

**GRAIN PRODUCTION, MARKETING,
AND TRANSPORTATION IN ARGENTINA**

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Abstract: Argentina is currently the world's second-largest exporter of corn, the largest exporter of soybean oil, the second-largest exporter of soybean meal and an important competitor in the world wheat market. This study offers descriptive information regarding grain farming, marketing and transportation in Argentina. Grain production costs in Argentina are found to be lower than in the United States but marketing and transportation systems are comparatively inefficient partially offsetting their competitive advantage in production. Recent improvements in the Argentinian transportation and marketing systems have enhanced efficiency but the majority of production is marketed in the months following harvest resulting in traffic congestion and exacerbated marketing costs. The harvest-time marketing surge is, in part, a result of inadequate storage in rural areas and an ineffective railroad industry that cannot move large quantities of grain in comparatively short periods of time. Attracting capital for construction of storage facilities and expansion of railroad capacity is difficult, however, Argentinian firms are currently pursuing international corporation to invest in alternative grain transportation and logistics systems that are thought to be financially rewarding.

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GRAIN PRODUCTION, MARKETING, AND TRANSPORTATION IN ARGENTINA

EXECUTIVE SUMMARY

Argentina has excellent natural resources for crop production and is viewed as having one of the most fertile crop production regions in the world. Unfortunately, the historic policies of the federal government had a stifling affect on the agricultural sector, its productivity, and the ability of crop agriculture to compete in international markets. Recent liberalization of Argentinian trade policies, privatization of nationalized industries, monetary reform and other actions initiated during the Menem administration have revitalized Argentinian agriculture and created concern among those who compete with Argentina in the international marketplace. Previous analyses suggest that Argentina is a more efficient producer of most grain crops than the United States. Argentinian farmers are comparatively more diversified and larger than U.S. farms and tend to be more efficient in the use of many inputs. Argentinian grain and oilseed production is largely directed toward the export market because of the dominance of this outlet. Increasingly efficient port facilities are in close proximity to production areas. Regardless, there is concern about the efficiency of the transportation and grain storage system, and railroads that link the nearby production regions to ports. Currently, the majority of crop exports are made in the early months of the crop year resulting in congestion and exacerbated marketing costs. The harvest-time marketing surge is due to inadequate storage in rural areas and an inefficient rail industry; most grain traffic is transported by truck. Attracting capital for storage infrastructure and railroads is difficult. Most producers are currently without adequate resources to invest in storage, thus attempts to attract outside capital are underway. Large international corporations (e.g., Mitsubishi) are being pursued by various Argentinian groups that present alternative logistics and storage systems. The grain/oilseed sector in Argentina appears to have a promising future if unfortunate government policies are circumvented.

Grain Production, Marketing, and Transportation in Argentina

Argentina has a surface area of 2.79 million square km and an estimated population of 37 million. The per capita income in Argentina ranks third among American countries behind the United States and Canada. The degree of urbanization is high with nearly 90 percent of its population living in cities and urban areas. The rural population is estimated at about 5 million during the mid-1970's but is currently estimated at 4.05 million with approximately 1.46 million comprising the agricultural labor force (Liboreiro). Most of the population is of European origin, predominately Spanish or Italian. The level of general education is high because of a well developed educational system: about 97 percent of the population is literate (USDA-ER, CIA).

Argentina is generously endowed with high-quality, agricultural land resources. Arable and permanent crop land make up about 10 percent of its surface area (0.27 million square km). The productive and most fertile land is located within a radius of 500 km of Buenos Aires and is known as the Argentinian pampas. The pampas produces the majority of the country's cereal, oilseed, and cattle. The proximity of the pampas to the Argentina Coast and ports favor the export of grains and oilseed from the region (USDA-ERS, CIA).

Economic development in Argentina accelerated in the latter decades of the 19th century when political stability was attained and agriculture in the pampas prospered. Significant reductions in ocean shipping costs in combination with important increases in world demand for agricultural products greatly increased Argentina's agricultural exports. Exports in combination with inflows of European immigrants and capital contributed to high and sustained growth until the world crisis in the 1930's. After World War II, policies that discriminated against agricultural prices stagnated the agricultural economy and led to a highly volatile Argentinian economy, one that has been referred to as a "stop-go" economy. Between 1950 and 1974, per capita real gross domestic product increased at an average rate of about 2.3 percent. During the latter 1970's and 1980's Argentina experienced serious economic difficulties when real economic growth stagnated, prices rose as its currency depreciated, financial markets collapsed and capital exited the country. Inflation rose reaching average annual rates of 2,600 percent in 1989 and 1990. In view of this economic collapse, reforms were initiated during the 1990's. The government eliminated export taxes and many quotas that restricted imports, reduced import duties and permitted entry and exit of direct investment. Many public sector activities were privatized. In 1991, a radical monetary reform was implemented that pegged the peso to the U.S. dollar and limited growth in the monetary base. Inflation fell sharply in subsequent years and real growth in gross domestic product recovered strongly reaching 8 percent in 1997. Growth in gross domestic product during much of the 1990's averaged 4.7 percent while export revenues increased about 8 percent per year (Pou). In 1998, international financial turmoil increased Argentinian interest rates and dampened economic growth and in 1999 gross domestic product declined by 3 percent. The 38 month recession continues in Argentina. In spite of Argentina's current economic difficulties, the deregulation, privatization and liberalization initiated during the 1990's has favored agriculture and agricultural export activities.

