# INFLUENCE OF LEGISLATION/SUBSIDIES, TO HELP AGRICULTURE AND/OR AGRICULTURAL MECHANISATION, ON THE MARKET OF AGRICULTURAL MACHINERY (SOUTH AMERICA)

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The two countries in South America which lead the region's market for tractors and agricultural machines are Argentina and Brazil. In both, there are major factories of companies that in addition to supplying the domestic markets also export a considerable number of units. They are also characterised by a highly mechanised agriculture in which demand for machinery fluctuates widely, because a large proportion of the agricultural output is exported, making farmers' income dependent on variations in food commodity prices on world markets.

Consequently, the domestic market for tractors and agricultural machinery is influenced by the legislation applied to exported food products, as well as by the incentives and taxes aimed at supporting local manufacturing and restricting imports of machines or their components.
Although both Argentina and Brazil are members of MERCOSUR, this market has not been fully developed, primarily due to major differences in socioeconomic and agricultural-climate conditions. Implementation of common legislative measures is thus hampered, with policies instead geared to the specific country, region or even province.

One key difference between the attitudes of these two countries is that Brazilian purchasers tend to give preference to nationally manufactured products, whereas in Argentina the price-quality ratio is the most important consideration.

## INTRODUCTION
## PHYSICAL ENVIRONMENT

### Argentina

Argentina extends from above the Tropic of Capricorn down to nearly 54º south latitude, and incorporates subtropical, temperate and cold climate regions.

It should be noted that, because the latitudes in question lie in the southern hemisphere, the temperatures (and climates) are colder than at the corresponding latitudes in the northern hemisphere.

The Andes mountain range, running from north to south within the country, blocks western winds entering the temperate area, producing a dry climate in proximity of the mountains. In most of the country, rainfall decreases with increasing distance from the Atlantic Ocean. In Patagonia, agricultural activity is limited by strong winds and cold temperatures.

**Brazil**

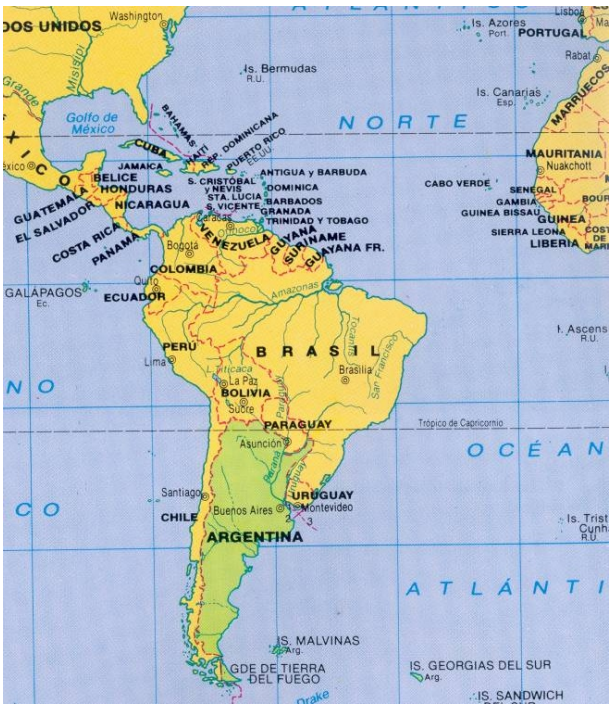
Brazil, situated between 5º north latitude and 33º south latitude, consists of tropical and subtropical regions, although their climates are sometimes modified by altitude.

The geographical conformation of Brazil, with low-lying areas surrounded by mountain ranges which block the entry of prevailing winds, produces dryness in some of the warmest regions such as the São Francisco river basin, which affords good potential for agriculture under irrigation.

The Prata river catchment area, which covers a large portion of the Centre-West and Southeast regions of the country, includes rivers that flow toward the interior and can therefore be used for freight transport. These regions, along with the South, are the most highly developed in the country.

Brazil ranks as an agricultural superpower by virtue of its leadership in products such as coffee, soybean, sugar and alcohol, oranges, beef and chicken.
The practice of no-till methods in soils weakened by conventional tillage has made it possible to extend the agricultural boundaries, particularly in the west (soybean) and south. For example the cultivation of sugar cane for alcohol production has increased, with a tendency to displace grain production, because the central and eastern ecosystems have adjusted to this crop.

