APAC Agricultural Policy Analysis Center
The University of Tennessee

PolicyPennings by Dr. Daryll E. Ray

Today's tropical soybean production was not biologically possible in mid-1970s

From February 8-18, 2006, Daryll Ray and Harwood Schaffer were a part of a research/study tour led by Robert Wisner, University Professor, Iowa State University. The nine person group studied the various factors that affect Brazilian agricultural production, processing, and marketing, with a focus on soybeans. This column is one in a series describing their trip.

By Wednesday, February 15, 2006, the eighth day of our trip, we had been in nine different airports (some twice), ten different cities, and had covered miles and miles of country roads from the bench seats of at least four vans. At that point we were much like the proverbial tourist: if this is Wednesday, we must be in London – oops, Londrina. And yes, Londrina is named for London, England the home of the original European settlers.

The main reason we were in Londrina was to visit Embrapa, the Brazilian equivalent of the USDA Agricultural Research Service. Londrina is the home of Embrapa's National Soybean Research Center where much of the research that made it possible to grow soybeans in tropical areas was conducted.

In a presentation by Embrapa staff we were told that the center was founded in 1975 and today employs 79 researchers who, in addition to soybeans, work on sunflowers and wheat. The experiments are conducted on nearly 900 acres surrounding the research laboratories and offices. As one might expect the research involves genetics and plant breeding. In addition, areas of study include: entomology, plant pathology, crop and soil management, climatic zoning, social economics, technology transfer, weed science, and mechanization.

The first mention of soybeans in Brazil was in 1882 in Bahia state, but it wasn't until 1941 that the first commercial cultivation was attempted. The 1960s saw the expansion of commercial production with most of the production limited to areas between the 20th and 30th parallels south which are a very small portion of Brazil. The bulk of the country is tropical, lying between the 20th parallel and the equator.

As a crop that originated in the temperate zone, soybeans were not well adapted to be grown in Brazil's huge tropical area where harvest time does not bring with it shorter days and longer nights. Soybeans respond to the change in the length of daylight to trigger flowering and plant maturity. The establishment of the National Soybean Research Center at Londrina made it possible for Brazil to conduct the research that was needed to find ways to adapt soybeans to grow in low latitudes.

Some of what they told us was familiar: rapidly increasing soybean production, the importance of exports (77 percent of the soybean crop), the problems associated with a transportation system heavily dependent upon trucks, and the crop losses caused by the Asian Soybean Rust (ASR). But, most of the presentation broadened our understanding of agricultural research and production issues in Brazil.

One of the innovative ideas we heard about is a soybean combine that they are working on. The standard combine was designed not for soybeans but for corn and then later adapted to harvest soybeans. The combine design they are working on does not put the stem and leaves through the combine, but rather strips the beans from the plants, reducing the throughput and increasing the machine's efficiency. At present the combine is in the one-row prototype stage.

The researchers talked about the green bridge problem in conjunction with ASR. Because they can grow crops year-round, host plants for the soybean rust are always growing, unlike most of the US where frost kills host plants. In that setting, the timing of planting and including non-host plants in the rotation becomes important.

Monitoring fields for the appearance is also critical. An analysis of leaf samples showed that most of the fungus attacks occurred between the V9 stage and the R7. The later the attack, the fewer the number of sprayings required to control the rust. In the absence of a soybean tolerant plant, Embrapa researchers recommend a five point strategy. (1) Avoid winter plantings and when necessary spray continuously. (2) Shorten the planting period to avoid early soybean fields serving as an ASR host for later planted fields. (3) Plant an area according to your spraying capacity. (4) Monitor the farm to look for rust attacks. (5) Plant early short cycle cultivars in part of the property.

We heard about research into no-till planting, integrated pest management, the use of biological control of soybean pests, the integrated management of plant diseases, the development of soybean varieties suitable for human consumption, integrated weed control and symbiotic nitrogen fixation. With symbiotic nitrogen fixation research they have been able to develop better strains of bacteria and better techniques for inoculation that have resulted in reducing the use of nitrogen fertilizer by 3.2 million tons a year.

As a public research agency, Embrapa takes seriously its responsibility for technology transfer, making the results of the latest research available to Brazilian farmers. Like with extension in the US, they do this through on-farm demonstration plots, field days, publications, and the work of extension agents and a range of farmer organizations.

Embrapa is also working on developing a rotation program between crops and livestock. In this rotation, degraded pasture land is converted to soybean production with the use of soil corrections (lime and essential micronutrients) and fertilizer. Soybean production increases the availability of nitrogen and improves the soil. After several seasons of soybean production the land can once again be planted to pasture. The recovered pastures are able to support more cattle than before, improving profitability. After the nitrogen has been depleted, the land is returned to soybean production, beginning the cycle once more.

One of the challenges Brazil faces is how to balance economic development with environmental preservation and production sustainability. To preserve the ecosystem, Brazil has increased the amount of area in the "Legal Amazon" that must be set aside for permanent conservation. In the cerrado region the reserve requirement was increased from 20 percent to 35 percent in 1998. In forest areas that same legislation increased the reserve requirement from 50 to 80 percent. While laws on conservation reserve requirements are in place, the challenge is how to facilitate their enforcement.

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