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# Feeding Nemo

Turning Brazil's Economic Turmoil into Seafood Business Opportunities

**RaboResearch**

**Food & Agribusiness  
Research and Advisory**

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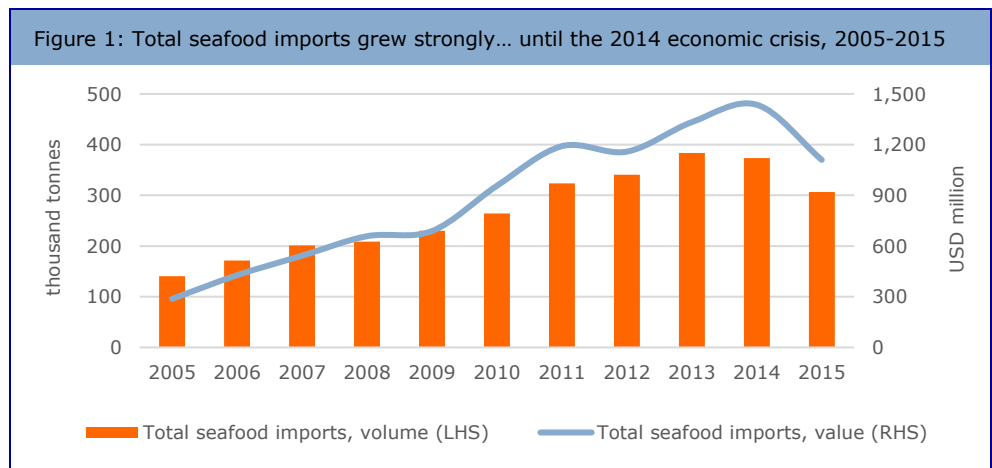
Rabobank expects Brazilian tilapia production to increase by 10 percent a year, surpassing 490,000 tonnes by 2020. Additionally, annual production of tambaqui (a freshwater species native to Brazil) is projected to surpass 330,000 tonnes over the same period. Much of the expansion will be supported by rapidly expanding Brazilian grain production, particularly in the Midwest, where abundant supply, coupled with underdeveloped logistics, acts to keep local grain prices relatively low. The sector's prospects are also enhanced by a weak exchange rate, along with declining profitability and competitiveness of key aquaculture exporters, which will allow Brazilian aquaculture to develop in the coming years.

**Brazil: the sleeping aquaculture superpower**

Brazil has all the ingredients to become an aquaculture superpower. But there are reasons why the country's aquaculture production is still a fraction of that of China, India, Indonesia or Norway. In fact, even in Latin America, Brazil trails Chile and Ecuador, which both have globally exporting aquaculture industries. A combination of red tape and insufficient supportive legislation, infrastructure and investments by both the domestic industry and multinational seafood groups, as well as—until recently—a highly overvalued currency which rendered imports very competitive throughout most of the past decade have discouraged the development of the sector.

Since then, however, and particularly starting in 2014, important changes have taken place, especially on the macroeconomic side. Brazil has been going through political turmoil and a macroeconomic downturn, with high inflation and a rising unemployment rate, producing what some describe as the most serious economic crisis it has ever faced. This economic scenario has also been accompanied by the considerable devaluation of the Brazilian real, which has declined from around BRL 2.0/USD at the beginning of 2013 to close to BRL 3.3/USD in June 2016. And it is even expected to potentially decline further, to BRL 3.5/USD, during the second half of 2016. Thus, there are implications for all domestic industries, especially those competing with imports, such as the aquaculture sector.

Brazil remains dependent on imported seafood products. According to the Brazilian Ministry of Agriculture, 30 percent of all fish consumed in the country is sourced from other countries, and the imports grew at an annual rate of 11 percent from 2005 to 2014. But this trend has been changing since 2015 (see Figure 1).