The primary agriculture sector has traditionally been the driving force of Brazil's economy, and continues to be so today, however the relative importance of the industrial sector is now gradually increasing, with a trend toward shifting industrial activity to the southern states.
The companies which manufacture tractors and agricultural machinery are among those with the strongest growth prospects. The factories of the major manufacturers located in the country export 50 % of their production, in addition to which there are many Brazilian SMEs which export various types of machines such as seed drills and sprayers.




| | |
|---|---|
| **Argentina:** | |
| Area: | 2 791 815 km$^2$ (8º) |
| N-S distance: | 3694 km |
| Min. latitude: | S 21º 46’ 10” |
| Max. latitude: | S 55º 03’ 00” |
| E-W distance: | 1423 km |
| Min. longitude: | E 53º 38’ 52” |
| Max. longitude: | E 73º 34’ 00” |
| Inhabitants: | 38.59 millions (2005) |
| Density: | 13 inhab./km$^2$ |
| GDP: | 567 313 M US$ (22º) |
| GDP/per capita: | 14 838 US$ (50º) |
| **Brazil:** | |
| Area: | 8 511 965 km$^2$ (5º) |
| N-S distance: | 3500 km |
| Min. latitude: | N 5º 16’ 20” |
| Max. latitude: | S 33º 47’ 34” |
| E-W distance: | 3000 km |
| Min. longitude: | E 34º 47’ 32” |
| Max. longitude: | E 74º 8’ |
| Inhabitants: | 186.11 millions (2005) |
| Density: | 21 inhab./km$^2$ |
| GDP: | 1 665 434 M US$ (10º) |
| GDP/per capita: | 8 964 US$ (69º) |

## PROJECTED REGIONAL AGRICULTURAL GROWTH

Taken together, Argentina and Brazil occupy an area of over 11 million square kilometres, although obviously not all of this is available for agriculture, livestock or renewable forestry uses.

Table 1, from the FAO document on "Potential for Agricultural and Rural Development in Latin America and the Caribbean (Annex IV)", describes the types of agricultural environments found in the various regions of Argentina and Brazil.

Table 1.- Agricultural environments in Latin America and the Caribbean (Source: FAO "Potencialidades del desarrollo agrícola y rural de América Latina y el Caribe" (Anexo IV)

| | **Latin America/Caribbean** | | **Brazil** | | **South America** | |
|---|---|---|---|---|---|---|
| | **[Mha]** | [%] | **[Mha]** | [%] | **[Mha]** | [%] |
| A) Humid tropics | **748** | 34.4 | **497** | 52.5 | **0** | 0.0 |
| B) Tropics and subtropics with acid soils | **235** | 10.8 | **143** | 15.1 | **14** | 3.1 |
| C) Semiarid tropics and subtropics | **301** | 13.9 | **158** | 15.1 | **44** | 10.0 |
| D) Humid land areas | **251** | 11.5 | **99** | 10.4 | **64** | 14.3 |
| E) Sloping land areas | **399** | 18.4 | **109** | 11.5 | **68** | 15.3 |
| F) Land areas with no limitations | **73** | 3.4 | **22** | 2.4 | **24** | 5.4 |

***A) Humid tropics:***

- Growth period of over 9 months
- Predominance of acid and low fertility soils; pressure from pests and disease; little infrastructure and limited markets.

**B) Tropics and subtropics with acid soils**

- Growth period from 9 to 6 months.
- Low fertility soils; need for intensive fertilizing; low retention of nutrients.

***C) Semiarid tropics and subtropics***

- Growth period from 6 to 3 months.
- Short growth period except under irrigation; risk of drought and high demand for water.

***D) Humid land areas***

- Waterlogged soils for periods of over 60 days.
- Bad drainage negatively affects non resistant crops; some areas may be flooded for part of the year.

***E) Sloping land areas***

- Gradients of more than 30 %.
- Restricts use of mechanised agriculture; transport problems; heavy soil erosion; additional problems related to precipitation, temperature and soil fertility.

**F) Land areas without significant limitations**

- Growth period of 9 months, with no physical or soil fertility limitations.
- Unpredictable droughts may damage agriculture in dry areas.

**Note**: Environments not appropriate for agriculture are included in the percentages of each type of land; the sum of the regional percentages is not always 100 % because non-agricultural environments are not included in the classification and the specified environments are not mutually exclusive.

Source: FAO "Potencialidades del desarrollo agrícola y rural de América Latina y el Caribe" (Anexo IV)

Humid tropics, found in the highest areas of the Amazon rain forest, cover half the surface of Brazil. Tree crops such as oil palm, banana, rubber and cocoa are those best suited to these areas, as also tropical timber in combination with other types of crops.

Tropics and humid subtropics with arid soils cover a large portion of central Brazil.

These are mainly tropical savannas with a dry season lasting 3 to 6 months, used for cattle farming with very low livestock density (0.2 head/ha). The soils here have a low phosphorus content which could be corrected, along with the acidity, to make possible high yields of maize, soybean and sorghum. These are areas with potential for the expansion of agriculture.

With the availability of water, the semiarid tropics and subtropics would also have agricultural potential. For example, the Brazilian semiarid tropical and subtropical regions and those near the mountain range in the north of Argentina. These are mainly used for cattle, sheep and goats, but would have a high productive potential under irrigation.

The humid regions located in the Amazon basin and in the southwest of Brazil have ground water levels very close to the surface. Here, lack of drainage is the greatest problem, and the soils with good drainage are capable of producing rice.

Steeply sloping land areas are characteristic of the Andean region of Argentina. This type of land is subject to erosion problems, and there are also frosts at the highest altitudes. Mechanisation is not possible with slope gradients of more than 30%.

