International Benchmarks for Soybean Production

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Examining the competitiveness of soybean production in different regions of the world is often difficult due to lack of comparable data and agreement regarding what needs to be measured. To be useful, international data needs to be expressed in common production units and converted to a common currency. Also, production and cost measures need to be consistently defined across production regions or farms.

This paper examines the competitiveness of soybean production for important international soybean regions using 2012 to 2014 data from the *agribenchmark* network. This network collects data on beef, cash crops, dairy, pigs and poultry, horticulture, and organic products for 32 countries. The *agribenchmark* concept of typical farms was developed to understand and compare current farm production systems around the world. Participant countries follow a standard procedure to create typical farms that are representative of national farm output shares, and categorized by production system or combination of enterprises and structural features.

The sample farms used in this paper was comprised of seven typical farms with soybean enterprise data from Argentina, Brazil, and United States. All of these farms also produced corn. For information pertaining to corn production see Langemeier and Lunik, 2015 (*farmdoc daily* November 6, 2015). It is important to note that soybean enterprise data is collected from other countries. These three countries were selected to simplify the illustration of costs and discussion.

The farm and country abbreviations used in this paper are listed in table 1. Typical farms used in the *agribenchmark* network are defined using country initials and hectares on the farm. There are five U.S. farms with soybeans in the network. The two farms used to illustrate soybean production in this paper are the Iowa farm (US700) and a farm in west central Indiana (US1215).
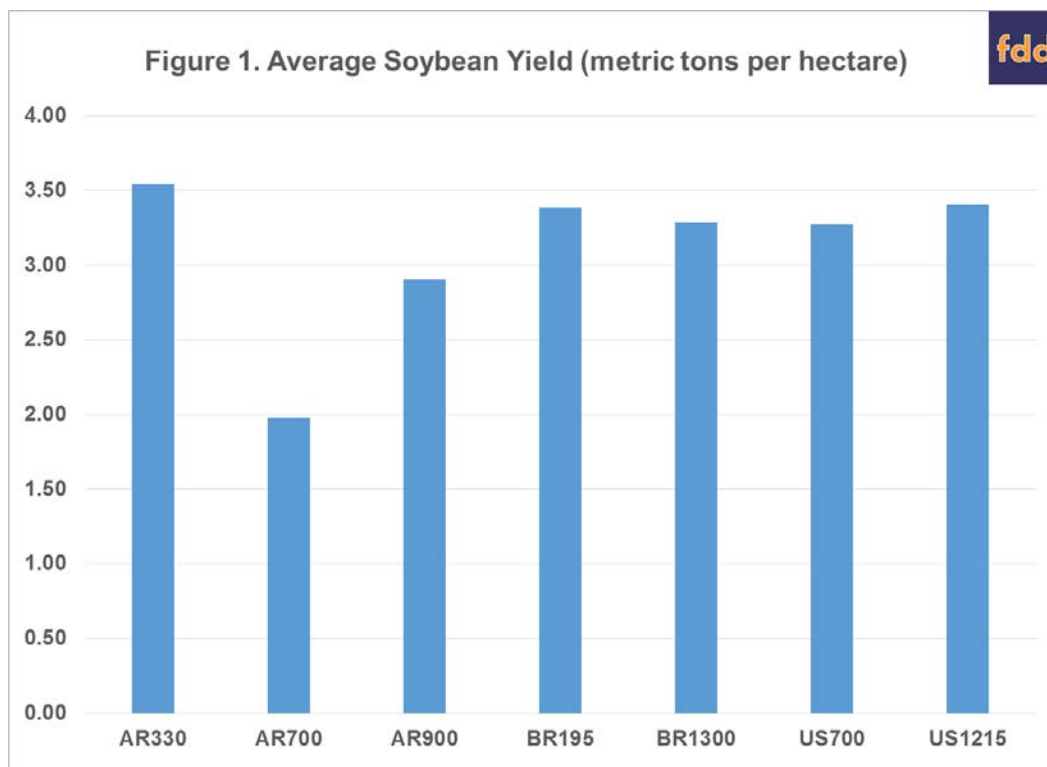
Table 1. Abbreviations of Farms and Countries

