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# Agribusiness: A Primer

## Definitions

Agribusiness, now a popular theme, is not a rebranding of the somewhat archaic term agriculture, livestock, forestry, and fisheries, as it still appears in national accounts statistics. Indeed, they are different concepts, to the extent that the former contains the latter.

Agricultural activity, narrowly defined, includes crop and livestock production, aquaculture, fisheries and forestry for food and non-food products. According to the World bank's estimates, the value-added by these activities in 2022 was worth 4% of global GDP, or USD4 trillion. Agribusiness, on the other hand, covers this primary production but also the processing and distribution of those goods, which warrants the inclusion of other sectors that are specifically related, such as agri-inputs, agri-manufacturing, and agri-services. The estimated value-added by these activities in 2022 was worth 12% of global GDP, or USD12 trillion, a much greater sum.[1]

## Key long-term trends

Among the key transformations countries experience on the trajectory to becoming developed economies is a sharp increase in the agribusiness productivity, so much so that it leads to a fast growth of food and raw material output, and hence of the total population. Because agriculture, narrowly defined, typically employs two-thirds to three quarters of the labor force in pre-industrial societies[2], it also frees human resources that can gradually migrate to manufacturing and services activities in urban areas, thus enlarging the domestic market and speeding up economic progress. While this is still true for today's poorer nations in their development processes, it is crucial for advanced ones as well, owing to adverse demographic trends. Aging and longevity bring about a shrinking working-age population along with a rapidly growing cohort of retired individuals that still need to be fed, clothed, and lodged. Such secular trends strongly suggest that agribusiness will remain in the forefront of global affairs for quite a while.

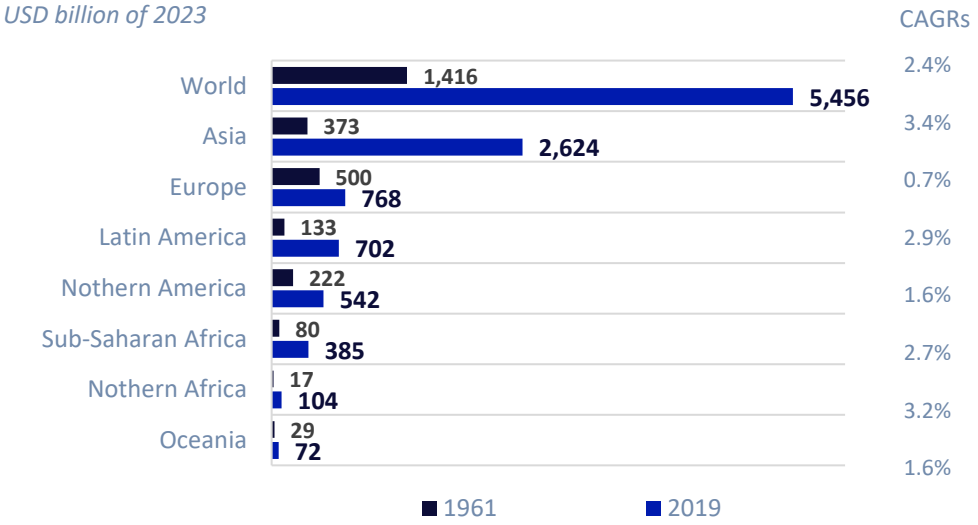




Whereas there are no reliable statistics to compare value-added in agribusiness across different countries and regions, the data concerning agricultural activity, narrowly defined, is homogeneous. The market value of crop and livestock production, aquaculture, fisheries and forestry for food and non-food products in constant U.S. dollars has increased fourfold between 1961 and 2019, which signifies a compound annualized growth rate (CAGR) of 2.4% (Chart I).3 Asia s by far the most impressive showing, both in terms of the value of production and its growth rate.

But then there is a twist in that story.

