Bernard Hubert

The need for a conceptual paradigm shift

Business as usual vs sustainability

The "business as usual" vision tends to consider the living world as an industrial process simply turning inputs into outputs. Following Larrère and Larrère (2015)[1], it is the kingdom of *techne*, creating artifacts, thinking in terms of stability, homogenization, uncertainty reduction, where truthfulness tests rely on the classical "validation" as a universal value. In this vision, there is a separation between human and nature ("naturalism"), and there are normative arrangements, e.g. hierarchies in biodiversity values.

Another way of seeing the living world is to consider it as transforming spontaneous dynamics to be steered and taken care of ("doing with" nature). It is the world of *physis*, where performances are evolving and unpredictable and resources emerging from interactions, and where complexity and diversity are considered as assets. Here, evaluation is expressed in terms of "robustness", i.e. its relevance when put to the test in a diversity of situations. In this vision, culture and nature are considered as the two faces of society. Priority is given to relationships and interactions, environmental feeling, techniques as an emerging process independent of theoretical frameworks, e.g. plant and animal domestication as pure products of the society-nature interface.

Two approaches to sustainability in agriculture: resources sufficiency and functional integrity

This process of establishing understandings in institutions leads to particular practices and policies which may outlast commitments to the understandings on which they were built[2]. Two philosophical approaches to sustainability in agriculture have been distinguished by Thompson (1997)[3]:

1. 'Resource sufficiency' stresses the measurement of the rates at which resources are used in production, distribution and consumption of food. In livestock production, for example, the issue is one of increasing efficiencies, reducing pollution and finding substitutes for scarce inputs. This creates policies that opt for efficiency as the main – even single – assessment criteria by universal norms (productivity: yields/ha/worker/animal).

Agricultural science currently favours 'resource sufficiency' understandings. It identifies two ways to maintain sustainability in light of declining resources: Sustainability requires either a decreasing rate of consumption or an increased efficiency or substitution with other resources. Thus, many technical recommendations regarding rangeland and uses deal with a decrease in stocking rates (in regard of

'carrying capacity') and the introduction of improved pasture, mastered in practices valued as part of modern agricultural paradigms. Research and policy must focus on increasing the efficiency at which scarce resources are consumed, by introducing new technologies with better yields, and in finding substitutes.

2. 'Functional integrity' stresses the vulnerability that may arise from a lack of understanding of the systemic interactions of production practices and innovations with processes of ecological and social renewal. It understands agriculture as a system, which embodies complex and poorly understood value commitments and ecosystem relationships. Here, policy strategies focus on resilience, the avoidance of irreversible effects and systemic understandings designed to mitigate unintended consequences. The issue is to forestall irreversible changes in an agroecosystem and to better understand critical trajectory-changing points.

"Functional integrity" strategies focus on a systemic understanding to mitigate unintended consequences and increase resilience.

The notion of 'functional integrity' presupposes crucial elements that are reproduced over time in a manner or at a rate that is contingent upon previous system states and upon interactions of different living communities within the system. The elements to be maintained might be soil fertility, crops, domestic animal herds, wildlife populations, know-how on management practices or product processing, or even human institutions such as the family, rights regimes, specified markets, or the state. Extensive livestock farming is illustrative, where stocking rates are challenged by herds mobility: forage, non-forage plants such as brush, wildlife, and products (milk, meat, wool or landscape services) exhibit complex relationships. These elements of 'range systems' can remain in a dynamic equilibrium for extended periods of time, but disequilibrium can appear suddenly (or with a substantial time lag) as a consequence of critical changes in the reproductive capacity of any single element. Human practices can threaten functional integrity if they drive the system into states from which reproductive processes cannot recover. At the same time, human practices are part of the system, and functional integrity can be disrupted in many ways, including simple failure to perform an action that is crucial to reproducing some system element or to maintain it in a changing environment (economics, policy, climate change, consumer behaviour),

There is an urgent need to shift to managing ecosystems functionalities

Prioritizing long term food security based on complex agroecosystems relies on new concepts: dynamics, thresholds, resilience, viability kernels, learning processes and collective action, based on co-evolution of a society-environment relationship facing uncertainties. We are not in a stable (or foreseeable) environment and need to manage or steward ecosystems functionalities in order to facilitate 'ecosystem services', building 'capacities', adapting to changes, and not being steered by a set of technologies.

Making changes in our social systems relies on how knowledge capacities, social institutions and human incentives can be regenerated, taking care of the coexistence of a pluralism in concepts and approaches in order to 'act always so as to increase the number of choices' (following von Foerster, 2002)[4]. Cultural perspectives on the relationship between nature and culture must change to give priority to relationships and interactions, rather than emphasizing the split between humans and nature.

Endnotes

1 Larrère C. et Larrère R., 2015 : Penser et agir avec la nature. Une enquête philosophique. Ed. La Découverte, Paris, 334 p.

2 Hubert B; and Ison R., 2011: Institutionalising understandings: from resource sufficiency to functional integrity. In A paradigm shift in livestock management: from resource sufficiency to functional integrity. Kammili T., Hubert B. and Tourrand J.-F., Dirs., Cardère Ed. : 11-16.

3 Thompson P.B., 1997: The varieties of sustainability in livestock farming. In Livestock Farming systems. More than food production, Proc. 4th Int. Symp. on Livestock Farming Systems, Aug. 1996, Foulum (Denmark), in: Sorensen J.T. (Ed.), EAAP Publication No. 89, Wageningen Pers, Wageningen, 1997, pp. 5–15.

4 von Foerster, H. & Poerkson, B., 2002: Understanding Systems. Conversations on Epis¬temology and Ethics. IFSR International Series on Systems Science and Engineering, 17. Kluwer Academic, New York and Carl-Auer, Heidelberg.

Bernard Hubert, member of the French Académie d'Agriculture, is Emeritus Senior scientist at INRAE and Professor at EHESS. Originally trained as an ecologist, Bernard's work has broadened to focus on the contribution of social sciences to issues relating to the life sciences. He has published 80 papers in Scientific Journals and written 100 book chapters, and has (co-)edited 25 books and supervised 26 PhD theses. He was also the lead author for the "natural resources use regimes" chapter of the "global" report of IAASTD and since 2010 he has chaired the French Commission for International Agricultural Research.