



Grain Flow Through the Northern Arch of Brazil

Ana Paula Harumi Higa^{1,2(✉)}, José Gonçalves Moreira Neto³,
Rodrigo Guimarães Trajano³, and Herbert Koehne De Castro³

¹ Brazilian National Waterway Transportation Agency, São Paulo, Brazil
ana.higa@antaq.gov.br

² Graduate Program in International Relations San Tiago Dantas (UNESP,
UNICAMP, PUC-SP), São Paulo, Brazil

³ Brazilian National Waterway Transportation Agency, Brasília, Brazil
{jose.moreira, rodrigo.trajano,
herbert.castro}@antaq.gov.br

Abstract. Brazil is the world's largest producer of soybean followed by the United States. These two countries accounting for roughly 68.7% of world production. The largest soybean producing region in Brazil is the Midwest, followed by the southern region. Between 2010 and 2020, the exported volume of soybean rose from 29.1 million tons to 83 million tons, respectively, representing 185% rise. The soybean exports are drained by nine logistic corridors and recently it calls attention the expansion of the logistics corridors of the Northern Arch of Brazil. It is expected that Ferrogrão, a railway project connecting the 933 km from Sinop (Mato Grosso state) to Itaituba (Pará state), will consolidate the Tapajós River Corridor as one of the most important corridors to the grain flows and it will help to reduce freight prices. The objective of this paper is to present the recent change in the grain exports flows through the Northern Arch of Brazil and discuss the potential impact of Ferrogrão rail in the Brazilian logistics of grain exports. For it, at the first item will be presented the importance of Brazilian soybean production in the world market and the main producing region in Brazil; in the second item will be presented the main logistic corridors for grain exports; in the third item will be presented the Northern Arch logistic corridors; in the fourth item will be presented the Ferrogrão railway project and in the fifth item will be presented the final considerations.

Keywords: Logistic corridors · Grain flows · Tapajós river · Madeira river · Northern Arch logistic corridors

1 Brazil Soybean Production

Brazil is the world's largest producer of soybean followed by the United States. These two countries accounting for roughly 68.7% of world production. The United States Department of Agriculture estimates a world production of 363.3 million tons of soybean in the 2020/2021 harvest, which represents an increase of 6.9% against the previous period. According to the US Department of Agriculture, Brazil is expected to produce 137 million tons of soybean in the 2020/2021 harvest, representing a share of 37.7% of the world production (Table 1).

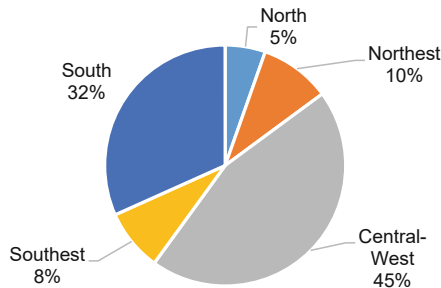
Table 1. World soybean production – select countries – million metric tons

Countries	2019/20	2020/21*	Change	Participation
Brazil	128.5	137.0	6.6%	37.7%
United States	96.7	112.6	16.4%	31.0%
Argentina	48.8	46.0	-5.7%	12.7%
China	18.1	19.6	8.3%	5.4%
India	9.3	10.5	12.4%	2.9%
Paraguay	10.1	9.9	-2.0%	2.7%
Canada	6.2	6.4	3.4%	1.8%
Russia	4.4	4.3	-1.1%	1.2%
Ukraine	4.5	3.0	-33.3%	0.8%
Others	13.2	14.1	6.4%	3.9%
World Production	339.7	363.3	6.9%	100.0%

* Preliminary estimate – September 2021

Source: United States Department of Agriculture (Sept. 2021)

The largest soybean producing region in Brazil is the Midwest, followed by the Southern region. Between 2010 and 2020, the exported volume of soybean rose from 29.1 million tons to 83 million tons, respectively, representing a raise of 185% (Fig. 1).



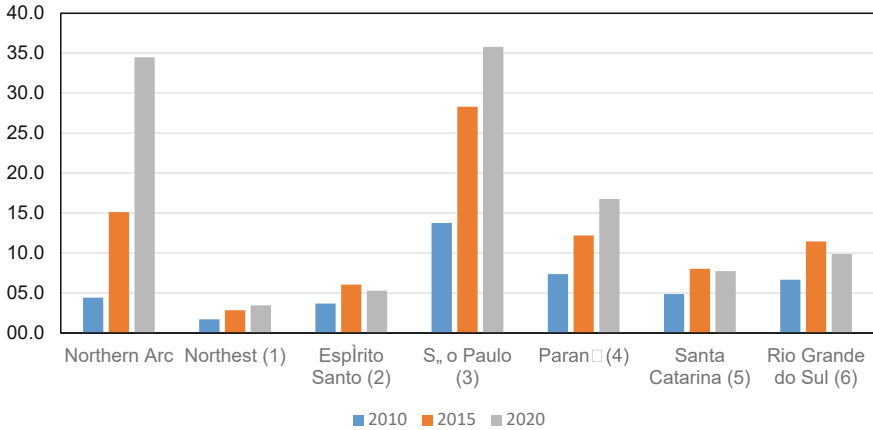
Source: CONAB (2021)