### I. Market value of agricultural output & respective CAGRs




**12% vs. 4%**

of global GDP: share of agribusiness compared to agricultural activity, narrowly defined

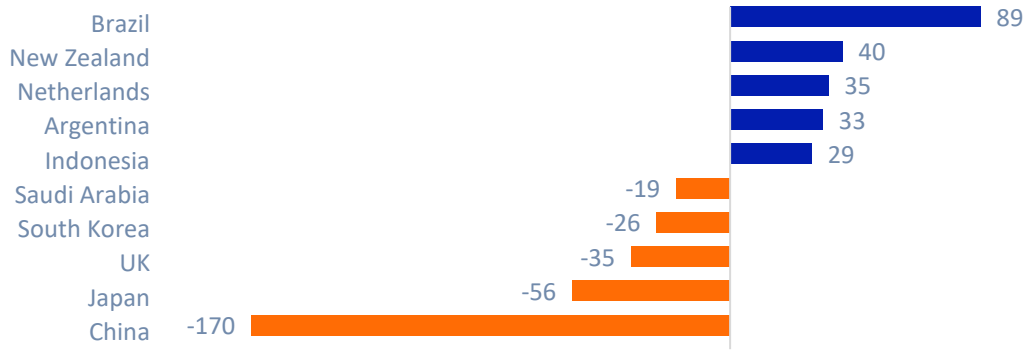
While Asian countries accounted for 48% of the market value of global agricultural produce in 2019, the single largest share, 59% of the world population live there, which suggests an excess demand despite an extraordinary increase of supply. And there is plenty of empirical evidence supporting this hypothesis.

Countries' statistics show that China, Japan and South Korea are in the top-five group of the world's largest net importers in 2021 **(Chart II)**.

Conversely, Europe holds privileged spots among the major exporters due to the outperformance of developed economies such as the Netherlands and, on a lesser scale, of several emerging nations such as Ukraine and Poland. Latin America ranks higher than Northern America because the latter specialized on foodstuffs whereas the former also developed comparative advantages on raw materials (hence Brazil's agricultural trade surplus, which is second to none).

## II. Agricultural products: major net exporters vs. importers

USD billion in 2021




**137 million metric tons**

of grains: volume of Asian net imports (2019); the world's largest volume by region

Owing to methodological issues, it is feasible to perform detailed calculations mostly on production, domestic consumption, exports, and imports of grains. Yet the conclusion that Asia is a huge net importer still holds true: 137 million metric tonnes (mmt; **Chart III**). Moreover, the extrapolation of trends recorded between 1990 and 2019 strongly suggests that Asian net imports will increase further, to about 160 million mmt by 2030.

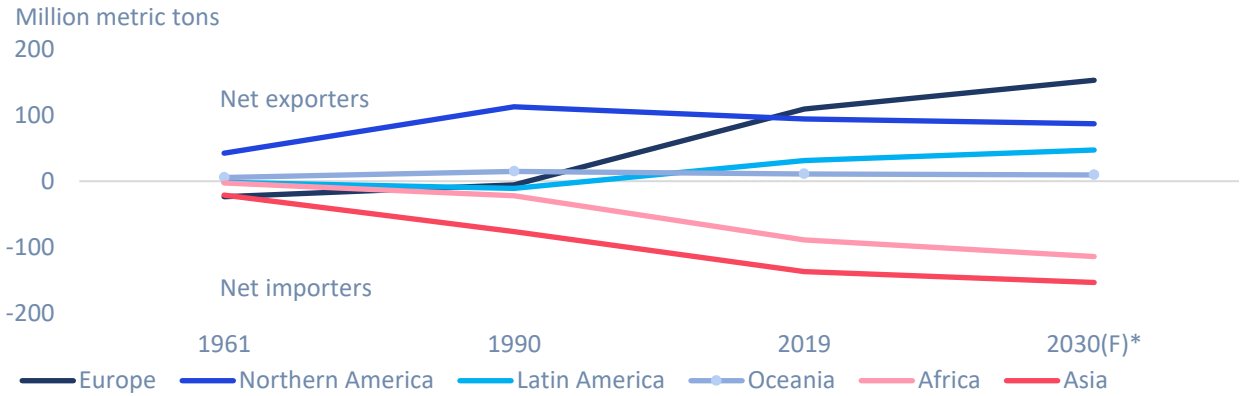
Footing the bill of larger grain imports will be a non-trivial challenge for many Asian economies, notably the poorest ones. However, the situation is likely to be more difficult in Africa, where per capital GDP is usually lower and net grain imports amounted to 89 mmt in 2019, also a substantial volume. Trend extrapolation points to net grain imports of 114 mmt by 2030 in that continent, even taking into consideration relatively high CAGRs for agricultural output in recent years.

