

ANALYSIS OF LOAD SCHEDULING SYSTEM IMPLEMENTATION AT BRAZILIAN SANTOS PORT

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ABSTRACT

The general objective of this study is to evaluate observed facilities by the use of the scheduling system, in the Brazilian Port of Santos, which was established in early 2014. The system implementation was mainly motivated by the logistical chaos seen in recent years, specifically regarding the arrival trucks at the Santos area. Traffic jams and extensive delays turned into ordinary subjects of the day-to-day port, and led to this required improvement in management. The methodology used was descriptive research, based on documents that discuss the matter. In terms of results in the short term, the scheduling system generated small changes in landfills in the harbor, which changed the routine of the agents involved. The congestion in the port region decreased, but was not observed large effect in terms of unloading at the terminals productivity. In the medium and long term, it is expected that the operators to adapt to this new routine activities, and this can be observed real improvements in port logistics process. It is also worth noting that only the improvement of management will not solve all bottlenecks in the Port of Santos, being required other investments be made so that the port productivity can be expanded significantly.

Keywords: *Logistics, Port of Santos, Scheduling System, Sugar.*

1. INTRODUCTION

Brazil is the largest producer of sugarcane and sugar, followed by India, China, Thailand and Pakistan (FAO, 2014). According to FAO's data, in 2012, Brazil produced about 50% more sugarcane than the second largest producer country, India. More than 70% of Brazilian production is shipped through the Port of Santos, which features intense logistical problems, particularly as regards the arrival of trucks to unload. For this reason, the CODESP (Santos Port Authority) decided to deploy a pre-scheduling system to improve the management of the port. The intention of this system is to avoid queues on the roads. In the opinion of trucker's representatives, there will be further concentration of trucks in the countryside area. According to the President of the Transport Companies' Union (STTRR),

Luiz Gonçalves da Costa, "The Rest Law (12.619) is not being fulfilled in practice. According to this rule, all drivers must rest at least eleven hours between work journeys. In this sense, during these resting time, truckers spend pulling the queue at places of loading and unloading", he says. The wait time is not being paid, contrary to the law. "The law says that the shipper has to pay \$ 1 per ton / hour to the carrier after 5 hours queue. There have been terminals condemned for not fulfilling it. The correct would be the companies receiving the detention time fine and also indemnify the truckers", he explains. According to Costa, despite of having been condemned to fulfill the law, trading companies are very powerful and carriers do not have the courage to face them.

From this problem, this article aims to evaluate which methods the Port of Santos have been using for loading and unloading schedules, dealing with logistics and also the infrastructure gaps.

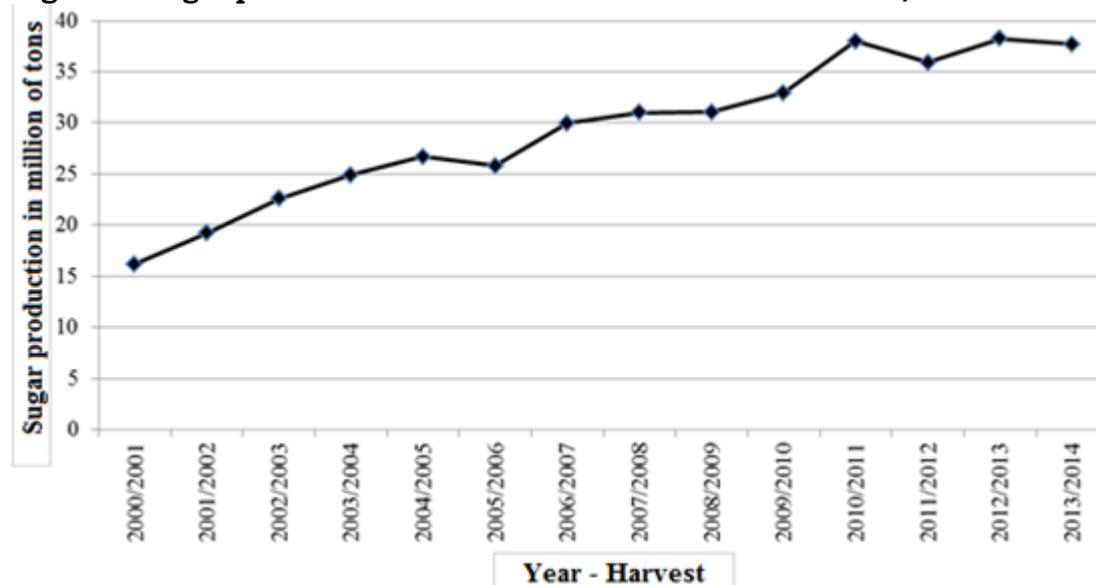
Due to the large representation of the Port of Santos, being responsible for about a third of Brazilian foreign trade, and also combined with various existing logistics bottlenecks in the Santos region, this paper aims to study what were the main changes that occurred after the implementation of the scheduling system conducted by CODESP in early 2014.

