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How to analyze the contributions of tropical livestock production systems in territorial sustainable development? Poultry production chain in Goiás, Brazil

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Today, the impact on regional development is a major question with the challenge of building sustainable livestock production systems. This territorial dimension of sustainability needs new methodological approaches: sectorial or production chain approaches, are insufficient, precisely because they do not consider the territory. This paper analyzes the interactions between production chain and territory. The territory is defined as a crucible in which social, economic and environmental development mechanisms interact, and hence in which the sustainability of development is defined. Our approach was systemic, built on a Pressure – Response model (DPSIR) developed by the OECD. DPSIR allows for a given system, formalizing the relationship between *Drivers* exercising *Pressures* on the system, changing its *State*. This leads to *Impacts* on the components of this system, which can trigger *Responses*, which in turn alter the initial driving forces. For each mechanism, a list of indicators was compiled, prioritized and grouped in a participatory approach. This methodology aimed at facilitating the regulation of the two systems, production chain and territory, to better control their interactions. Given the high degree of complexity of the systems considered, the methodological approach began with a functional analysis of the poultry production chain, a historical analysis of territorial construction, and diagnosis of livestock production systems. The analysis was applied to an emblematic area of the challenges of tropical livestock production, the Rio Verde in Brazilian *Cerrados* region, one of the biggest areas of poultry agribusiness exports in Brazil.

The results describe the sustainability of territorial development in the poultry production basin. In addition to good technical performances of production systems, vertical integration of the industry has transformed the territory into a production tool very competitive on the world standard chicken market (economic competitiveness, health quality). Two key events have marked the territory: the entry of soybeans in the early 1980s and again in 1997 when Perdigão, a Brazilian poultry giant, decided to move closer to its raw materials (basin of Rio Verde then the second place nationally for the production of soybean). In two years, the federal government financed a complete industrial plant (factory animal rations, culling of 500.000 chickens per day, cutting/processing, water treatment) and a large poultry farm complex (modules 100.000 head in 150 farms, eggs production, incubators). With this massive installation and its numerous direct and indirect effects, Perdigão polarizes the trajectory of territorial development. DPSIR shows that the efficiency of this production chain has enabled a boom in territorial development, intelligently directed toward social programs (housing and urban development, education, health). Rio Verde has become a national benchmark for sustainable development, an exception in rural Brazil, where generally unemployment, inequality and poverty predominate. DSPIR advanced four limits of the system. 1/The system is efficient thanks to the specialization of the territory, orchestrated by Perdigão. But such a territorial domination is difficult to maintain. New political conflicts arise concerning the use of resources, development choices, planning. 2/The operating system produces new mechanisms, uncontrolled and disruptive, as migration flows exceed the capacity. 3/The system remains highly dependent on exogenous factors: global market accessing, public financing, international strategies of the firms. 4/Sustainability is only temporary, because its time scale is greater than that of system components. The sustainability during the last fifteen years is due to synergies between the rhythms of the company Perdigão, family cycles of migrant farmers, the phases of regional development and public policy. But today the poultry industry maturity is beginning to stagnate, the younger generation of farmers is making new life choices, biofuels compete with grain in land use, environmental issues are needed and question the actual modes of governance. The territory will bounce back, the poultry industry must adapt. Thus the sustainability of farming systems depends upon the virtuous interaction between production and territory, but also the capacity to reorganize these interactions over time. In Rio Verde, this reorganization should build a new system, integrating at the territorial scale grain production, poultry production, forage production, and milk and beef production. The nutrient cycles are today incomplete. The manure production of poultry production is now used for fertilization of the grass lands, for better productivities of milk and beef production systems.

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