

# **The Changing Role of Standards for Agricultural Equipment in Brazil**

by *Daniel W. Zacher*

BRAZIL

## **1. Introduction**

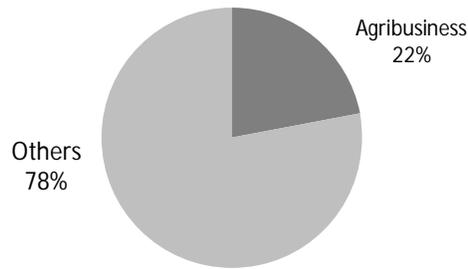
The industry of agricultural machinery in Brazil is undergoing deep and fast changes, due to an ever competitive market that requires from organizations technologically updated products and quality standards, costs and better services. In this scenario, successful companies are those that are able to create, adapt, disseminate and apply technology. One of the strategic tools to help companies to solve the most demanding modern business challenges is standardization [12]. Technical standards help align product and service specifications, making companies more efficient and contributing to the access to new markets.

More specifically, the purpose of this report is to describe the creation process of “Comitê Brasileiro de Tratores, Máquinas Agrícolas e Florestais” (Brazilian Committee for Tractors and Machinery for Agriculture and Forestry) from ABNT – Associação Brasileira de Normas Técnicas (Brazilian Association of Technical Standards), mirror of the Technical Committee ISO/TC-23. Such initiative is supported by two Brazilian manufacturers’ associations, ABIMAQ/SINDIMAQ and ANFAVEA, as well as by several private companies and was approved in May, 2013 by Associação Brasileira de Normas Técnicas – ABNT, under the heading ABNT/CB-203. An increase in the number of technical standards on tractors and agriculture and forestry machinery is expected in Brazil. There currently are 25 standards [2], a much reduced number when compared to the 349 ISO/TC-23 standards [12]. On the medium term, the purpose of the initiative is to contribute with technology innovation and increase the safety of products manufactured in Brazil, for the continuous improvement of quality and information provided to consumers of tractors and agriculture and forestry machines, as well as to assist, with technical literature, the standardization processes in the country.

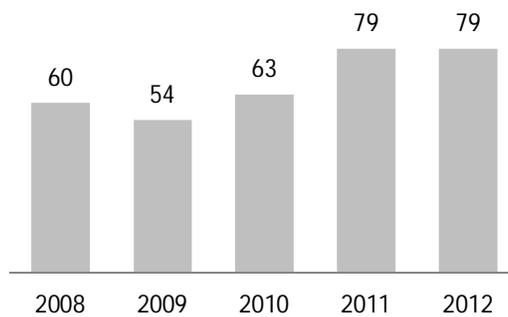
## **1. Development of agriculture in Brazil**

Historically, agriculture is one of the most important economic activities in Brazil. Agribusiness is currently responsible for more than 20% of the gross domestic product and is becoming the economic activity that contributes the most for Brazilian trade balance surplus [15]. From 2000 to 2011, the exported volume increased almost 155% and external prices, 131%, whereas trade balance increased more than 400% (that is, it was multiplied by 5), reaching US\$ 412.3 billion [8]. In 2012, exports of agribusiness products amounted to US\$ 95.8 billion, whereas all exports, of all economic sectors combined, represented US\$ 242.6 billion [15]. During the 2012/2013 grain harvests, the country confirmed its agricultural vocation, with a planted area of 53.34 million hectares and a production of 187.09 million tons [9] – in the last four seasons, production increased by 26% while the area increase was only of 12% [7]. The increasing productivity in the field can be exemplified by two major grains grown in Brazil: corn and soybeans. In 1980, Brazilian corn production represented, on average, 1.79 tons per hectare while, in the 2010/2011 season, 4.17 tons per hectare were produced instead. As far as soybeans are concerned, during that same period, the average national production went from 1.7 to 3 tons per hectare [5].

