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Weekly Farm Economics: Comparing Direct Costs of Soybean Production in the United States and Brazil

Joana Colussi, Nick Paulson, Gary Schnitkey, and Jim Baltz

Department of Agricultural and Consumer Economics
University of Illinois

Carl Zulauf

Department of Agricultural, Environmental and Development Economics
Ohio State University

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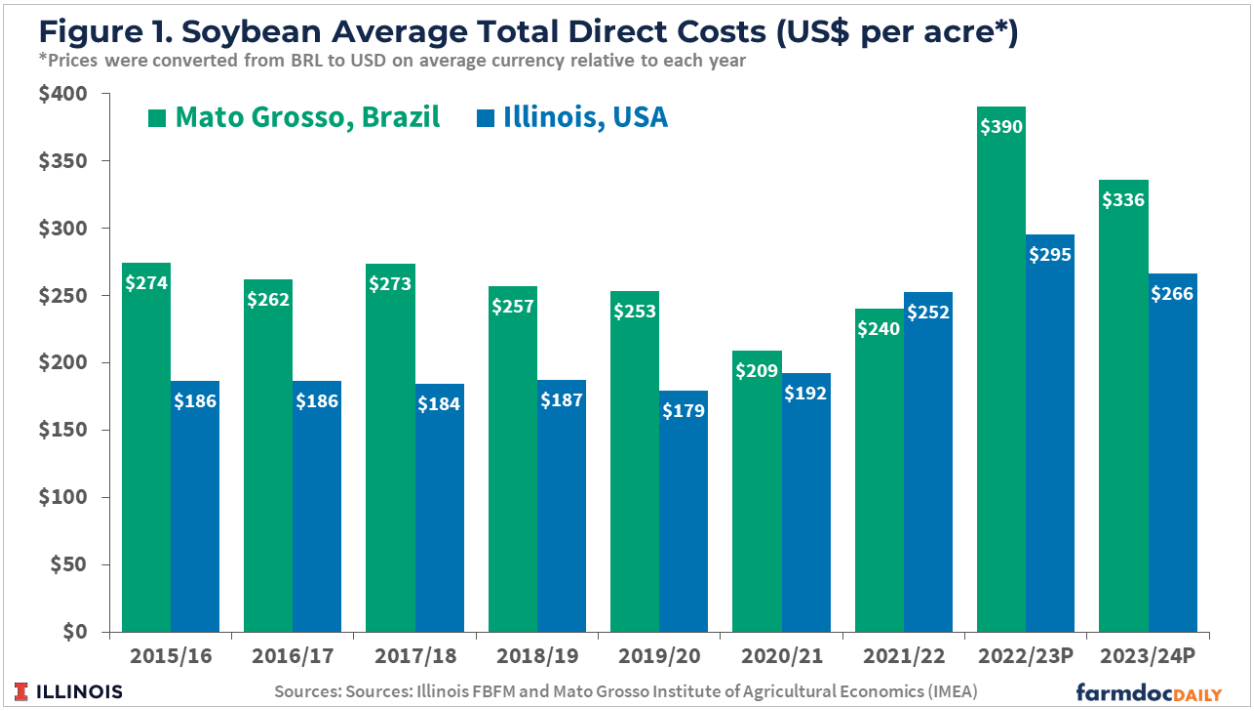
The direct costs of soybean production in the Brazilian State of Mato Grosso have increased at a similar rate to those in Illinois since 2016. Direct input costs in Brazil reached record levels for the 2022/2023 crop season and are projected to decline for the 2023/2024 crop season. Overall, the direct costs to produce soybeans have been higher in Mato Grosso than in Illinois. Today's article compares trends in the direct costs of soybean production in major production regions of Brazil and the United States, the world's largest soybean producers and exporters.

Similar Trends in Direct Costs

Direct costs include the cost of production inputs, such as fertilizers, seeds, pesticides (herbicides, insecticides, fungicides), and costs associated with drying, storage, and crop insurance. Total direct costs for soybean production in Mato Grosso have increased from $274 per acre in 2016 to $390 in 2023 (see Figure 1), which implies an average annualized growth rate of 7.5%. From 2016 to 2023, total direct costs for soybean production in central Illinois have increased from $186 to $295, an average annual growth rate of 7.4% (see Figure 1).

