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International Benchmarks for Wheat Production

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Examining the competitiveness of wheat production in different regions of the world is often difficult due to lack of comparable data and consensus 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 wheat production for important international wheat regions using 2013 to 2016 data from the *agri benchmark* network. Earlier work examined international benchmarks for the 2013 to 2015 period (*farmdoc daily* September 23, 2016). The *agri benchmark* network collects data on beef, cash crops, dairy, pigs and poultry, horticulture, and organic products. There are 38 countries represented in the cash crop network. The *agri benchmark* 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 of farms used in this paper was comprised of ten typical farms from Argentina, Australia, Canada, Germany, Russia, Ukraine, and United States. The farm and country abbreviations used in this paper are listed in table 1. Typical farms used in the *agri benchmark* network are defined using country initials and hectares on the farm. It is important to note that wheat enterprise data is collected from other countries. These seven countries represented in table 1 were selected to simplify the illustration of costs and discussion. There are three U.S. farms with wheat in the network. The U.S. farms used to illustrate wheat production in this paper is the western Kansas farm (US2025KS) and the southern Indiana farm (US1215INS).

All of the typical farms listed in table 1 produced multiple crops. The Argentine farm produced soybeans, corn, sunflowers, and winter wheat. The Australian farm produced barley, fodder, rapeseed, and summer wheat. The Canadian farm located in the Red River Valley produced barley, rapeseed, soybeans, summer wheat, and winter wheat. The Canadian farm located in Saskatchewan produced linseed, oats, peas, rapeseed, barley, and summer wheat. The German farm produced rapeseed, sugar beets, and winter wheat. The smaller Ukraine farm produced corn, rapeseed, soybeans, sunflowers, and winter

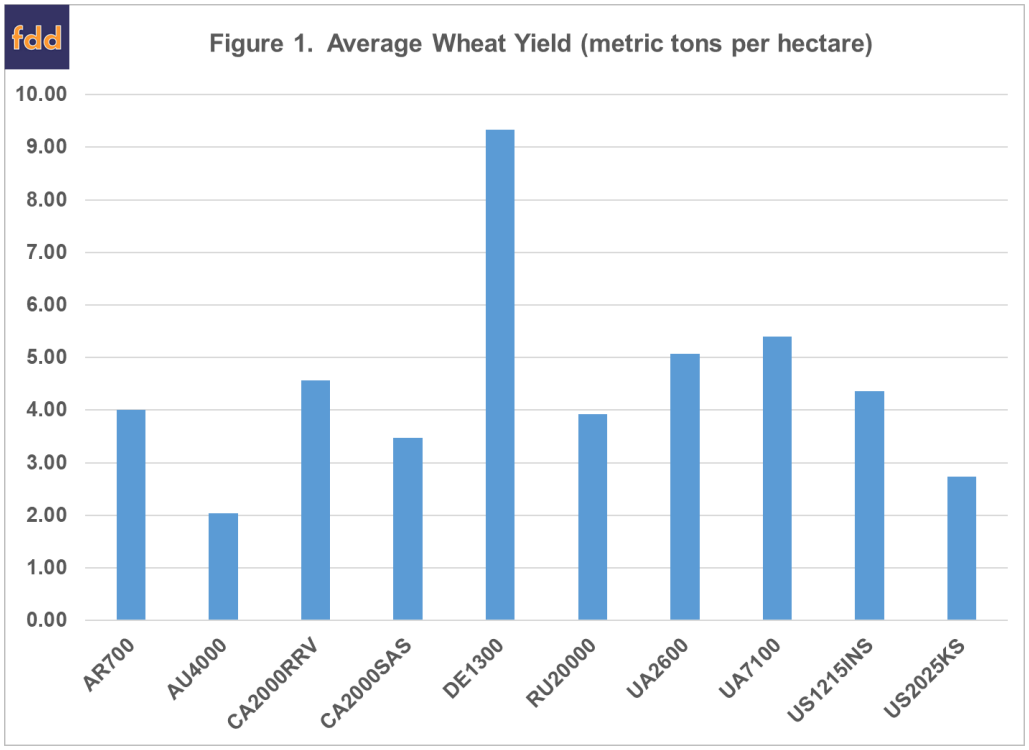
wheat. The larger Ukraine farm produced corn, soybeans, sunflowers, and winter wheat. The southern Indiana farm produced corn, soybeans, and winter wheat. The production of winter wheat on the southern Indiana farm enables this farm to produce double-crop soybeans. The Kansas farm produced corn (both irrigated and non-irrigated) and winter wheat.