**Figure 1 -** Relative share of Agribusiness in the GDP. *Source: [15]*



**Figure 2 -** Brazilian agribusiness trade balance in billions of US\$. *Source: [15]*



Regarding the extent of the planted area, among the leading agricultural varieties produced in Brazil, it is important to point out: soybeans (with a planted area of 27.7 million hectares in 2011); corn (with a planted area of 15.9 million hectares in first and second 2011 harvests); sugarcane (with a planted area of 8.4 million hectares in 2011); beans (with a planted area of 3.0 million hectares in the three 2011 harvests); rice (with a planted area of 2.3 million hectares in 2011); coffee (with a planted area of 2.3 hectares in 2013); wheat (with a planted area of 1.8 million hectares in 2011), among others [9]. Based on the value of exports, according to the Ministry of Development, Industry and Foreign Trade, the main production chains, in percentages, in 2012, are: soy (27%); meat (16%), sugar and ethanol (16%), forest products (10%), grain and flour (7%), coffee (7%) and other products (17%) [15]. This natural vocation for agriculture and livestock allows Brazil to be the leader in the production and export of various products, as shown in Table 1.

**Table 1 -** Brazil in the 2012 global ranking of commodities. *Source: [17]*

Commodity	Production	Exports
Soy	2°	1°
Corn	3°	2°
Coffee	1°	1°
Sugar	1°	1°
Ethanol	2°	2°
Orange Juice	1°	1°

Cotton	5°	4°
Rice	9°	8°
Bovine Meat	2°	1°
Chicken Meat	3°	1°
Pork Meat	4°	4°

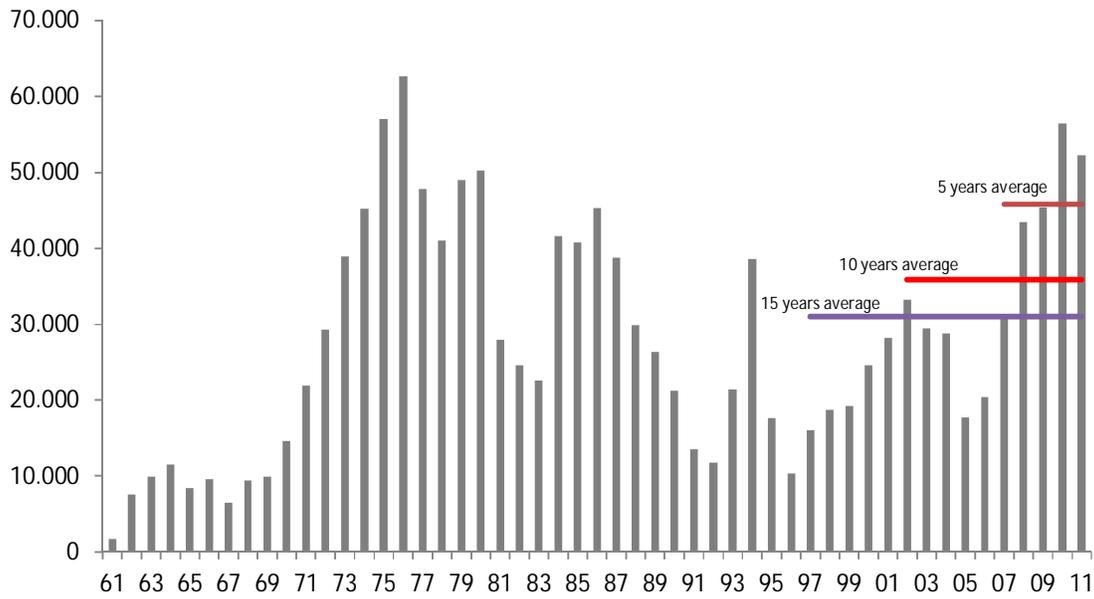
The factors that led to this recent development of Brazilian agriculture, according to the Ministry of Agriculture, Livestock and Supply, mainly are: availability of area for the production of grains, meat and forests; sunlight and regular rainfall in most regions; agricultural policies, through investment credit, funding and marketing, associated to plant and animal health and use of technologies that make better use of the soil and reduce the use of inputs; and activities of producers engaged in increasing production based on the modernization of their rural properties [13].

With regard to the expansion of the production area, it is important to highlight the process of settlement of new agricultural frontiers in Brazil, an initiative that had its greatest impulse as of the 1970s, with the migration of settlers from the south of Brazil to more central regions, known as “cerrados” (savannahs). These families of farmers, coming from a region with a different climate, soil and flora, succeeded in the management of tropical agriculture with the intensive use of technology and much persistence. According to Associação Nacional de Fabricantes de Veículos Automotores – ANFAVEA (National Association of Automobile Manufacturers), “the significant gains of Brazilian agribusiness in recent years are mostly due to the automation of field activities. Agricultural productivity grew from 2145 kg/ha to 3100 kg/ha from 2000 to 2010, a 41.2% increase” [5]. According to data from the Ministry of Agriculture, Livestock and Supply, mechanization played a decisive role in the increase of production capacity, accounting for about 30% of gains in recent years [13]. Other factors associated with growth were developments in biotechnology and management systems, and investments in irrigation.