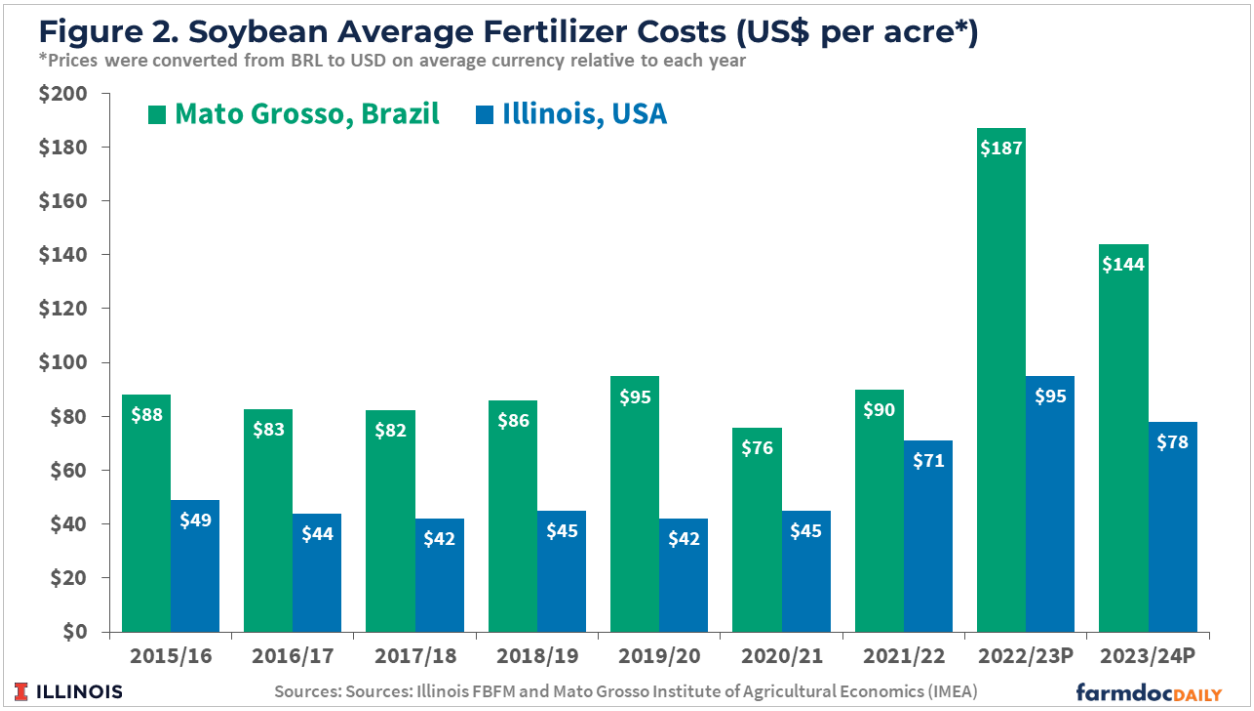
Overall, soybean production costs have been higher in Mato Grosso than in central Illinois since 2016. Despite the higher costs, Brazil's operating margins remain positive because of high commodity prices in recent years, robust global demand, and a favorable exchange rate for Brazilian exporters. From 2016 to 2023, the Brazilian currency depreciated by 60% in relation to the dollar (moving from 3.23 to 5.23 Brazilian real per US dollar).



Total direct costs are projected to decline 14% for the 2023/2024 crop year in Mato Grosso, compared to the record levels in 2022/2023. Even so, direct costs in Brazil will remain higher than in central Illinois. The primary driver of this direct cost gap for the upcoming crop season is the continued high cost of fertilizers (see more in the following section). Compared to the United States, high prices and volatility in global fertilizer markets have more negatively impacted Brazilian farmers as they rely on imports for 85% of their overall fertilizer needs.

Higher Fertilizer Costs in Mato Grosso

Fertilizer costs for soybeans in Mato Grosso increased from $88 per acre in 2016 to $187 per acre in 2023, an average annual growth rate of 16.4%. In the same period, fertilizer costs for soybean production in central Illinois have increased from $49 to $95, an average annual growth rate of 12% (see Figure 2). Fertilizer costs tend to experience more volatility than other direct cost categories as the prices for fertilizer products follow swings in both commodity and energy prices.



