

# THE DETERMINANTS OF TRANSPORT COSTS IN BRAZIL'S AGRIBUSINESS<sup>1</sup>

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## **Abstract**

Transportation infrastructure can determine the competitive success of an agricultural enterprise or of the entire agricultural sector. The Brazilian Government has proposed investment in large projects to improve transportation infrastructure in the country's Center-West and North regions. These projects intend explicitly to develop the commodity delivery system in those regions, which should stimulate the continued expansion of soybean cultivation into northern areas. The highway freight market is not under government control, meaning that freight prices are formed through free negotiation determined by supply and demand for the transport service. Carriers have to stay current with changes in every shipping cost variable to negotiate efficiently with shippers. These demanders, except under certain very specific circumstances, have the negotiation power to exert strong pressure on carriers to obtain freight transport discounts. The new deregulated railway system shows good potential, especially for the shipment of grains. Transportation using waterway systems, considered to be the most economical method for the shipment of bulk volumes, has generated many positive expectations due to foreseen utility of projects such as the Madeira waterway system. It is hoped that this waterway system will efficiently reduce transportation costs for grains produced in Brazil's Center-West region. The ports of Santos and Paranaguá are still the preferred embarkation points, but the ports of Itaquí, Vitória, Ilhéus, São Francisco do Sul and Rio Grande can now be considered very good alternatives. The shape of the present and future Brazilian transportation system, in particular the location of and access to efficient transportation corridors, is a crucial variable in the determination of processing plant location by private investors.

*Keywords:* logistics; transportation; agriculture

## **1. Introduction**

One of the most striking phenomena observed in Brazilian agriculture over the past decades, and even more noticeable in recent years, is the transformation of its spatial arrangement. Agricultural businesses have occupied areas in Brazil's new frontier, the country's North, Center-North, while continuing to expand in large areas of the Northeast. The majority of this expansion has combined agricultural activities with modern production technologies. Similarly, in a drive to minimize transportation costs, input suppliers and storage and processing industries have clustered around new production centers. These changes have already implied a

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clear reduction of export costs and thereby improved the competitiveness of Brazilian agricultural products.

Empirical evidence of the effect of agricultural transportation infrastructure on competitive position is clearly and elegantly documented by Crainic and Laporte (1997) in their review, "Planning Models for Freight Transportation." The authors emphasize that strategic decisions determine general development policies and broadly shape long term logistic system operating strategies.

## **2. Transportation corridors in the Brazilian North, Center-West and Northeast**

Helfand & Rezende (1998) report that a major factor determining regional soybean price differentials at major Brazilian markets has been the transportation infrastructure in frontier regions. As soybean production moved to regions that are farther and farther from consumption centers and from the exporting ports in Brazil's South and Southeast, the development of transportation corridors to the North became necessary. These corridors have been used for regional commerce in northern states for quite a long time; however, they have only recently gained attention, mainly because of projects initiated by private investors.

Grain has been effectively transported to northern embarkation points when the transportation infrastructure permits, as it is the case of the Carajás railway and Madeira river waterway; but in most instances, northern grain flows to ports in the South and Southeast or to the nearest agro-industrial user.

There is a clear interdependence between transportation and agricultural production, with transportation cost reductions denoting growth in agricultural production. Helfand & Rezende (1998), analyzing agricultural price differentials between selected Brazilian regions, suggest that costs of production would be significantly reduced if livestock herds were shifted from Brazil's Southeast to its Center-West. However, shifting livestock production from the South to the Center-West would not result in lower production costs, as what is gained from lower feed costs in the Central-West would not compensate for the higher costs of shipping from the Center-West to the consumption markets of the Southeast.

