

## Soybean Production Costs: An Analysis of the United States, Brazil, and Argentina

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**ABSTRACT:** U.S. farmers' share of world soybean exports has declined, while Brazil and Argentina are gaining. There is much debate concerning the competitive advantage of U.S. versus Latin American soybean producers. A detailed analysis of soybean production costs under different systems and technologies in the United States, Argentina, and Brazil was conducted.

**Keywords:** Argentina, Brazil, international competition, soybeans, productions costs, United States

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# Soybean Production Costs: A Competitive Analysis of the United States, Brazil, and Argentina

## **Introduction**

Over the past several years, U.S. soybean farmers have seen their share of world soybean exports decline. While U.S. soybean production represents approximately one-half of total world soybean production, other competitors such as Brazil and Argentina are gaining. Furthermore, U.S. farmers are facing some of the lowest soybean prices in decades, due in part to bumper crops, coupled with a weaker world demand. Also, the relative loan rates and loan deficiency payments (LDP) incentives associated with the 1996 Farm Bill have encouraged American farmers to increase soybean production.

## **Geographical Comparisons**

The three major soybean producers in the world market today are the United States, Brazil, and Argentina, respectively. To better understand the existing agricultural conditions and future potential, it is important to compare and contrast these countries. The United States and Argentina share a temperate climate, while the climate in Brazil is more tropical. Because of their location in the Southern Hemisphere, Brazil and Argentina have almost an opposite crop production season compared to the United States, with approximately a six-month difference in the time of harvest. This provides some market advantages to Brazil and Argentina because their farmers harvest their soybeans between February and April. Growing seasons for these three countries also vary in their length. The United States experiences a generally shorter growing season (May through October) than its competitors. Argentina's potential growing season extends from November through May, while in Brazil's frost-free tropics three crops can potentially be produced per year.

In the United States, the deep rich soils of the Corn Belt have made that region the world's most productive soybean-growing area. Argentina's soybean production region, known as the "Pampas", has soils that are equally fertile (See figure 1).

In Brazil, soybean production is concentrated in the area called the “Cerrado”, which is a savannah-like flatland. These soils, which are high in aluminum, highly acidic, and deficient in phosphorus and nitrogen, are less fertile. Many native Cerrado plants have high tolerances to aluminum toxicity. Soybean varieties in Brazil have been bred to adapt to these soil conditions. The low pH of the soils reduces the availability of phosphorus and increases the availability of aluminum and iron (Leibold et. al.). This becomes a problem for producers since soybeans require large amounts of phosphorus. The addition of lime and phosphorus minimizes aluminum toxicity, and Brazil has large supplies of lime. The soils in the Cerrado are very fragile, and high rainfall levels create significant soil erosion problems. Producers in Brazil have adopted no-till production practices and terracing to minimize these erosion risks. Hence, soil management techniques have elevated the productivity of this region to a competitive level.

U.S. soybean production has increased between 1991 and 2001, from 52.9 to 79.1 million metric tons. In 1991, the United States exported 23.6 million tons, approximately 39% world market share. In 2001, exports had increased to 35.1 million tons, but the export share had fallen to 32% (Schnepf et. al, 2001).

Brazilian soybean production has been steadily increasing over the last decade, from 18.5 million metric tons in 1991 to 41.5 million tons in 2001 (Schnepf et. al, 2001). Brazilian production has expanded faster than domestic consumption, resulting in increased exports. Argentina too has experienced an increase in soybean production. In 1991, Argentine soybean production was 11.1 million tons, and has increased to 27 million tons (Schnepf et. al, 2001).

U.S. soybean production is already very efficient. However, soybean yields are comparable among all three producers; with producers in the U.S. Heartland Region averaging 45.0 bushels per acre compared to average U.S. yields of 41.0 bushels per acre (Table 1). Soybean yields in Brazil and Argentina are 44.5 and 40.0 bushels per acre, respectively.

