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Build It and They Will Come

The Impact of Port Expansion on Brazilian Soybean Output

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Global grain & oilseed consumption is expected to increase throughout the next decade. As Brazil features over 75 million hectares of underused pasturelands which could be turned into productive cropland, it is a natural candidate for responding to this demand by increasing supply, especially of soybeans—its main export grain commodity.

Lacking port capacity and a history of underinvestment in port terminals has, however, remained a key bottleneck for Brazil when it comes to fully realising its grain trade potential. Yet starting in 2013, changes in the country's regulatory framework underlying port use have been helping to proliferate investments in port capacity, and Brazil's exporting capabilities are expecting a boost.

Accordingly, a robust expansion of Brazil's soy area is anticipated, particularly where productive areas can be connected to the increased export port capacity.

Brazil's great latent potential to feed the world

The outlook for the global demand for grains & oilseeds is very promising for the near future, as the dietary shift towards foods with higher protein content in developing countries (particularly China and India) materialises—driven by rising incomes and a growing middle class. Global demand for animal feed is also set to increase, at an annual rate of 2.7 percent over the next decade. This will boost grain consumption, since grain comprises over 70 percent of conventional feed ingredients.

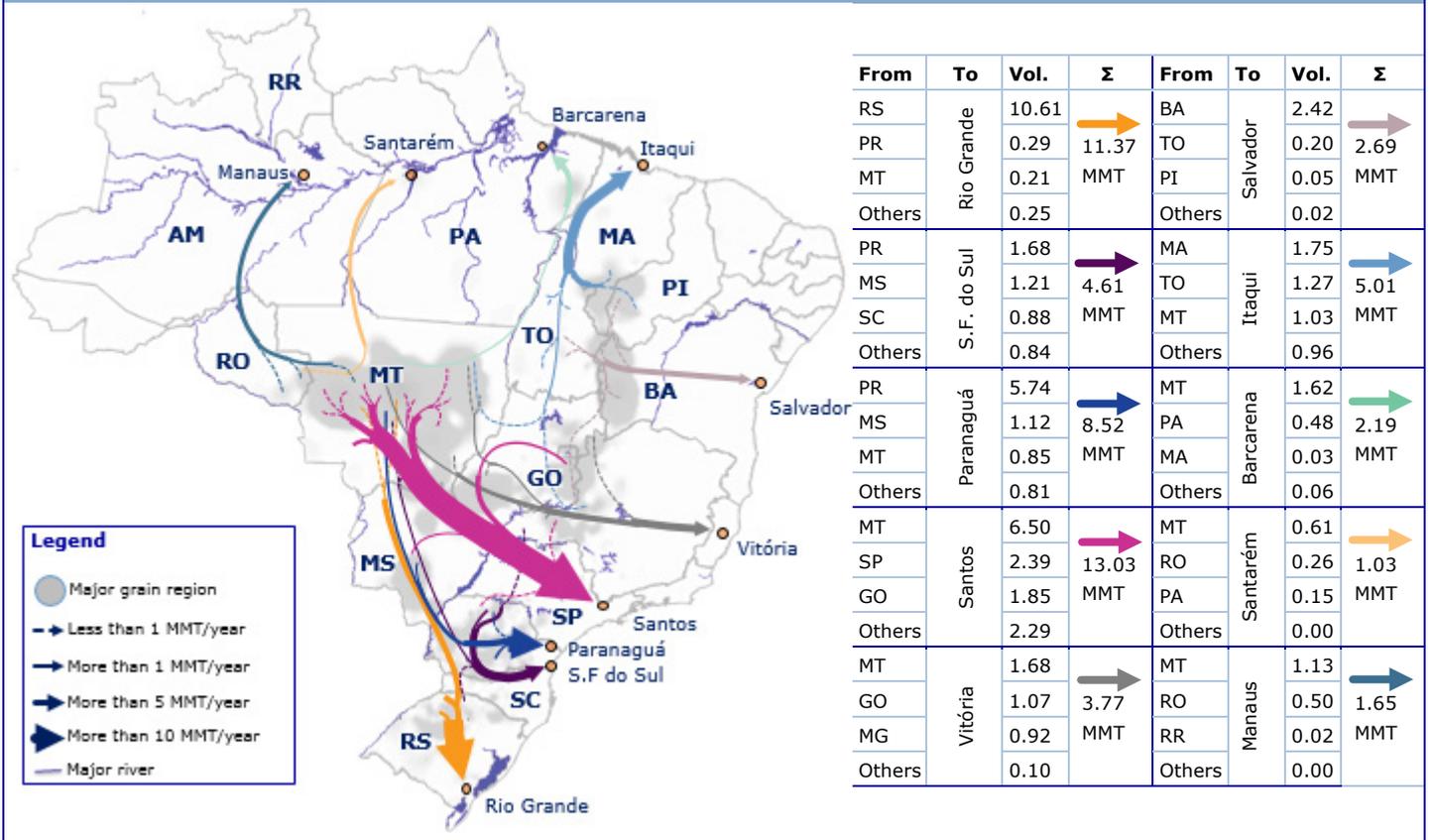
In this context, with arable land of about 75 million hectares and the possibility of almost doubling it—mostly through an agricultural exploitation of underused pasturelands—Brazil is a strong candidate for producing a large portion of the world's expected increased demand for grains, especially soybeans. This view is supported by the 120 percent rise in soy exports Brazil has experienced over this past decade, leaping from 25 million tonnes in 2006 to 55 million tonnes in 2015. However, lacking port capacity has often been singled out as one of the country's main hindrances for sustained future expansion of its grain exports.

