



Innovation Development in the Brazilian Crop Protection Market

Brazil has consolidated itself as one of the largest food producers in the world and to continue growing it needs crop protection Technologies that are sustainable and accessible. New technologies and new players need planning and expertise to participate in this growth in the coming years.

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ArenaAgri® is an agro-industrial strategy and planning consulting firm, specialized in crop protection technologies for the Brazilian market.

Merieux NutriSciences® one of the world's largest laboratories is dedicated to protect consumer's health by offering solutions in chemical analysis and studies to a wide range of industries, including food sector, water and environment, agrochemicals, and crop protection.

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Brazilian Market Overview

Considering the growth of the population and an increase in the demand for food, it is expected that the global demand for agricultural products - food, feed, fiber and biofuels will rise. As a consequence, the expansion of the planted area and the increase in productivity will lead to a greater demand for better inputs in general, and crop protection products in particular.

Brazil has consolidated itself as one of the main food producers in the world. USDA studies point to the need for the world to increase food production in order to supply the growing population demand by 2026/2027. The forecast is that Brazil will be the country with the highest growth rate (41%) in this period.

These are relevant figures that position the country as a powerhouse in the production and export of food, on a global level and, as a consequence, Brazilian agribusiness sector constantly demands new technologies in addition to sustainable practices in each harvest and for each crop. The “Brazilian agro” must pursue innovations from the selection of inputs, services and technologies, in addition to sustainable practices, to ensure its continuous growth.

To maintain this position, it is essential that the country continues to produce more and better. Innovation is the key word that drives the growth process of Brazilian agribusiness. Innovation requires investment and, to protect companies that invest in this area, it is essential to rely on tools to protect intellectual property, such as patents and data protection.

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The “expansion” in new technologies occurs more intensely after the expiration of patents and the data protection period, allowing companies that are interested in accessing these technologies to do so without restrictions, increasing the level of competition in the market.

Market Access Dynamics

It is important to understand the governing dynamics that the entry of a new active ingredient (AI's) and its formulation will face in Brazil once introduced. New products and new mode of actions (MOA's) gain traction by bringing modern practices for agro production in Brazil. Crop protection products must apply for registry on a federal level, subjected to the review and approval from the Agriculture Ministry which will evaluate agronomic efficiency, review from IBAMA (National Institute from Environmental and Renewable Resources) which will evaluate the environmental impact and finally from ANVISA (National Agency for Sanitary Watch) which will evaluate toxicology aspects of AI's and formulations. Beyond the federal level, each formulation must apply and hold authorization in each state where commercialization is expected.

Registry

The crop protection registration process in Brazil is one of the most complex in the world. New molecules may have their registrations approved, under normal conditions, within a timeframe of more than 6 years after the process submission. Each country has a different registration system and, in most cases, there is a varying data protection period given each type of authorization that can vary from 1 to 10 years. A pursuing company cannot use protected data to support a registration request without the permission of the information owner.

A company aiming to enter the Brazilian market with business model based on products with expired patents, must properly estimate its market entry timing considering local patent period, the time to obtain registration and the period of data protection.

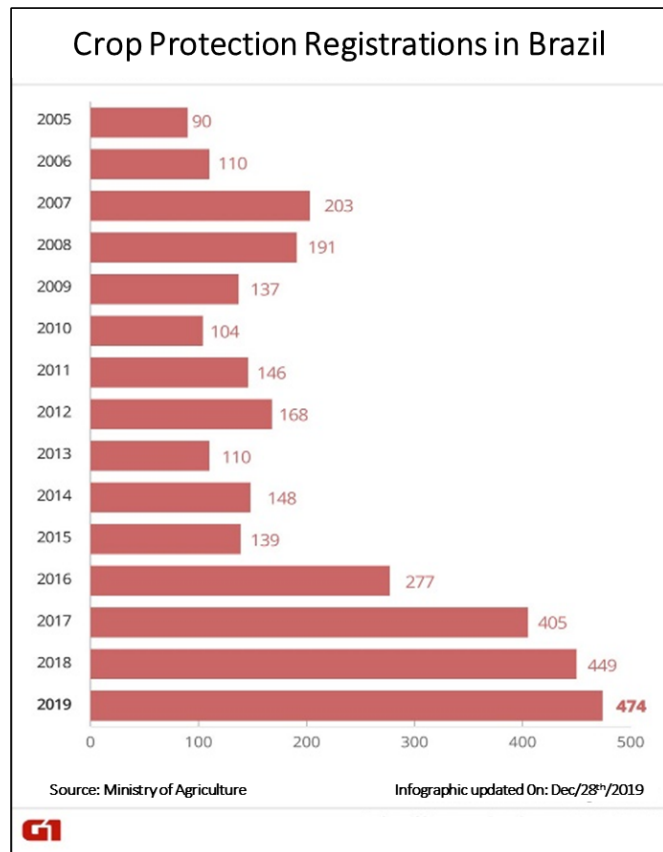
Companies whose business model are based on the discovery of new molecules (Research and Development), target an efficient development processes, submitting their registration processes and protecting their molecules by overarching their patents, based on new formulations, new uses and/or new mixtures. Their post-patent strategy is of relevance in portfolio management, seeking to maximize the time of exclusivity in the market, maximizing the profitability of the molecule and its formulations.