Total U.S. agricultural land area is 418.3 million hectares, with 239.3 million hectares in permanent pasture, 177 million hectares in cropland, and 2.1 million hectares in permanent crops. Any soybean expansion in the United States would have to come from a reduction in the area planted to another crop. Brazil and Argentina combined have

approximately the same amount of agricultural land in use as the United States: 419.4 million hectares. The difference lies in the potential for expansion. Nearly 600 million hectares of land in Argentina and Brazil combined is accessible underdeveloped agricultural land (Schnepf et. al, 2001). For example, Brazil currently has 50% as much land under cultivation as the United States, but it has the potential to increase crop area by 56% more than the United States has under production (Leibold et al.). Both Argentina and Brazil have vast expanses of land in permanent pasture which could be converted to soybean production with appropriate market incentives and technologies.

### **Infrastructure**

The United States possesses an infrastructure that is vastly more developed than its competitors. With its widespread internal transportation network, U.S. soybean producers are able to move their product to international markets more efficiently and at a cheaper cost. Paved highways are more prevalent in the United States than in Argentina and Brazil, where only 10 percent and 30 percent, respectively, of the highways are paved. The availability of rail lines and a common single gauge allows for larger load densities in the United States that further reduce transportation costs for commodities.

In contrast, Argentina's and Brazil's waterways and overland transportation infrastructure are underdeveloped and generally sub-standard. The governments in these countries have not invested much capital or implemented policies to modernize and improve existing transportation infrastructure. Inefficient barge and railroad transportation systems have led to a dependence on slower, and more expensive, overland trucking. However, recent initiatives to deregulate and privatize railways and ports in both countries could lead to improvements in infrastructure.

Another major problem in Argentina and Brazil is the underdeveloped on- and off-farm storage. Increasing storage capacity would reduce the need for harvest-time sales, and shipment, which tends to depress harvest-time prices and create congestion at terminal elevators and port facilities.

## **Competitive Positions**

Competitiveness in international commodity markets reflects the ability to deliver a product at the lowest cost. Competitiveness is influenced by many factors: relative resource endowments, agro-climate conditions, macroeconomic policies<sup>i</sup>, agricultural policies<sup>ii</sup>, infrastructure and supporting institutions<sup>iii</sup> (Schnepf et. al, 2001). The combination of farm-level production, transportation, and marketing costs will determine a farmer's competitiveness on the international stage.

As noted previously, there are clear differences in agro-climate conditions among the three soybean production regions. Soil types and climate conditions dictate yields and when the product reaches the market. However, there are other equally important differences: types and availability of technology, land costs, labor costs, access to capital (cost of capital), transportation costs and marketing costs.

All three major competitors have some potential to expand their areas of soybean production. In Brazil this potential exists in the development of new land areas for soybean production. Argentina's expansion will come from converting pastureland into agricultural production. U.S. potential for expansion lies in switching production from other crops into soybeans.

In the United States, soybean acreage increased between 1997 and 2001 by approximately 4 million acres (Table 2). The reason for this increase could be a result of two things: some soybean expansion into the Dakotas, a region previously considered too far north for the production of soybeans, and a shift in crop acreage. At the same time soybean acreage has been expanding, there has been a slight decrease in corn acreage, and a substantial decline in wheat acreage.

Brazil's soybean production is occurring in two main regions: the south and central west. Increased soybean production in these areas will come from increased yields, shifts from other crops to soybean, and land clearing. Most of Brazil's expansion in soybean production is in the Cerrado, on recently cleared land. The Cerrado includes land in several states, but much of the current development is in Mato Grosso.

In Argentina, the potential for expanding soybean production into new areas is limited. The biggest change could come from converting pastureland into land for

soybean production. Another alternative for Argentine producers is to switch production of other crops into soybean acres under appropriate price and technology conditions.