As for the exporters, there are three geographies that should secure an adequate global supply of grains: Europe, Northern America, and Latin America (Oceania plays a marginal role in balancing the world market). The sharp rise of European exports after 1990 results to a great extent from the former Soviet Union region, notably countries that adopted more business-friendly agrarian policies.

The end of large government subsidies to both consumers and producers of beef was particularly consequential as it reduced the domestic demand for cattle feed grain, thus creating a surplus that could be sold in international markets.[4]

## III. Grain production vs. domestic consumption: net balance

Million metric tons




Note(*): extrapolation based on CAGRs from 1990 to 2019.

However, the downsizing of livestock had mixed effects on agribusiness' total factor productivity (TFP) growth, which became erratic. Northern America (the U.S. and Canada) is still a key world player though it is no longer the major net exporter. A surprise it is not, since the CAGR of its agricultural output in recent years has been unimpressive. On the other hand, Latin America is on the ascent thanks less to the increase in arable land and much more to striking TFP gains.

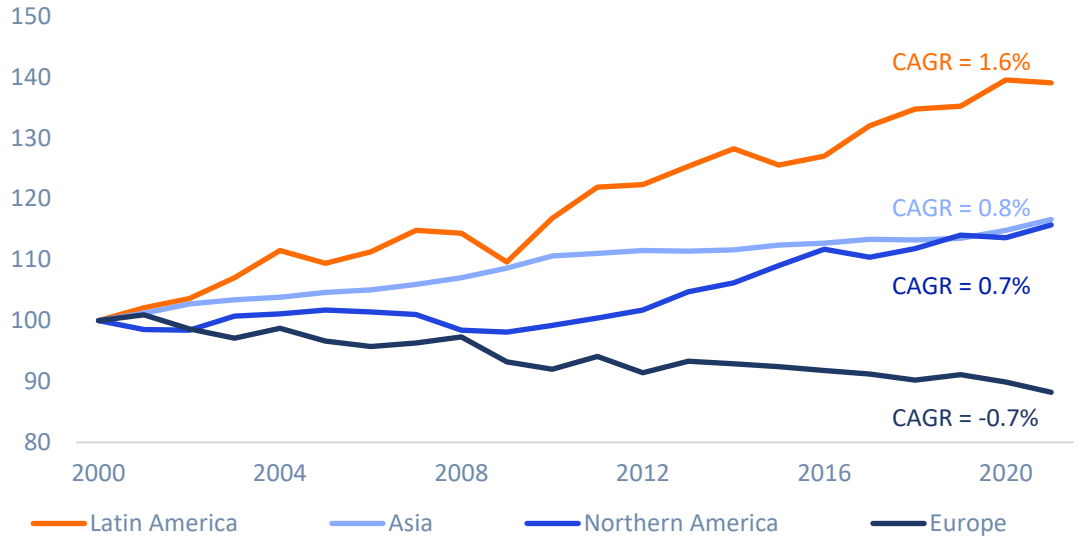
The aggregation of land, labor, capital, and materials inputs to build a TFP index is instructive, for it reveals levels of performance in this century that diverge by much across geographies (**Chart IV**).

As a result of improved crop management and steady biotechnological progress that resulted in better adapted seeds[5], Latin America tops the ranking and its CAGR is twice as much of the next competitor, Asia. Northern America, which comes at a very close third, only recently has recovered from the adverse shock of the Global Financial Crisis in 2008-9.