## **2. The local industry of agricultural machinery**

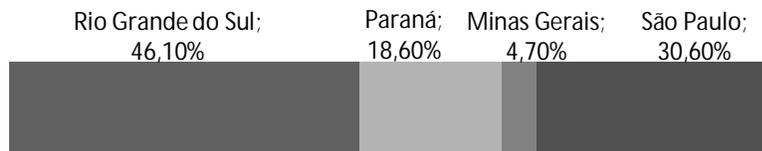
Over its 50 years of history, the Brazilian industry of agricultural machinery represented an important contribution to the country’s generation of income, employment and productive capacity. In the past decade, manufacturers have invested more than USD 1.3 billion in new ventures and Brazil reached, in 2012, a volume of more than 74,000 machines produced, 12,000 of them to be exported [4]. Agricultural machinery in Brazil started to develop in the 1970s when a policy for the development and fostering of production in the center of the country caused production of tractors to grow significantly. According to ANFAVEA, 80,200 units of tractors were sold in 1976, against 17,000 units sold in 1970. The production of machines strongly grew during certain periods of history, as a result of policies fostering the mechanization or increase/decrease of producers’ income. However, the last few years were characterized by stable growth rates as shown in figure 3, which refers to the evolution of sales of agricultural tractors [5].

**Figure 3 -** Evolution of sales of tractors in Brazil (units/year). *Source: [4]*



This great moment in Brazilian agribusiness has contributed to the investment, by manufacturers operating in the country, in an increased production capacity and product portfolio expansion, as well as it has stimulated new manufacturers to open offices in Brazil, a precondition for access to government funding policies that require local minimum machine content. The production capacity of the country’s agricultural machinery industry is of 109,000 tractors per year [5]. According to Anfavea, there were 1,122 points of service in 2012, among its members [4]. Regarding its location, the agricultural machinery industry is concentrated in the south of the country, and the state of Rio Grande do Sul (a pioneer in the production of grains and also the birthplace of the production of agricultural machinery in Brazil ) is the leading producer of agricultural machinery [4], as shown in figure 4.

**Figure 4 -** Production of agricultural machinery per state. *Source: [4]*



In 2010, the industry of tractors and agricultural machinery employed 63895 workers in Brazil, 24,169 of which were in Rio Grande do Sul, representing 37.8 % of the sector [16]. The sector exports to the five continents, especially South America, which, in 2012, accounted for 50.3 % of exports. The total revenues of companies that are members of ANFAVEA, among external and internal sales, totaled US\$ 10.3 billion in 2012 [4].

### 3. Standardization of Agricultural Machinery

According to Associação Brasileira de Normas Técnicas - ABNT, standardization is the “activity that establishes, in relation to existing or potential problems, provisions designed to common and repetitive use in order to obtain the optimum degree of order in a given context” [2]. Standardization has been increasingly seen as a means for achieving production and final product cost reduction while maintaining or improving products’ quality. Besides, in an increasingly global economy, standardization helps to facilitate sales in the international market and, also, regulate the import of products that do not comply with the importing country standards. Among some of the standardization benefits indicated by ABNT, we can list [2]:

Qualitative:

- The appropriate use of resources (equipment, materials and workforce)
- Production standardization
- Facilitation of workforce training, improving their technical level
- Possibility of technological knowledge registration
- Improvement of the hiring process and sale of technology

Quantitative:

- Reduced consumption of materials and waste
- Standardization of equipment and components
- Reduction of product variety (improve)
- Provision of procedures for calculations and projects
- Increased productivity
- Quality improvement
- Process Control

Worldwide, the standardization activity regarding tractors and agricultural and forestry machinery is organized by the International Standardization Organization - ISO through the technical committee ISO/TC 23 Tractors and Machinery for Agriculture and Forestry. ISO/TC 23 currently has 349 standards published, and 24 countries as participating members and 41 countries as observing members. Brazil is a participating member [12]. Please find below how ISO/TC 23 is structured in its various subcommittees by area of interest:

**Table 2 -** ISO/TC 23 structure. *Source: [1]*

<b>Subcommittee</b>	<b>Description</b>
TC 23/SC 2	<i>Common tests</i>
TC 23/SC 3	<i>Safety and comfort</i>
TC 23/SC 4	<i>Tractors</i>

TC 23/SC 6	<i>Equipment for cropprotection</i>
TC 23/SC 7	<i>Equipment for harvesting and conservation</i>
TC 23/SC 13	<i>Powered lawn and garden equipment</i>
TC 23/SC 14	<i>Operator controls, operator symbols and other displays, operator manuals</i>
TC 23/SC 15	<i>Machinery for forestry</i>
TC 23/SC 17	<i>Manually portable forest machinery</i>
TC 23/SC 18	<i>Irrigation and drainage equipment and systems</i>
TC 23/SC 19	<i>Agricultural electronics</i>

In Brazil, ABNT, a private nonprofit organization that was founded in 1940, is the entity responsible for technical standardization. ABNT is a founding member of ISO - International Organization for Standardization, COPANT - Pan American Technical Standard Commission and AMN - MERCOSUR Standardization Association, being the official representative of these entities in Brazil, in addition to IEC - International Electrotechnical Commission [2].

The standardization of agricultural machinery in Brazil significantly developed during the 1980s, with activities related to terminology, requirements, test methods and generalities, through ABNT/CB-12 - Brazilian Committee for Agriculture and Livestock, which is currently in recess. Later on, during the 2000s, standardization activity resumed with the creation of the commission of studies on agricultural tractors, with ABNT/CB-05 - Automotive. Afterwards, another initiative, through ABNT/CB-04 - Mechanical Machinery and Equipment, established a study commission on machinery and inputs for the application of pesticides and on embedded electronic communication. Thus, at the end of 2012, the country had the following active study commissions, working with standardization of agricultural machinery:

- CE 05:108.01 - Agricultural Tractors (mirror of ISO TC 23 SC 4)
- CE 04:015.10 - Machines for the application of pesticides (mirror of ISO TC 23 SC 6)
- CE 04:015.15 - Embedded Electronic Communication (mirror of ISO TC 23 SC 19)

#### **4. The creation of the Brazilian Committee of Tractors, Agricultural and Forestry Machinery**

In order to act as a mirror of ISO/TC 23, Tractors and Machinery for Agriculture and Forestry in Brazil, and to structure study commissions in a harmonized manner with ISO subcommittees, the creation of the Brazilian Committee - CB of Tractors, Agricultural and Forestry Machinery was proposed to ABNT in November 2012. The proposed creation of CB was supported by entities representing the industry of tractors and agricultural and forestry machinery in Brazil, ANFAVEA and ABIMAQ/SINDIMAQ, and by several private companies who were willing to sponsor the Committee. Both ABNT/CB-05 - Automotive and ABNT/CB-04 - Mechanical Machinery and Equipment, which housed study commissions on tractors and agricultural machinery, joined the process, using their best efforts to create the Brazilian Committee, mirror of ISO/TC 23.

The Brazilian Committee of Tractors, Agricultural and Forestry Machinery, ABNT/CB-203, approved on May 7, 2013 by the management council of ABNT, shall develop standardization activities aimed at tractors, machines, systems, accessories and equipment used in agriculture and forestry as well as gardening, landscaping, irrigation and other related areas that use these devices, including aspects of electronics and electronic identification of all types of animals [1].

Internationally, it shall act as a mirror of ISO/TC 23: Tractors and machinery for agriculture and forestry, of SCM 06:04 - Subcommittee on Agricultural Machinery, and of CSM 06 MERCOSUR Sectorial Committee on Mechanical Machinery and Equipment, regionally.

