need. One example is the migration of family members to off-farm jobs for additional income to the family. Another example is the development of irrigated agriculture for additional income, but also to feed the family or to profit from new market cash crops. In this way, according to local and global markets, some farmers invest in intensive livestock farming systems including fattening, feedlots, dairy production or intensive poultry production.

The third result is the new social demand which strongly impacts the livelihoods and life conditions in rangelands. In this context, young people and their parents wish to be better integrated into urban society, at least to achieve to similar pay and similar life conditions as in urban areas. This means better access to education, health services, communications and leisure, pensions for old farmers, and so on.

The fourth result is the major role of public policies to incite and help the livestock sector to find sustainable alternatives. These include: water infrastructure and feeding facilities in Egypt; subsidies to build equipment and intensify livestock farming systems in China; loan facilities to buy sheep and other inputs in Argentina; and social services, road infrastructure and a tendency towards environmental protection and land sparing in the three contexts.

Discussion and Conclusions

There are similarities between the mental models of breeders in the three contexts about the complexity of global change and the main factors of change. They focus on the multiple roles of livestock in reducing vulnerability, (Chambers 2006; Adger 2006), mainly in harsh contexts, (Ashley 1999), and their major roles in diversification and intensification processes (Duteurtre and Faye 2009). The alternative systems are based on better efficiency of resources available to family and community, especially scale to integrate feed production, purchase of by-products, appropriation of buildings and equipment, and more efficient social services, as mentioned Levin (1999, cited by Cumming *et al.* 2006). Among the drivers of future scenarios and the interactions between society and ecosystems, breeders including young people show a strong attachment to the land and pastoral culture. Social links, especially at the collective level, are particularly important in the governance of their resilience, consistent with previous findings (Folke *et al.* 2005; Janssen and Ostrom 2006). Consistent with Kammili *et al.* (2011), local and national public policies were found to be particularly relevant in this context.

References

- Adger WN (2006) Vulnerability. *Global Environmental Change* **16** (3), 268–281.
- Ashley S, Holden S, Bazeley P (1999). Livestock in Poverty-Focused Development. Crewkerne: Livestock in Development. Available from <http://www.smallsto-ck.info/referencence/LID/livestock.pdf>
- Cumming GS, Cumming DHM, Redman CL (2006) Scale mismatches in social-ecological systems: causes, consequences, and solutions. *Ecology and Society* **11**(1), 14.
- Duteurtre G, Faye B, (2009) L'élevage, richesse des pauvres : Stratégies d'éleveurs et organisations sociales face aux risques dans les pays du Sud. Editions Quae, Versailles, France, 286p.
- Folke C, Hahn T, Olsson P, Norberg J, (2005) Adaptive governance of social-ecological systems. *Annual Review of Environmental Resources* **30**, 441–73
- Janssen MA, Ostrom E (2006) Editorial: Resilience, vulnerability, and adaptation: a cross-cutting theme of the International Human Dimensions Prog. on Global Environmental Change. *Global Environmental Change* **16**, 237-9.
- Kammili T, Hubert B, Tourrand JF (2011) A paradigm shift in livestock management: from resource sufficiency to functional integrity. 28th and 29th June 2008, Hohhot, China, Cardère Editeur, Lirac, France, 272p.