Source: MDIC, Rabobank 2016

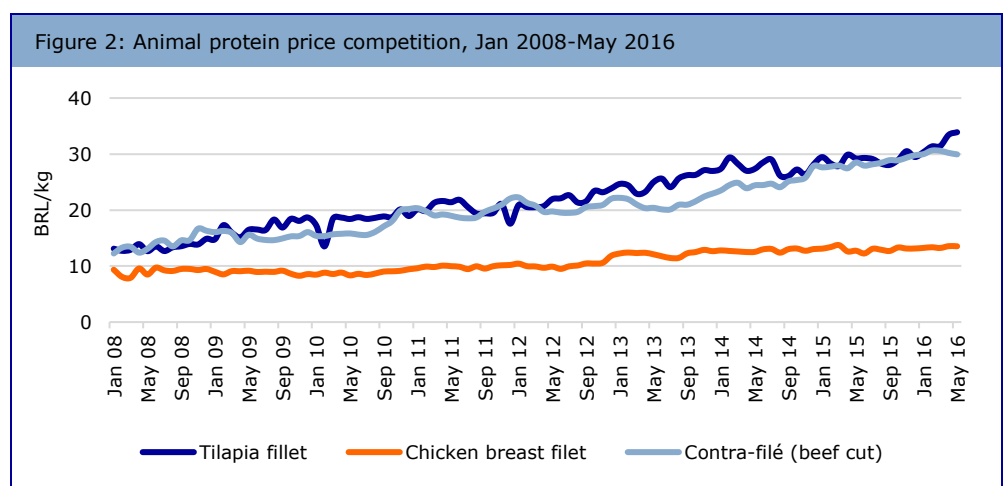
### Seafood consumption: once sparked by imports... but no longer

Traditionally, the Brazilian demand for fish products has always come second to a strong consumer preference towards beef and poultry. To put it into perspective: according to the IBGE (the Brazilian Institute of Geography and Statistics), while the Brazilian annual per capita consumption of fish is at around 10kg, pork consumption is roughly 15kg, beef above 30kg and poultry at around 45kg.

This preference has a lot to do with Brazil’s cultural background and its abundant natural resources. However—no different from what has happened globally—a growing part of the Brazilian population has been changing its dietary habits toward fish products, as growing health concerns lead consumers toward healthier meals. In this context, fish consumption in Brazil increased by 76 percent over the past decade (2004-2014), according to a 2015 study by the Food and Agriculture Organization of the United Nations (FAO).

It is important to mention that, although Brazil has imported close to 30 percent of its domestic consumption, it features one of the longest coastlines in the world (of about 8,500 navigable kilometres), abundant freshwater resources (which account for about 12 percent of the world’s surface water resources) and a tropical climate.

The success of imports boosted Brazilian seafood consumption until the beginning of the economic recession in 2014. The fall of the Brazilian currency has made a relatively expensive protein drastically more expensive, especially when compared to local meat alternatives. According to the Institute of Agricultural Economics (IEA) and the Paraná State Department of Agriculture (SEAB/PR), in May 2016, one kilogram of fresh tilapia fillet was priced at retail at around BRL 34, while one kilogram of chicken filet cost about BRL 14. Meanwhile, one kilogram of contra-filé (a beef cut similar to American sirloin steak) was around BRL 30 (see Figure 2).