Fig. 1. Participation in the soybean production by country region

2 Main Logistic Corridors for Grain Exports

The expansion of grain production and exports was also accompanied by a significant increase in Brazilian ports operation. In 2010, 42.5 million tons of grain were handled in Brazilian ports. In 2015, the volume handled almost doubled to 84 million tons and in 2020, the volume handled jumped to 113.5 million tons, representing an increase of 35% in relation to the movement of 2015 and of 167.1% in relation to the 2010 movement.

This growth of grain movement in Brazilian ports occurred along with the raise in grain movement in ports located in the North Region, called Northern Arch and composed by ports in the states of Rondônia, Amazonas, Pará, Amapá and Maranhão (Fig. 2).



Source: Brazilian National Waterway Transportation Agency

Fig. 2. Grain exports movement in Brazilian ports – million metric tons

Between 2017 and 2018, the Brazilian Ministry of Transports, Ports and Civil Aviation, released a series of reports on the project “Strategic Logistics Corridors”, which aimed to present a diagnosis and a panoramic view of the transport infrastructure focused on the flow of goods and services of the country’s main cargoes, namely: soy and corn; iron ore; auto-vehicles; sugar and ethanol and fuels.

Regarding grain flow, the Brazilian Ministry of Transports considered “Strategic Logistics Corridors” as being the complex system of modal and intermodal routes through which cargo from soybean and corn complex converge (MINISTÉRIO DOS TRANSPORTES, PORTOS E AVIAÇÃO CIVIL, 2017).

The mentioned report identified and detailed the main routes for the flow of grain production and analyzed the options for routes that connect the production hub (origin) to the export hubs (destiny). According to the methodology adopted in the report, the point of origin of each route was defined as being a city close to a federal highway, chosen to represent the producing region close to this city. As for the destination, in the case of export, the city where the destination port complex is located was considered.

As a result it was identified nine logistic corridors used for the transport of soybeans and corn correspond to approximately 37 thousand km of transport routes, divided between the modes: road (23.6 thousand km), rail (9.2 thousand km) and waterway (4 thousand km), with a predominance of highways.

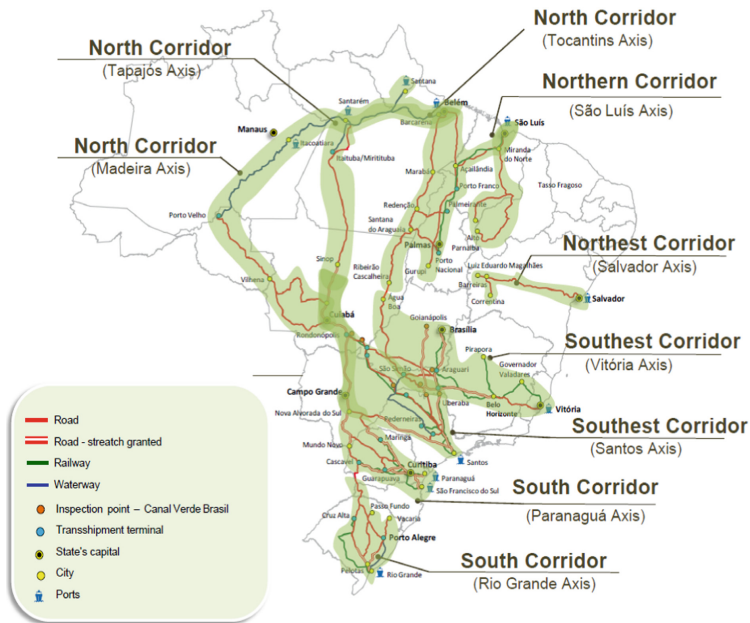
Considering export flows, nine logistical corridors were defined, namely:

- Northern Logistics Corridor – Madeira Axis;
- Northern Logistics Corridor – Tapajós Axis;

- Northern Logistics Corridor – Tocantins Axis;
- Northeast Logistics Corridor – São Luís Axis;
- Northeast Logistics Corridor – Salvador Axis;
- Southeast Logistics Corridor – Vitória Axis;
- Southeast Logistics Corridor – Santos Axis;
- Southern Logistics Corridor – Paranaguá Axis;
- Southern Logistics Corridor – Rio Grande Axis.