The next topic, literature review, aims to characterize the domestic production of sugar, and the role of Santos Port on this business, specifically the structure they are using to work with the export of sugar. Next, it will be made a brief description of what is the scheduling system and how it works. The third topic presents the methodology used in this article. The fourth topic illustrates the results, emphasizing the changes that the industry players perceived before and after the implementation of this scheduling system. And lastly, will be presented the final considerations of this work and references.

2 - PRODUCTION CHARACTERISTICS NATIONAL SUGAR

From sugarcane, mills industries produces sugar, ethanol and electricity, among several other by-products of this agroindustrial system. This article focuses on the sugar, whose Brazilian production history can be seen in Figure 1 (ÚNICA, 2014).

Figure 1: Sugar production in Brazil between the harvests 2000/2001 and 2013/2014

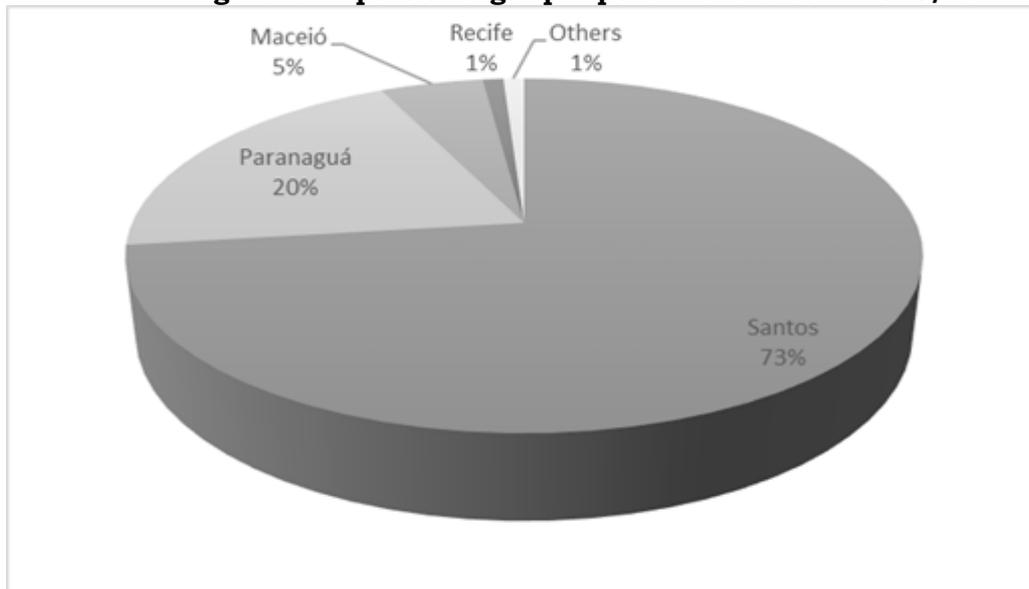


Source: UNICA (2014)

Through Figure 1, it can be seen that in the last four seasons, the country has been stable in sugar production reaching the level of 38 million tons in 2014. Of this amount, about 70% has been exported, representing a volume of approximately 26 million tonnes (UNICA, 2014). This product's main destinations are Russia, African countries (such as Nigeria and Algeria), and Arab countries (with emphasis on Saudi Arabia and United Arab Emirates).

According to SECEX (2014), Santos Port is the main exit door of Brazilian sugar, as can be seen in Figure 2.

Figure 2: Export of sugar per port in the season 2013/2014



Source: UNICA / SECEX (2014)

In the season 2013/2014, over 19 million tons were exported through Santos, which also is the largest port in Brazil. Currently, a number of problems have been reported, resulting from the precarious structure and infrastructure for loading and unloading in the harbor. Every day, more laws trying to regulate the road transportation arise, trying to minimize port's bottlenecks.