A major production cost difference is the cost of land. The relatively high soybean production costs in the United States are primarily attributed to higher fixed costs, especially land. A recent study by the ERS shows estimated land rental rates for Brazil at \$6 per acre (in Mato Grosso) to \$14 per acre (in Parana). Per acre rental rates in the United States and Argentina were much higher: \$88 and \$63, respectively. U.S. data represent the Heartland region, while those for Argentina represent prime land in northern Buenos Aires Province. The lower land rental rates in Brazil are a reflection of the abundance of land available in the Cerrado for agricultural development. High yielding land in Mato Grosso can be purchased for as low as \$200<sup>iv</sup> per acre compared to the \$2000 or more per acre costs in the U.S. Corn Belt (Schnepf et. al, 2001).

In terms of competitive advantages from infrastructure, the United States still holds the advantage. U.S. transportation systems are superior to those in South America. The U.S. infrastructure is better for moving soybeans from the field to the port and from the domestic port to Rotterdam. Since the mid-1980's, the average U.S. producer to free-on-board port price spread has shown little variability, about \$16 to \$18 per ton. Lower transportation and marketing costs for U.S. soybean producers reflect in part the efficient barge transportation system. With the barge system, soybeans can travel long distances at relatively low costs. However, on the Mississippi River, barges loaded with Heartland grown soybeans often wait in line for hours to pass through a series of 80-year-old locks that lower the barges down to sea level at New Orleans. From there the soybeans are loaded onto freighters. Farmers have been lobbying for upgrades in the lock system, a project that will cost more than \$1 billion (Rich, 2001). This long awaited upgrade has been slowed by doubts raised about an eight year cost benefit analysis and environmental impact study by the Army Corps of Engineers. Such transportation improvements will be essential if U.S. soybean producers are to remain competitive in the international market.

This transportation advantage is under constant threat from U.S. competitors. There have been some reductions in internal transportation costs in Argentina and Brazil, which has boosted their soybean export competitiveness. However, despite construction of some new rail lines and ports, roadways are still the primary means of moving

commodities throughout Brazil. In the last few years, the Brazilian government has leased roads for private maintenance. To fund road maintenance, private companies charge high tolls, thereby increasing the transportation costs for Brazilian soybean producers. The trucking distance in Brazil is greater than that faced by U.S. farmers. On average, Brazilian soybeans travel 900 miles by truck before being transferred to railroad cars or waterways (Spangler and Wilson, 2002). These soybeans must then travel approximately an additional 900 miles to reach an east coast seaport, as is the case for soybeans produced in Mato Grosso. The producer f.o.b. price spread is estimated at \$47 per ton.

The Brazilian government has been promising upgrades in paved roads and navigable waterways, but chronic economic instability and large budget deficits have held up this work. Private companies are stepping in and partially filling the gap. Using loans from a government development bank, private companies are building new railroads. One example of private initiative is the case of Blairo Maggi, one of Brazil's largest soybean producers. When promises of infrastructure improvements from the government went unfulfilled, Maggi used \$20 million of his own money and \$40 million from the state of Amazonas to build a port on the Amazon-feeding Madeira River. Once the port was opened, soy shipments on the Madeira River quadrupled, and Maggi's shipping costs fell 20 percent (Rich).

Another competitive advantage for Brazilian soybean producers comes from the government breaking up the long-standing petroleum monopoly. New laws have allowed new fuel and petroleum companies access to the country, allowing increased fuel imports. In January 2002, Brazilians saw a 20% drop in fuel prices, which translates into decreased fuel costs for soybean producers.

One area that has concerned government and soybean producers alike is the state of navigation on Brazilian rivers. Producers want the government to invest in the development of a system of locks and dams to raise water levels on the rivers, especially the Parana River. This would help control river flows and keep the waters deep enough to float larger barges capable of carrying larger soybean loads to ports. Such a project would require huge investments. However, there are also some severe environmental implications for such a project. Damming the river would drain other areas that house

many species of flora and fauna. Draining this watershed could have an adverse impact on the wildlife of that region. The social welfare cost of losing that natural environment could be high. As a result, environmentalists, both foreign and domestic, oppose such a plan.

