

Abstract

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What are the consequences of coupling Energy and agriculture? Is corn to fuels putting fire on the debate?

From agriculture's stagnant perspective in the late sixties of the past Century to blooming exports in the present Century, there was a combination of public policies, the transfer of global technologies from corporations, and migrant entrepreneurship from south Brazil towards center-west Brazil. A peculiar phase four of agricultural development (Barret et al., 2010) was waiting for China's incentives for high farm prices (Silveira, 2014).

Since the beginning of this Century, Brazil has become a net agriculture exporter based on productivity gains and the growing demand from external markets, partly due to China's purchases, revealing a combination of increasing mechanization in the flat lands of "cerrados" and a modified Lewis model of rural migration to cities in China.

Curiously, Brazil, with the biggest idle land in the world, is only the fourth grain producer, China the biggest. This means that food security issues raised by Campi et al. , 2021 have been overcome by agriculture intensification in China. Lessons from modern industrialized agriculture show that technology improvement and firm demand supersede determinants of stagnant agriculture.

However, like many other trajectories, agriculture trajectories (Vieira Filho and Silveira, 2016) reach their ceiling. Environmental concerns are serious:

- a) The direct impact on the "Cerrado" biome is now viewed as deforestation since it contributes to GEE emissions;
- b) Water supply is affected by the intensification of agriculture;
- c) Climate change contributes to the emergence of desert lands;
- d) Climate instability affects agriculture seasonality (Carauta et al., 2017);
- e) Soil fertilization is becoming expensive.
- f) labor is scarce in many regions, meaning migration is no longer a virtuous phenomenon.

Finally, the economy is a source of different types of renewable energy, coupling agriculture and energy and generating a potential new source of instability in agricultural prices and investment decision.

Moved by opportunities and risks, the novelty in the Brazilian agriculture scene is the emergence of corn ethanol. It reflects the importance of local energy settlements and the quest for energy decentralization. The results are an increase in complexity even when there is

a common goal of reducing GEE emissions. Recent studies have shown that corn production is scattered across the Brazilian territory, increasing its productivity records (Meiners & Vieira Filho, 2023; Silveira & Magalhães, 2022). It raises the possibility of the diffusion of ethanol fuels far ahead of southeast Brazil. Byproducts, like dried distilled grains (DDG or WDG), are a close substitute to soybean meals, reducing the concerns about the negative impact of the use of corn in energy production. The expansion of corn to ethanol is a new component of the tense agriculture scene once the crop is the cornerstone of Brazilian agriculture export chains. Is Brazilian agriculture reaching a tipping point? What lessons from Chinese agriculture can contribute to spurring new policies based on intensifying Brazilian agriculture in an environmentally friendly way?

Key words: bioeconomy, agriculture sustainability, technological trajectories, Chinese agriculture, corn biofuels