As a result of government reforms and strong commodity prices in the 1990's, Argentina commenced to realize its agricultural potential, in particular, as it related to grain and oilseed production. Liberalization of international trade (MERCOSUR), privatization of selected highways, granting railroad concessions to the private sector, and port privatization encouraged efficiency and international competitiveness. Further, the disbanding of the National Grain Board in 1994 and their operations enhanced operating and pricing efficiency of the grain handling and export sector. Important gains in grain and oilseed production were made by Argentina during the 1990's. Argentinian production of corn, soybeans, and wheat during the 1990's increased by 51, 109, and 19 percent, respectively, relative to the 1980's (USDA-ERS, 2001). Argentina is currently the world's second-largest exporter of corn, the largest exporter of soybean oil, the second-largest exporter of soybean meal, and an important competitor in the world wheat market. The following sections offer descriptive information regarding grain farming, production, marketing and transportation in Argentina.

Grain/Oilseed Farming in Argentina

Estimates of average farm size in Argentina range from about 360 to 470 hectares or about two to two and one-half times the average farm size in the United States (Lence; Liboreiro; White). White estimates about 69 percent of Argentinian farms are small (< 100 hectares), 18 percent are medium sized (> 100 and < 2,500 hectares) and 13 percent are large (> 2,500 hectares). Since the early 1990's, the number of farms in the small size category have declined 18 percent while medium and large farm numbers have increased 100 and 116 percent, respectively. Some estimate that 30 percent of the largest farms produce about 80 percent of the grain and oilseed output. Most farms are sole proprietorships except for farms in excess of 1,000 hectares which are often incorporated for tax and estate purposes. Typically these corporations involve the primary owner (producer) and several minority partners which are often a spouse or relative (White).

Approximately, one-fourth of Argentina's farmers have a university degree or a degree from a technical institute, 35 percent a secondary education certificate, 35 percent a primary education certificate, and 5 percent have no formal education. About one-fourth of the farmers obtain production and/or marketing consulting service on a permanent basis, while 48 percent receive these services in some circumstances and 26 percent obtain no consulting input. Thirty-eight percent of Argentina's producers have a computer and about 9 percent are connected to the Internet. In addition, 92 percent have a telephone and 38 percent a cellular telephone (White).

There are several important differences between grain and oilseed farms in Argentina and the United States. The typical grain and oilseed producer in the pampas is more highly diversified than their U.S. counterpart and they tend to use less fertilizer. Argentinian producers often use a crop/pasture rotation involving at least three different crops (corn, soybeans, wheat, and sunflower) in combination with a beef production enterprise (cow-calf and fat cattle) that depends on improved pasture (Lence). It is estimated that 97 percent of the grain farmers produce more than one crop and

68 percent of these farmers have a livestock enterprise. Most farmers are involved in a beef enterprise since only modest quantities of pork are produced and consumed in Argentina.

The reasons for farm diversification in Argentina are based on economic and technical considerations. Typically after five years of crop production, a field is rotated into an improved pasture that includes alfalfa. The improved pasture provides forage for beef production and adds to soil fertility, thus reducing the need for fertilizer in crop production. Historically, corn was rotated with other crops to control the European corn borer while sunflower and soybeans were rotated to control selected fungi populations. Since the development of Bt corn, there is less need for rotation of corn production and with the advent of no-till farming methods and selective herbicides and insecticides, the need for crop rotation has declined. Regardless the highly-diversified enterprise prevails.

Lence observes that the Argentinian farmer historically relied on improved pastures in their rotation to increase soil fertility because of the comparatively high price of fertilizer relative to grain. For example, in the early 1990's, two to three times as much grain was required to purchase one pound of ammonium phosphate in Argentina as in the United States. Other factors contributing to diversification in Argentina were the lack of an economic safety-net that is generally available to U.S. crop producers through federal programs, and the comparatively large variation in Argentinian yields and prices. Finally, Lence notes that diversification allows for the more efficient use of machinery since machinery costs attributable to any particular crop are smaller under a diversified farming system.