Agricultural producers, on the other hand, could benefit from such a project. By draining this swampy region, land that is not currently productive could be converted to viable productive farmland. The Brazilian government faces pressure both for and against this project, since there are positive and negative economic and political implications. Even if such a project were to garner approval by the government, the Brazilian government has no funds to undertake such an expensive project. This kind of infrastructural development would require obtaining a loan from the World Bank which faces considerable political pressures to reject such a project.

In Argentina, soybean producers face the problem of shallow rivers. The Parana River which connects the Port of Rosario, one of the largest in Argentina, to the Atlantic Ocean requires dredging to maintain a deeper channel. As a result, barges cannot carry big shipments nor larger ocean going vessels to transport as many tons of soybeans as their U.S. or Brazilian competitors. This results in higher transportation costs for Argentine soybean producers.

Despite its problems with antiquated systems of locks and dams, the United States still has a fairly efficient water-based system of transportation using barges. Trucking distances in the United States are shorter, especially since the majority of soybean production occurs in the regions surrounding the Ohio, Illinois, Mississippi, and Missouri Rivers. Once the soybeans are hauled overland to the nearest river, they are loaded onto barges. Except some western parts of the soybean growing area, the majority of the beans flow down the Mississippi River for export.

Even if Brazil could greatly improve its infrastructure, Brazilian soybeans must still travel larger distances overland before reaching a waterway. Rivers in Brazil do not connect in the same way as they do in the United States. The major rivers in Brazil are a long distance from the main soybean production regions. As a result, Brazilian producers must pay more in transportation and handling costs than U.S. producers.



In South America there have been some investments or improvements in infrastructure, primarily on railroads and roads. Not much investment has been made in water transport systems. Despite these investments in South America and the need for repairs of the current system of U.S. locks and dams, the United States still remains cost efficient, particularly in water-based transportations. The challenge for all three competitors is to improve or make more efficient their current transportation systems. This will require heavy investment.

In the long run, there is the potential for substantial gains in South America. This is due to the fact that South American infrastructure is so far behind that of the United States, it has further to go. However, this will require consideration of economic, political, and environmental issues. The bottom line is that the current gap in production costs will narrow with improvements in South America, but the United States will still have the comparative advantage on transportation costs, especially if there are improvements in the existing U.S. locks and dams.

## **Analysis**

Different countries and institutions within a country use different concepts, definitions, terminologies, and measurement methods to estimate production costs. As a result, there are some limitations to the data used in this study. Data for U.S. soybean production costs were gathered and published by the Economic Research Service (ERS) of the USDA. Data for Argentina and Brazil were gathered from various government agency websites, e-mail contacts with key personnel in the industry in South America, individual company websites, and the ERS.

Comparisons of farm-level costs of production can be potentially imprecise for a number of limiting factors. Methods used to calculate costs vary from country to country, with certain variables included in the costs by one country but omitted by another. Another difficulty lies in the different production practices. These would include single versus double cropping, conventional till versus no-till, Genetically Modified Organisms (GMO) versus conventional varieties, etc. It is currently illegal to raise genetically modified soybeans in Brazil, but some GMO soybeans are planted in the southwest part of Brazil. Most of these are exported through Argentina.

Tillage systems are defined by the amount of crop residue remaining on the soil surface from the previous crop. Conventional tillage leaves between 15% to 30% crop residue covering the soil when planting another crop, while reduced tillage leaves at least 30% residue. No-till means that no tillage operations have occurred prior to planting.

Exchange rate conversion issues further complicate cost estimates. Fluctuations in the Brazilian currency make accurate dollar-valued representations somewhat difficult. Between 1995 and 1999, apparent declines in Brazilian soybean production costs were largely a reflection of a weakening Brazilian currency. After the Real was allowed to free float in international exchange markets, Brazilian total production costs actually increased in local currency terms (ERS, 2001). If exchange rates adjustments are ignored and nothing changed in terms of the Real, devaluation alone makes it appear as if Brazilian producers possess a cost advantage in soybean production. However, the devaluation affects the cost of tradable goods. Imported tradable goods include machinery, petroleum, and agro-chemicals, all of which are used in soybean production. Non-tradable goods include land and labor, two key production costs, which are minimally impacted by currency devaluation. Currency devaluation drives up the cost of imported inputs, while making soybean exports more competitive in international markets.