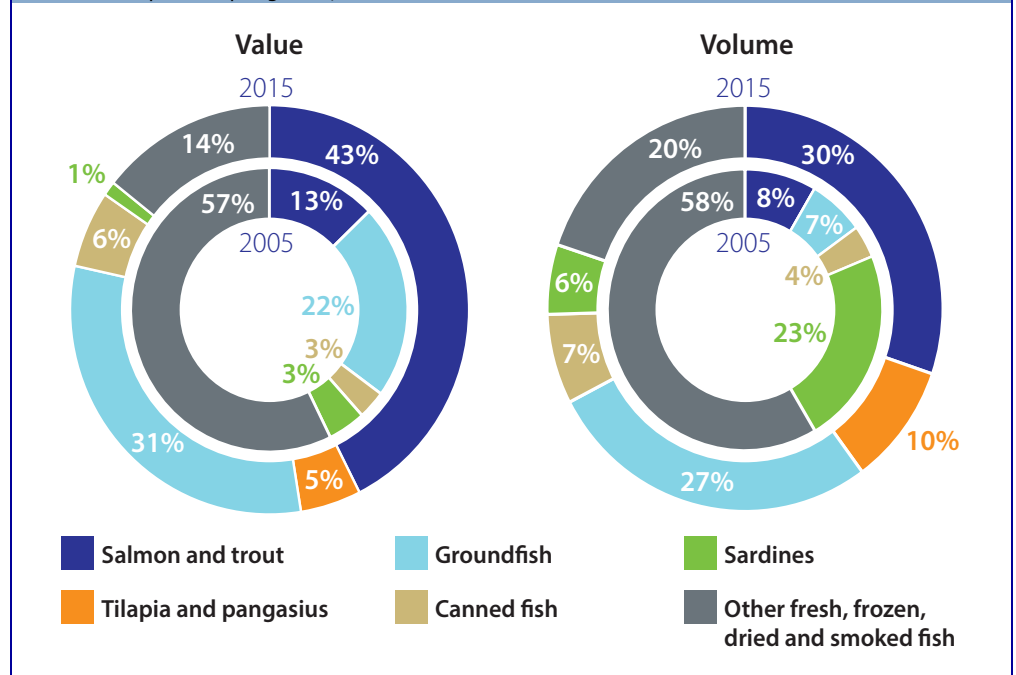
Source: SEAB/PR, IEA 2016

With regard to salmon products, one kilogram of Chilean fresh salmon fillet is even more expensive than tilapia, at around BRL 100. Salmon—almost exclusively imported from Chile—has become Brazil’s leading seafood import, overtaking cod in volume and value terms (see Figure 3). But unlike cod and hake, which are wild-caught and more traditional seafood products, salmon from Chile is farmed, and until 2015, it was in growing supply, both globally and on the Brazilian market.

What’s more, trendy and innovative products (such as smoked salmon and sushi) tend to convert new and younger seafood consumers, rejuvenating the category and driving consumption. But this will not continue in the next four to five years. The salmon industry in Chile, which single-handedly developed salmon consumption in Brazil, is in bad shape.

Two years of biological challenges, financial losses and a devastating algae bloom—which in less than two months destroyed 20 percent of harvestable biomass—have forced the industry to contract. The following years will require new regulation and restructuring, which means declining supply and sky-high prices. Even in US dollar terms, the salmon price increase in Brazil in 2016 is close to 100 percent. In local currency, the price change is extreme.

Figure 3: Growth in seafood imports was driven by salmon, groundfish and freshwater whitefish, such as tilapia and pangasius, 2005 vs. 2015



Source: MDIC, Rabobank 2016

With Brazilian whitefish imports, we also see a reversal in fortunes within the exporting regions in Asia. Relatively high feed costs, rising labour costs and occasional food safety issues, combined with a strong renminbi, are eroding the competitiveness of the once affordable and booming frozen fillet. Despite the scale and efficiency of the Chinese industry and considerable subsidies, the sector has lost momentum in key export markets such as the EU and the US, and it is now beginning to focus on developing local markets where the fish can be sold fresh. It will be very difficult for China and Vietnam to remain competitive in the Brazilian market.

In the coming years, although an economic slowdown is expected, several import-substituting industries are likely to benefit. Even though there is no direct local substitute for Chilean salmon, an aquaculture industry of tilapia, tambaqui and shrimp production is already thriving in Brazil.

The seafood demand that the imports once created will, at least in part, need to be filled by either locally produced chicken and beef, or locally produced fish and shrimp. This could provide a unique opportunity for local aquaculture producers to step up, initially by providing products to the domestic market and, in a few years, perhaps by also positioning Brazil among the ranks of seafood exporters.

### The integration between grains and fish production in Brazil

In fact, Brazil is uniquely placed to fulfil the global market’s growing demand for fish products. This is partly due to the country’s unmatched position when considering its potential for expanding grain production, especially corn and soybeans—the two most universally used ingredients for fish rations. In that regard, Brazil has dramatically increased its total grain output over the past decade, with combined corn and soybean production increasing from 88m tonnes in 2006 to about 160m tonnes in 2016.

However, while Brazil has been rapidly increasing its grain production in recent times, most of the expansion has been taking place in agricultural frontiers such as the northern fringe of the Centre-West and the Northeast, where deficient infrastructure has meant that local grain availability in these regions has been high, and local prices have been correspondingly low.

Over the past five years, Mato Grosso, for instance, has increased its soybean area by nearly 40 percent, to 7.9m hectares, producing an additional 24m tonnes. But while the distance to port averages 500 kilometres for traditional producing states in the south (such

### Box 1: The regulatory environment is in constant change, 2003-2015

**2003** Created the Special Secretariat of Aquaculture and Fisheries, along with a decree on the permission of national water bodies for aquaculture.

**2004** Normative instruction about the registration of fishing activities and additional regulations for permission of national water bodies for aquaculture activities; antidumping tax for Brazilian shrimp.