Because of developments in countries that were formerly part of the Soviet Union, the productivity story in Europe is more complex. Farmland and pasture area today are still smaller than when the USSR existed in 1991, therefore a significant part of the expected increase in European output and exports of agribusiness products over the next few years should result not from productivity gains but from a larger cultivated acreage.

## IV. Productivity in agribusiness in the 21st century

Index: 2000 = 100







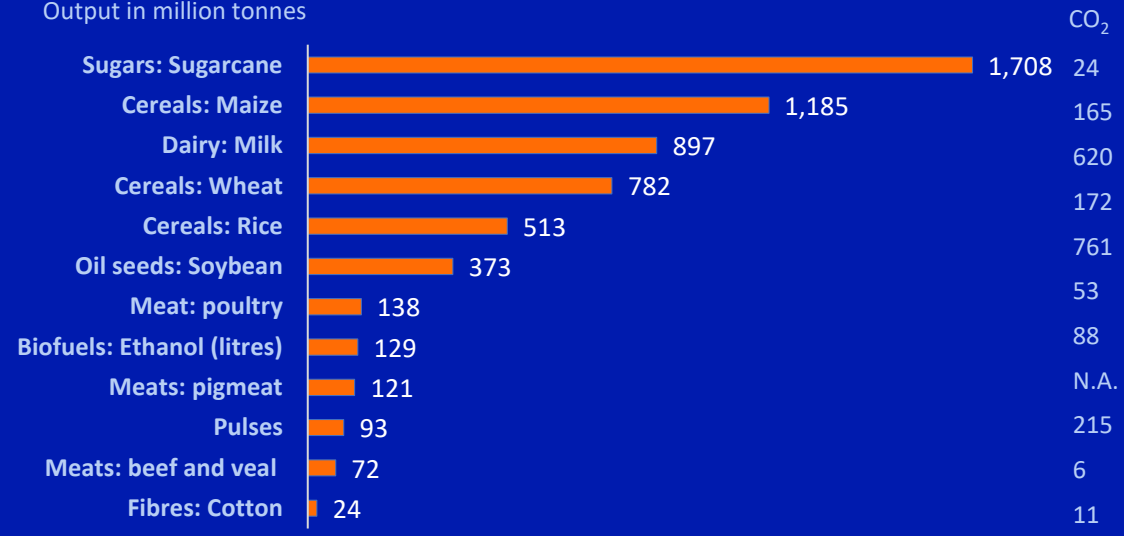

# Major crops & livestock and their carbon footprints

What are the major agricultural commodities in terms of world output tonnage? Taking into consideration crop and livestock production, aquaculture, fisheries and forestry for food and non-food products, the latter item account for an exceedingly small fraction of the total (Chart V). Measured in million tonnes, the production of the most important non-food commodity, cotton, amounts to a slim 1.4% of the key food produce, which (perhaps surprisingly) is not a cereal, but sugarcane.

Admittedly, cereals are an important subgroup, yet within it maize, not wheat or rice, stands as the major crop. Feeding a growing population will be the focus of agribusiness in the foreseeable future, although energy transition and the rise of biofuels are becoming a significant topic. To be sure, the production of biofuels, whose metrics are distinct from other primary agricultural products, has grown by 286% over the past two decades. To compare, the output of all cereals combined grew by 36% in the same period, a noteworthy but less stellar performance.

## V. Global agricultural production vs. GHG emissions (2022)

Output in million tonnes



Also related to climate change is the emission of greenhouse gases (GHG), a critical factor for this industry owing to the staggering variance among products. Measuring the million tonnes of equivalent $CO_2$ direct emissions, the production of beef and veal meat signifies a carbon footprint that is 29 times higher than that of poultry meat, an alternative source of animal protein, and 405 times higher than that of pulses such as beans, lentils, and chickpeas.