The situation is uncanny. Even though Brazil features one of the longest coastlines in the world—approximately 8,500 navigable kilometres—and over 50 inland ports and seaports, nearly all publicly owned, most are unsuited for shipping grains due to low-draft issues, limited handling capacities, constrained space and environmental issues. Moreover, the present infrastructure is plagued with inefficiencies, deriving from a general lack of investments. In a recent survey by the World Economic Forum, Brazil ranked 126th in port quality, out of 150 countries.

Thus in recent years, Brazil faced limitations in servicing some of its key grain-producing regions and, in particular, its rapidly expanding agricultural frontiers. While the country's top four grain-exporting ports are situated on its southern coast—accounting for over 70 percent of Brazil's total exported volume—most of the production expansion has been happening in its less developed and more remote regions, in the north-east and centre-west (see *Figure 1*).

Illustrating the situation, Mato Grosso, Brazil's main grain-producing and -exporting state, increased its planted area by nearly 40 percent, to 9.1 million hectares, over the past five years. Yet as the development of nearer ports in the Amazon region lagged, in order for this additional volume to reach international markets, 73 percent of Mato Grosso's exported soybean volume had to be flown to the four main southern ports, particularly Santos and Paranaguá—2,000 kilometres and 2,500 kilometres south, respectively.

Figure 1: Main routes used to export Brazilian soybean production, 2015



Source: Brazilian Institute of Geography and Statistics (IBGE), Companhia Nacional de Abastecimento (Conab), Secretaria de Comércio Exterior (SECEX), Rabobank 2016

Such limited port availability has been severely impacting exporters and producers in recent years, particularly those operating in locations more distant to ports and urban centres, as increased transport costs directly result in lower farmgate prices. This is, for example, the case for producers based in the northern Mato Grosso agricultural frontier, where grain prices are reduced by up to 30 percent (annual average), compared to prices received by farmers located in the more traditional areas in the south.

Likewise, because approximately 70 percent of all fertilisers currently used in Brazil are imported and transported into the country, primarily via ports located in the south and south-eastern regions, the long distances also invariably result in increased production costs, which end up eroding farmers' margins. Fertiliser importers almost immediately transfer any increases in freight rates to farmers through higher sales price.

With the increased availability of ports in the Amazon region, such as Barcarena or Santarém, distances to the export ports for producers in northern Mato Grosso can be reduced by a third, potentially lowering freight costs by up to 40 percent. Potential savings in internal freight costs are magnified by reduced international shipping times and lower physical losses. Moreover, by exporting through the northern ports, a vessel's travel time to Europe—Brazil's second-largest grain buyer, after China—can potentially be reduced by up to five days.