Comparisons of costs of production are further complicated by interest rates and inflation. Choosing the appropriate exchange rate and adjusting for inflation are common problems because all estimates have to be denominated in a common currency at one point in time in order to make accurate multi-country comparisons. For example, in the recent past, Brazilian inflation has exceeded 30% per month (AAEA, 1998), and from 1997 to 2002 the Real depreciated by 132%. In 1997, the Real was at 1.0779 to \$1, and by 2002 it had devalued to 2.32. Government macro policies have direct impacts on levels of inflation. Increased government spending, due to domestic support programs such as subsidies, increases inflation. This increase in inflation normally leads to currency devaluation.

In the last 6 years, soybean producers in Argentina have adopted Round-Up Ready soybean with about 95% of the area devoted to the technology. This resulted in higher yields and lower overall production costs. The goal of producers was to drive

down the cost of production, increase efficiency, and become more competitive in international markets. This was in line with the Argentine government's plan to stimulate the economy.

In the 1990s, the Argentine government privatized the economy to drive out excess labor and excess cost. The result was an increase in unemployment to almost 20%. Structural readjustment plans take a long time to take effect, and as a result social unrest can develop, and investors can lose confidence in the economy. After nearly a decade of parity of the Argentine Peso to the U.S. dollar, the exchange rate fell from 1 to 1 to 3.22 to 1 in a period of three months (January to March 2002). While this made Argentine exports more competitive, import prices increased dramatically. The cost of most inputs, including capital and imported inputs, could rise by as much as 100% (ERS/USDA, 2002). That has resulted in higher production costs for soybean farmers who use imported inputs such as agro-chemicals or machinery. Further concerns over financing of present and future production have led to a fear of inflation. Argentina currently finds itself in the midst of a serious economic crisis.

“Underlying the current economic crisis in Argentina are three interrelated factors: the policy of pegging the domestic currency to the U.S. dollar throughout most of the 1990s, the Argentine government's failure to reduce budget and trade deficits, and the ensuing default on government debt” (ERS/USDA, 2002). In the short-run, supply-side effects of capital controls have made it difficult to obtain dollars to buy imports. As well, in April 2002 the Argentine government imposed even more export taxes on many agricultural products and other primary products, with soybeans experiencing an export tax of 23.5%. Nitrogen-based fertilizer and fuel, which are produced domestically, are expected to at least double in cost. As well, percentage markup for transportation and export marketing expenses will likely rise due to increased market and policy uncertainty.

One way for Argentine farmers to assuage the higher costs of inputs is to change cropping patterns. Should this happen, farmers are most likely to plant more soybeans and less corn, since corn requires greater amounts of fertilizer, diesel fuel, agro-chemicals, and high-cost seed than soybeans. Prospects for Argentine farm exports will depend on that sector's ability to adopt innovative solutions to the higher production costs.

Production costs are defined as the sum of the operating and ownership costs for consumable inputs. These costs exclude marketing and storage costs, as well as opportunity costs for land and unpaid labor. Operating costs are the sum of costs that vary directly with the amount of soybean acreage planted (Foreman and Livezey, 2002). Those are referred to as the variable costs. These variable costs include the costs of seed, fertilizer, fuel, repairs, manure, chemicals, custom operations, purchased irrigation water, interest, and hired labor. Unfortunately, specific data for Brazil and Argentina production are unavailable for some of these inputs. Rather, they are often aggregated into general categories labeled “variable costs”. Ownership costs are costs relating to capital items consumed during the annual production process. These costs include capital recovery<sup>v</sup> costs for farm machinery and equipment, property taxes and insurance. These ownership costs are considered fixed costs.

### **Empirical Results**

Average soybean yields are similar for all three countries (Table 1). Per acre variable costs for soybean production are lower in the United States, while fixed costs are higher, mainly due to the higher cost of land. Total production costs are higher for U.S. producers (Table 3). The implications of these findings indicate U.S. producers will have to find new means of staying competitive, since their competitors are currently able to produce at a lower cost per bushel.