Registration increases in Brazil

In general terms, the number of new molecules registered in Brazil has fallen in recent years as a result of biotechnology growth and with the increase in regulatory restrictions that occur worldwide. These restrictions end up significantly increasing the risk of obtaining registration for new molecules.

As mentioned, the registration time for new molecules remains very long in Brazil, despite promises that several governments have made, to review

processes and reduce deadlines. There has been indeed an increase in the release of agrochemical registrations in Brazil, but this increase has been focused on those molecules with patents already expired, to name more generic products responsible for increasing the competitiveness level in the Brazilian arena.



Innovation in Crop Protection – Segments and Crops

One can understand the innovation level in the Brazilian market by matching the traditional crop segments with each crop protection indication. Here, herbicides, fungicides and insecticides are plotted over the top 80% market value representative crops, soybeans, maize, cotton and sugarcane.

Innovation Level (new molecules) in Crop Protection

Crops vs Segments

Herbicides:

As shown in figure 1, the herbicide segment has not produced relevant innovation in the past years. On contrary, products that are in the market for years like dicamba and 2-4D have been “promoted” to innovation given a new generation of tolerant crops from GMO biotech. In this



Figure 1 - ArenaAgri 2020

segment, the introduction of soybeans varieties, corn and cotton with different AI's tolerant traits like glifosate, hormone herbicides (dicamba and 2-4D), imidazolinones (via conventional breeding), ammonium glufosinate and, in the future, herbicides from groups HPPD and PPO's.

Beyond that, traits “stacking” generates multiple technology combination aiming to increase the herbal control range for each single technology. Nonetheless, crops like rice, sugarcane, pasture and other perennials remain very attractive to conventional herbicides.

Few new molecules have been introduced in the Brazilian Market lately, worth mention Indaziflan (2016) and piroxasulfone (2020) as recent examples. New molecules are also undergoing registration process like diflufenican (cereals), halauxifen-methyl (soybean, wheat and maize), florpiauxifen-benzil (soybean, rice and maize), bixlozone (cereals) e pinoxaden (cereals).

Fungicides:

The fungicide segment stands out for leading the innovation process. It is the market segment that has the highest concentration of valid patented products and the highest number of new

molecules and formulations launched in recent years, with emphasis of carboxamides chemical group.

Soybean rust has been the most demanding driver for research and development, as it is a segment of high value, strategic importance and the main source of vegetable protein. This trend is due to continue with the introduction of products with new modes of action to assist in the disease management through chemical groups rotation - triazoles, strobilurines, carboxamides, morpholine and multi-sites (chlorotalonil, mancozebe and copper), in order to maintain the crop viability in Brazil.

Some newly introduced molecules and formulations in the Brazilian market are fluxapiroxad (2013), benzovindiflupyr (2014), fenpropimorph in soybeans (2017), bixafen (2017) e fluopyram (nematicide and fungicide, 2019).

Products undergoing registration process are fluindapyr, impirfluxam, mefentrifluconazol, fenpropidin, focusing soybeans, maize, cotton and wheat markets. Beyond those, oxathiapiprolin focusing tomatoes, potatoes and other vegetables is also under registration and pidiflumetofen shall enter in several crops, single and in mixtures.

Insecticides:

In the insecticide segment, as in the case of herbicides, investment in biotechnology leading into Bt varieties (tolerant to lepidopterans) may hinder companies interest in investing in new molecules. Recent innovations - chemical group of diamides - leads the market in this segment. The first diamide formulations registered were - flubendiamide (2009), chloratraniliprole (2010) and ciathraniliprole (2016). In addition to diamides, emamectin benzoate was registered in Brazil in 2017 for lepidopterans management.

The expansion of Bt technology makes the sucking insect segment to gain relevance and new molecules have recently been introduced to the Brazilian market, such as flupiradifurone (2017), sulfoxaflor (2019) and dinotefuran (2019).

New molecules are being registered, such as afidopyropen, isocycloseram and spyropidion targeting various crops.

Seed treatment:

In the seed treatment segment, products are characterized by ready mixes between insecticides and fungicides that have an action (contact or systemic) on seeds. The recently introduced formulations on the market are based on diamides such as cyantraniliprole (2016). Nematicides such as fluensulfone (2018) and fluopyram (2019) are examples of recent records.

New developments in the nematicide segment include biological agents such as *Bacillus firmus* and *Bacillus amiloliquefaciens*, among others.

Opportunities to new entrants

The Brazilian market demands innovations. Post-patent companies can also participate in this market by responding to this demand for innovations, either by introducing new product formulations or even by launching mixtures of active ingredients that provide control synergy.

For companies with post-patent products, it is essential to understand the best time to start their development and registration activities, aiming to enter the market at the right time, choosing the right market and products. In this article, we present some products that were recently introduced and others that will enter the market in the coming years. Invariably, the conclusion we reach is that there are several opportunities for new entrants.

The information presented in this article does not exhaust the subject. The idea is not to present all products, but to present trends and examples of what is happening in the Brazilian arena. To better understand the market and its opportunities, contact ArenaAgri or Mérieux NutriSciences consultants and request a virtual meeting to detail the market segments that are of most interest to your company.



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