2.1 - SANTOS PORT

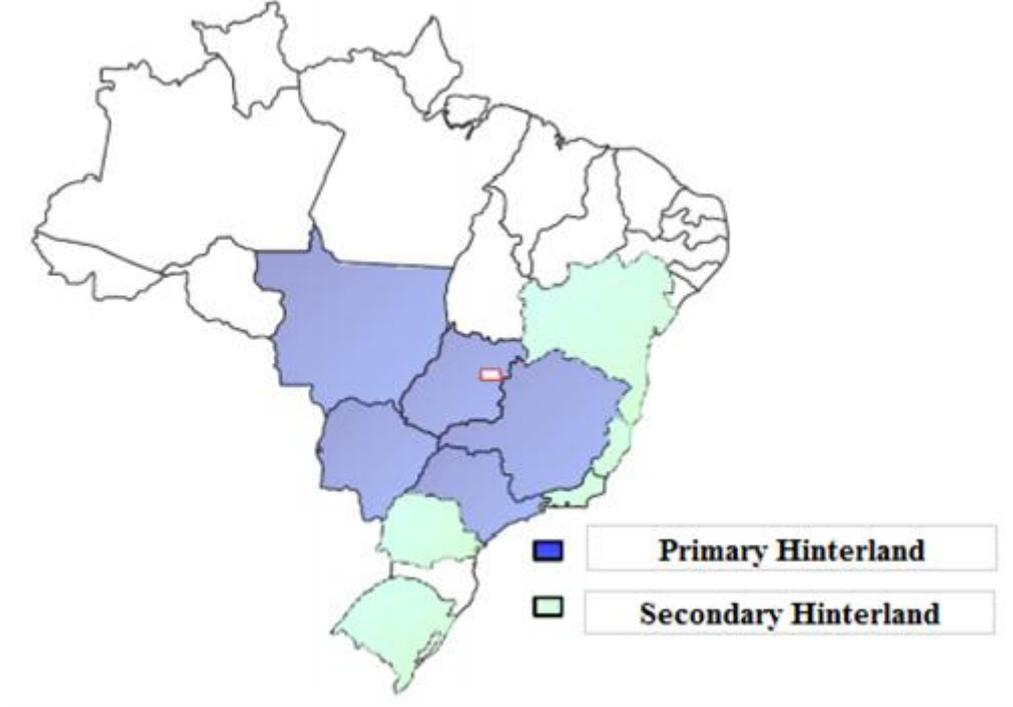
Brazilian portuary sector has undergone through significant changes with the implementation of the Port Modernization Act, which changed the exploration and operation model of Brazilian ports, granting the exploration to the private sector through the lease of terminals with a public management more focused on supervising and regulating. In this context, the ports start to fit the new reality of the port economy, and private use terminals are gaining strength and beginning to specialize in certain commodity groups (CASTRO JUNIOR, 2010).

The Port of Santos is considered, if compared to others ports in the world, outdated, time consuming, inefficient and without planning. It also has been the main reason of problems and cancellations of import and export contracts account, due to delays in loading and unloading of materials, especially foods such as beans (soybean and corn). It notes that the infrastructure has certain relationship with economic growth, to the extent that, the better the logistics efficiency is, the economic development will be less compromised. When there are queues of trucks or a lot of bureaucracy in the release of the goods, who pays the cost of this inefficiency is the country, since the product loses its competitiveness in the international market (BRITO, 2010).

In this context, one realizes the importance of the Santos Port, as the largest port in freight movement in the country. The Port of Santos plays an important role in the economy, accounting for 25% of the movement of the Brazilian trade balance (CODESP, 2014). It is also being responsible for more than 1/4 of the Brazilian trade balance, being the great drainer of agroindustrial production of large states such as São Paulo, Minas Gerais, Mato Grosso, Mato Grosso do Sul and Goiás. It is within their area of influence that is installed most of the agricultural production for export, as well as Brazil's most important industrials centers, giving importance to the geo-strategic characteristics of the port (IPEA, 2009).