From lacking port capacity to over-capacity

For years, the Brazilian government has attempted to improve the country's export port infrastructure. Past initiatives, however, proved insufficient, given the daunting magnitude of the task, the politics and bureaucracy involved, and the lacking funds. Nevertheless, in an effort to raise capacity, reduce costs and increase efficiency, the Brazilian government enacted the 'New Port Regulatory Framework' in 2013, aimed to encourage private investments in port infrastructure. Under the new model, the concession of public ports—including terminals and facilities—moved towards a leasing bid system, with terms ranging from 25 to 35 years.

Large grain trading companies soon took on the regulatory change as an opportunity to secure originating capability through port infrastructure development, rather than the traditionally riskier tactic of directly financing production (see Figure 2). After all, aside from

being a relatively cheaper way of tapping into the quickly expanding volumes coming from Brazil's agricultural frontiers, this would potentially allow for the control of a scarce asset, conceivably leveraging commercial arbitrage—or so they thought.

Figure 2: Selected port expansion projects underway in Brazil*

Company	City	State	Initial Cap. (MMT/year)	Estimated (MMT/year)	Total invest. (BRL million)
Amaggi	Porto Velho	Rondônia	-	5.0	450
Hidroviás do Brasil	Barcarena	Pará	-	6.5	505
TGSC	São Francisco do Sul	Santa Catarina	-	10.5	419
Cianport/Flagril	Santana	Amapá	-	3.0	137
Cargill Agrícola	Santarém	Pará	2.0	5.0	240
ADM/Glencore	Barcarena	Pará	1.5	6.0	N.A.
Bunge/Amaggi	Barcarena	Pará	2.5	4.0	700
TEGRAM	São Luis	Maranhão	3.0	10.0	600

Source: company reports, Brazilian Secretariat of Ports, Rabobank 2016

* Note: This list is not exhaustive. Only projects which have been considered as having a high probability of becoming operational in the next five years have been considered. In addition, only investments appearing in publically available governmental databases are listed.

Plans were bold and investors plenty, particularly on the ports of the so-called Brazilian 'Northern Arc'—terminals strategically located to serve, not only as an alternative to the established routes towards the south-east, but also as closer exits to the grain coming from some of Brazil's most important grain frontiers, such as northern Mato Grosso.

The expansion stemming from the port investments now underway is expected to translate into an additional soybean export volume of 16 million tonnes by 2025, or an increment of 30 percent on total Brazilian soybean shipments in 2015. Thus, all the ports comprising the Northern Arc are expected to greatly increase their soybean export volumes, especially as new barging operations get underway on the Tapajós River (a branch of the Amazon), transporting the oilseed produced in central and northern Mato Grosso to the new export terminals.

As a matter of fact, an increase in export volumes deriving from these investments is already palpable. In Pará state, for instance, a region considered by many as Brazil's last agricultural frontier—thanks to the development of two new ports in the municipalities of Barcarena and Santarém—soybean exports reached 2.2 million tonnes and 1.0 million tonnes, respectively, in 2015, after being at almost zero less than five years ago.

While terrific news for producers within the Brazilian agricultural frontiers—eager for the savings enabled by lower freight rates—such a rise in port capacity also means the battle across trading houses for sourcing ever-increasing grain volumes is heating up in Brazil. In reality, many originators are now faced with not only procuring the incremental grain volume to flow through their new assets, but also with moving it through internal routes that are often plagued with deficiencies. After all, only 15 percent of Brazil's 1.58 million kilometres of highways are paved, and many of the paved roads are in poor condition—particularly in the provinces where the transportation of heavy cargo is just starting.

And the challenge is expected to become anything but easier, as public investments in the established ports in the Brazilian south start to accelerate. Perhaps as a response to the upcoming competition, the port of Paranaguá, for example—Brazil's second-largest grain-exporting port—invested over BRL 480 million in improvements over the past five years, and as a result, it is expected to increase its annual export capacity significantly. For soybean loads, export volume in that port is expected to rise from 8.5 million tonnes to 10.7 million tonnes by 2025.

Build it and they will come

Grain production can be very competitive in a country with such outstanding agricultural conditions as Brazil. Aside from being the fifth-largest country in the world, most of the country is favoured by a tropical climate with good precipitation, and Brazil has about one-third of the world's freshwater reserves. So it is no wonder that it is an agricultural powerhouse with some of the lowest production costs worldwide.