Although the use of fertilizer by Argentinian producers is considerably less than that of U.S. producers there has been a trend toward greater fertilizer usage. From 1992 through the latter 1990's, fertilizer use increased about five times. This was a result of reduced tariffs on fertilizer imports, the high grain prices in the latter 1990's, and the greater yield potential of available genetic material. The fertilization of corn and wheat acreage increased substantially because of the known response of these crops to fertilizer. White reports about 28 percent of the wheat acreage received fertilizer in 1993, while 76 percent received fertilizer in 1999, and during this same time period, the portion of corn acreage receiving fertilizer increased from 13 to 72 percent.

Argentinian farmers are open to advances in crop production methods and biotechnology. It is estimated that over 70 percent of the planted soybeans are Roundup Ready varieties and a considerable portion of the purchased seed corn (50%) is resistant to the European corn borer (Bt). Producers find these new production methods (reduced tillage and Roundup Ready varieties) reduce costs and increase yields and profits. Reduced tillage and double-cropping methods fit well within Argentinian agriculture. White estimates that about 13 percent of the planted soybean, corn, wheat, and sunflower area was under no-till production methods in 1995/96 and by 1998/99 about 37 percent of the planted area involved this production method.

In contrast to the United States, a considerable portion of the tilling and harvesting activity on Argentinian grain farms is contracted for by the farmer. Because of the financial impossibility of owning a complete complement of farm machinery, most small- and some medium- and large-sized

farming operations in Argentina contract with machinery operators for much of the tilling activity. This allows the farm operator access to new technology and facilitates a reduction in production costs. Lease fees for chisel plows and discs are quoted at \$15 and \$9/hectare, respectively, while combining charges are \$25/hectare for wheat/soybeans, and \$40/hectare for corn (Grobocopatel). Few Argentinian farmers own combine-harvesters or grain trucks.

Most short-term or production loans to Argentinian producers are made by seed, fertilizer and chemical companies, and country elevators. Interest rates on these loans currently range from 1.0 to 1.8 percent/month. Increasingly, farmers are allowed to repay the loans with the harvested commodity. This arrangement reduces producer price risk and has tax advantages for the producer. Long-term financing is not common. Typically, state-owned banks are the only institutions that make these loans and currently the interest rates on these loans range from 12 to 21 percent/year.

Corn, soybean, and wheat production costs in Argentina and United States were contrasted by Lence. The analysis shows the per bushel variable cost of producing corn in Argentina is substantially lower than in the United States. The per bushel variable cost of producing corn in Iowa was estimated at \$1.51/bushel while high-technology farmers in Argentina had estimated costs of \$1.15/bushel and average-technology farming methods yielded estimated corn production costs of \$1.19/bushel. On a per bushel basis, the cost of renting land to produce corn in Iowa (\$0.98/bushel) was about twice the cost of renting land in Argentina (\$0.45 to \$0.51/bushel). Lence reports similar results when contrasting soybean and wheat production costs in the United States and Argentina. When Argentinian soybeans are produced as the only crop, the estimated costs range from \$1.92 to \$2.39/bushel and when produced after wheat (double crop) the estimated cost is \$2.50/bushel. In contrast, the variable costs associated with soybean production in the United States of \$2.91/bushel while land rental costs for soybean production in the United States were generally two times those in Argentina. In addition, Lence shows that the variable and land costs of producing wheat in Argentina are about 70 percent of those in the United States.

Grain Production, Consumption, and Exports in Argentina

Argentinian corn production during the 1990's averaged 13.38 million metric tons (mmt). Through the first half of the 1990's, annual corn production ranged up to 11.4 mmt, whereas during the latter half of the decade (Table 1), production ranged from 15.0 to 19.39 mmt, hence a strong upward trend in production during the decade. The expanded production results from important increases in yields and planted area. Corn yields in the first half of the 1990's (4.2 mt/hectare) were about 28 percent higher than yields in the latter 1980's (3.27 mt/hectare) while yields in the latter 1990's (5.35 mt/hectare) were about 27 percent larger than yields in the early 1990's. In addition, Argentina's harvested corn area increased about 25 percent during the 1990's (USDA-ERS, 2001). Typically, corn exports have comprised about 60 percent of total disappearance (8.09 mmt) while the remaining 40 percent has been directed to domestic consumption (5.29 mmt) (Table 1). It is estimated that 17 percent of production is destined for manufactured feed which is fed largely to poultry, another 17

percent is consumed on farms, and the remaining 6 percent is processed by wet and dry corn milling operations. See Figure 1 for location of Argentinian corn production.