According to the PDZ Santos (2006), the hinterland is the market area of a port, ie, it's zone of influence. The currently known hinterland of the Port of Santos refers to the state of São Paulo, Northern Paraná, south of Minas Gerais, Mato Grosso do Sul, south of Mato Grosso and Goiás, as shown in Figure 3.

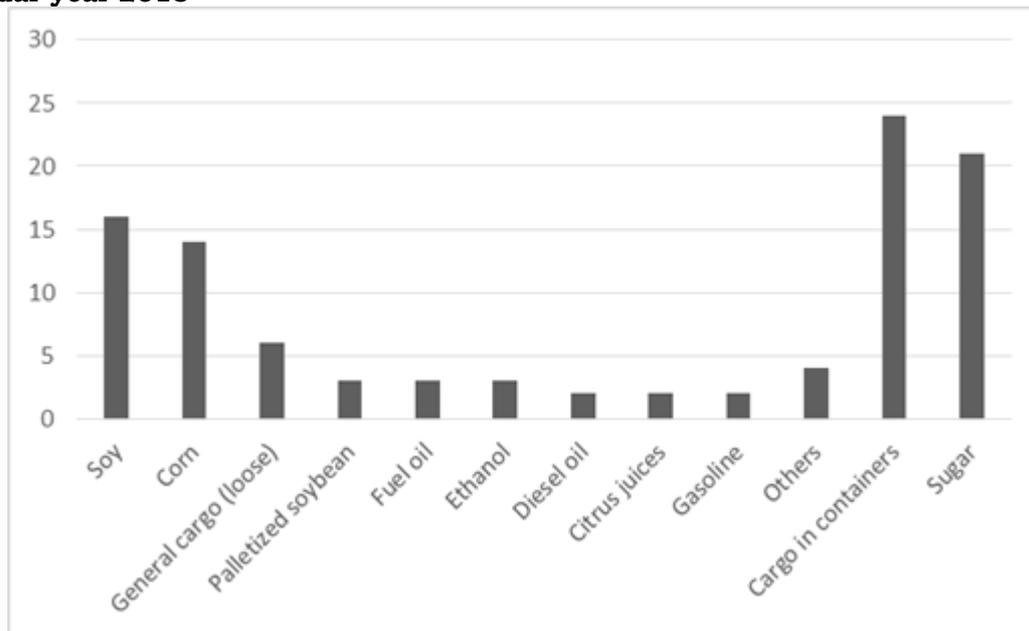
Figure 3: Hinterland of the Port of Santos



Source: PDZ Santos (2006)

In 2013, considering exports and cabotage, about 80 million tons of products have left the port. Of this amount, Figure 4 shows that the sugar corresponded to 21% of the total.

Figure 4: Percentage division of products exported through the Port of Santos in calendar year 2013



Source: CODESP (2014)

Sugar is exported by Santos basically in two different ways: bulk and bagged. The export of bulk product (without packaging) is performed by terminals that are specialized in this type of movement. The terminals of Copersucar, Rumo Logística (Cosan) and the TEAG, are examples of terminals that work with sugar all year round. Besides these, other terminals can also move the bulk sugar during part of the year: 12A, and the terminals of Guarujá (Bunge and Cargill). The transportation of this product can be done by road or rail. In both cases the product is stored in the transport mode and is unloaded through hoppers systems, which elevate the product until the stores of each terminal and then places them on the ship.

As for the bagged sugar, it is exported in two different ways. The first operation, known as a break bulk, consists of placing the sugar bags directly into the hold of the ship. This operation in the Port of Santos occurs at the terminals of Copersucar, Rumo Logística (Cosan) and TEAG. The second type of bagged sugar operation is to export it via container. In this case, are the container terminals that perform the export itself, the main terminal in the Port of Santos is Santos Brazil, but there are several other container terminals operating in the port. (Figure 4 shows that 24% of port movement correspond to containers (CODESP 2014)).

For both of bagged sugar operations, the transportation of the product to the port takes place exclusively by road. However, at the time to unload the product at the port, logistics is performed in a completely different way. In the case of break bulk, receiving the truck cargo is made in the port terminal, where the product is unloaded and sent to warehouses (by track system), which will be later placed within the hold of the ship. In the case of container, the sugar bags are received in the retro area, in companies that make the stuffing container process. This procedure is nothing more than putting the product inside the container and seal it. For this, however, the presence of some institutions are needed, as the IRS (Importation Regulatory System), which releases the documentation of the inserted load on the container. These stuffing companies then stuff the container, which is then taken to the container terminal in the primary area of the port, where it will be placed on the ship.

