Overcoming Winter Mortalities and Poverty in Mongolian Pastoral Systems: Which Framework for the Definition of Resilience-Based Strategies?

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Abstract

Peaks of livestock mortality regularly occur in Mongolia when harsh winters follow droughts. These frequent events called dzuds are one of the main factors of vulnerability for the Mongolian pastoralists; vulnerability which contributes to maintain 30% of the country’s population in a state of poverty (World Bank 2012). A resilience-based approach is therefore needed to define any development strategy.

Resilience is a measure of the ability of systems to absorb perturbations and still persist (Holling 1973). It is often represented by the attraction basin metaphor which describes the movements of a system around its equilibrium point, in response to perturbations: the largest the basin is, the most resilient the system is (Elmqvist et al. 2003).

However for most systems, it is difficult to use this approach because it requires a topographical representation of their dynamics.

The viability theory makes it possible to overcome this difficulty. Viability is a mathematical framework whose aim is to define, through a state-control approach, strategies that respect pre-defined constraints, possibly in a stochastic environment (Aubin 1991). To apply the viability theory, no topographical basin representation is required. One of the main principles of the viability framework is to identify a set of initial states – the viability kernel – from which at least one strategy ensures that the studied system respects the constraints through time. Moreover, a variant of the viability kernel can be used on systems that are not respecting yet the defined constraints. It is called the capture basin and is the set of initial states from which at least one strategy points toward the viability kernel. It is very close in meaning to the attraction basin (Martin et al. 2011).

Viability could therefore be particularly well adapted to the Mongolian pastoral systems confronted with frequent climatic shocks and poverty. Definition of development strategies in this framework would have to identify the management schemes with the largest capture

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basin possible, to maximize their chance of success.

Practically, a capture basin would look like a set of initial states defined by density intervals of livestock species. From this area there would be one or more production strategies that lead the system into a state where herders maintain their livestock in a satisfactory productive situation, by decreasing their vulnerability to climate uncertainties while securing their income above the poverty line, despite the risks of dzuds. This state would belong to the viability kernel.

To define the capture basin as such, the strategies would have to take into account the different resistance and productivity patterns of the five local species that are sheep, goats, cattle, horses and camels. The large species are much more resistant to dzuds than the small ones, but the production of the small animals are more profitable (goats produce cashmere and sheep one the most popular meat in Mongolia). Strategies would therefore have to arbitrate between the genders and proportions of the different species, and to preserve the renewal capabilities of the supporting pastures, their numbers should also be taken into account.

References


Keywords: Livestock mortality, Climate stochasticity, Mongolia, Snow disaster, Multi species production strategy, Viability, Capture basin