The ever-growing list of environmental, social and governance (ESG) demands by consumers, governments, non-government organizations (NGO) and investors is already reshaping agribusiness. The production of affordable, greener food and renewable energy from biomass will continue driving growth and change in this economic activity.

# USD89 billion

Brazil's net exports of agricultural products (food + non-food & forestry) in 2021; the world's largest surplus

# 405x higher

$CO_2$ emissions from the production of beef and veal compared to pulses (beans, lentils, chickpeas, etc.)

# Relative vs. general price changes

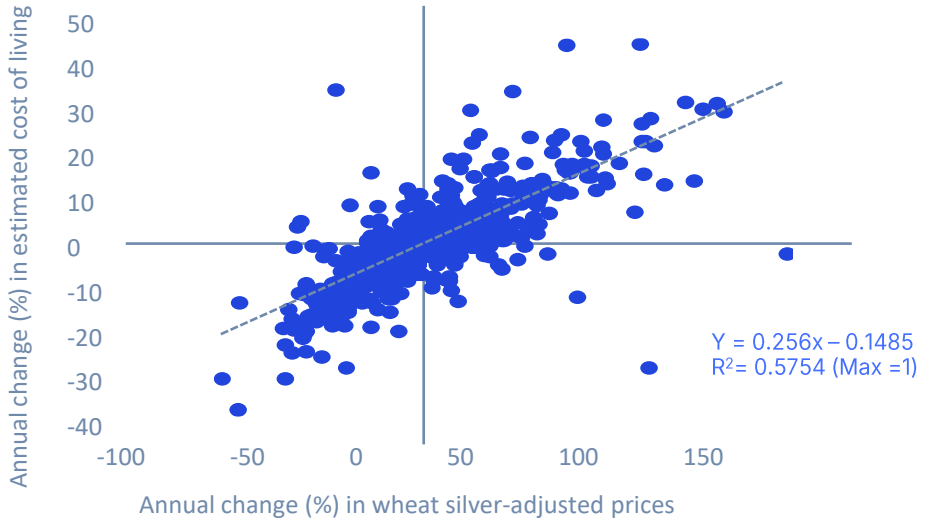
During millennia, agribusiness led to pivotal changes in relative prices of economies and, under certain monetary conditions, in their general price level as well. The empirical evidence about the long-term relationship between food costs and consumer inflation is robust. (**Charts VI & VII**).

Intriguingly, several centuries of economic progress together with a colossal diversification of consumption habits and possibilities haven't changed a fundamental fact about food prices and inflation..

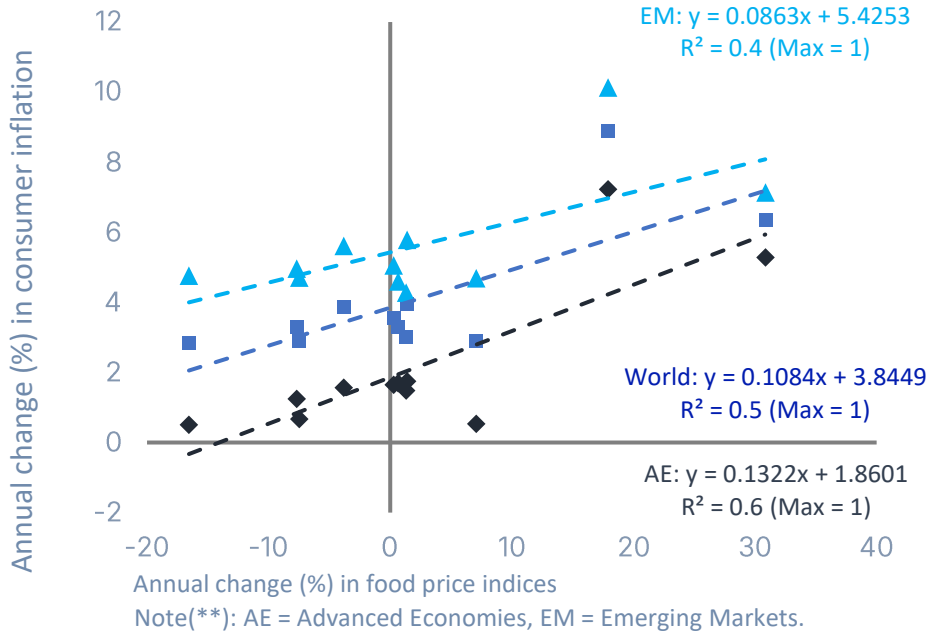
The sensitivity of CPIs worldwide to variations in food prices that is remarkably similar to that recorded in the cost of living in England as wheat became more or less expensive from the second half of the 13th century until early the 20th century.