Importantly, the export of sugar per container is an operation that has grown considerably in Brazil in recent years. The main reason for this growth is the consumer market. The lower volume of export per container enables to export the product to countries that have a lack of structure and / or demand to receive a complete ship in bulk. This makes it possible to reach new markets. Accompanying this growing trend, many companies have specialized in making the stuffing of the container in the countryside of the state. The containers are filled and sealed in any company within the state, and then the container is transported to the port directly to the port terminal. Thus, it eliminates a process step, relieving the port structure. Sumaré is a city in São Paulo, about 150 kilometers from Santos, where this type of stuffing out of the harbor operation is done.

The Port of Santos is cutted by a canal. The so-called left margin corresponds to the Port of Santos city, and is where are located the terminals of Copersucar, Rumo Logística (Cosan), 12A and some container terminals. The right side of canal corresponds to the city of Guarujá, and is where are the terminals of Cargill, Bunge, Santos Brazil (container), among others.

In addition to the terminal structures, there are also parking lots at the port area, specific for trucks. The main parking lot is the Ecopátio, where they're headed up to 1,500 vehicles / day. This lot is located between the cities of Santos and Guarujá. The main objective of these parks is to remove the rows of trucks from the streets. In practice, the vehicles before heading to port terminals must pass this parking lot, where they make a record and await the call from the terminal to unload (CODESP, 2014).

Although soon after its implementation it has given a good result, reducing the port congestion, in recent years this has been a huge bottleneck in the Santos region. The number of vehicles that addresses daily the port exceeds the receiving capacity of the

parking lots. In addition, the low efficiency of port terminals has caused the vehicles to wait in the parking lot for a very long period of time, clogging it. The optimum waiting time in Ecopátio is 3 to 4 hours. During the last years, it was quite common to find truck drivers who waited on average more than 24 hours, and you can even find truck drivers waiting more than 36 hours to unload the product.

In addition to this bottleneck in its own parking, traffic in the Ecopátio's access roads also affect the locals (which reaches a population of 50,000 residents in nearby neighborhoods). In April 2013, congestion peaks were recorded up to 50 km, involving the Anchieta and Cônego Domênico Rangoni highways. Especially the Cubatão City, in 2013, tried to impose provisional measures to avoid the logistical chaos, restricting vehicle access times in the city. However, this measure was palliative and only contributed to congest other highways before arrival to the municipality (PREFEITURA MUNICIPAL DE CUBATAO, 2013).

Faced with this major logistical bottleneck, the Port of Santos implemented in 2014, the scheduling system, which aims to minimize the traffic jam.

2.2 - LOADING AND UNLOADING SCHEDULING SYSTEM

The scheduling system was implemented on January 1, 2014. The purpose of this system is to try to get an improvement in the logistics of Santos Port, scheduling loading and unloading to avoid further delays as has occurred in the last decade with constant frequency. Upon arriving at the port, the driver can park in one of the control areas, Rodopark or Ecopátio, and simply wait to be called to unload at the terminal.

Still fresh, however, the results of this system have already proven to be effective showing improvements in logistics harbor. According to Globo Rural (2014), in 2014 the queues to unload lasted between 14 and 18 hours, while in the same period last year this time amounted to four days.

The electronic scheduling system is done via the Internet, usually at the place where the vehicle was loaded. There is also a support point in Sumaré, São Paulo, which makes this procedure. Upon entering the website, the carrier type vehicle data, the value of the goods, the note number and the number ETC (Electronic Bill of Lading). Through this data, the system generates a screen for printing, which will be attached to documents onward. In other words, before the vehicle proceeds to the port, it must be properly registered in this electronic platform. Reaching the port area without prior registration, the terminal is subject to fines.

3. RESEARCH METHODOLOGY

This research began with a literature review, in order to explain a problematic (CERVO and BERVIAN, 1996) and raise key concepts. This research is still classified as exploratory due to its perspective of observation and analysis of variables present in the survey.

For both bibliographic and documentary research, the methodology will be conducted through the selection of various materials for analytical reading (books, articles, theses, monographs, laws and documents). This paper will use this kind of research to support the typology to be held.