The North Corridor includes the Madeira Axis, the Tapajós Axis and the Tocantins Axis. Besides the highways, this corridor encompasses the following waterways: Madeira river, Amazonas river and Tapajós river; the following port complexes: Ita-coatiara (AM), Santarém (PA), Belém/Barcarena (PA), Santana (PA) and São Luis (MA); and transshipment terminals in the city of Porto Velho and the city of Itaituba/district of Miritituba. The North Corridor also counts with two railways: “Ferrovia Norte-Sul – Tramo Norte” and “Ferrovia Estrada de Ferro Carajás”. A more detailed description of this corridor will be done in the next section.

The Northeast Corridor includes de São Luis Axis and Salvador Axis. It has only highways and contains the port complexes of São Luis and Salvador. It is important to note that the São Luis port complex is part of both the North and Northeast corridors, as it receives cargo from routes that come from both the Tocantins Axis and the São Luis Axis (Fig. 3).



Source: Ministério dos Transportes, Portos e Aviação Civil (2017)

Fig. 3. Logistics corridors for grain flow

The three modes of transports (road, railway and waterway) are used in the Southeast Corridor which includes Vitoria Axis and Santos Axis. Besides de highways, the Southeast Corridor encompass the following railways: “Ferrovia América Latina Malha Norte (ALLMN)”, “Ferrovia América Latina Paulista (ALLMP)”; “MRS Logística”, “Ferrovia Centro Atlântica (FCA)” e “Ferrovia Estrada de Ferro Vitória Minas (EFVM)”. Further, this corridor includes the main Brazilian waterway, Tietê-Paraná, and the largest Brazilian port, the Santos port complex. The Vitória’s port complex is also part of the Southeast Corridor. There are also 9 transshipments terminals.

The South Corridor includes de Paranaguá Axis and the Rio Grande Axis. This corridor has three modes of transport, with two sections of railways – “Ferrovia America Ltina Malha Sul (ALLMS)” and “Estrada de Ferro Paraná-Oeste (EFPO)” - and one waterway – “Hidrovia do Sul”. Furthermore, three ports complexes are part of this corridor: “Paranaguá”, “São Francisco” and “Rio Grande”. There are also 5 transshipments terminals (Table 2).

Table 2. Number of routes by modes of transports at the exports corridors

	Road	Rail	Road-rail	Road-water	Road-rail-water	Total
Corridor North	5	–	3	7	–	15
Corridor Northeast	4	–	–	–	–	4
Corridor Southeast	3	4	4	–	2	13
Corridor South	5	1	2	1	–	9

Source: Ministério dos Transportes, Portos e Aviação Civil (2017)

The aforementioned report identified 41 different routes. All corridors have roads as mode of transports and the Northeast Corridor is the only one that has only roads. Although the North and South Corridors have the three modes of transport (road, rail and water), only the Southeast Corridor has integration between all of them for the transport of grain.

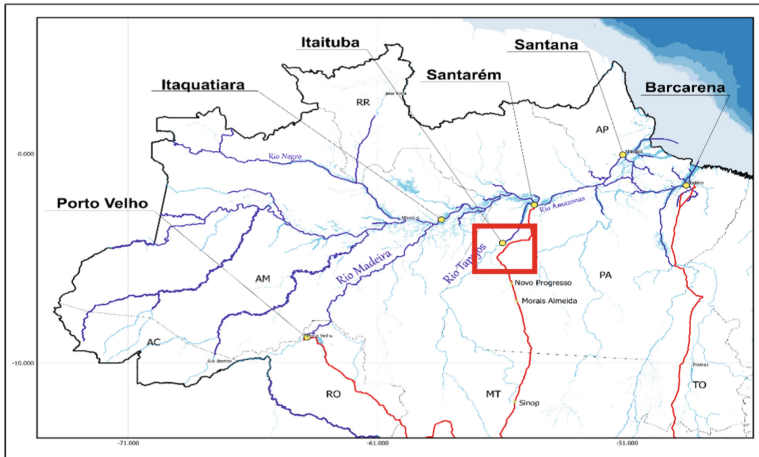
3 Northern Arch

We consider ports of Northern Arch those located in the state of Rondônia, Amazonas, Pará, Amapá and Maranhão. In 2010, 4.4 million tons were exported through the ports of the Northern Arch. In 2015, this volume increased by 242% and reached 15.4 million tons of grains. In 2020, 34.4 million tons of grains were handled in that corridor to be sent abroad.

Considering the figures above, it calls attention the development occurred in Tapajós River. Moreover, the Northern Arch encompasses the North Logistics Corridor and part of the Northeast Logistics Corridor, that is, the Madeira Axis, Tapajós Axis, Tocantins Axis and São Luis Axis.