Table 1. Abbreviations of Typical Farms

Farm		Country	Region	Hectares
AR700	AR700SBA	Argentina	Southeast of Buenos Aires	700
AU4000	AU4000WB*	Australia	Wheat Belt - Tammin	4000
CA2000RRV	CA2000RRV	Canada	Red River Valley	2000
CA2000SAS	CA2000SAS	Canada	Saskatoon	2000
DE1300	DE1300MB*	Germany	Magdeburger Börde	1300
RU20000	RU20000BS	Russia	Chernozem/Black Soil Region	20000
UA2600	UA2600WU	Ukraine	Between Rivne and Ternopil (Kremenets)	2600
UA7100	UA7100PO*	Ukraine	Poltava region, Central part of Ukraine	7100
US1215INS	US1215INS	United States	Southern Indiana	1215
US2025KS	US2025KS	United States	Kansas	2025

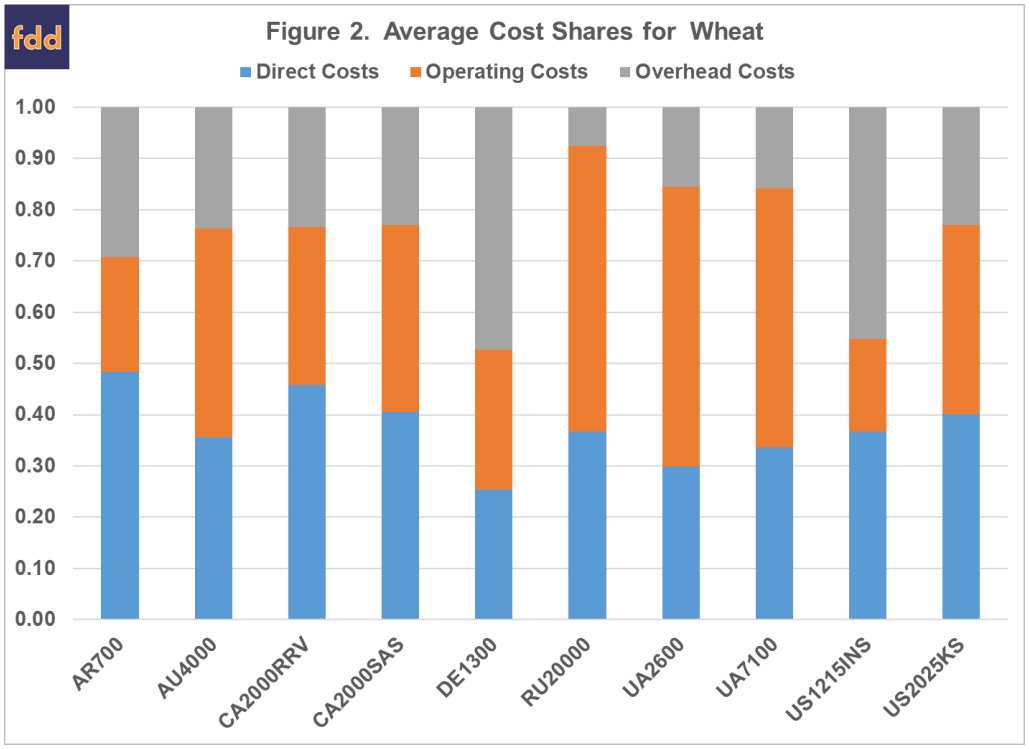
Wheat Yields

Although yield is only a partial gauge of performance, it reflects the available production technology across farms. Average wheat yield for the farms in 2013 to 2016 was 66.8 bushels per acre (4.49 metric tons per hectare). Figure 1 illustrates average wheat yield per hectare for each typical farm. Average farm yields ranged from approximately 30.3 bushels per acre (2.04 metric tons per hectare) for the typical farm in Australia to 138.8 bushels per acre (9.33 metric tons per hectare) for the German farm. The Indiana farm had an average yield of 64.8 bushels per acre (4.36 metric tons per hectare) while the Kansas farm had an average yield of 40.6 bushels per acre (2.73 metric tons per hectare).