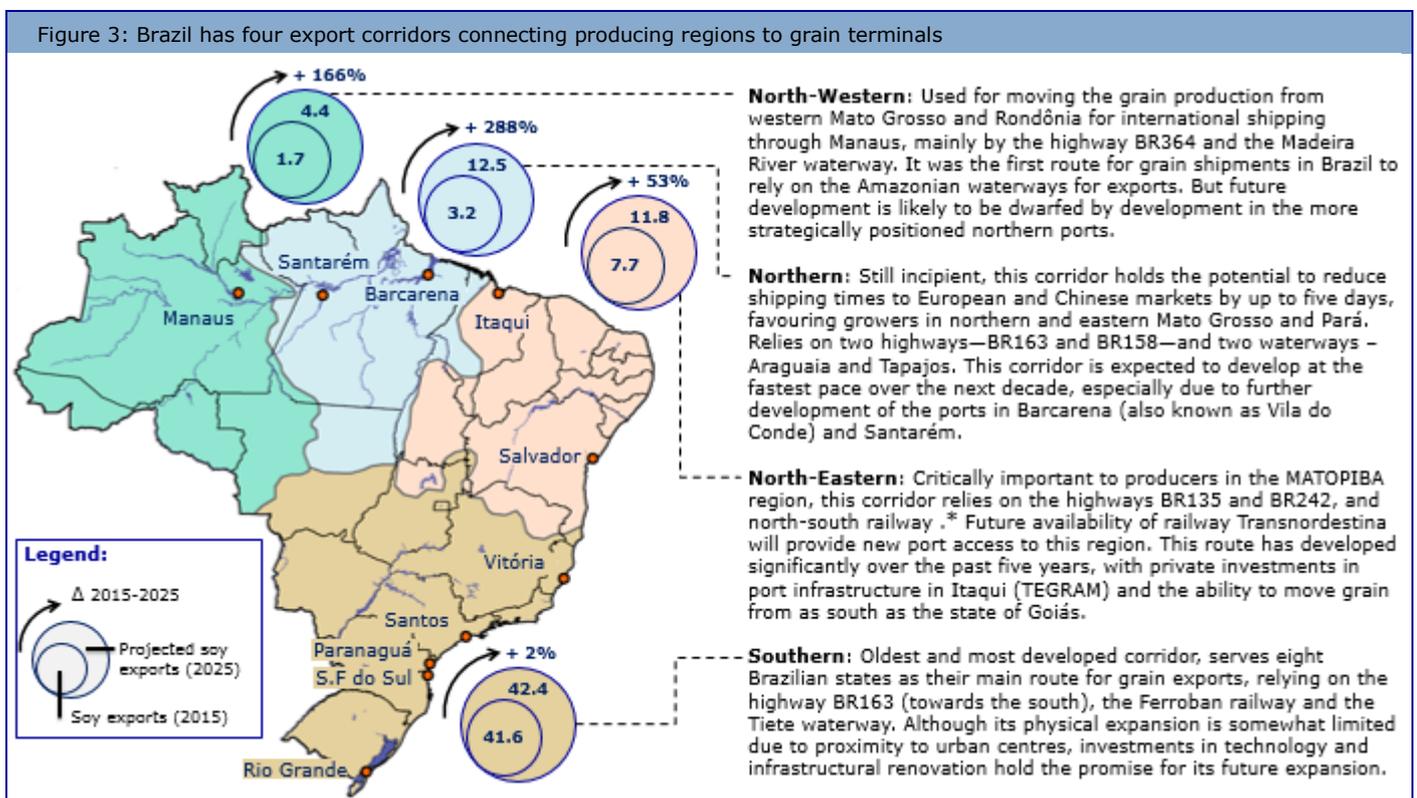
Build it and they will come

The problem, however, lies in the costs involved in transporting production across its continental dimensions. To put it into perspective, Mato Grosso’s soybean exports struggle with high logistics costs, estimated to represent about 30 percent of total production costs, or about USD 100/tonne—nearly three times more than in established producing locations in the south.

Nevertheless, such high expenses beyond the farmgate also mean that marginal costs can be quick to assimilate any new improvements in infrastructure. In other words, any latent logistic capacity rapidly fades away, saturated by the proportional increase in volumes arising from an expansion in planted area on its surroundings.