Farm	Country	Hectares
AR330	Argentina	330
AR700	Argentina	700
AR900	Argentina	900
BR195	Brazil	195
BR1300	Brazil	1300
US700	United States (Iowa)	700
US1215	United States (Indiana)	1215

Soybean Yields

Although yield is only a partial gauge of performance, it reflects the available production technology across farms. Average soybean yield for the farms in 2012 to 2014 was 3.11 metric tons per hectare (46.3 bushels per acre). Average farm yields ranged from approximately 1.98 metric tons per hectare for one of the farms in Argentina (29.4 bushels per acre) to 3.40 metric tons per hectare for the Indiana farm (50.6 bushels per acre). Figure 1 illustrates average soybean yield for each typical farm. Average yield for the Iowa farm was 3.27 metric tons per hectare (48.6 bushels per acre).
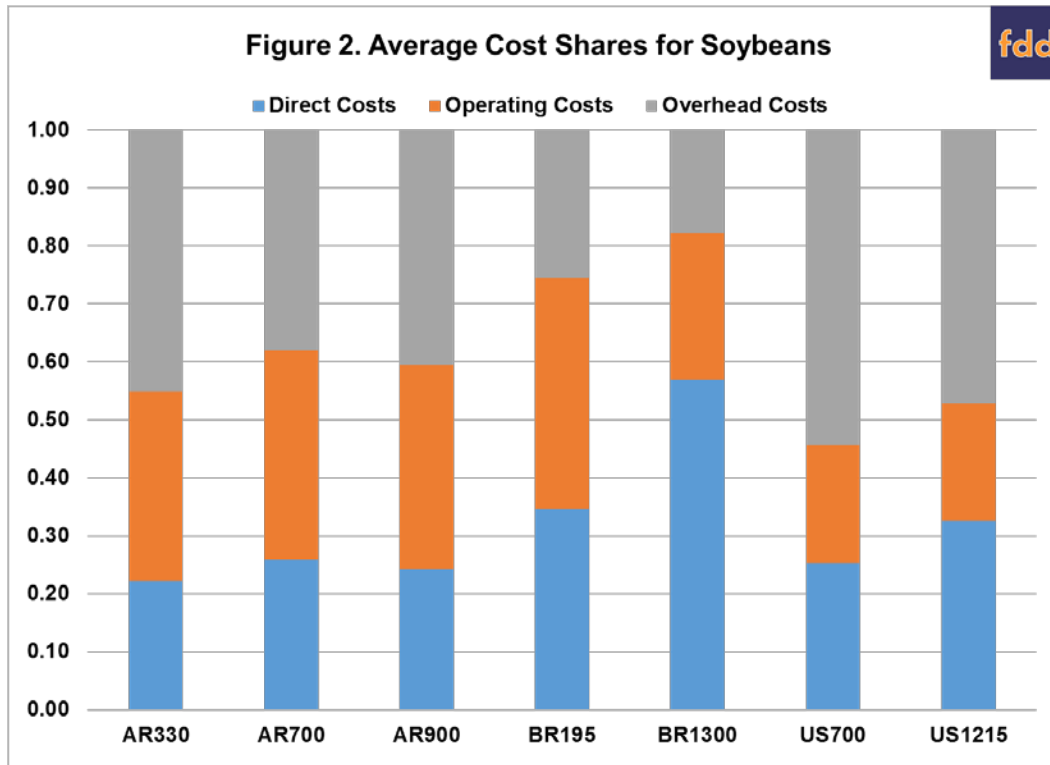

Figure 1. Average Soybean Yield (metric tons per hectare)

Input Cost Shares

Due to differences in technology adoption, input prices, fertility levels, efficiency of farm operators, trade policy restrictions, exchange rate effects, and labor and capital market constraints, input use varies across soybean farms. Figure 2 presents the average input cost shares for each farm. Cost shares were broken down into three major categories: direct costs, operating costs, and overhead costs. Direct costs included seed, fertilizer, crop protection, crop insurance, and interest on these cost items. Operating cost included

labor, machinery depreciation and interest, fuel, and repairs. Overhead cost included land, building depreciation and interest, property taxes, general insurance, and miscellaneous cost.

