Brazils crop production system holds much potential

Brazil, already a major player in the world soybean markets, has a huge undeveloped land area that holds great potential for even further expansion in the future in soybeans and other agriculture product production.

By KELVIN LEIBOLD, C. PHILLIP BAUMEL, ROBERT WISNER and MARTY MCVETY

Brazil has become a major player in world soybean markets, second only to the U.S. A huge undeveloped land area holds great potential for future Brazil expansion in soybean and other agricultural product production.

Brazil is the largest country in South America, only slightly smaller than the U.S. Unlike the U.S., though, only a small amount of Brazil’s land mass consists of mountains and deserts. Almost all of its land area, including rain forests, can be used for some kind of economic activity.

The Table (p. 31) compares several physical and economic characteristics of Brazil and the U.S. Brazil’s per capita income is substantially below that of the U.S. Most of the income in Brazil is generated in urban areas, while a large portion of the rural residents in Brazil live in poverty. This income disparity has caused major migration from rural to urban centers.

Today, Sao Paulo is the world’s third-largest city; about 80% of its residents live in poverty. One reason behind Brazil’s efforts to increase soybean production and exports is to increase employment and income in rural areas to slow the migration into poverty-stricken urban areas.

Brazil’s soybean production is occurring in two main regions. The traditional region is the south and southeastern part of Brazil, including the states of Sao Paulo, Parana, Santa Catarina and Rio Grande do Sul. Most of the land in these states is under cultivation. Increased soybean production in these areas will come largely from increased yields and shifts from other crops to soybeans on areas already in production.

Most of Brazil’s expansion in soybean production is in the Cerrados. The Cerrados includes land in several states, but much of the current development is in Mato Grosso. The long-term potential for additional soybean acres and production in the Cerrados is staggering. The Figure shows the locations of the southern and Cerrados soybean production areas in Brazil. If these two areas were located in the U.S., they would stretch from Texas and Louisiana into Canada and west to east from Montana through Ohio.

Brazil currently has only about 50% as much land under cultivation as the U.S., but it has 56% more potential crop acres than the U.S. currently has under production.

Natural vegetation in the Cerrados ranges from open, treeless grasslands to dense, scrubby forests. The forest areas can be divided as “light” and “heavy” cerrados. The light cerrados, with relatively few and small trees, can easily be cleared with two crawlers tractors dragging a heavy chain between them. The heavy cerrados consists of denser forest that requires cutting out the heavier brush and trees before it can be dragged. The cleared trees can be used for firewood, manufacturing charcoal or drying grain.

In a typical progression of converting heavy cerrados land into grazing, rice production and then to soybean production, producers are increasingly skipping the grazing step. After the land is cleared, it typically receives a heavy application of lime and is planted with rice. Soybeans are planted after the lime raises the pH of the soil.

Soils

Most of the soils in the Cerrados are classified as tropical soils, or oxisols. The two largest areas in the world with these soils are in the Amazon Basin of South America and the Congo Basin of Africa.

Oxisols are highly weathered soils with low native fertility, low organic matter and high acidity. Aluminum toxicity is often the major limiting factor for crop production in very acidic soils. High aluminum toxicity inhibits root development. Many native cerrados plants have high tolerances to aluminum toxicity. The process of how aluminum toxicity occurs in the plant is not well understood. However, much research is underway in Brazil to find ways to overcome these root development problems.

The low pH of the soils reduces the availability of phosphorus and increases the availability of aluminum and iron. That is why some had believed production.

Consumer-driven environment affects primary breeders

While the traditional business goal of primary breeders has been to select birds that emphasize commercial traits, breeders increasingly are going to have to also consider welfare issues, the environment and quality traits, which will require them to have a better understanding of the interactions of genotype, nutrition and environment and how best to apply this information to improve performance, health and
that the Cerrados soils would never be productive. Soybeans require large amounts of phosphorus compared to corn and wheat. Phosphorus stress on plants usually occurs in the seedling stage when roots have not developed enough to supply all the needed phosphorus. The addition of lime and phosphorus minimizes the aluminum toxicity and increases productivity. It should be possible for these soils to produce even greater yields in the future as producers have an expanding selection of adapted plant varieties and a better understanding of soil chemistry.

Brazil has large supplies of lime. When the government tried to stimulate agricultural growth in central Brazil in the 1970s with loans and grants, a key factor in deciding where to target these new growth areas was the location of low-cost lime.

The soils in both the south and the Cerrados are very fragile. The high rainfall in the Cerrados creates significant risk of soil erosion. Some of the areas have significant slopes, in rise and in length. Producers use no-till and terracing to minimize erosion problems.