The fraction of land areas with no significant limitations for agriculture within the Latin American/Caribbean region is quite low (only 3%, in absolute terms). The most extensive such areas are located in South America (24 million ha) and in Brazil (22.5 million ha). Most of these land areas have temperate or subtropical climates, are covered with grassland, have dark soils (rich in organic matter) and calcium carbonate-rich subsoils. They could be used for various types of crops, forage and cultivated pastures. The soils are well suited to mechanised, intensive agriculture. Although most of these land areas are already cultivated, their productivity is much lower than what could be achieved using fertilizers and improved varieties.

Soil potentials for specific crops, with two levels of inputs (FAO), are classified into four categories:

| **Categories** | **Yield (% of maximum)** |
|---|---|
| Very appropriate | > 80 |
| Appropriate | 40 – 80 |
| Marginally appropriate | 20 – 40 |
| Not appropriate | < 20 |

Table 2 below shows the areas within Argentina and Brazil that are classified as "appropriate" or "very appropriate" (not taking irrigation into account), in comparison with Latin America/the Caribbean as a whole.

## POPULATION AND DEVELOPMENT

Although Argentina and Brazil have a joint population of over 200 million inhabitants, the agricultural output of both countries is sufficient to meet their needs, with a high capacity for export as well.

Table 3 shows the relation between the available cultivated area (arable land, hectares per person) and the potential demographic density capacity.

The development model of these countries is based on land use, rather than manpower use.

Although some regions have an abundance of agricultural labourers, with low incomes and low working productivity, there has been a shift towards their employment in non agricultural sectors capable of absorbing the manpower.

Table 2.- Land areas classified as "appropriate" and "very appropriate" for different crops (percentage of country area)

| | Brazil | | South America | | Total | |
|---|---|---|---|---|---|---|
| **Crop** | high | low | high | low | high | low |
| **Manioc** | 25 | 25 | 3 | 2 | 16 | 15 |
| **Cotton** | 8 | 1 | 8 | 3 | 8 | 2 |
| **Corn** | 9 | 7 | 16 | 14 | 10 | 8 |
| **Beans** | 7 | 3 | 11 | 9 | 9 | 5 |
| **Rice** | 11 | 4 | 5 | 4 | 11 | 5 |
| **Sorghum** | 3 | 2 | 7 | 6 | 5 | 4 |
| **Soybean** | 9 | 4 | 7 | 5 | 8 | 4 |
| **Sweet potato** | 17 | 9 | 7 | 7 | 13 | 8 |
| **Wheat** | 1 | 0 | 11 | 8 | 4 | 3 |
| **Potato** | 1 | 0 | 9 | 8 | 3 | 2 |

Source: modified FAO

Table 3.- Potential demographic density capacity in Latin America and the Caribbean (FAO)

| **Normalized arable land (1983)** | | | | | |
|---|---|---|---|---|---|
| **ha/person** | | | | **Argentina** | Paraguay |
| **> 0.5** | | | | | |
| **0.3 - 0.5** | | | **Brazil** | | Bolivia Guyana |
| **0.2 - 0.3** | | | Cuba Nicaragua | Uruguay | |
| **0.1 - 0.2** | El Salvador | Honduras Guatemala Dominican Rep. | Colombia | Costa Rica Ecuador Panama - Peru Venezuela | Surinam |
| **< 0.1** | Haiti Jamaica Trinidad and Tobago | | | | |
| | **< 1.0** | **1.2 - 2.0** | **2.0 - 4.0** | **4.0 - 6.0** | **>6.0** |
| | **Coefficient of potential demographic density capacity, year 2000** | | | | |

The expansion of the agricultural boundary, particularly in Brazil, has been made possible through the overcoming of ecological obstacles, and most importantly through the introduction of new agricultural technologies, such as the direct drill.

In the case of Argentina, there has been a shift from livestock farming to the cultivation of crops, prompted by the demand for products such as soybean. In Brazil, grain production has been reduced in order to increase the areas devoted to sugar cane, which has been gradually mechanised.

The increase in technology level has sometimes been held back by a lack of financial resources, but has nevertheless shown an upward trend, as compared with investments in increasing the available farm holding areas.

The exploitation of water resources, the use of varieties of plants genetically enhanced for the particular areas in question, and improvements in harvest preservation could all help elevate the productivity and quality of life in rural areas.

Within these countries, which are at an intermediate level of development, there are emerging concerns about the risk of damage to the environment, although some environmental alterations are an inevitable consequence of population growth and the expansion of the economic base. In the tropical and subtropical regions, new technologies have made it possible to practice sustainable agriculture and exploitation of natural resources.

The greatest risks are directly linked to the deforestation of tropical environments. The erosion and deforestation of tropical areas also affects the arid regions with sloping land during the short season of heavy rains. It can be avoided through the use of conservation cropping methods. Salinisation and alkalinisation are linked to irrigation with inadequate technology.

These are the most significant challenges faced by the agriculture of the region, and arise from a poor understanding of the characteristics of tropical and subtropical environments, which have very often been treated in the same way as humid temperate environments.