Soybean production in Argentina averaged about 15.67 mmt during the 1990's, however, production increased dramatically during this period from about 11 mmt in the early 1990's to 25 mmt in 2000-2001 (Table 2). The increased soybean production is largely due to expanded harvested area: during the 1990's, harvested area increased about 50 percent while yields increased approximately 6 percent. Since 1994, small amounts of soybeans (average of 0.527 mmt) have been imported by selected processors in Argentina because of their recently expanded capacity. Comparatively small amounts of unprocessed soybeans are annually exported from Argentina because of a 1.5 percent federal export tax. During the 1990's about 19 percent of soybean production was (2.96 mmt) exported in its unprocessed form while remaining production and imports were processed (USDA-ERS, 2001). About 95 percent of Argentina's soyoil and soymeal production are exported, hence Argentina's soybean producers are highly dependent on the international market. See Figure 2 for location of Argentinian soybean production.

Argentina's wheat production during the 1990's averaged about 12.44 mmt (Table 3). Production increased from about 9.8 mmt in the early 1990's to an average of about 15.0 mmt in the latter portion of that decade. Harvested area expanded about 26 percent during the 1990's while yields increased approximately 6 percent. About 65 percent of wheat production is exported while the remaining 35 percent is milled for domestic consumption, export and livestock (USDA-ERS, 2001). See Figure 3 for location of Argentinian wheat production.

It is estimated that cereal and oilseed production constitute about 54 percent of Argentina's gross crop product and about 28 percent of the general gross product of the agricultural sector. Cereal and oilseed production is concentrated in the pampas region, which is located in east-central Argentina. The most productive portion of the pampas is in the northern portion of the Buenos Aires province, the southern portion of the Santa Fe province, and the southeastern area of the Cordoba province. It follows that the Argentina's production of grains and oilseeds is concentrated in the provinces of Buenos Aires, Santa Fe, and Cordoba. These provinces typically produce about 85 percent of Argentina's annual corn production, and about 80 and 60 percent of the respective wheat and soybean output. Buenos Aires dominates by producing about half of the nation's corn production, two-thirds of the wheat output and about one-fifth of the soybean production. Cordoba supplies about a 25 percent of the corn, and 20 and 8 percent of the soybean and wheat output, while Santa Fe produces about 10, 6, and 20 percent of Argentina's respective corn, wheat, and soybean production (SAGPyA, 2001a). Remaining cereal and oilseed production tends to be located in the provinces of La Pampa, San Luis, Entre Rios, Santiago del Estero, Tucuman, Salta, and Jujuy.

Grain Marketing in Argentina

Argentinian grain originates at the farm and is either shipped to a country elevator, processor, or export elevator. Argentinian soybean processors ship large quantities to export facilities while

remaining processors ship primarily to the domestic market. As noted above, the export market is the primary outlet for much of Argentina's grain and soybean output. It follows that most grain marketing activity focuses on exports.

Total grain storage capacity in Argentina is estimated at about 50 mmt or about 90 percent of total crop output. This is in contrast to the United States which can store about 128 percent of annual crop production. Lence indicates that on-farm storage in Argentina represents about 27 percent of all storage while others report that about 25 percent of all storage is on-farm and at country elevators, thus there is some disagreement about the location of Argentinian grain storage. Remaining grain storage in Argentina is located at processing facilities and export elevators. In the United States, on-farm storage capacity includes about 56 percent of all storage capacity. Thus, the storage capacity in U.S. producing areas (on-farm plus country elevator) is relatively great as compared to Argentina. Because a comparatively modest portion of Argentina's grain production can be stored on farms, most grain exits the farm at harvest. Because of this harvest-time surge in transportation demand, considerable truck congestion occurs at country elevators and ports during this time period. Currently, Argentinian agribusinesses are considering alternative storage and logistics schemes that might be located in rural areas. It is argued that these facilities would enhance grain value by facilitating segregation and by lowering high transport costs associated with harvest-time congestion.

Grain Handling, Storage, and Processing Facilities

Country elevators play a central role in Argentina's grain marketing system since most of the farmers grain production is handled and/or marketed via a country elevator. It is estimated that country elevators market about 80 percent of Argentina's grain production. Typically, the country elevator offers a variety of services to the producer. These include credit, truck transportation, grain brokering, and documentation (federal sales tax) as well as grain drying, storage, and conditioning. In some cases, country elevators offer forward pricing services to farmers by forward contracting with an exporter or hedging the purchases through sale of futures contracts. Often country elevators market inputs (chemicals, fertilizer) to farmers and in many cases the elevators finance these inputs for producers. At harvest time the farmer repays the loan with grain. Few Argentinian farmers have trucks or means of grain transportation, hence country elevators own and/or contract trucks to provide this service for producers. The trucking service is valued by the producer since they simply contact the elevator to obtain the truck when needed. Often farmers who do not market through country elevators have difficulty obtaining trucks during the harvest season.