Lima et al. (2000) enumerate the main alternatives for Brazilian multimodal transportation corridors analyzed in recent studies (see, particularly, Lício & Corbucci, 1996), emphasizing:

— Center-West and North regions:

- Madeira waterway corridor: used for the transportation of grains hauled to Porto Velho (RO) from Mato Grosso by road, transferred to barges for the trip down the Madeira river to the Amazon River city of Itacoatiara, where the grains are loaded onto ocean going ships for international delivery;
- Ferronorte railway corridor: used to transport grains from Mato Grosso to southeastern ports, mainly the port of Santos. The railway is already operating to the city of Alto Taquari (MT), with network expansion to the city of Cuiabá, (capital of MT) underway;
- multimodal Center-North corridor: used to transport grains from the states of Goiás, Tocantins, Pará, and part of northeastern Mato Grosso via the Araguaia river to the city of Xambioá (TO), and then by road to the city of Estreito (MA). From Estreito, the grains are then shipped by the North-South and Carajás railways to the port of Itaqui, in São Luiz, the capital of Maranhão. It is predicted that the Tocantins river between Miracema (TO) and Estreito (MA), and North-South and Carajás railways will eventually be used to ship grain from eastern Tocantins and southern Maranhão;

- Cuiabá-Santarém highway corridor: used to transport grains from Pará and northern Mato Grosso to the port of Santarém (PA);
- Teles Pires/Tapajós waterway corridor: used to transport grains shipped from Mato Grosso to the border with Pará by road, where it is loaded onto barges for a journey on the Teles Pires and Tapajós rivers to the city of Santarém (PA), where the Tapajós River joins the Amazon River, and then transferred to oceangoing ships for international shipping;
- Paraná-Paraguay waterway corridor: used to transport grains from Mato Grosso by a waterway which begins in Cáceres (MT), passes through the Pantanal region, and then proceeds to Argentine and Paraguayan ports, where processing often takes place before the grains are loaded onto oceangoing ships for international delivery.

— Northeast region:

- the São Francisco waterway corridor: used to transport grains to Juazeiro (BA) where they are offloaded and shipped by rail to the ports of Salvador (BA) and Petrolina (PE) or via the Transnordestina railway to the ports of Suape (PE) and Pecém (CE). This corridor can also be used to transport grains to Brazil's Northeast region for domestic consumption.

— South and Southeast regions:

- In these regions, the projects usually developed are directed toward the renovation of the existing railways, highways, and port terminals.

### **3. Logistic strategies in the highway freight market**

Research about the spatial movement of freight has become essential for transportation planning purposes (see Vanek, 2001, for a very comprehensive review on that issue). Particularly in Brazil, the increase in soybean production, chiefly for export, has resulted in increased demand for freight hauling services to move the harvest from Brazil's central regions to its major ports.

In addition, recent mergers and acquisitions involving agricultural input and food companies, as well as privatization of the Brazilian rail network and private investment in waterways, have signaled the consolidation of a new paradigm: the "cargo's owner" has also become the "logistics' owner." With larger volumes to be moved, shippers necessarily become more concerned about the logistics supplier, which in many cases results in the justifiable vertical integration of transportation services.

Following this theme, a number of strategies to optimize both in-bound and out-bound logistics have been observed. These strategies range from the construction of new types of transportation vehicles, which are now used in the shipment of bulk solids (e.g., highway double-trailers) to the prioritization of back-hauling as increased grain production has necessitated that highway grain carriers make the return trip from port to interior with fertilizers and other inputs.

Although, agro-industries and traders are the great supporters of this increased export flow, they are not the only ones who have focused on back-hauling freight. This benefit is available to all companies willing to import and transport fertilizers to grain producing regions. The formal mechanisms that determine who transports what freight do not establish that the trucking company used to transport grain from the Central-West must be used to return to the Center-West region with inputs. However, the bargaining power of large shippers when negotiating soybean and fertilizer hauling with highway carriers becomes greater each year, especially due to of the large quantities involved. Moreover, an agro-industry operating with both

soybeans and fertilizers – classic examples for a good load-matching operation – will certainly be more likely to increase its logistical efficiency than a single product industry.

In recent seasons, a larger set of routes of fertilizers had its freight value cheaper than the one practiced for soybeans over similar distances. Those efficiencies derived from back-hauling imported fertilizer from grain export ports has forced intermediary fertilizer carrier companies that transport domestic fertilizer to reduce their hauling charges (as in the cases of flows starting in the Triângulo Mineiro region and in the State of Paraná) to compete with the imports.