According to Cervo and Bervian (1996), by looking up documents, explain problems involving certain topic, or not being able to use descriptive research as the basis for the study, thus aiming to understand the application of the concepts studied.

4. RESULTS

It is not an easy task to list all the changes observed after the scheduling system has been implemented at Santos Port. As there is a procedure change in the port routine, it ends up reflecting in different ways in order to do something that the market players are already used doing. In the short term, this generates a lot of resistance, but in the medium / long term, as the agents will adapt to this new way of performing the operation, difficulties will decrease and the results can be better observed.

In this sense, the first major change to be highlighted concerns the day-to-day between the carriers and drivers. Before the scheduling system, as the loading operation was about to start, the carrier would give the collect order to the driver to go load the vehicle in the company. Then the driver would make the trip to the port, stop in the parking lot and wait to be called to unload. After the implementation of scheduling system, before the carrier release the truck to carry the load, it must have the electronic password generated by the scheduling system and made available to the port terminal, which will transfer to the shipper, which will transfer to the carrier. Otherwise, even loaded, it can not go to the port because the terminal will be fined if the vehicle arrives at Santos downloaded without prior scheduling.

Obviously during harvest peaks (both grains and sugar), the demand for electronic passwords is greater than the amount available. In other words, some carriers are unable to get passwords to unload at the port, or can get just a small quota in the day. In these cases, the immediate consequence is the displacement of the lines: what once stood in the port area waiting to unload, is now concentrated in the countryside awaiting to be released.

Of course, creating queues in the countryside prevents the formation of queues in the Santos region, where space is smaller. Also, this line in the countryside is better distributed between companies, not building up entirely in a single point (in Ecopátio in this case). More than that, if the vehicle is not waiting loaded, the product (grain or sugar) is properly stored in the company's warehouse, which has more appropriate phytosanitary conditions, than staying in the back of a truck, exposed to sun and moisture. And, above all, in the medium term each market player can understand the dynamics of releasing passwords, and it will be possible to predict the number of vehicles that can go to Santos daily. With such provision, stranded vehicles can be used on another type of operation, such as for transfers between units and supply refineries. Thus, the loading operations in agribusiness can be better planned.

The second great agent affected by the changes are the port terminals. Before the system, the management of vehicles that arrived at the terminal was made by them. Today, this management involves a limitation stipulated by the port authority. If the terminal receives vehicles without prior registration, it is going to be fined by the port authorities. This is what happened, for example, with the T-Grain (Port Terminal Grain) in February 2014. According to the A Tribuna (2014), 106 vehicles were fined waiting in the terminal without prior scheduling. The fine applied to this terminal was approximately 200 thousand BRL.

Leaving a bit of drivers and port terminals point of view, it is also necessary to analyze the shipper's vision (cargo owner), although in some situations the shipper is the same company in the port terminal. Two major trends have been observed after the implementation of the scheduling system. The first concerns the extension of the crop flow. This trend, moreover, was not due only to scheduling system, but it's something that has been done for some time in the industry. This tendency is to flow off the crop throughout the year, not only in peak season.

As can be seen, the entire infrastructure is available for 12 months of the year: both the truck and the railway, the port terminals and ships. However, the sector as a whole ends up focusing the flow at the harvest peak, either to prevent the formation of stocks (since in some cases there is not enough capacity) or to obtain the short-term revenues. Thus, all this is invariably installed infrastructure part of the year unused, ie without being used. In addition, the values of transport services end up having positive adjustment when demand is very large. This is mainly with road, rail and sea freight. In view of all this system, a number of market participants has sought to flow off the crop more evenly throughout the year, using the installed infrastructure 12 months a year, and pay dearly for avoiding inflated transport in peak season. So that the flow extension trend has already been observed by the agents of the sector, and the scheduling system adds to that practice was further strengthened.

In this sense, coupled with the extension of the flow of the harvest, transport services prices also ends up hovering less. This lower range of prices is good for the entire industry, since the agents (suppliers and demanders) can be programmed to better transport operations, avoiding large budget breaks.