Evidence of this dynamic is plentiful, such as in the recent development of the port of Santarém in Pará state, where, even though connecting roads are yet to be paved, soybean exports originating from northern Mato Grosso have been vastly increasing over the past three years. Likewise, in São Luis (Itaqui), grains are already being shipped to international buyers, even without the full conclusion of the north-south railway, expected to eventually become its key grain-supplying route.

As a matter of fact, the development Brazil has been experiencing in its export port infrastructure is already starting to reflect on flows sufficiently large as to allow for the delimiting of at least four key export corridors, where only two could be observed less than five years ago (see Figure 3).



Source: Rabobank 2016

* Note: MATOPIBA is an acronym for the north-eastern states of Maranhão, Piauí, Tocantins and Bahia.

Mapping the impact on Brazil’s soy area

Resulting from the developments in export port infrastructure, a robust expansion of Brazilian soy production is anticipated to take place throughout the next decade, particularly in regions where internal logistics—connecting producing areas to the increased port capacity—develop sooner.

Clearly, identifying such locations is critical for players exposed to Brazilian agribusiness. After all, these regions present strong opportunities—not only to producers and trading companies, but to all sorts of agricultural entrepreneurs. Moreover, many indirect opportunities are expected to stem from the economic growth driven by cities within these locations.

Yet the importance of such an undertaking is only matched by its difficulty—a multitude of elements can impact the development of logistical projects. There are too many factors in

play to be able to perfectly model how grain expansion may actually happen, and the lack of up-to-date and reliable data makes the task especially challenging.

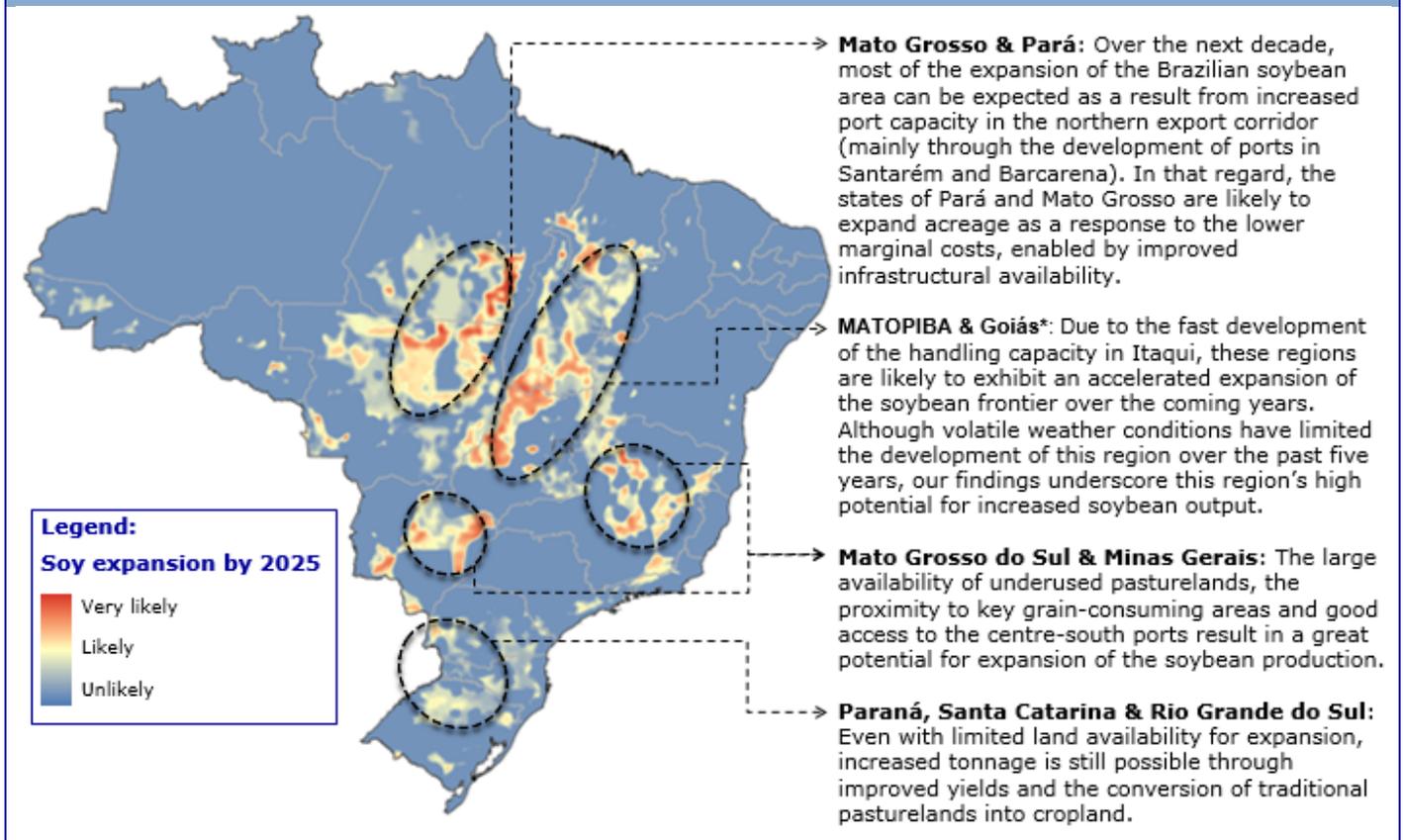
Nevertheless, by crossing public data on land use with information from key identified port developments underway, we can estimate where increased soybean production can be expected to materialise (see Figure 4).