Back-hauling makes economic sense and in some regions can determine a carrier's financial health: the simple fact that a North-South and return flow of any sort of cargo, a back-hauling operation, implies lower hauling costs than a one way flow and lower freight value per km shipped.

For selected products, very typical behaviors for unitary highway freight values as well as for the participation of highway freight costs in product value stand out. Corn, a low value-added product with a low freight value, shows a most striking freight cost influence on its commercial value; on the other hand, coffee, a high value-added product, shows the lowest relative participation of freight costs in product value.

#### **4. Logistics: market expectations**

In the course of this study, several representative agents of the transportation and agro-industrial sectors were consulted and interviewed to ascertain their main concerns regarding the logistic future they will face. It was found that there was a generally pessimistic view with respect to the Brazilian highway systems future due most probably to the extremely inefficient application of past public highway investments, although, several private highway projects have brought about significant road improvements. This negative outlook is reinforced by the experience of many highway cargo transportation operators.

Haulers, especially those that transport products of low value, such as grains, have had to deal with a significant cut in the profits. Well-structured carriers that understand and can predict their costs have even interrupted their operations because of the low price paid by demanders. Unfortunately, some carriers cannot afford to curtail operations as the threat of client desertion compels them to continue. As a result, one observes a picture made up of deteriorating, devalued, precariously maintained transportation equipment.

In the specific case of back-hauling for agricultural carriers, the recommendation already made by several agents of the transport and agro-industrial sectors is reinforced: there is the need for a new policy that permits the release of production funding during harvest. In this way, producers can acquire agricultural raw materials at the same time their harvest is delivered, permitting the transportation of inputs as a back-hauling operation and thereby reducing freight costs through transport-combined operations.

Grain transportation carried out exclusively by road is not desirable, due to the resulting high energy consumption. However, it is extremely important that the highways are well maintained to reach a reasonable condition, as this mode is the only one allowing door-to-door transportation. As a side note, there was an expectation that the privatization of some highways will lead to better road maintenance and inspection.

Those who were interviewed predicted a gradual drop of diesel subsidies that will affect the value of highway freights and increase the importance of the railways as a means of freight transport. Although the railway networks are highly desirable in future scenarios, the new holders (grantees) of railway licenses face a significant challenge: the rescue of credibility lost during the period when the railways were a public monopoly. At this time, skilled and respectable companies are the majority holders of shares in these new private railway companies, but there is a chance that the eventual occurrence of mergers and acquisitions among these new

grantees will culminate in a private monopoly management model. The evolution of the new Brazilian rail system must be carefully monitored.

Some other interviewees considered Brazil's waterways to be of great importance if the country's logistics network is to become an efficiently operating system, especially the Tietê-Paraná and Madeira waterways. In practical terms, the Brazilian waterway system has only proved to be competitive as a cargo mover in regions with severe transport supply deficiencies. The region of the Madeira waterway is characterized by the existence of basically a single transportation system involving the waterway. In the region of the Tietê-Paraná waterway one finds stiff competition among highways, railways, and the waterway for freight business.

The principal reason that Brazil's waterways have so little impact on freight transportation is that none of the country's navigable rivers empty into the ocean and only the Tietê-Paraná system connects important economic centers. These geographic problems necessitate several transshipment operations before most cargos transported using waterways reach their final destination, which implies additional costs and losses. In many cases, it is more rational for decision-makers to load their cargo on a truck, which provides door-to-door service and involves no transshipments, than to load them on a ship or barge.

The near future implementation of new intermodal freight terminals and the construction and finalization of complementary works along the Brazilian waterways (such as the construction of locks) are expected to increment the viability of waterway transportation.

It was also revealed from the interviews that the ports of Paranaguá, Santos, Itaquí, Vitória, Ilhéus, São Francisco do Sul and Rio Grande are expected to have greater probabilities of incrementing the efficiency of Brazilian logistics in the future. In the port of Santos, where an intense modernization process is observed, many issues between the service rendering companies and the unions remain to be resolved, unlike what is observed at the port of Paranaguá.