**2009** Creation of the Ministry of Fishing and Aquaculture; CONAMA resolution on the environmental licensing of aquaculture; law for the national policy for sustainable development of aquaculture; decree on the cooperation between the Ministry of Fishing and Aquaculture and the Ministry of the Environment for the sustainability of fishing resources.

**2012** First subsidy programme specifically for fisheries and aquaculture: 'Plano Safra para Pesca e Aquacultura'.

**2015** Second year of 'Plano Safra para a Pesca e Aquicultura'; disbanding of the Ministry of Fishing and Aquaculture, now part of the Ministry of Agriculture.

as Paraná and Rio Grande do Sul), Central-Western states such as Mato Grosso are 1,500 kilometres away.

As a result, the logistics deficiency has created a tremendous negative spread in basis across the main Brazilian grain-producing regions. As feed for fisheries in Brazil is, on average, composed of 60 percent corn and 20 percent soymeal, the opportunity to source grains at competitive prices from these regions has been enticing for fish producers. This is especially significant, as feed accounts for around 70 percent of tilapia and tambaqui production costs, and grain prices differ widely between states. In addition, it is less expensive in relative terms to ship meat to consumer markets than it is to ship bulk grains.<sup>1</sup>

Brazilian grain producers, particularly in times of pressured commodity prices, have pursued alternatives to add value to their products. As a result, the integration between grains and an animal protein product (fish in this case) could arise as an alternative. The aim of growers is to transport higher-value-added products as a way to improve margins.

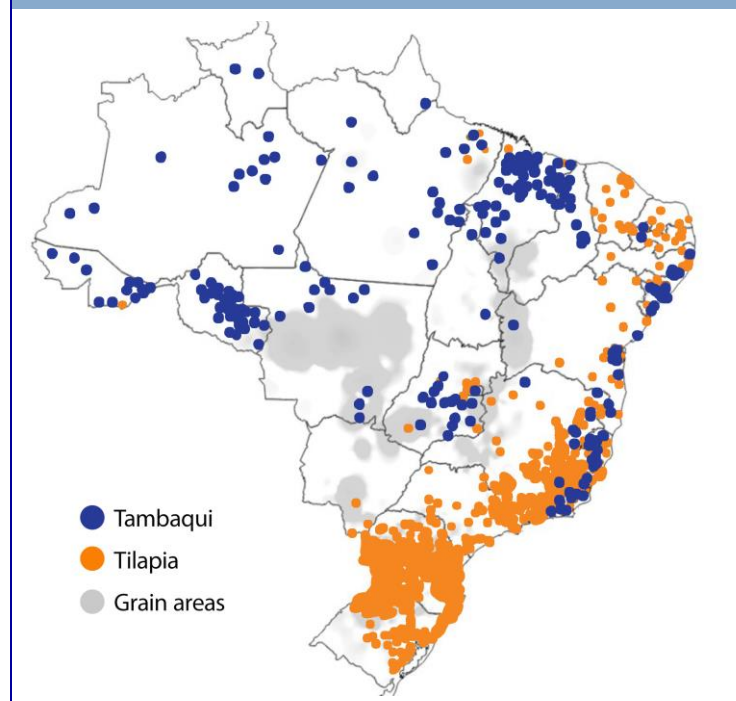
In terms of business models, large-scale farmers have a competitive advantage, as they are able to integrate three stages of the chain—combining grains, fish and also the processing facility, as some examples already in place in the Brazilian Midwest show. Small- and medium-scale farmers need to operate by selling their fish to a third party.

Despite all the potential this sector holds, the supply chain still has room for improvement. Additionally, the regulatory environment has seen constant change (see Box 1).

### Aquaculture: on the verge of the next stage of development

Brazil's tropical climate and abundant freshwater resources are ideal for the aquaculture of tilapia (*Oreochromis niloticus*) and a number of local Amazon species such as tambaqui (*Collossoma macropomum*) (see Figure 4). Meanwhile, the long coastline is suitable for the aquaculture of shrimp (*Litopenaeus vannamei*). As we described in our 2012 report, these species are the drivers of the Brazilian aquaculture industry.<sup>2</sup>

Figure 4: Tilapia and tambaqui production still has room to develop throughout grain areas, 2016



Source: IBGE, Embrapa, Rabobank 2016

However, more recently, the once booming seafood imports are contracting, presenting an opportunity for the local industry to capture market share. In 2015, while total Brazilian seafood imports declined by 71,000 tonnes YOY, aquaculture production increased by 87,000 tonnes, compensating for the lost imports and delivering further growth. Although aquaculture is gradually becoming a sizable industry, the growth momentum continues.