The representative Argentinian country elevator charges a base fee to the farmer for receiving the grain which ranges from \$2.80 to \$3.80/metric ton (mt): often this fee includes free storage for a 60- or 90-day period. Drying charges vary but typically range from \$1 to \$1.60/mt. It is estimated that 100 percent of the corn requires drying, while 50 percent of the soybeans and 10 percent of the wheat must be dried. The quantity of wheat that must be dried depends on the portion of wheat production that will be followed with a second-crop of soybeans. If the wheat is to be followed by

soybeans, the wheat may be harvested with a high moisture content, thus the need to dry. Screening or sieving charges at the country elevator are about \$2/mt and typically elevators charge a 3 percent commission on the sale that includes grain brokerage and documentation services. The 3 percent commission is based on the destination market price, typically a port price. Representative charges for marketing corn via a country elevator in Argentina are \$11.45/mt while similar services for wheat and soybeans are \$10.40 and \$18.87, respectively (Margenes Agropecuarios). Estimated transportation costs that link the producer to destination markets (typically export elevators) were estimated to average about \$26/mt or about 70 percent of the total marketing costs for corn and wheat, and nearly 60 percent of the total costs for marketing soybeans (Margenes Agropecuarios). It follows that country elevator charges plus transportation costs from the farm to the elevator and from the elevator to the destination market are considered when arriving at the producer's net price.

Country elevators in Argentina are either an independent elevator, a cooperative elevator or a line elevator (Lence). Independent elevators are operated by their individual owners while cooperatives are jointly owned by farmers and a line elevator is operated by an exporter or processor. Most elevators are independent, however, because of bankruptcies during the 1990's, farmers are increasingly marketing through line elevators which are viewed as more financially stable. Cargill, Niderera, Andre, and Louis Dreyfus have bought and/or built country elevators that offer size economies, hence increased competition to independent elevators. Most cooperatives belong to Federacion Argentina de Cooperativas Agrarias (FACA) and Asociacion de Cooperativas Agrarias (ACA) which operate a port elevator. Country elevator turnover rates (annual volume/storage capacity) are considerably higher in Argentina than in the United States because of the comparatively small storage capacity at Argentinian country elevators.

Argentinian country elevators typically include vertical steel silos of either welded carbon steel or bolted galvanized steel because they are less expensive than slip-formed concrete silos. Considerable flat or horizontal storage is used at Argentina's large storage structures at port or processor sites. The metal silos found at country elevators have a conical, gravity discharge floor that allows them to be emptied without the use of additional labor. Elevators include a leg which is a vertical, continuous belt that includes buckets which lifts grain for subsequent routing via gravity-feed spouting to bins, dryer, railroad car or truck. Tower dryers are typically used to dry Argentinian grain/soybeans. A variety of truck unloading mechanisms are found in Argentinian elevators. Older facilities require that trucks discharge their grain via doors on the truck/trailer grain beds which are opened after the truck enters the unloading area – about 20 percent of the grain is discharged from the truck/trailer by workmen with shovels. More modern facilities have small platforms which elevate the truck (35 degrees) and trailer separately: these facilities unload 120 to 150 mt/hour. The most modern facilities have platforms that elevate the truck and trailer simultaneously: these facilities can unload about 600 mt/hour. Comparatively, little labor is required to unload trucks/trailers at facilities which can elevate the truck and trailer. Port elevators are a critical link in Argentina's grain/oilseed marketing chain since comparatively large portions of annual production are exported. Argentinian export facilities are located (1) at Atlantic Coast ports in the eastern and southern portion of the Buenos Aires province, (2) in the city of Buenos Aires, and (3) on that portion of the Parana River that extends from above Buenos Aires to Santa Fe (Figures 4 and 5). The export facilities handle large quantities of grain, soymeal, and vegetable

oil (soybean and sunflower). The most active Atlantic Coast grain ports are located at Bahia Blanca and Quequen (Necochea) which include four and two export facilities, respectively, while remaining export facilities at Mar del Plata handle comparatively modest quantities. In 1998, port facilities at Bahia Blanca and Quequen/Necochea handled 69 percent of Argentinian wheat exports, 24 percent of the corn exports, and important quantities of vegetable oils (21 percent) (Table 4). Most port facilities in Bahia Blanca accommodate Cape-size vessels (up to 50 ft. draft) and have modern receiving and load-out capacities as do facilities at Necochea and Quequen. The port at Buenos Aires includes three facilities that exported 7 percent of Argentinian corn exports in 1998, and about 2 and 5 percent of the wheat and vegetable oil (soybean, sunflower) exports. These facilities typically accommodate Panamax-sized vessels. Except for an export facility on the Uruguay River (Entre Rios province), all remaining agricultural export facilities are located on the Parana River (Buenos Aires and Santa Fe provinces), the most active grain, soybean, and vegetable oil export area in Argentina (Table 4) (SAGPyA, 2001b).