For the U.S. Heartland Region, variable costs are comparable to those in Argentina, while Brazil’s variable costs are almost double that amount. In Brazil it is illegal to plant Round-Up Ready soybeans, resulting in higher herbicide costs for producers. Also, the majority of soybean producers custom hire harvesting, further increasing their variable costs. And finally, inputs for production (fuel, chemicals, lime, etc.) have to travel longer distances to the soybean production region in the interior of Brazil, which also result in higher variable costs to producers.

Brazil, with its vast supply of unused agricultural land, has considerably lower fixed costs compared to that of their competitors. The fixed costs for U.S. producers are nearly triple that of their Brazilian counterparts. Much of this is attributable to higher

land costs in the United States. Fixed costs for Argentine producers falls somewhere in-between, as their land costs are higher than in Brazil but lower than in the United States.

As noted earlier, data gathered from various different sources are not based on the same methods of cost estimation. However, the variability in the data range is relatively small. Using data from an ERS study, costs for transportation and marketing indicate the United States holds the competitive edge in international freight costs (Table 4). Internal transport and marketing costs for Brazil are nearly three times more expensive, due in large part to the inefficiency of the infrastructure and the larger distances the beans must travel before reaching a waterway. However, U.S. producers have a slight cost advantage when shipping to European markets. Internal transportation costs are much lower for the United States, affording U.S. producers a competitive advantage over their competitors.

Recent U.S. government policy developments will have an impact on future soybean production costs. On May 13<sup>th</sup> President Bush signed a new farm bill that will increase subsidies to agricultural producers. Agricultural spending is expected to swell by nearly 80% over the cost of existing programs (AgriAmerica, 2002). Once the variable production costs have been met, remaining revenues are used to pay operator salaries, management costs, and returns to land. These new subsidies will be used to offset input costs, resulting in more residual income. Much of this residual income will be capitalized into land prices, resulting in higher cash rent and land values. Higher land costs translate into higher production costs for U.S. soybean producers. Hence, an outcome of the new farm bill will be to encourage production and drive down market prices, while increased subsidies will tend to increase land prices.

## **Implications**

How can U.S. producers become more competitive? If the United States wants to expand its exports, there are two methods to increase competitiveness: reduce costs or increase yields on the supply side, and increase consumption on the demand side. Supply side changes can be affected by boosting production through improved genetics. Demand can be expanded by adding value to soybean products.

Most soybeans in the United States are already produced under a no-till system. By encouraging farmers to switch to no-till practices, soybean producers could reduce

somewhat labor, machinery, and fuel costs. Many farmers in Brazil and Argentina have already incorporated no-till practices into their production. No-till practices are of vital importance in controlling soil erosion, and maintaining long term production efficiency.

Another method of affecting a supply side change would be to improve soybean yields or quality. In the United States, a large percentage of soybean producers have already adopted Round-Up Ready seed. This allows farmers to reduce herbicide costs, improve weed control, and make fewer trips across the field. However, the amount of improvement that can be gained from adoption of this technology in the United States in the future is limited. Currently, 74% of all soybean acres in the United States are planted to biotech varieties (NASS, 2002). In Argentina, about 95% of the soybeans are biotech varieties (Round-Up Ready). For Brazil the story is different. Currently, it is illegal to use biotech varieties. Even so, between 10% – 20% of soybeans produced in Brazil are Round-Up Ready. The potential growth in biotech soybean in Brazil will be much greater if the government allows biotech varieties.

Another way to reduce production costs is through enhanced varieties. Currently, research is being conducted on ways to improve pest resistant soybean varieties. Several insects and diseases attack the soybean plant. Sudden death syndrome (SDS) and the soybean aphid can reduce yields by 20% or more. Also, nematodes can attack the roots of the plant and reduce yields. The nematode problem has led to the development of CystX, a soybean variety that is resistant to nematodes. Research is underway to cross this variety with other existing varieties, thereby increasing their resistance to nematodes.