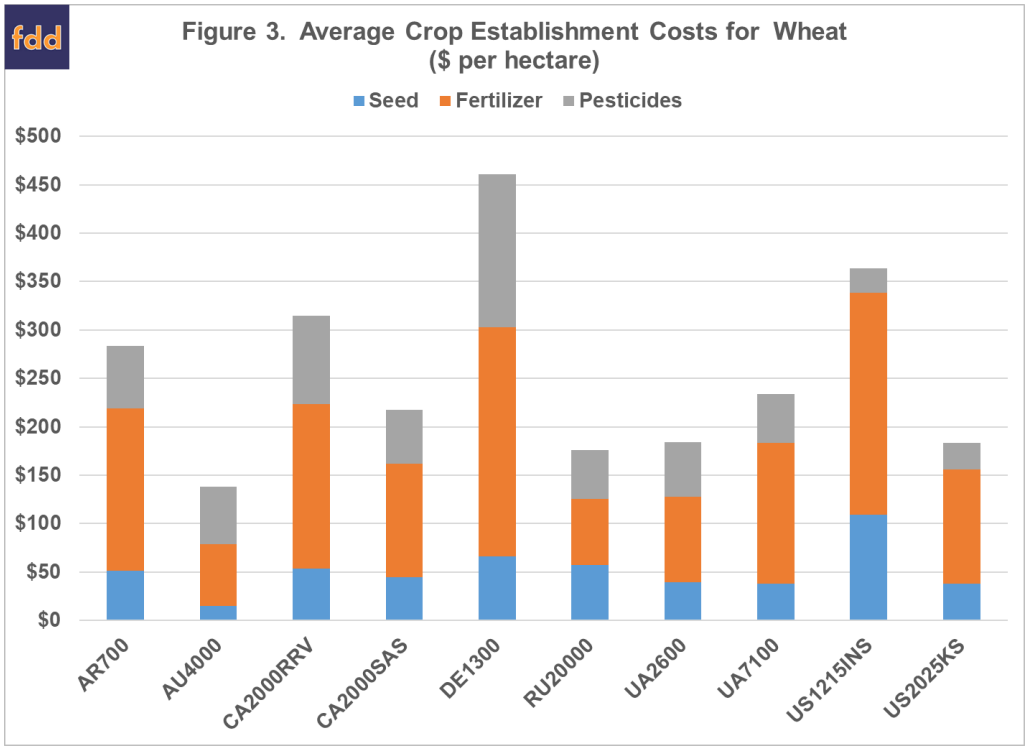
Input Cost Shares

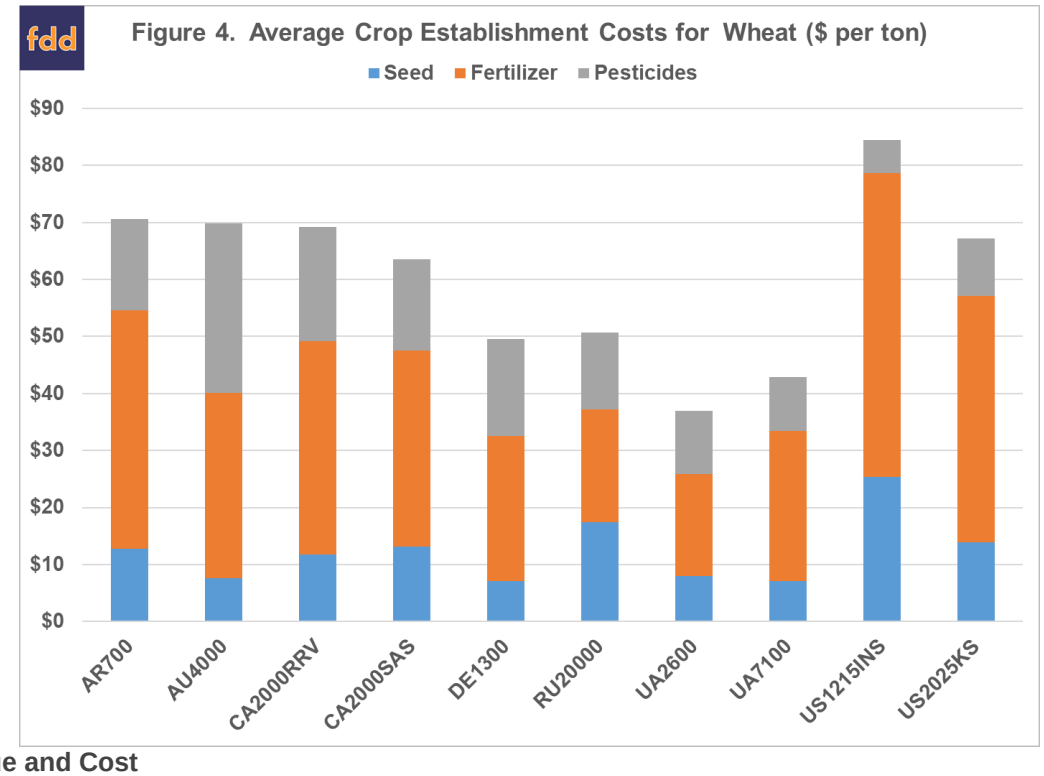
Due to differences in technology adoption, input prices, fertility levels, efficiency of farm operators, trade policy restrictions, exchange rate effects, and labor and capital market constraints, input use varies across typical wheat farms. Figure 2 presents the average input cost shares for each farm. 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 37.3 percent for direct cost, 37.4 percent for operating cost, and 25.4 percent for overhead cost. The Kansas farm had an above average cost share for direct cost at 40.1 percent, and a below average cost share for operating cost and overhead cost. Crop establishment costs are a large proportion of direct cost. The Indiana farm had an above average cost share for overhead cost at 45.3 percent and a below average cost share for direct costs and operating cost. The German farm also had a relatively high cost share for overhead cost. The relatively large cost share for overhead cost in Indiana and Germany largely reflects relatively high land costs. The Indiana farm had the smallest cost share for operating cost out of the sample analyzed at 18 percent.