Export facilities on the Parana River extend from San Pedro to Santa Fe, which is about 590 km above the mouth of the Rio de Plata near Buenos Aires (Figure 5). The most intense export activity is in the Rosario port area, which is about 420 km above Buenos Aires (Table 4). The Rosario area includes San Lorenzo/San Martin as well as Rosario: the Rosario port area includes about 17 agricultural export facilities. In 1998, the facilities in the Rosario area exported 58 percent of Argentina's corn exports, while other Parana River ports accommodated about 11 percent of corn outflow. In 1998, Parana River ports handled about 30 percent of Argentinian wheat exports (Rosario area facilities about 23 percent) and a large portion of soybean, soymeal, and vegetable oil exports. In particular, the share of national soybean, soymeal, and vegetable oil exports from lower Parana River ports were estimated at 97, 91, and 79 percent respectively, while Rosario area facilities' respective national shares were 82, 89, and 74 percent. It is estimated that 78 percent of Argentina's soybean crushing capacity is located in the Rosario area. Many soybean crushing facilities are near the Parana River and ship meal and oil via ocean-going vessels, thus reducing transshipment charges. In addition, these facilities receive soybeans for processing from barges that originate on the Parana/Paraguay River system (north Argentina, Paraguay and Bolivia). Panamax-sized vessels may be fully loaded at Rosario area ports and points on the Parana River below the Rosario port area, however, above Rosario these vessels can only be partially loaded. Currently, the Parana River has been dredged to a depth of 32 feet to the Rosario port area, while from Rosario to Santa Fe the river has been dredged to 22 feet (Bolsa de Comercio de Rosario, 2000a).

The geographic advantage that Argentina possesses regarding its export activity is suggested by the proximity of the export facilities to the location of production (Figures 1, 2, 3, 4, and 5). For example, Parana River ports, the principal outlet for Argentina corn, soybean, soymeal, and soyoil are located within 220 km of Argentina's most intensive corn producing region and about 170 km from the center of Argentina's primary soybean producing region. Further, Bahia Blanca and Quequen/Necochea, the principal export locations for wheat (70%) are within 200 km of Argentina's southern wheat production region while Parana River ports are about 170 km from the heart of the northern production region.

Argentina's export terminals are distributed among 24 ports and have a total ship load-out capacity of 40,000 mt of grain/hour. Loading capacity to ships range from 800 to 3,200 mt/hour at these facilities (Hajnal). Argentinian port terminals have undergone modernization and expansion in the past two decades with some of the most modern facilities operated by Cargill at Bahia Blanca and Quebracho (Rosario port area), Toepfer at Bahia Blanca, Louis Dreyfus at General Lagos (Rosario port area) and Terminal 6 (Rosario port area).

Terminal 6 is owned by a consortium of soybean processors and is viewed by some as the most modern export facility in Argentina. Grain is moved via inclined belt conveyors rather than a leg. Terminal 6 has a ship load-out capacity of 1,800 mt/hour and storage capacity of about 460,000 mt which is distributed among nine horizontal or flat storage facilities. Two berths at Terminal 6 accommodate soymeal and grain while the two remaining berths handle vegetable oil and copper that is received from northwest Argentina. The facility can daily receive 250 railcars, 1,000 trucks and has a barge receiving facility that has an effective unload rate of 450 mt/hour. Recently, the facility handled about 6 mmt which included: corn (0.6 mmt), wheat (0.3 mmt), soyoil (0.4 mmt), and soymeal (4.7 mmt). Approximately 40 percent of receipts at Terminal 6 were by rail, 53 percent by truck and 7 percent by barge. Much of the barge traffic is soybeans and soymeal received from Paraguay (\$16 - \$20/mt barge rate) and Bolivia (\$20 - \$25/mt barge rate). Terminal 6 is served by a wide and a narrow-gauge railroad. The wide-gauge railroad transports soymeal from Cordoba in 40 car trains that include 45 to 50 mt/car while the narrow-gauge railroad transports about 35-cars per train that includes 30 mt/car. Total charges at Terminal 6 for receiving and loading grain, soymeal, and soyoil to ship range from \$2.00 to \$2.30/mt. Often Panamax-sized vessels (40,000 to 70,000 mt of cargo) receive grain at Terminal 6, however, on occasion, Cape-sized vessels (70,000 to 120,000 mt of cargo) are partially loaded. The Cape-sized vessels must be topped-off at Atlantic Coast ports (Ferres).