More specifically on the cargo route through the Tapajós Logistics Corridor, the grain harvest is transported from the north region of the state of Mato Grosso by trucks

along the BR-163 highway and unloaded at transshipment terminals located in the city of Itaituba. Afterwards, the cargo is transported by barges across Rio Tapajós with destination to Santarém or to Barcarena/Vila do Conde (Fig. 4).



Source: Brazilian National Waterway Transportation Agency

Fig. 4. Main waterways in Amazon region

In 2021, with the aim of capturing the perception of large agribusiness companies that operate mainly in the export of grains, about multimodal transport operations, the Brazilian National Waterway Transportation Agency held meetings with some of the largest companies in this sector, namely: Archer Daniels Midland Company (ADM), Amaggi Group and Louis Dreyfus Company (LDC). In addition to these companies, a meeting was also held with Hidrovias do Brasil, in order to learn more about the operationalization of the flow of the grain harvest through Northern Arch.

The grain harvest arrives at Brazilian ports through different logistic corridors, depending on the region of production. Apart from the location where the soybean or corn is produced, the domestic freight cost is also important for the choice of a port, in addition to the shorter distance. In this sense, Brazil's competitiveness in the international grain market depends directly on the costs related to the production and to the transportation.

The agribusiness companies confirmed that, regarding the logistics corridor and the port used for grain exports, in general, the choice depends on the freight market conditions. The companies also highlighted that they consider as being very important to have different modal options and logistic corridors available for the flow of grains to the ports, as it increases competition between modes and also among logistics corridors, contributing to the freight costs reduction.

As large agribusiness companies have a verticalized market structure, it means that they are holders of assets along the logistics chain. They were the largest investors in construction of port terminals in the city of Itaituba and Miritituba district.

Since 2014, the National Waterway Transportation Agency (ANTAQ) authorized 6 grain terminals to operate in the city of Itaituba (Fig. 5).



Source: Movimento Pró-Logística

Fig. 5. Transshipment cargo station – Itaituba/Miritituba (Pará)

The construction of Ferrogrão railway has the potential to consolidate the Northern Arc as the main logistic alternative to the grain flows from the Midwest of Brazil.

4 Ferrogrão Railway Project

The Ferrogrão railway is a project that intends to connect Sinop in Mato Grosso up to Itaituba in Pará. It has an extension of 933 km and will be constructed in parallel to BR-163 road. It will allow an integration between rail and water and it is expected to consolidate the Northern Arch as the main logistic corridor for grain exports.

The Ferrogrão would allow the flow of grain production from the Midwest region of Brazil (municipality of Sinop) to the city of Itaituba, Miritituba district, where the cargo would be loaded on barges that would go on Tapajós river to the Santarém port or Barcarena port where cargo would be transhipped to long-haul ships.

The paving of the road BR-163, which connects the city of Sinop in the state of Mato Grosso to Miritituba in the state of Pará, gives a good idea of the potential that a logistic connection can have on the freight costs. The freight costs between Sinop and Miritituba fell by 26% after the conclusion of the 51 km paving that remained until Miritituba, in 2019. It is expected that with Ferrogrão railway, the freight costs fell between 30% to 40% (Fig. 6).

According to the Brazilian Nacional Land Transport Agency (ANTT) the Ferrogrão railway should take 10 years to operate and it will be granted for the private sector for 69 years. The Brazilian National Agriculture Confederation estimates that 20 million tons of grains could be transported by Ferrogrão railway, changing the logistic axis from the Southeast to the North region of Brazil and in the end period of the concession the transported volume could be around 48 million tons.

Nevertheless, there are some important steps to follow before Ferrogrão railway could be conceded the private sector and it is still under analysis of the Brazilian Federal Court of Accounts (TCU). Among the main obstacles, the Ferrogrão railway crosses environmental protection area in the Amazon region and also indigenous land.



Source: Brazilian Nacional Land Transport Agency (ANTT)

Fig. 6. Transshipment cargo station – Itaituba/Miritituba (Pará)

5 Conclusions

Brazil as the largest world producer of soybeans counts with important and diversified logistic corridors to bring the grain production from the Midwest of Brazil to the coast, to be exported. An important factor of competitiveness in the international markets of grains is the freight costs, which demands a low internal freight cost. As a result an efficient logistic transportation which combines different modes of transports is essential to make Brazilian grain production competitive in the international markets.

Recently, the logistics corridors of the Northern Arch gained importance, specially the Tapajós Axis, with the expansion of port terminals in the region of the Itaituba/Miritituba. Now, the ports of the Northern Arch disputes importance with port of Santos related to the grain exports. The Ferrogrão railway is expected to consolidate the importance of the ports of the Northern Arch, but it could take some time to be concluded and prior to it, this railway has to deal with important questions related to environmental protection area and indigenous land.

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