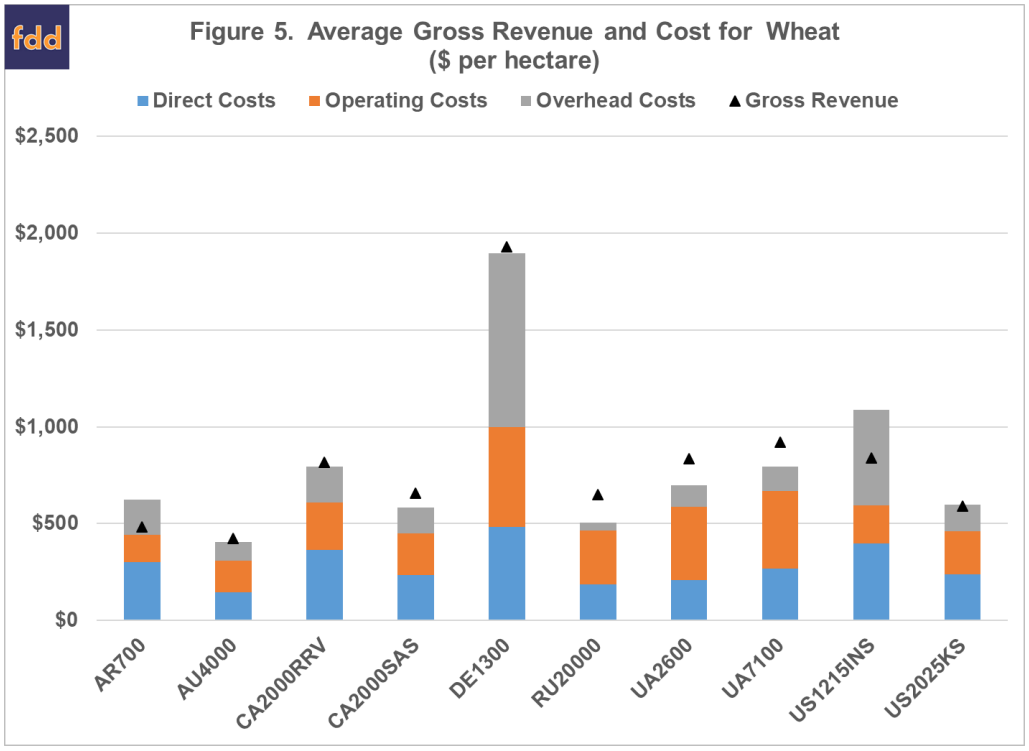
Figures 3 and 4 present seed, fertilizer, and pesticide cost per hectare and per ton for each of the typical farms. Compared to the U.S. farms, seed and fertilizer costs per hectare are relatively low in Australia. As noted above, the German farm had, by far, the highest yield per hectare. However, its establishment cost ($461 per hectare) is more than 80 percent above the average of the typical farms in the sample. Of the farms selected, the German farm had the highest seed, pesticide, and fertilizer costs per hectare. On a per hectare basis, the Indiana farm had the lowest pesticide cost, but this farm also had the highest seed cost. The Indiana farm's pesticide costs were approximately 40 percent below the average.