The Terbasa export facility at Buenos Aires may be more representative of many Argentinian export grain elevators than Terminal 6. It was constructed in the 1940's when it was operated by the National Grain Board, then in the 1970's the facility was expanded and since 1992 it has been operated by a consortium of international companies. The Terbasa grain export terminal is a slip-form concrete structure with 100,000 mt of grain storage capacity. Typically it annually receives about 700,000 mt of grain, with corn comprising about 70 percent of receipts and wheat and soybeans each making up about 15 percent of total receipts. Approximately 95 percent of receipts at the Terbasa facility are received from trucks while the remainder (5%) are rail-transported. Grain is received via four truck unloading lines that have a capacity of about 18,000 mt per 12 hour shift, and railcars which are unloaded at the rate of five cars per hour (50 mt/car). Ships are loaded at the rate of 1,200 mt/hour with typical ship size averaging 30,000 deadweight mt. Charges for receiving and loading out grain to ship average \$5/mt at the Terbasa facility (von Stremayr).

The soybean crushing industry in Argentina is one of the largest suppliers of soymeal and soyoil to the world market. It is estimated that 94 percent of Argentina's soybean production is exported – approximately 80 percent as meal and oil, and the remainder as soybeans. In the latter 1990's over \$400 million was invested in expansion of soybean processing capacity. Total daily processing capacity is estimated at 94,268 mmt s: this capacity is distributed among about 53 plants. Over two-

thirds of the capacity comes from solvent extraction plants (Hajnal). The largest facility is operated by Louis Dreyfus which has a daily crush capacity of 12,000 mt/day. Other large facilities are operated by Cargill, La Plata Cereal, Vicentin, and Terminal 6 with projected daily crushing capacities of 7,500, 6,100, 5,500, and 4,800 mt, respectively (Bolsa de Comercio de Rosario, 2001). All facilities are located within the Rosario port area. These plants are among the largest and most efficient soybean processing facilities in the world (Lence).

The Argentinian flour milling industry includes 11 companies that operate about 85 mills. Six companies account for about 60 percent of domestic flour sales. Most existing mills have been modernized and new mills constructed to achieve greater efficiencies. Because milling capacity exceeds that needed to produce domestic flour needs, flour is produced for the export market (Hajnal).

Because of constraints in farm and country elevator storage capacity, there is considerable seasonality in Argentinian grain flows. Lence observes that 20 percent of Argentina's corn exports occur in the second month (harvest period) of the crop year and half of the exports are during the second, third, and fourth months of the crop year. At the end of the crop year, monthly exports are about 2 percent of total annual exports. In contrast, in the United States, monthly corn exports range from 7 to 9 percent of total annual exports. A similar temporal export pattern is revealed for Argentinian wheat with about 21 percent exported during the second month of the crop year (harvest period) and about half during the second, third, and fourth months of the crop year. In the United States, monthly wheat exports range from 7 to 11 percent of total annual exports (Lence).

Price Discovery and Related Institutions

In Argentina, boards of trade provide facilities that permit grain buyers and sellers to interact for the purpose of determining spot or cash prices. The principal markets are at important export locations at Bahia Blanca, Buenos Aires, and Rosario. The traded grain contracts may be registered with the board of trade for a fee (1-1.5% of value) and if the trade is documented the contracting parties agree to submit to the board of trade for arbitration if problems arise in the execution of the contract. It is estimated that about one-third of Argentina's grain production is registered with Argentinian boards of trade (Lence). In addition, Argentina includes two derivatives markets (Buenos Aires and Rosario) that trade grain and oilseed futures and options. In general, these markets are thin and illiquid and many exporters hedge in Chicago Board of Trade futures rather than the futures contracts traded at Argentinian exchanges.

Another important difference between the United States and Argentina involves the availability of price information in the hinterland or producing region. In the United States, country elevators quote cash prices to interested producers on a daily basis. In contrast, in Argentina the producer is quoted a delivered export price rather than a local country elevator price, thus the producer must identify marketing, handling and transportation charges for purposes of estimating a net price. Because of the numerous charges involved in the marketing and transportation of grain it is difficult

for producers to compare net prices that are available via various locations and markets. Thus, prices are less transparent in Argentina than the United States (Lence). It is for this reason that brokers are often used when Argentinian producers or country elevators are selling grain and oilseeds.