**Weed control**

Farmers in Brazil tend to have fewer weed problems than in the U.S. because the land has been cultivated for fewer years. Almost all farmers have switched to no-till, which will increase weed pressure over time. Chemical weed control costs about $15-20 an acre and gives reasonable broadleaf and grass control. There are several weeds that current chemicals do not control well. Warm temperatures after the soybean leaf canopy has fallen encourage end-of-season weed growth. This late-season growth has very little, if any, yield impact, but it can be a challenge to harvest crops with young growing green weeds.

A major concern is the growing number of herbicide-resistant weeds. Many of the chemicals used for weed control have the same chemistry and the same mode of action. Continued and repeated use of the same chemistry places tremendous selection pressure on the weeds to develop resistance. Rotating crops and chemical modes of action will minimize the probability of developing resistant weeds. Chemical carryover is less of a problem in the Cerrados because of its warm soil temperatures and high rainfall.

It is illegal to raise genetically modified (GM) soybeans in Brazil, but some GM soybeans are planted in the northwest part of Brazil. Most of these are exported through Argentina. Glyphosate is used as a burn down pre-plant. Brazil has glyphosate-resistant soybeans in research plots and would adopt the technology rapidly if it were legalized.

Brazil faces the questions: "Would a 'GM-free' market remain in Europe and the Far East if Brazil legalizes herbicide-resistant soybeans?" and "How high would the premium be for large quantities of GM-free soybeans?" Reports from a major international grain

### Table: Comparison of physical and economic characteristics of Brazil and the U.S.

<table>
<thead>
<tr>
<th></th>
<th>Brazil</th>
<th>U.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area, million square miles</td>
<td>3.3</td>
<td>3.7</td>
</tr>
<tr>
<td>Population, millions</td>
<td>173</td>
<td>276</td>
</tr>
<tr>
<td>Population per square mile</td>
<td>52</td>
<td>75</td>
</tr>
<tr>
<td>Percent rural population</td>
<td>19</td>
<td>23</td>
</tr>
<tr>
<td>GDP, per capita, thousand $</td>
<td>6</td>
<td>34</td>
</tr>
<tr>
<td>GDP, agriculture, billion $</td>
<td>148</td>
<td>185</td>
</tr>
<tr>
<td>Paved highways, thousands of miles</td>
<td>114</td>
<td>2,318</td>
</tr>
<tr>
<td>Railways, thousands of miles</td>
<td>17</td>
<td>149</td>
</tr>
</tbody>
</table>

The warm winters in Brazil intensify disease problems, including stem canker, frogeye leaf spot, powdery mildew and white mold. Sudden death syndrome is also a major disease problem caused by no-till and high rainfall. About 90% of the soybeans are treated with systemic or contact fungicides. Planting in narrow rows enhances company in July 2001 indicated that Brazilian soybean meal in Paranaguá received $17-20 per metric ton premium over Argentine GM soybean meal. That is equivalent to a 34-40 cents/bu. premium for meal at the same geographic location.

### Diseases and insects

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From p. 1

Soil nematodes (SCN) were discovered in Brazil in 1992. About 5 million acres are currently infested with SCN. Researchers are attempting to develop varieties that are resistant to SCN and stem canker.

The warm weather also makes insect problems more severe in Brazil than in the U.S. Insects include velvetbean caterpillars, southern stinkbug and the Ceratoma beetle. Many producers spray several times during the growing season to control insects and diseases, making disease and insect control costs higher in Brazil than in the U.S.

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Massey Ferguson appears to be the dominant tractor brand in Brazil. CaseIH and Deere, under the brand name SLC, appear to be increasing their market share. A major factor in tractor competition is who can expand output in Brazil to avoid the 15% import tax.

Most of the planters in southern Brazil are no-till, set up for five-rows of corn on approximately 36 in. rows. Add-on units allow planting soybeans in 18 in. rows. New planters are larger with more units and air-metering systems.

Traditional sprayers, fogggers and aerial application are used for spraying. Cheap labor encourages application by farmers rather than by custom applications.

Brazilian-made machinery is less expensive than comparable U.S. equipment. Hired labor operates most of the equipment, so there are few cabs and other options on tractors and combines. A new 100 hp tractor costs about $50,000, and a new SLC combine with cab and a 15 ft. platform costs about $90,000.