<sup>1</sup> Rabobank Industry Note 487, [Moving Inland](#).

<sup>2</sup> Rabobank Industry Note 362, [Brazilian Aquaculture](#).

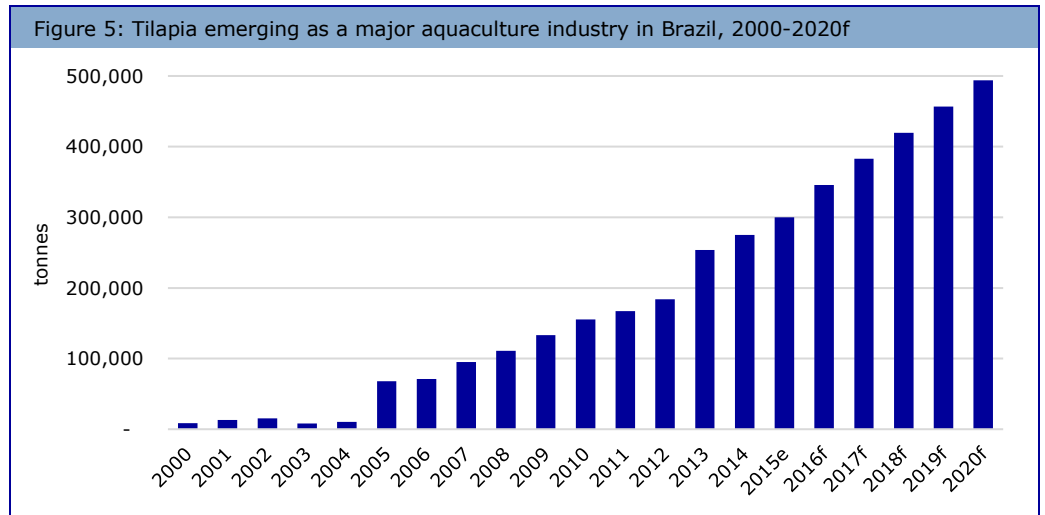
**Tilapia: the leading Brazilian aquaculture industry**

Globally, tilapia has emerged as the main industrially farmed freshwater aquaculture industry. Highly traded, fairly easy to farm, sturdy with good disease resistance and requiring only a vegetable feed diet, tilapia is aquaculture’s version of poultry. Global frozen tilapia exports are dominated by China, while Indonesia and Latin American countries such as Honduras, Costa Rica, Ecuador and Colombia are successful exporters of fresh fillets, whereas the US is the main importer.

In Brazil, tilapia is now the largest aquaculture industry and one with a particularly bright future. The state of Paraná, in southern Brazil, is the main tilapia producer, representing more than 25 percent of national production. One of the main reasons for the growth trend in the tilapia sector has been the excellent feed conversion rate, which can be around 1.4, according to Embrapa (the Brazilian Agricultural Research Corporation) and the CNA (the Brazilian Confederation of Agriculture and Livestock). As a matter of comparison, the feed conversion rate for poultry in Brazil is around 1.8. In addition, it is important to mention that feed represents more than 70 percent of tilapia’s production costs, suggesting locally produced tilapia can be a cost-competitive protein. Helped by the fairly low capital requirement and low technology input, small- and medium-size farmers in Brazil can generate a 20 percent profit margin on tilapia farming.

With a strong acceptance on the domestic market, the sector is expected to evolve, initially growing by supplying the domestic market and potentially substituting seafood imports. As a locally farmed and relatively low-cost fish, tilapia is ideal for the current recessionary environment. In the medium term, the next stage of development will be to enter the fresh fillet export market, while in the long term, it may even be possible to compete with China on the frozen fillet market.

Not only is the increasing sophistication of local players driving the speed of development of the industry, but also the arrival of leading multinationals. Nutreco, InVivo NSA and Cargill, the three global leaders in aquatic feeds, are already present in Brazil. AquaGen, a leader in fish genetics and part of the EW Group, recently entered the Brazilian tilapia genetics industry by acquiring a local producer.