Challenging conventional wisdom, simple econometric models have a better fit (and a higher price-elasticity too) in advanced countries than in emerging nations, which reinforces the argument that agribusiness is a major macroeconomic issue across all geographies.

VI. Wheat prices vs. cost of living in England 1265-1913



## VII. Food prices vs. consumer inflation worldwide 2012-22**




Note(**): AE = Advanced Economies, EM = Emerging Markets.

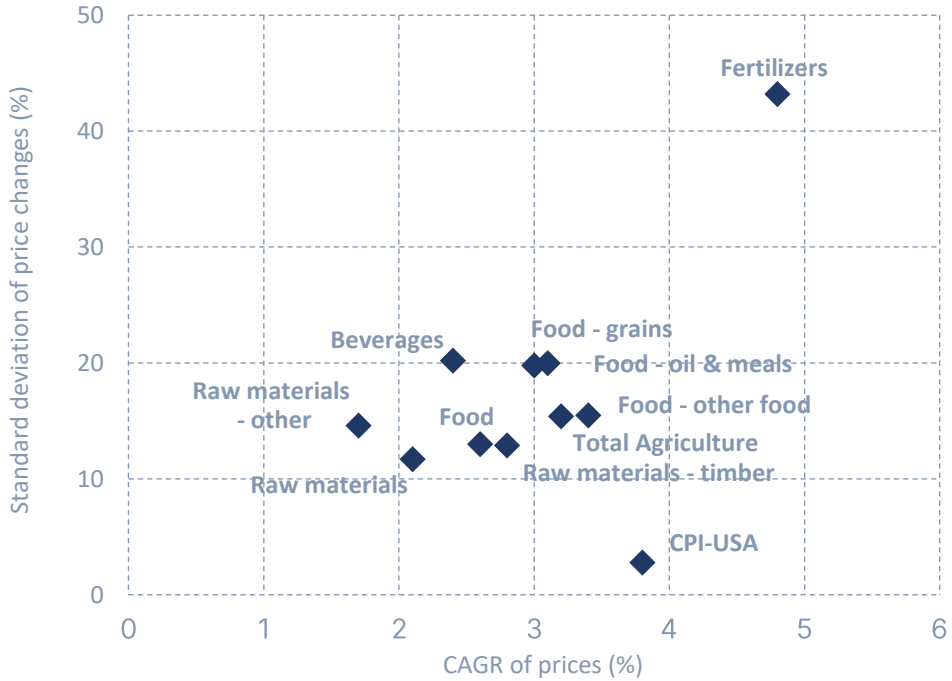
Is agricultural inflation the main driver of consumer inflation in the long haul?

No. There is solid empirical evidence that services are the bogeyman, since their rate of price change is well above that of the CPI, a consequence of the Baumol effect, which posits that, over time, costs of labor-intensive activities such as services tend to increase relatively more if earnings in the economy are rising due to faster technological progress in other areas (e.g., agribusiness, manufacturing or information technology).

Accordingly, the prices of industrialized goods have been a secular deflationary force because the most notable technological advances have taken place in this sector. As for commodities, the picture is less clear. Broad price indices of primary products, such as the one regularly published by the World Bank, has outpaced CPIs, however that outcome depended heavily on prices of energy, notably oil & gas, and precious metals. Agricultural prices typically lagged consumer price indices (CPIs) when measured over several-years periods (Chart VIII).