U.S. producers can find ways of increasing demand by enhancing the quality of their product and searching for alternative markets. By enhancing the quality of soybean meal, oil, amino acids, and processing characteristics, there exists a potential for increased demand for soybeans. For example, there is growing demand for soybean oil blended with diesel fuel. This blend of soybean oil (which can be as high as 20%) can be used in diesel motors, for both on- or off-road vehicles (trucks, school buses, tractors, etc.). This new fuel blend is environmentally friendly and reduces sulfur emissions. Research is also currently underway to blend soybean oil with jet fuel. The goal is to find a cleaner, more efficient jet fuel. This would also help make the United States less dependent on foreign oil.

Increases in demand can also be achieved through value-added components in food. For example, work is underway to develop soy iso-flavons (food additive). Soy derivatives can also be used for hormone replacement in women, which would help reduce osteoporosis. Researchers are looking for ways to blend soybeans with petroleum for plastic polymers. This would make polymers more biodegradable, which would have significant impacts in food packaging and landfills.

Latin American producers also have various methods of increasing their competitiveness. First, producers can increase no-till methods to reduce production costs. Second, soybean producers need to look for higher yields through research and development. With the high costs of agro-chemicals for Latin American producers and the greater amount of applications required, herbicide and insect resistant varieties could reduce production costs. For example, in Brazil the warm weather makes insect problems more severe than in the United States (Leibold et. al.). Many producers spray several times during the growing season to control insects and diseases. Brazilian producers are also plagued by the nematode problem. If Brazilian producers were to adopt genetically enhanced pest resistant varieties, they would be able to improve yields as well as reduce production costs, thereby increasing their competitiveness in the international export market. Thirdly, producers could reduce their transportation and handling costs through improvements in infrastructure and port facilities.

## **Conclusion**

It is not likely that U.S. soybean producers will be able to regain the dominant position they enjoyed in the international market 20 or more years ago. U.S. producers need to continue to challenge growers in all regions of the world by remaining more competitive and efficient. This can be accomplished by reducing costs, enhancing quality, and increasing yields.

Recent developments in U.S. government policy could afford U.S. producers a new advantage. The target prices and loan rates in the new farm bill will stimulate crop production. Increases in the supply of soybeans will decrease market prices. U.S. producers will be compensated by subsidies. However, South American growers will feel

this increase in competitive pressure from U.S. growers. This may become a contentious issue to be challenged in the World Trade Organization (WTO).

A growing concern among U.S. producers is that their Latin American competitors will gain more market share due to lower production costs, mostly associated with lower land costs. As previously noted, land values are lower in Brazil and Argentina, but these countries face other issues that reduce their competitive edge. They include: economic instability, inadequate transportation infrastructure, and geographical disadvantages associated with warmer climates. There is nothing in the foreseeable future that points to Brazil and Argentina leaping over their U.S. competitors in the export market. Just like their American counterparts, Brazilian and Argentine soybean producers must find way to increase their competitiveness and efficiency in production.



**Figure 1: Soybean Production Regions for Latin America**



Economic Research Service, USDA

**Table 1: Soybean Yields, Major Production Regions**

<b>Soybean Yields (Bushel/acre)</b>	
United States <sup>a</sup>	41.0
Heartland <sup>a</sup>	45.0
Brazil <sup>b</sup>	44.5
Argentina <sup>c</sup>	40.0
Source: <sup>a</sup> USDA National Agricultural Statistics Service, <sup>b</sup> Companhia Nacional de Abastecimento, <sup>c</sup> Consorcio Regional de Experimentacion Agricola	

**Table 2: U.S. Crop Acreage**

<b>U.S. Crop Acreage Per Marketing Year</b>			
<b>Crop</b>	<b>1997/1998 Crop Year --millions of acres--</b>	<b>2000/2001 Crop Year --millions of acres--</b>	<b>Change --millions of acres--</b>
Corn	97.5	95.8	(1.7)
Wheat	70.4	59.6	(10.8)
Soybeans	70.0	74.1	4.0
Source: Agricultural Outlook ERS/USDA April 2002			