The average input cost shares were 31.7 percent for direct cost, 30.0 percent for operating cost, and 38.3 percent for overhead cost. The U.S. farms had below average cost shares for direct cost and operating cost (29.0 and 20.2 percent, respectively), and an above average cost share for overhead cost (50.8 percent). The relatively large cost share for overhead cost in the U.S. reflects, in part, our relatively high land cost.

Figure 2. Average Cost Shares for Soybeans

Revenue and Cost

Figure 3 presents average gross revenue and cost for each typical farm. Gross revenue and cost are reported as U.S. dollars per hectare. Soybeans are a major enterprise on all of the typical farms presented in figure 3. It is obvious from figure 3 that gross revenue per hectare is substantially higher for the two U.S. farms. However, cost is also substantially higher for these two farms. The only typical farm that did not earn an economic profit producing soybeans during the 2012 to 2014 period was the Iowa farm. Average economic profit on the three typical farms in Argentina ranged from $66 per hectare ($27 per acre) to $353 per hectare ($143 per acre). For the two farms from Brazil, average economic profit was $216 per hectare ($87 per acre) and $402 per hectare ($163 per acre). For the west central Indiana farm, average economic profit was $85 per hectare ($34 per acre) during the 2012 to 2014 period.

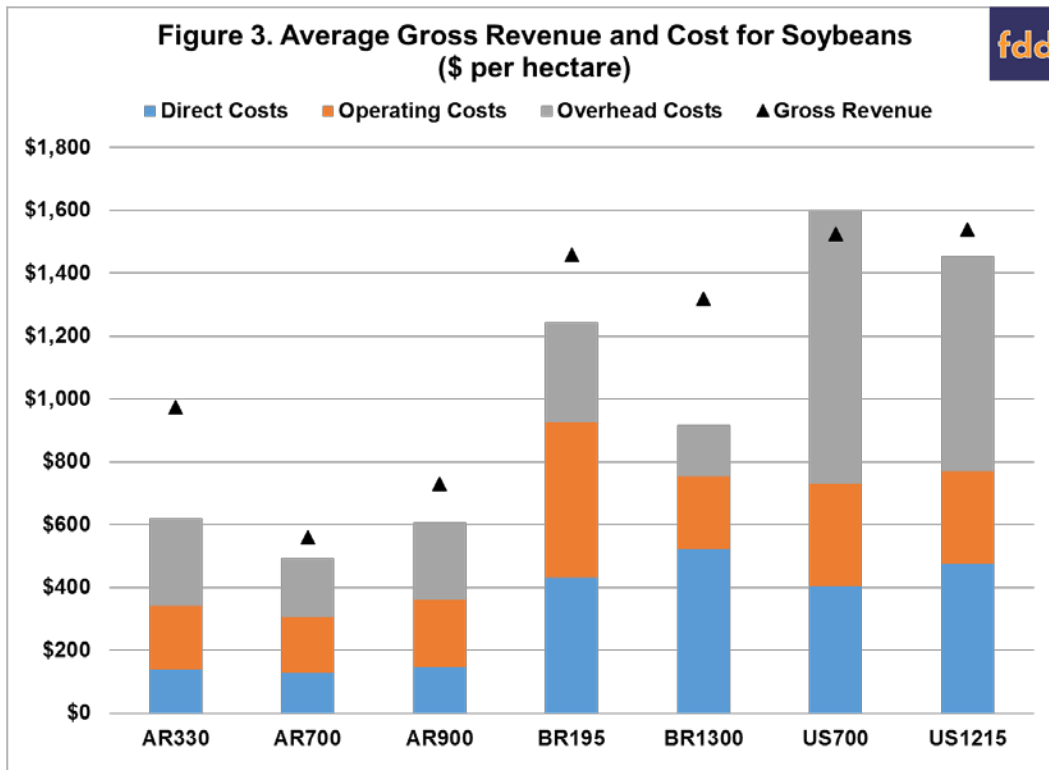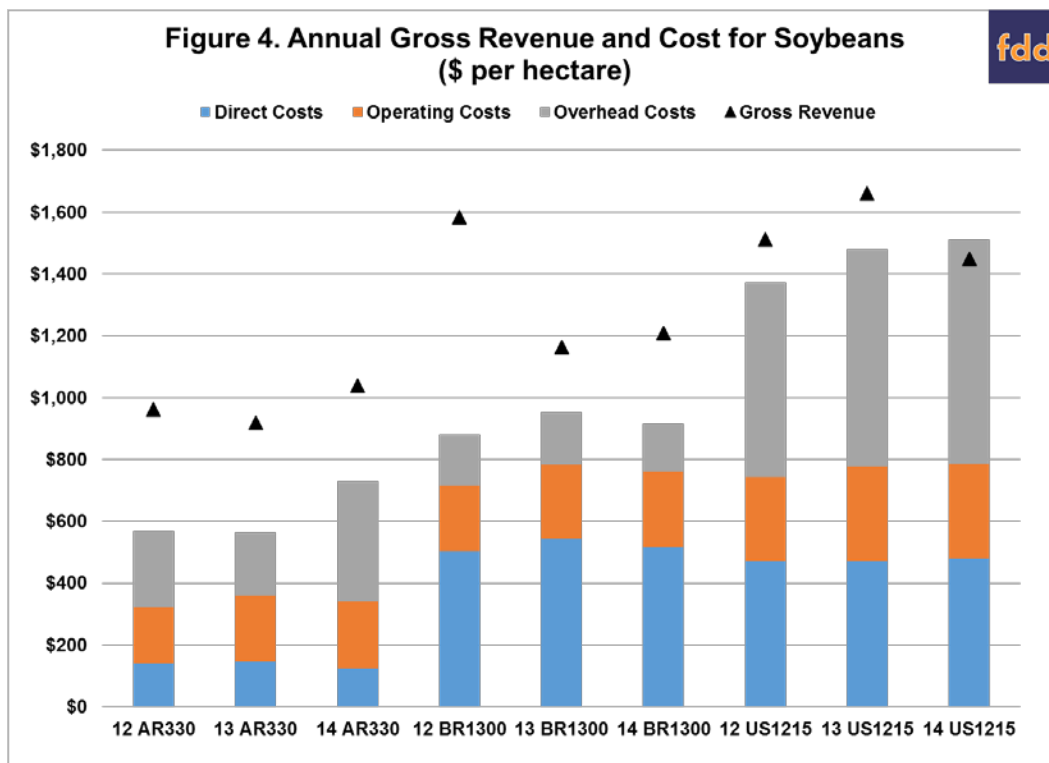**Figure 3. Average Gross Revenue and Cost for Soybeans ($ per hectare)**

Figure 4 presents the annual gross revenue and costs for the most profitable typical farm in each country. For the farms from Argentina and Brazil, economic profit was the largest in 2012. For the Indiana farm, economic profit was the largest in 2013. Amazingly, annual economic profit remained above $300 per hectare ($121 per acre) for the typical farm in Argentina. Similarly, annual economic profit remained above $200 per hectare ($81 per acre) for the typical farm in Brazil. The west central Indiana farm incurred an economic loss in 2014.

Figure 4. Annual Gross Revenue and Cost for Soybeans ($ per hectare)

Conclusions

This paper examined yield, gross revenue, and cost for farms with soybeans in the *agribenchmark* network from Argentina, Brazil, and the United States. Yield, gross revenue, and cost were substantially higher for the U.S. farms. Farms in Argentina and Brazil were extremely profitable during the 2012 to 2014 period. The two U.S. farms were closer to breakeven during this period. It will be interesting to see how the farms fare under the current price environment. The next couple years will certainly be more challenging environment for the typical farms.

References

Langemeier, M., and E. Lunik. "International Benchmarks for Corn Production." *farmdoc daily* (5):207, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, November 6, 2015.