Box 1: Procedures and assumptions adopted for modelling the expansion of soybean area in Brazil, as a result of upcoming larger export capacity

- 1) The service area of each Brazilian grain-exporting port was delimited (based on 2015 export data from the Brazilian Ministry of Development, Industry and Foreign Trade).
- 2) The service areas were then aggregated and delimited into four distinct export corridors (see Figure 3).
- 3) The expected upcoming additional export port capacity was identified and geo-referenced from public records, such as environmental licences and certifications.
- 4) Land use data from the Brazilian Institute of Geography and Statistics (IBGE) on soil quality, land ownership, climate, geology, declivity and elevation was used to classify the potential of land conversion into arable land in the following order of preference (multiplicative effect): fertility of the soil, presence of productive pasturelands, presence of unproductive pasturelands, regions where perennial crops are traditionally produced—such as coffee and sugarcane—have been excluded, low-declivity, private ownership of the land, uncleared land.
- 5) Indigenous land, and land with high declivity, poor soil and inadequate rainfall (below 500mm/year and above 2,500mm/year) has been arbitrarily excluded, as have environmentally protected areas or areas within delicate ecosystems.
- 6) The resulting multi-layered map was then overlaid with the expected port capacity expansion, in order to show where soybean expansion is most likely in the near future, within each one of the four pre-defined export corridors.

The resulting map, which outlines regions in Brazil where soybean production is more likely to expand in the near future, is presented in Figure 4, where four distinct regions for expansion can be identified: Mato Grosso & Pará; MATOPIBA & Goiás; Mato Grosso do Sul & Minas Gerais; Paraná, Santa Catarina & Rio Grande do Sul.

Figure 4: High-level overview of key areas identified, according to their likelihood for soybean expansion in Brazil throughout 2025



Source: Rabobank 2016

* Note: MATOPIBA is an acronym for the north-eastern states of Maranhão, Piauí, Tocantins and Bahia. Only the impact on increased volumes for exports was considered. Domestic demand was assumed as remaining stable.

Conclusion

Brazil has an undeniably high potential to boost its soybean area over the next ten years, particularly when considering the impact of expansion in port capacity for soybean exports, expected to take place by 2025. This progress means Brazil could potentially expand its annual soybean shipping volume by 16 million tonnes over the next decade.

The favourable outlook for international grain demand in the coming years is thus likely to encourage the continued development of Brazilian agriculture. Still, the rate and location of expansion of its agricultural frontier will largely depend on the pace at which logistical development occurs. In that regard, about 60 percent of total future private infrastructure investments are aimed at states in the north and north-east regions of Brazil.

Nevertheless, while development of the centre-south ports is not anticipated to be as dramatic as that of their northern counterparts, improved technology and renewed facilities can be expected to continue positioning the southern corridor as Brazil's main grain export route. The investments currently underway will be essential to reduce the pressure on the south and south-east ports, and to ensure improved margins for producers within some of Brazil's most important soybean frontiers. As a result, Figure 4 provides an overview of where soybean production expansion is most likely to occur in the coming years.