Source: Food and Agriculture Organization of the United Nations, Peixe BR, Rabobank 2016

The entry of Regal Springs—the world’s largest tilapia farming company—may be the final ingredient to boost future production of the industry in Brazil. Regal Springs is a Swiss-owned, globally diversified and vertically integrated leader in tilapia aquaculture, and it has formed a JV with a local agribusiness group, Axial Holding, to create a tilapia farming operations which is expected to reach 100,000 tonnes over the next five years.

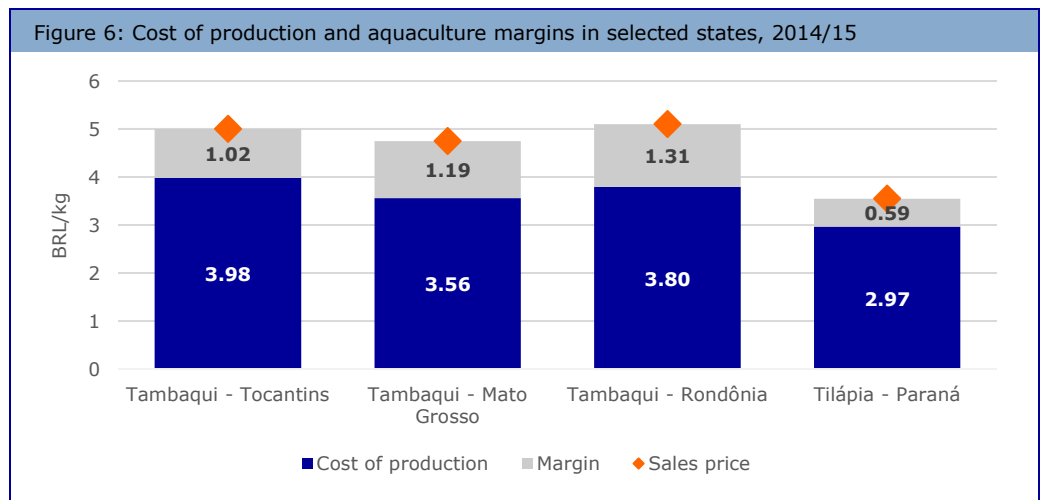
With all of the necessary components in place, Rabobank forecasts tilapia production in Brazil to surpass 490,000 tonnes by 2020 (see Figure 5). This would make Brazil the world’s fourth-largest tilapia producer, after China, Indonesia and Egypt.

**Amazon species: Brazil’s secret weapon and a new emerging industry**

Along with tilapia, native freshwater species have experienced a significant increase in production over the last few years. In contrast to tilapia, these species are concentrated in northern Brazil, where fish per capita consumption is around three times higher than the national average.

Tambaqui, also known as cachama in other South American countries, has become the local champion in Brazil. Tambaqui (and a number of similar hybrid species) are easy to farm, and they have few diseases and a strong resistance to environmental changes. A natural fruit and nut eater, tambaqui has a feed conversion rate very similar to poultry, at around 1.8. Together, the states of Rondônia, Amazonas and Roraima were responsible for two-thirds of Brazilian tambaqui production in 2014.

Compared to tilapia, tambaqui has a higher cost of production due to its feed conversion rate—in these two species, feed represents more than 70 percent of the costs—considering they have the same production system. However, according to Embrapa—using data collected in 2014/15—tambaqui prices for growers are also higher than tilapia prices (also considering the sales price received by growers), which is a competitive advantage (in terms of profitability per kilogram produced) for the Amazon species (see Figure 6).