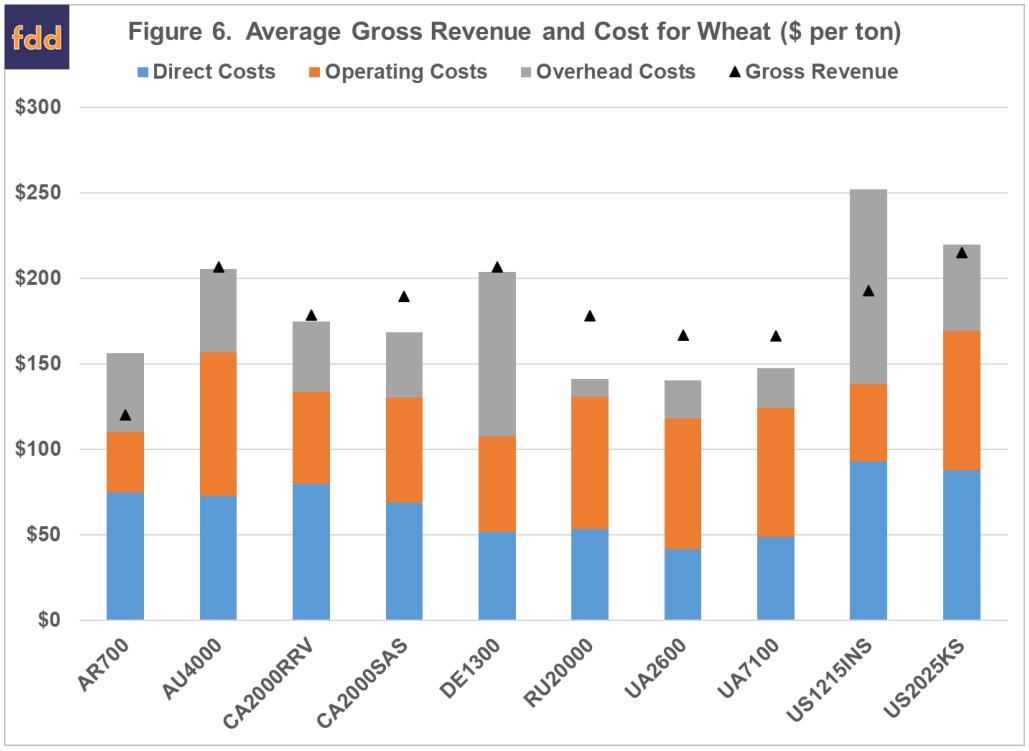




Revenue and Cost

Figures 5 and 6 present average gross revenue and cost per hectare and per ton for each typical farm. Gross revenue and cost are reported as U.S. dollars per hectare and per ton. Wheat is a major enterprise on all of the typical farms presented in figures 5 and 6. It is obvious from figures 5 and 6 that gross revenue per hectare and per ton are substantially higher for the German farm. However, cost is also substantially higher for this farm. In fact, the German farm had the highest direct cost, operating cost, and overhead cost per hectare. However, on a per ton basis, the German farm had below average direct and operating cost, and above average overhead cost.





Three of the selected typical farms had a negative economic profit during the 2013 to 2016 time period. Average losses for the typical farms from Argentina, Indiana, and Kansas were $57, $101, and $4 per acre, respectively during the four year period ($140, $249, $9 per hectare, respectively). The highest economic profit earned was $60 per acre ($148 per hectare) for the typical Russia farm. Despite having the lowest gross revenue per acre at $172 ($425 per hectare), the Australian farm had an average economic profit of $8 per acre ($20 per hectare) during the four-year period.

Conclusions

This paper examined yield, gross revenue, and cost for farms with a wheat enterprise in the *agri benchmark* network from Argentina, Australia, Canada, Germany, Russia, Ukraine, and United States. Although the typical German farm had the highest yields, that farm also realized the highest seed, pesticide, and fertilizer costs per hectare. Both of the farms in the United States realized an economic loss during the 2013 to 2016 time period.

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