While some of the identified regions with high potential for soybean expansion fall within the Legal Amazon—and thus have special regulations with regard to land use, including increased restrictions for deforestation and other environmental requirements related to large-scale agriculture—it is important to note that most of this expansion is expected to happen on currently underused pastureland (see Box 2).

Box 2: Most of the expansion in the soybean area is expected through use of underused pastureland, rather than through deforestation and the clearing of new areas

Rabobank expects the great majority of soybean expansion in Brazil throughout the next decade to take place over previously used areas, particularly underused pasturelands.

The Brazilian Forest Code currently demands that 20 percent to 80 percent of private farm land must be set aside for conservation purposes. And with current sophisticated geospatial monitoring systems implemented by the government and private sector companies, any acreage expansions in discordance with the Forest Code law can be identified and considered as illegal deforestation, subject to hefty penalties.

Data from the Rural Environmental Registry (CAR)—a virtual map of property, indicating production and conservation areas, a legal demand for farmers—shows that there is more preserved vegetation in privately owned areas than in governmentally managed national parks. 85 percent of all properties already have the CAR, and it will be a condition for rural credit in 2017.

Moreover, although the current legislation still allows some native vegetation removal—as long as the mandatory preservation areas are kept—it needs to be considered and authorised by the environmental authority on a case-by-case basis, which is bureaucratic and expensive for producers.

Furthermore, there is a growing lobby against the conversion of any areas to produce commodities. One important example is the Soy Moratorium, a multi-stakeholder initiative that unites NGOs and companies such as Greenpeace and the Brazilian Vegetable Oil Industries Association (ABIOVE) and aims to eliminate deforestation from the soy supply chain.

The Soy Moratorium states that only 1.5 percent of the soy produced in 2014 was planted in areas blocked by the agreement and, therefore, excluded from the supply chain of the signatories. In other words: areas in which vegetation was removed, regardless if it was done legally or not. Aside from the Soy Moratorium, several other initiatives have the same market demands, such as the Roundtable on Sustainable Soy, the Consumer Goods Forum and the Banking Environment Initiative.

All of the above further support the fact that the great majority of soy expansion will take place on previously used areas, such as pasture land, an assumption behind this study's model and maps.

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However, it is important to make it clear that such a transition cannot happen overnight, as it takes several years of recurring investments in farm inputs for the fertility of the land to reach its true potential (see *Box 3*). Moreover, Brazil has been experiencing an economic slowdown in recent times, which may result in limited subsidized credit availability for this investment.

Box 3: Potential benefits for farm input companies

As agricultural production increases in Brazil, so does the demand for farm inputs. Consequently, port infrastructure improvements in Brazil—particularly that of ports located in the north and north-east—play a strategic role for farm inputs suppliers, such as companies dealing in fertilisers, crop protection and seeds.

For example, considering the past five years, the Brazilian Fertiliser Association (ANDA) estimates average fertilisation use at 0.4 tonne/hectare for soy production. Thus, a potential market may arise from the resulting expansion of the soybean crop.

As a result of the expansion in soybean area and fertiliser consumption in this potential agricultural frontier, changes can already be seen in the farm inputs' logistical system.

Fertiliser companies, for instance, see opportunities and have started to invest in projects in Brazilian ports. Terminals for fertiliser in the 'Northern Arc' should help to optimise investments in the region. What's more: as more companies and producers export grain production through northern ports, more trucks can return to the producing regions carrying fertiliser, lending economic viability to these projects.

This means a potential market for the expansion of fertiliser sales in the areas highlighted in this study—in fact, not only for fertilisers, but also for farm inputs in general (e.g. seeds, crop protection and machinery).

Farm input companies can use this information to allocate distribution channels in these new agricultural areas and to prepare in terms of supply chain—e.g. sales team, R&D of new products specific for these regions, etc.

Nevertheless, in order to remain competitive in the long run, hefty investments in the logistical infrastructure connecting producing regions to the ports (e.g. road, rail and river links) will undeniably be required. Investment in transport infrastructure in Brazil is currently in its early stages.

Current market participants and potential new entrants with a long-term view can find a unique combination between agricultural potential and investment needs in Brazil. If on the one hand, the country's infrastructure problems represent higher production costs and loss of competitiveness, they also represent an array of opportunity well worth considering.

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