Assuming that the headline consumer price index in the United States is a useful yardstick, its CAGR from 1961 to 2022 was 3.8% with a standard deviation (a proxy for volatility) of 2.2%. While agricultural prices have overshot and triggered many adverse shocks in the past, their respective numbers were 2.8% and 12.9%. The cost of raw materials – products such as cotton, rubber and tobacco –lagged CPI the most, whereas the only agricultural sub-item that beats it is fertilizer prices.

## VIII. Agricultural prices vs. consumer inflation 1961-2022



Fertilizers, a key input for agribusiness, are a category of their own. Because they are energy intensive (nitrogen, for instance, requires substantial amounts of natural gas to be transformed into two main end-products, ammonium nitrate and urea), their price correlates highly with the cost of fossil fuels in a world where renewable sources still play a significant role. Consequently, fertilizers tend to become inordinately expensive when geopolitical tensions flare up or when there are episodes of large excess demand for oil & derivatives.

Examples of these phenomena occurred during the Yom Kippur war in the Middle East in 1973, which led to the first oil shock afterwards, in the heydays of the commodity super-cycle, rightly before the Global Financial Crisis in 2008-9, and, more recently, in the aftermath of Russia's invasion of Ukraine in early 2022. The CAGR of fertilizer prices is high, 4.8%, but so is its standard deviation: 43.2%. Such instability hinders its utilization as an effective inflation hedge, although arguably not as useful protection for tail risks deriving from geopolitical crises.

# 2.8% vs. 3.8%

CAGR of prices of global agricultural commodities compared to consumer inflation in the USA from 1961 to 2022

# 2.8% vs. 4.8%

CAGR of prices of global agricultural commodities compared to fertilizer prices from 1961 to 2022





## Footnotes

[1] The World Bank - World Development Indicators, October 2023, The Agriculture Global Market Report 2023, and Centro de Estudos Avançados em Economia Aplicada – CEPEA –ESALQ-USP.

[2] See, for instance, Clark (2002), pp. 2 and 12.

[3] Calculations over data provided by the United States Department of Agriculture (USDA) Economic Research Service. The adverse shock associated with the pandemic in 2020 and the subsequent global recovery in 2021 caused the market value of agriculture output to become remarkably volatile and these datapoints were not taken into consideration.

[4] See Liefert, Liefert and Luebehusen (2013).

[5] See OECD-FAO (2023).

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# Investment opportunities in this sector

Over the past centuries agribusiness has consolidated its position of one of the most strategic sectors of the world economy. Consequently, there is no scarcity of attractive risk-adjusted returns for capital allocation in that area. Yet, the sharp differences in weather and soil conditions, demographics, total factor productivity (TFP), macroeconomic drivers, geopolitical factors and ESG practices across the globe lead to entirely different investment propositions.

As for geographies, Asia is the world's largest and fastest growing consumer market, therefore agribusiness investments with a focus on that region should take into consideration the widening gap between supply and demand, which translates into vast imports, notably of food and raw materials, from the rest of the world.

At the opposite end of this equation are the global net exporters. At this stage, Latin America is the most intriguing story because the impressive growth of its agribusiness' TFP speaks of a secular trend resulting from the region's generous endowment of natural resources, sensible ESG practices, lower geopolitical risk, and reasonable macroeconomic performance.

The historic evolution of the respective prices and volatilities suggests that risk-adjusted returns from direct investment in specific agricultural commodities are less attractive than those in inputs for the agribusiness broadly defined (e.g., farm implements, fertilizers, seeds, eco-friendly pesticides). The latter mitigates the exposure to single crops or livestock and typically implies stronger pricing power versus commodity producers, who are price takers in world markets.

**39% vs. 7%**

Increase in Total Factor Productivity in Latin America's agribusiness from 2000 to 2021 vs.Rest of the World*

Note(*): average of Asia, Europe and Northern America.



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