Consider the machinery costs for a 2,500-acre farm with $250,000 invested in equipment, repairs at $10 per acre and 2 gal. of fuel per acre. Machinery costs for this farm, excluding labor, would be about $23 per acre — somewhat less than the cost on a typical Iowa farm. This is made possible by the use of older machinery with fewer options, lower initial investment costs, more hours of use per year and lower repair costs. No-till also decreases the use of tillage equipment and fuel consumed. Labor costs are low enough to encourage substitution of labor for machinery.

Exporting soybeans

Brazil exported almost three-fourths of its 2000 soybean production as whole beans or as oil and meal. This is the equivalent to about 1.0 billion bushels. The U.S. exported more than 1.3 billion bushels of soybeans in raw or processed form. U.S. raw soybean exports increased sharply from 589 million bushels in 1994 to a record 973 million bushels in 2000. In addition, the U.S. is exporting increasing amounts of soybean meal through meat exports.

Brazil’s annual growth in exports of soybean meal from 1990-91 through 2000-01, in contrast to its soybean exports, was a meager 3.3%. That compares with average annual growth in U.S. soybean meal exports of 7.8% and 13.4% in Argentina.

Historically, Brazil placed a tax on exports of unprocessed soybeans, encouraging exports of value-added products rather than raw soybeans. Removal of the tax brought a strong surge in exports of raw soybeans. In contrast, neighboring Argentina placed high priority on processing its soybeans to add value to exports.

World consumption of soybean products increased at a rate of 6.3% from 1990 to 2000. Brazilian production increased at an annual rate of 13.8%, while the U.S. increased at a rate of 4.4%. Brazil’s raw soybean exports increased at an astounding annual rate of 61.7% over this time period. The production capability of the Cerrados, if fully realized at some future date, would likely exceed current world production and place downward pressure on world soybean prices.

The rate of growth of additional acres of soybeans in Brazil will be a function of price and profit. Observers and producers believe soybean production in Mato Grosso will be profitable down to a Chicago Board of Trade price of $4.20. This price would translate to a farm-gate price in the heart of the Cerrados of about $3.00.

Other crops

Although much has been written about soybeans, Brazil produces several other major crops, including corn, rice, coffee, sugarcane, wheat, cow peas, peanuts, cassava, bananas, cotton, mulberry (for silk worms), citrus, castor bean, grain sorghum, eucalyptus (for grain drying and energy) and tobacco. Also raised are pineapple, papaya, sunflowers, canola, coconut palm, rubber trees, date palms and pasture.

In 2000, Brazil planted 32 million acres of corn, only slightly fewer acres than the 34 million acres of soybeans. In the south, corn is often double cropped. Typical yields in the south range from 60 to 120 bu. per acre, although greater yields are possible. Lower yields are the result of using corn as a second crop, low nitrogen fertilizer rates and high nighttime temperatures. Brazil’s national corn yields for the 2000 crop were estimated to be 44 bu. per acre, far below the U.S. average of 137 bu. per acre.

Producers in the south have increased their corn acres because of their close proximity to export ports, which reduces transportation costs. Nevertheless, most of the corn is fed to domestic livestock.

Coffee was the primary crop in Paraná before a freeze in 1975 destroyed much of the crop. Brazil is still a major coffee producer. Coffee is produced from the same trees for about 12 years and is harvested mechanically.

Sugarcane, widely grown in Brazil, is used to make ethanol. At the gas pump, 100% ethanol sells for about $1.60/gal compared to about $3.00/gal. for gasoline. Ethanol’s lower Btu content accounts for part of this price difference. Sugarcane is also used to make sugar, some of which is exported. Brazil sta-

The future

Brazil has, and is, making significant advances in crop breeding. It has a huge land mass that has great potential for development. The weather allows farmers to double crop over a large area and to raise a wide variety of crops. Producers are very competitive in the cost of production.

Future competitiveness in Brazil will depend on global prices, exchange rates, improvements in infrastructure and continued gains in productivity. It is questionable whether the government will be able to provide much financial support for improved transportation infrastructure. In July 2001, the Brazilian government reduced its budget to try to stabilize the value of the real. This action does not bode well for infrastructure development. However, the government appears to be opening the path for private funding of the infrastructure.

Brazil will increase the domestic feeding of soybean meal to its livestock industry in hopes of exporting more meat as value-added products. Brazil may increase corn exports from the areas near ports where transportation costs are low. The rest of the corn will be needed to feed the growing livestock industry.

There is one factor that has been significant about the various forecasts of Brazil’s agricultural growth potential. The dynamics of Brazil’s agriculture have caused almost all long-range forecasts to underestimate the actual growth of Brazil’s soybean production.