The technical secretariat of the Brazilian Agricultural Machinery Committee shall be located in the headquarters of ABIMAQ/SINDIMAQ, in the city of São Paulo, the same place where the meetings will be held. The choice of the technical secretariat is justified by the standardization tradition of ABIMAQ/SINDIMAQ, which is also in charge of the following committees in Brazil: ABNT/CB-04 - Mechanical Machinery and Equipment and ABNT/CB-48 - Road machines (mirror ISO/TC 127). The structure of ABNT/CB-203, in its first year of activity, shall include the following Study Commissions described in Table 3

**Table 3 -** ABNT/CB-203 Study Commissions. *Source: Author*

<b>Study Commission Code</b>	<b>Study Commission Description ABNT CB-203</b>	<b>Equivalent ISO/TC 23 subcommittee</b>
CE-203:003.01	Safety, Comfort and Operator Controls	TC 23/SC 3 - Safety and Comfort; TC-23/SC 14 - Operator controls, operator symbols and other displays, operator manuals
CE-203:004.01	Agricultural Tractors and Common Tests	TC 23/SC 2 – Common Tests, TC 23/SC 4 – Tractors
CE-203:006.01	Machines and inputs for the application of pesticides	TC 23/SC 6 - Equipment for crop protection
CE-203:007.01	Equipment for Harvesting and Conservation	TC 23/SC 7 - Equipment for Harvesting and Conservation
CE-203:013.01	Motor Equipment for Lawn and Garden Maintenance and Portable Machines for Forest Management	TC 23/SC 13 – motor equipment for lawn and garden maintenance, TC 23/SC 17 - portable forestry machinery
CE 203:019.02	Electronic and Embedded Communication	TC 23/SC 19 - Electronics in Agriculture

The organizational structure of ABNT/CB-203 comprises a committee manager and the head of the secretariat, who reports to such manager. To assist in the implementation phase of the committee, manager proposes the creation of an advisory group, composed of experts in: 1) technical quality of study commissions, 2) finance, 3) international relations, and 4) communication and events. The various study commissions shall meet every month, always on the same week of the month, according to **table 4**:

**Table 4** -Schedule of meetings of the ABNT/CB-203 Study Commissions. *Source: Author*

	<b>Monday</b>	<b>Tuesday</b>	<b>Wednesday</b>	<b>Thursday</b>
<b>Morning</b>	Embedded and Electronic Communication <i>(meeting every two months)</i>	Safety, Comfort and Operator Controls	Equipment for Harvesting and Conservation	Motor Equipment for Lawn and Garden Maintenance and Portable Machines for Forest Management
<b>Afternoon</b>	Embedded and Electronic Communication <i>(meeting every two months)</i>	Agricultural Tractors and Common Tests	Machines and inputs for the application of pesticides	

## 5. Conclusions

The proposed creation of the Brazilian Committee of Tractors, Agriculture and Forestry Machinery ABNT/CB-203 is based in some points which can be summarized as follows:

- 1) Legacy of active study commissions in traditional Brazilian committees so that the new committee shall inherit their process knowledge and technology;
- 2) One of the largest and most diversified industrial parks in the world in relation to tractors and agricultural and forestry machinery is located in Brazil and has companies supporting technical standardization, both abroad and in Brazil. Among these companies, we can point out: AGCO, Agroleite, Baldan, CASE IH, Guarany, Inroda, Jacto, John Deere, Montana, New Holland, Pinhalense, Stihl, Trapp, among others;
- 3) Educational institutions with a focus on agricultural mechanization with operations in several states of the federation and tradition in research, especially in tropical agriculture, a competitiveness factor of the country;
- 4) Government Agencies and Research Institutions focused on agribusiness and with a significant role in the technical standardization process: Embrapa, Agronomy Institute, Ministry of Agriculture, Livestock and Supply, Ministry of Agrarian Development, Ministry of Science and Technology, ABDI, Fundacentro, among others;
- 5) Professional and trade associations and unions with representation at different levels (employers, employees and machine manufacturers);
- 6) Relevance of the agricultural sector to the economy and job creation in the country and urgent need to expand its development process in the context of technical standardization;
- 7) Support from international organizations with legacy in standardization on tractors, agricultural and forestry machinery.

Among the factors that could affect the compliance and implementation of the new ABNT/CB-203 work program, it is important to point out the low participation of representatives in the study commissions – a risk that shall be mitigated through the intense mobilization of key stakeholders, the dissemination of initiatives in key communication means and companies' formal support to ABNT/CB-203, through the engagement of their leaders and technical professionals. It is noteworthy that, since the initial discussions for the creation of the CB, companies have been consistently engaging.

The work of ABNT/CB-203 shall significantly benefit civil society, since agriculture is a key economic activity in the country, inducing large-scale development in the most distant regions of the coast. And, every initiative that contributes to increasing the level of technology, safety and quality of these capital goods will directly increase the income of farmers and, consequently, benefit the entire society.

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