Source: Embrapa, CNA 2016

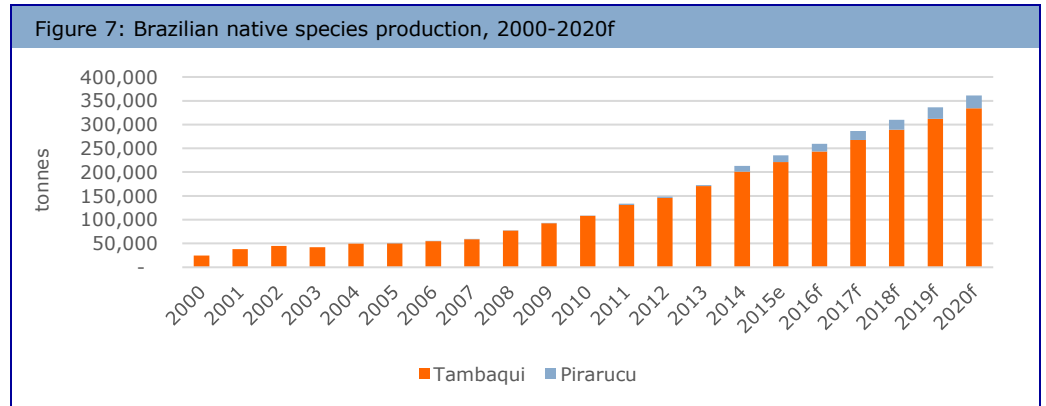
It is important to mention that the stocking rate of tambaqui is lower than that of tilapia, which also explains the higher costs. While the yield of tilapia can reach more than 50 tonnes/hectare of body of water, tambaqui’s productivity is lower than 10 tonnes/hectare, according to Embrapa. Therefore, its production requires more land in order to provide economies of scale. This optimisation of the costs and stocking rate can be addressed by genetic improvement and by the development of specific feed for this species.

Although small when compared to tambaqui production, another emerging Amazon species is the pirarucu (*Arapaima gigas*). Also known as paiche, it is the world’s largest river fish, with the largest specimens in the wild surpassing 3m in length and 200kg in weight. At the moment, a very young industry of pirarucu farming is expanding rapidly. One of the main advantages of this fish is its very rapid growth, reaching over 12kg in one year. Being sturdy and able to breathe air, pirarucu can be farmed intensively. Consequently, a relatively small body of water (above-ground water basins or pond cages) is needed to generate considerable production volumes. As challenges around juvenile production are solved and improved feed is developed, this industry should grow rapidly.

Unlike tilapia, both tambaqui and pirarucu are local species, which means they are allowed to be farmed in the Amazon River system, but there are a few other implications. There are no large, established international companies that have experience with these species, so it is not possible to ‘import’ knowledge. All of the challenges when it comes to developing this new aquaculture industry (such as breeding technology, juvenile survivability and developing efficient feeds) will have to be developed by local farmers, companies and research institutions.

But there is already an established local market based on wild-caught fisheries. Whole fish can be sold fresh to local markets without the need for considerable further processing, while there is less direct competition from imports. Especially since these native species have a unique texture and taste, they can develop as separate industries. Consequently, as the technology develops, with the increasingly higher availability of juveniles and better formulas, more farmers will be able to diversify their operations by farming Amazon species.

As a result of the abovementioned dynamics, Rabobank believes that tambaqui production in Brazil has the potential to surpass 330,000 tonnes by 2020 (see Figure 7).



Source: Food and Agriculture Organization of the United Nations, Rabobank 2016

**Shrimp: after stagnating for two decades, is it time to grow once again?**

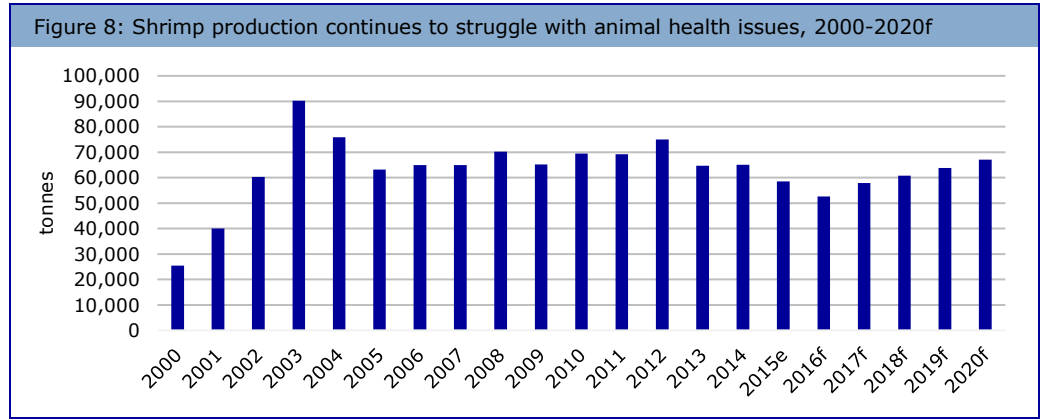
Shrimp was the first modern aquaculture industry in Brazil. It started in the early 1970s, growing rapidly with a strong focus on export, especially to the US. The industry reached over 90,000 tonnes by 2003, and at this time, Brazil was the largest shrimp-farming region in the Americas, recognised as one of the leading shrimp exporters and rivalling the likes of Thailand and Vietnam.