**Table 3: Production Costs, Major Competitors**

<b>Soybean Production Costs</b>			
<b>Cost of Production</b>	<b>Heartland<sup>a</sup></b>	<b>Brazil<sup>b</sup></b>	<b>Argentina<sup>c</sup></b>
	<b>-\$ per acre-</b>	<b>-\$ per acre-</b>	<b>-\$ per acre-</b>
Variable Costs	76.95	132.39	76.0
Fixed Costs	153.0	46.72	80.8
<b>Total Production Costs</b>	230.0	179.11	157.2
Source: <sup>a</sup> USDA National Agricultural Statistics Service, <sup>b</sup> Companhia Nacional de Abastecimento, <sup>c</sup> Consorcio Regional de Experimentacion Agricola			

**Table 4: Transportation Costs, Major Production Regions**

<b>Cost</b>	<b>Heartland</b>	<b>Brazil</b>	<b>Argentina</b>
	<b>-\$ per bushel-</b>	<b>-\$ per bushel-</b>	<b>-\$ per bushel-</b>
Internal transport and marketing	0.43	1.34	0.81
Border Price	5.54	5.23	4.74
Freight Costs To Rotterdam	0.38	0.57	0.49
Price at Rotterdam	5.92	5.80	5.23
Source: ERS/USDA			

## References

- American Agricultural Economics Association. 1998. *Commodity Costs and Returns Estimation Handbook*. Ames, IA.
- AgBrazil, 2002. *Brazil Production Inputs Markets*. <http://www.agbrazil.com>
- AgriAmerica. May 8, 2002., *US AG Today*. Wednesday, <http://www.agriAmerica.com>
- CONAB, Companhia Nacional de Abastecimento (National Food Supply Company). March 2002. <http://www.conab.gov.br/>
- CREA, Consorcio Regional de Experimentacion Agricola (Regional Consortium for Agricultural Research). March 1998. No. 209,
- EMBRAPA, Empresa Brasileira de Pesquisas Agropecuarias (Brazilian Institute for Agricultural Research). March 2002. <http://www.embrapa.br>
- Fee, R. October 2001. "U.S. Producers Say They Can Compete With Brazil." *Successful Farming*.
- Foreman, L. and J. Livezey. March 2002. "Characteristics and Production Costs of U.S. Soybean Farms." *ERS Statistical Bulletin*. No. 974-4,
- Leibold, K., P. Baumel, R. Wisner and M. McVey. January 14, 2002. "Brazil's Crop Production System Holds Much Potential." *Feedstuffs*. Vol. 74, No. 2.
- Rich, J. July 10, 2001. "Soy Growers in Brazil Shadow U.S. Farmers." *The New York Times*.
- Schnepf, R., E. Dohlman, and C. Bolling. November 2001. "Agriculture in Brazil and Argentina: Developments and Prospects for Major Field Crops." *ERS/USDA Agriculture and Trade Report*. WRS-01-3.
- Spangler, H. and M. Wilson. March 2002. "Beating Back Brazil." *Prairie Farmer*.
- U.S. Department of Agriculture, Economic Research Service (ERS). March 2002. Published Database. <http://www.ers.usda.gov/>
- U.S. Department of Agriculture, Economic Research Service. May 2002. "Argentina's Economic Crisis: Can the Ag Sector Help?" *Agricultural Outlook*.
- U.S. Department of Agriculture, National Agricultural Statistics Service (NASS). March 2002. Published Estimates Database. <http://www.nass.usda.gov>

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**Footnotes**

<sup>i</sup> Macroeconomic policies affect exchange rates, investment incentives, energy costs, etc.

<sup>ii</sup> Sector specific policies include credit subsidies, import and export taxes, etc.

<sup>iii</sup> Supporting institutions include regulatory, credit, news and information, etc.

<sup>iv</sup> This reflects land that has not yet been cleared or prepared for planting.

<sup>v</sup> These costs include depreciation for machinery, equipment, and buildings.