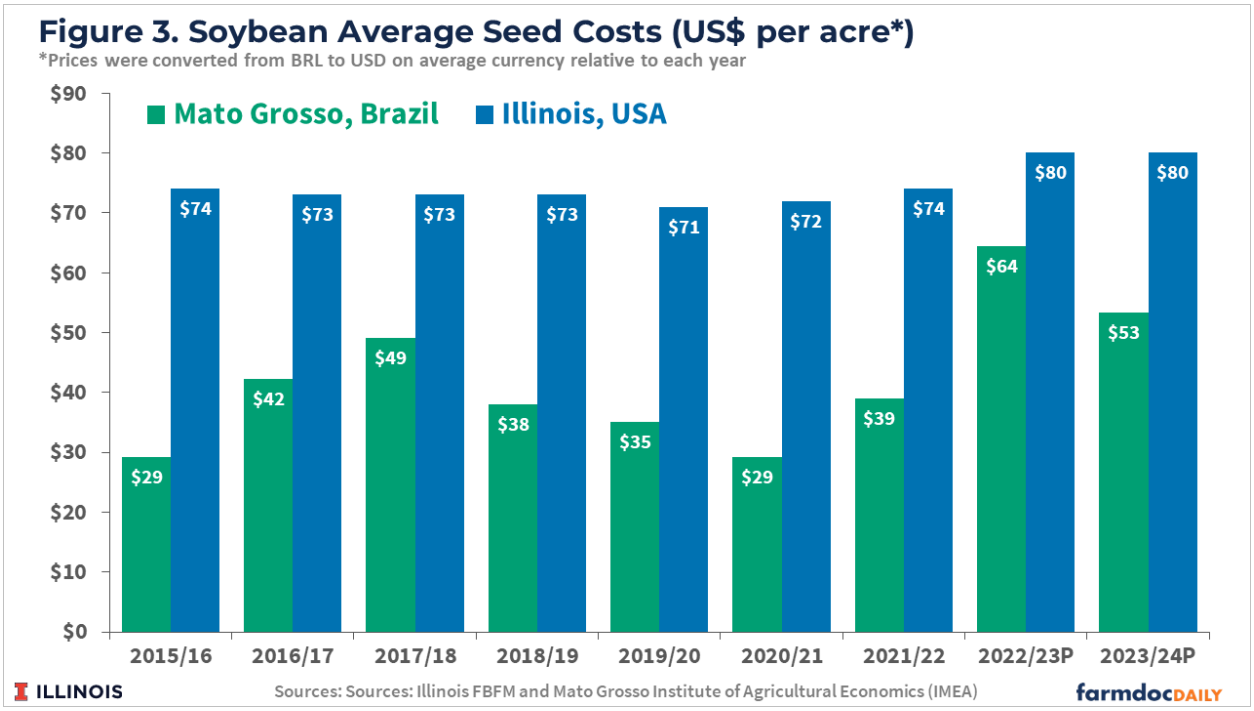
Fertilizer costs reached record levels in 2023 in Mato Grosso, but a 23% decline is expected for 2024. Fertilizer costs per acre in Mato Grosso are projected to be 46% higher than in central Illinois. The higher cost is mostly due to the high fertilizers rate, depreciation of the Brazilian currency relative to the dollar and Brazil's high dependence on imported fertilizers. Brazil imports around 95% of its nitrogen, 91% of its potash, and 75% of its phosphate needs (see *farmdoc daily*, March 17, 2022).

In 2023, for instance, the cost of fertilizer accounted for nearly half of the overall costs of soybean production in Mato Grosso. Historically, the cost of fertilizer has accounted for around 35% of total direct costs for soybeans. The relevance of fertilizers is explained by the high demand for fertilizers for the soils of the Cerrado region (Brazilian savannah), which is characterized by high acidity.