It is also important to note the changes observed in the shipping cost (since in this market the price of transportation is different from cost). It is possible to divide the costs of transport at fixed costs (the cost does not vary with the amount of cargo - insurance of the vehicle, the driver's wages, fixed costs of the carrier), and variable costs (which vary according to the trips made by truck - fuel, tires, etc.). Overall, the fixed costs are measured in BRL/h and variable costs in BRL/Km. Before the scheduling system, as if a great time spent standing in queues at the port, fixed costs would increase significantly as more time in line reflects a lesser vehicle uptime. After the scheduling system, the transport equipment itself is more productive, carrying more cargo and decreasing the fixed costs. In other words, even in terms of costs, a better organization in the port logistics helps the road transportation.

The second trend observed by shippers is the choice of alternatives for transporting the crop. As already happens in Paranaguá Port, where there is a limitation of daily volume to be received, this limitation of Santos Port encourages shippers to find other alternatives to put the products inside the ship. For grains, besides railway alternative, which is strongly present in Mato Grosso, the port of Vitoria has been an alternative to the flow of grains (coming by Vale's railway from Araguari), in addition to Miritituba and Santarem's port. In the case of sugar, the main alternative is the use of the railway to Santos, and the port of Paranaguá. Few operations with sugar are observed in other ports in Brazil.

The fact is that the results are being observed. According to Agência Brasil, the average length time of permanence of trucks at the Port of Santos fell from 9.25 hours to 5.5 hours between April 2013 and the same month of 2014. Data is from Companhia Docas do Estado de São Paulo (Codesp). According to CODESP, also in April 2014, the vehicle index that met the scheduled period to arrive at the port reached 67%. When the schedule came into effect, adopted in January to reduce congestion, this percentage was 23% (Agência Brasil, 2014).

Apart from these generalized results observed for all products that are encompassed in the scheduling system, this paper aims to focus on what has changed for sugar. According to industry players, in the case of bagged sugar, the changes were not significant. As the vehicle is directed to the retro area for container stuffing, it is not mandatory to use the scheduling system. Despite not mandatory, some terminals have adopted this practice and market participants (especially carriers) are already adapting to this new routine.

In the case of the bulk sugar, the improvement was clearer. After the implementation of scheduling system, the terminals can do a better planning of the number of vehicles that will arrive every period, and as a result, the receive operation of the volume is functioning more smoothly. In the case of rescheduling, which occur when the vehicle comes off the initially stipulated time, some drivers end up having to wait for 2 or 3 days to be rescheduled and then unload, but the terminals are now treating exceptions.

In both cases, bulk and bagged sugar, weren't observed changes in the terminal productivity, since their capacity remained the same. The change that in fact was noted is related to organization of vehicles, avoiding long queues and payment of detention time. In fact, there have been reports that before the scheduling system, some terminals ended up with their unload process idle because, due to the traffic of the Santos region, the vehicles could not reach the place of unloading. After the scheduling system, this type of problem has not been observed, enabling higher stability in the operations.

It can be seen that in the case of sugar, operational improvements were viewed more effectively for the bulk product. However, there were no significant changes in terms of productivity, since did not have to be made investments on equipment at the terminals for this change to occur.

5. CONCLUSIONS

In view of the importance and the growth not only of sugar in Brazil, but in all agro-industrial products, mainly soybeans and corn, the improvement of the management of existing infrastructure to flow these goods is very important to better use the industry resources. The scheduling system of Santos Port is a practical example of this management progress, which, as seen in this article, brought some inconvenience of operating mode change in the short term, but tends to have good results in the medium / long term, as the industry players will adapt to use the new system properly.

Obviously, the change also brings other direct and indirect consequences, such as the change in the behavior of the transport service prices (freight), the more spaced flow of the crop, besides the use of new alternative outlets in the country. Furthermore, it was also seen that the improvement was only operational, not interfering with the productivity of port terminals.

Although this system has shown good recent results reducing the apparent lines of trucks, it is still in the implementation phase and has a lot to be improved. It is expected that over the next few years, the agents learn to operate it better and enjoy their benefits. In addition, it is essential that further improvements are made in the port of Santos, as the increase of the use of railways, improvement in accesses and port avenues, increasing draft depth to handle the larger vessels and paperless initiatives are already being worked on to improve the process of importing and exporting goods. The scheduling system itself can reduce or mitigate some port bottlenecks, but only globalized changes in port, that enable to see the port structure in an integrated way, can actually bring sharp increase in productivity in operations, expanding the port capacity to export and import goods.

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