At that time, expert opinion was that Brazil would emerge to become a dominant force in shrimp aquaculture. But it was not to be. Shrimp is a species that is particularly susceptible to disease outbreaks and climatic changes. Diseases such as infectious mionecrosis virus (IMNV) and white spot, floods and droughts, combined with unfavourable trade legislation (antidumping duties to the US), decimated the industry.

As a result, the Brazilian shrimp industry stagnated, averaging 50,000 tonnes to 70,000 tonnes annually throughout the last decade. In the same period, shrimp aquaculture more than doubled globally, becoming a large industry and producing over 3.5m tonnes. To put it in perspective: Ecuador, where the industry was also decimated by disease in the 1990s, recovered and is now Latin America’s largest shrimp producer. With a small fraction of the land, coastal water and feed resources compared to Brazil, and no domestic market, Ecuador’s shrimp production is close to 350,000 tonnes, with annual exports of over USD 2.3bn.

After a white spot outbreak caused a decline in shrimp production in 2015, the disease has also affected the performance of the industry during 2016 (see Figure 8). Going forward, with the potential spread of the virus, the outlook for the shrimp industry in Brazil is mixed. On the other hand, the industry operates in a huge internal market isolated from imports, by tariffs and, more recently, biosecurity import barriers. According to the Brazilian Shrimp Farmers Association (the ABCC), per capita domestic shrimp consumption is 0.55kg. Only a small shift of consumption patterns could mean rapid growth for the local shrimp industry. Moreover, disease outbreaks in key shrimp-producing regions such as Thailand, China and Mexico, along with the falling Brazilian real, have left many importers in the US, the EU, Japan and China eager for Brazil to return as an exporter.

In 2015, Brazil exported only a negligible amount of shrimp, but if the supply were to increase, there would be plenty of buyers. Finally, with rapid innovation in the shrimp aquaculture industry and the increasing presence of leading aquaculture companies in Brazil, we can assume that innovation in genetics, feed formulas and husbandry technology will soon unlock Brazil’s potential in this high-value aquaculture industry.



Source: Food and Agriculture Organization of the United Nations, Rabobank 2016

### Conclusion

Brazil is already one of the world’s largest beef, poultry and pork producers and exporters. However, its seafood industry remains largely undeveloped and fragmented. Having produced around 640,000 tonnes in 2015, Brazilian aquaculture has experienced its fastest growth throughout the last decade (at 8 percent per year). But it is still far behind the production levels attained by other animal protein industries and also far behind leading traditional aquaculture producers globally.

Meanwhile, Brazil’s still-strong reliance on imported fish products and growing domestic demand for seafood suggest that substantial opportunities exist for the expansion of its own aquaculture industry. Brazil has a huge domestic market, with over 200m consumers, which makes the country less exposed to the international market.

It seems like the young, but ambitious Brazilian aquaculture industry has found drivers that will push the sector to the next level: (i) a relatively weak exchange rate; (ii) large feed availability at a low cost—through integrating grain and aquaculture production—and (iii) declining competitiveness of key aquaculture exporters. Increasing size and economical relevance will also lead to more visibility and, consequentially, to more investments in the Brazilian aquaculture sector.

The first necessary investments are already underway—primarily by animal nutrition and genetics companies, as well as by global aquaculture producers who have already placed themselves in the Brazilian market. They are aware of the high-potential Brazilian domestic market, aiming for import substitution in the medium term. However, the task is not an easy one, as the sector remains fragmented, which hinders faster growth and consolidation.

Meanwhile, we expect Brazilian grain producers to also play an important role in this process. They have already taken the step of adding value to their grain by producing other animal proteins, such as beef cattle. It now seems that aquaculture will also attract their attention. However, specific knowledge on aquaculture will be required. Therefore, support from local authorities and leadership from successful regional pioneers will be crucial.

Overall, Rabobank believes that tilapia production in Brazil will surpass 490,000 tonnes by 2020, while tambaqui production has the potential to surpass 330,000 tonnes over the same period. Moreover, it is likely that Brazilian aquaculture will follow the road already taken by other Brazilian animal protein industries—towards consolidation, investments and increased production. In the near future, such production may finally also allow it to become an important world supplier of tilapia and native Brazilian fish species.

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