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Book Review

The Sugarcane Complex in Brazil: The Role of Innovation in a Dynamic Sector on Its Path Towards Sustainability

Felix Kaup, 2015

Basel: Springer International Publishing Switzerland

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There is great concern at present about obtaining energy for the development of humanity. Non-renewable energy resources are being depleted, and we are looking urgently to replace non-renewable rainforest wood and other slow-recovering energy resources, without the intensive use of fossil fuels. Recently, biofuels have appeared as a viable alternative due to their renewability, relative ease of production and low impact on the environment. One of the most important biofuels is ethanol, produced mainly from corn and sugarcane. The latter is used most, especially in developing countries, and Brazil is at the head of world producers of sugarcane. Brazil is the world's leading producer of sugar and second in ethanol from sugarcane. Generally, when Brazil is named, it is thought of in terms of sugarcane and its products, tropical climate and sustainability. Sustainability is the main concern for Brazil, and it is here that a question emerges: will sugarcane crops be sustainable in the future?

Around this main question revolve other questions about the relationships between agriculture, energy, rural development and food security. These relationships are not simple because some of them are mixed up in multiple relationships as well as in dualistic links. Sugarcane is a crop that involves numerous complex factors, and hence it is necessary to analyse each of the factors and connections to understand their dynamics, and to predict the sustainability of the sugarcane industry in Brazil.

Thus, in order to recognize the necessary steps for sustainable development it is indispensable to know the stakeholders, technologies, and markets, and it is precisely here that *The Sugarcane Complex in Brazil: The Role of Innovation in a Dynamic Sector on Its Path Towards Sustainability* offers a profound academic study of the Brazilian sugarcane complex, focusing on the role of innovation to make this agribusiness economically sustainable for the future without ignoring environmental issues.

Felix Kaup is an economist with extensive international experience in project development relating to renewable energies and energy efficiency. During the last five years leading up to the writing of this book he worked in international and interdisciplinary projects, mostly in Latin America countries and in Brazil in particular, where he finished the PhD thesis that is the origin of this book.

The book is about technology and innovations and how they contribute to the sustainability of ethanol in Brazil. Also, it analyses the links between ethanol and other sensible factors such as air quality, biodiversity, deforestation, and food security. There is an argument that the expansion of the ethanol agribusiness should be guided by technological innovation. In fact, the author says that this innovation

is responsible for the growth of the sugarcane industry without endangering its renewal and, even better, that technological innovation helps to make this crop a fundamental contributor to Brazilian development.

As I said before, this publication results from a PhD thesis, which is the reason for the book's unique academic rigor, and for its thorough study of the technological factors that directly affect the production of Brazilian sugarcane. However, social and human factors are not the main ingredients for the author, which is a weak point.

The book is divided into five chapters. The first is an introductory chapter that explains briefly the three main objectives in the author's research. The first is to document and to analyse important developments of the sugarcane complex through conducting semi-structured interviews with experts from the Brazilian sugarcane industry. The second objective is to assess to what extent the identified dynamics and developments affect the capability of the sugarcane complex to evolve into an innovative system. The third objective is to evaluate to what extent the identified and analysed technological and institutional developments and innovations might contribute to a transition towards sustainability.

The second chapter presents the theoretical framework that deals with the concept of sustainability and the transition towards sustainable mobility. Here mention is made of one of the main fears of the production of biofuels, its environmental impact. The author uses the Environmental Kuznets Curve (EKC) to explain that industrial innovation leads to excessive consumption, which generally has a negative impact on the environment. However, the curve also suggests that continuous economic development can also promote environmental protection. It is important to cite that the concept of sustainable development is very controversial as some environmental economists affirm that it maintains capital for future generations. But no attention is given to the power asymmetries along the ethanol value chain, inequalities spots where there are people without economic growth opportunities.

The third chapter gives a detailed explanation of the methodology used for the research. Thus, the research design process is explained, concluding that it is a case of methodological pluralism. Here, the concept of triangulation is introduced, which is to investigate through different methods and different points of view and perspectives the advantages of innovation and technology within the sugarcane industry. Also, it is explained that methodological pluralism occurs when quantitative and qualitative methods are used within the process of data collection, field interviews, and the literature review; thus, they complement and explain each other towards a holistic view of the work.

The fourth chapter is the most extensive because it is the empirical analysis of the compiled data. After the theories of sustainable transition and innovation systems have been explained in the previous chapters, semi-structured interviews conducted with industry experts are followed by an elaborated analysis using, among others, ATLAS.ti software. In this chapter it becomes possible to understand Brazilian state intervention through policies developed by the government to influence, control and supervise the entire productive chain of sugarcane and its products. In turn, it explains the different governmental and private institutions that determine the global value chain of sugarcane (GVC) in Brazil. Here, for example, UNICA (Brazilian Sugarcane Industry Association) appears as an organization controlling more than 50% of all Brazilian ethanol and 60% of overall sugar production. At this point, it is interesting to note that after processing the interviews the frequency of occurrence

of institutions that are mentioned is governed by private and foreign institutions that traditionally control the Brazilian ethanol industry; no social institutions appear from the interviews. I believe that this biases the social perspectives within the work, since it is a loss of realistic information about the social and economic impact on the rural and marginal communities that depend on this crop.

In chapter five the author draws conclusions based on his work; for example, ethanol production and its use in mobility have a positive impact by reducing Greenhouse Gas (GHG) emissions. Also, unrestrained expansion would result in palpable negative effects. Obviously, there are many valuable, amazing, and crucial results, but I will let to the reader discover this.

In conclusion, *The Sugarcane Complex in Brazil* is a valuable book for scholars who want to know more about the sustainable production of Brazilian ethanol, and it allows the reader to contrast the realities and possibilities of this crop as a social and economic responsible motor of development through innovation systems. For them I would recommend this book.

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