Higher Seed Costs in Central Illinois

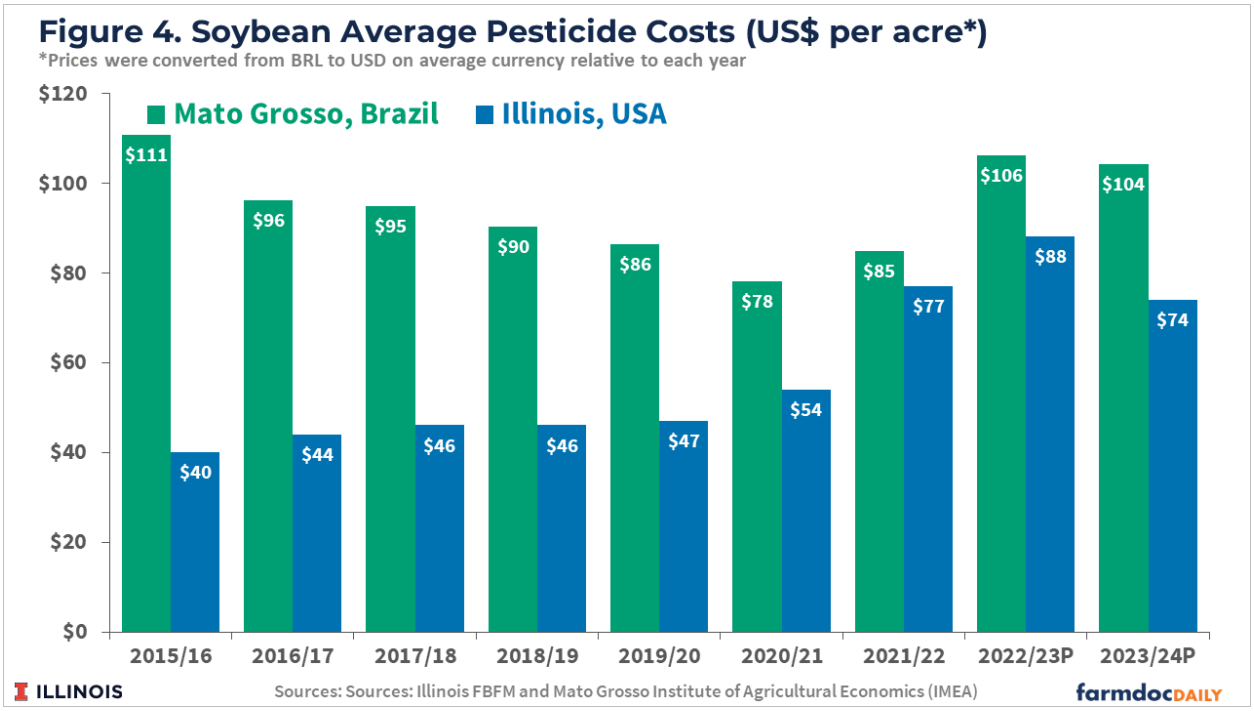
Soybean seed costs in Mato Grosso have increased from $29 per acre in 2016 to $64 per acre in 2023, averaging 16% in annualized growth. In central Illinois, from 2016 to 2023, seed costs for soybeans have increased from $74 to $80, an average annual growth rate of 1.2% (see Figure 3). Seed costs have been relatively flat in Illinois in recent years, trending down slightly until 2020, and increasing again with the higher returns from 2020 to 2022.

Per acre seed costs in Illinois have consistently been higher than in Mato Grosso. In central Illinois, seed costs are projected to be 51% greater than projections for Mato Grosso for the 2023/24 crop season. Soybean seed costs are typically less impacted by currency fluctuations compared with fertilizers and chemicals as much of the seed production in Brazil is domestic. In Mato Grosso, for example, 90% of the soybean seed used is produced in the State. As a consequence, there is no state tax and freight costs are relatively low.



Larger Pesticide Costs in Mato Grosso

Pesticide costs for soybeans in Mato Grosso decreased from $111 per acre in 2016 to $85 per acre in 2022, but are projected to return above $100 per acre for the 2023 and 2024 crops. In comparison, pesticide costs for soybean production in central Illinois have increased from $40 to a projected $88 for the 2023 crop (see Figure 4). In general, per acre pesticide costs in Mato Grosso have consistently been higher than in Illinois especially due to the lack of a hard freeze and the higher humidity during the growing season in Brazil.



Similar to Illinois, producers in Mato Grosso are facing increased weed resistance and increasing herbicide costs. In addition, Brazilian producers must deal with the proliferation of other pests due to

conditions exacerbated by the tropical climate in Brazil resulting in the need for additional applications of insecticides and fungicides. Higher soybean prices in recent years have also provided a greater economic justification for the applications of chemical pest controls. Overall, like in the United States, the use of chemicals on soybean fields has played a significant role in the expansion of soybean yields in Brazil (see *fardmoc daily*, November 14, 2023).

Conclusion

The direct costs of soybean production in Mato Grosso, the largest soybean producing State in Brazil, have increased at an average rate of 7.5% per year from 2016 to 2023 – a very similar pace to direct costs for soybean production in central Illinois. Direct costs in Brazil surged to record levels for the 2022/2023 crop season, but projections indicate a decline for the 2023/2024 crop season, also in line with cost projections for Illinois.

Per acre fertilizer and pesticide costs on soybean acres have been higher in Mato Grosso than in Illinois since 2016. This has been driven by currency fluctuations, global market volatility and a heavy reliance on fertilizer imports in Brazil, and increasing pest pressures in Mato Grosso's more tropical climate. In contrast, soybean seed costs have been higher in Illinois than in Mato Grosso. Seed costs in Brazil are lower and tend to experience less volatility than fertilizer and pesticides as the majority of the seed is grown domestically, sheltering prices from currency fluctuation effects.

For Brazilian farmers, a stronger dollar presents a dual impact: it raises costs as a result of the uptick in prices for imported inputs, such as fertilizers and pesticides; on the other hand, it also tends to boost revenues via greater export demand by making Brazilian soybeans relatively cheaper and more attractive on world markets.

Acknowledgment

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