In terms of new paradigms, there is a highly positive expectation that technological advances in the transportation sector will improve freight handling efficiency. Assuming that the highway network will remain the most used segment of Brazil's commodity delivery system--even over the medium term--measures to reduce transportation costs, over the short term, must focus on increasing the productivity of highway vehicles, improving the processes of loading and unloading, better organizing back-hauling operations, and providing for the adequate maintenance of both vehicles and roadways.

The professionalism of operators in the highway transportation sector should be encouraged through measures favoring the release of specific banking credit lines and the implementation of better strategies for systematic highway maintenance.

A definitive solution (not merely palliative) for problems arising from inadequate road maintenance is urgently required, since the problem's cycle is very well known by authorities and agents involved: obviously overweight trucks travel Brazil's highways subject to only minimal, extremely deficient inspection by inspectors who lack the tools (scales) to perform their duties. Overweight trucks damage the highways, which results in more fuel being consumed, more worn out tires, and higher consumption of lubricants and truck parts. The solutions that depend on road tolls resources often lead to further complications as toll costs lead drivers to switch to secondary, more hazardous roads that are inadequate for the load and quickly fall apart; and the cycle goes on.

As to the railway sector, effective measures to systematically evaluate the operational and financial performance indicators of railway companies must be developed; specific credit lines for the modernization of vehicles and infrastructure must be made more accessible; and interconnection between distinct railway systems and between railways and ports must be facilitated.

Improvement of Brazil's waterway transportation sector's effectiveness and viability should be slower than that of the other modes. Brazil has to go through a process of waterway

“acculturation,” which will involve, among other measures, the suitable location and increased operational capacity of waterway terminals, evaluation and redefinition of what has been so far considered within the scope of ‘waterway-viable cargoes,’ usually low added value cargoes, and evaluation and redesign of river lock systems.

Measures to reinforce the modernization of Brazil’s marine port and stimulate increases in their capacity and efficiency are anticipated. It is also expected that activities related to the coastal traffic (cabotage) movement will be expanded. In this sense, the Port Modernization Law must be enforced, and the freight handlers’ schedules must be arranged in accord with the Hand Labor Managing Agency’s (OGMO) guidelines and not determined exclusively by the unions.

It is worth remembering that a new storage structure, both physical and operational, has gradually been set up in the country. This offers greater possibilities of gains to the producer, who can avoid the selling transaction immediately after the season and operate according to the effective reality of the international market. In this context, Rezende (2002) stresses a very important fact to the agents involved in storing in Brazil: Law N° 9973, of May 29, 2000, which addresses the system governing the storage of agricultural products, regulated by the Decree 2855, of July 2001, replaced the 1903 Law of Storing. Also, the Federal Government, in a consistent way, has begun to encourage and finance the construction of on-farm storage systems.

Regulation of Brazil’s transportation systems, especially those that transport cargoes, has always been characterized by a generalized diversity of responsibilities. Probably because of the flexibility prevailing in the highway transportation sector, which is not necessarily (and it does not have to be) under any sort of centralized coordination, the managerial authorities of the several transportation modes are in large number, not integrated and operate under no common strategic policy. Because of this lack of coordination and the inefficiencies this entails, formatting and duly implementing the National Transportation Agency (now split as ANTT – National Terrestrial Transport Agency, and ANTAQ–National Aquatic Transport Agency), with the objective of regulating the transport sector as a whole, is of fundamental importance. Although regulatory policies must not impose excessive costs, at a minimum they should provide rules that normalize taxation for services provided (VAT, for instance) during intra- and interstate cargo movement and insure that cargo carriers and cargo terminals practice safe, environmentally sound transportation practices.

For the shipper, the main goals are to deliver the cargo in good condition, at the destination stipulated, within the scheduled deadline, and at a competitive price while making a profit. For the grain market in particular, one expects that competitive railway and waterway freight values will actually appear when making the transportation decision.

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