Performance of Marketing System

To gain insight on the efficiency of the Argentinian grain marketing system, Lence calculated costs of the Argentina marketing system and compared these with United States marketing costs. Lence found that the implicit cost of marketing export-destined corn from central Iowa to Gulf ports, a distance in excess of 1,000 miles, was similar to the costs of marketing corn over a 125 mile distance in Argentina. Since three-fourths of the Argentinian marketing costs are made up by transportation, Lence concludes that much of Argentina's advantage as an efficient corn producer is offset by an expensive transportation system. Lence carried out a similar analysis for other Argentinian grains and observed that the costs of transporting these commodities to port was also unusually high as compared to the United States. Lence concludes that much could be gained by improving the efficiency of the Argentinian grain transportation and logistics system.

Grain Transportation in Argentina

The Argentinian transportation network is comprised of 215,434 km of roadway (30% paved) and 38,326 km of railroad track. About 64 percent of the railroad trackage is broad gauge (1.67 meters), 29 percent narrow gauge (1.0 meter) and the remaining seven percent standard gauge (1.44 meters) (CIA). Grain and oilseed transportation is largely carried out by trucks with the estimated truck transport share ranging from 80 to 85 percent. Railroads are estimated to transport 14 to 19 percent of the grain/oilseed traffic and the barge mode about one percent. In recent years, the agricultural sector is estimated to have paid carriers about \$847 million with an estimated \$743 million (88%) spent for truck carriage, \$101 million (12%) for rail service and \$3 million (< 1%) for barge transportation. The average distance of haul for all modes was 265 km and the average cost for transport service was \$14.50/mt. The average distance of truck and rail grain hauls were 250 and 360 km, respectively (Bolsa de Comercio de Rosario, 2000b).

During the 1990's, Argentina made improvements to its transportation system that had important implications for agriculture. Most importantly, railroads were privatized as were portions of the road network, and dramatic improvements were made in the lower Parana River port area.

Trucks and roadways are central to the transportation of grain and oilseeds in Argentina. Commercial truckers and country elevators who operate trucks move virtually all grain/oilseeds from farms to country elevator, port elevator or processors, since very few farmers own grain trucks. Transport from farm to country elevator is over poorly maintained dirt roads which become

impassable during periods of extended rainfall. Trucking rates increase about 20 percent when transport over dirt roads is required. Hauls to port or processor are often over the privatized highway system which has had few major improvements. Highways are often narrow, traffic often dense, and tolls are generally expensive. For example, over one 265 km route, the estimated tolls were about \$0.40/mt.

Because of modest on-farm grain storage capacity in Argentina, most grain is transported from farms during the harvest season. As such, truck queues at country elevators and ports usually involve a one day wait and may require waits that extend for two to four days. In essence, the trucks become temporary grain storage for Argentinian grain production. At Cargill port elevators, truckers are asked to pay a \$2/mt fee to guarantee a 24-hour unload time. During the peak transportation period, truck rates often increase about 30 percent above those that prevail over much of the shipping season. Some argue that on-farm storage is almost economically feasible because of lower truck rates that producers might enjoy if not shipping during the peak transportation period. Most commercial grain truck operators belong to an association which establishes rates: some believe truckers have market power even though most trucking firms are small (Lence). A comparison of Argentinian and U.S. truck grain rates, shows that they are similar up to distances of 40 km, however, at greater distances, Argentinian rates exceed those in the United States. At a distance of 167 km, the Argentinian rate is about 20 percent higher (\$10.12/mt versus \$12.20/mt); at a distance of about 250 km, the Argentinian rate is about 27 percent higher (\$12.76 versus \$16.21/mt); and at a distance of 335 km the Argentinian rate is nearly 40 percent greater (\$14.74/mt versus \$20.47/mt) (Margenes Agropecuarios).

Argentinian grain trucks typically transport 28 to 30 mt in a truck/trailer combination with about one-third of the cargo carried by the truck and the remaining two-thirds by a three-axle trailer. All grain beds are of the box type with sliding doors on the bottom and side of the bed to facilitate grain discharge (Grobocopatel).

Some argue that the Argentinian grain transportation system would be more efficient if trucks had a diminished role and railroads an expanded role. Others counter that most grain/oilseed hauls in Argentina are comparatively short and railroads may be less efficient than trucks for some of these hauls. Further, it is argued that when the additional cost of transporting grain from farms to country elevators for loading aboard railcars is considered, it is often less costly to haul directly by truck from farm to the destination market.

The railroad industry currently suffers from a poor reputation regarding service even though these recently privatized companies have lowered rates 20 to 25 percent and have made improvements in service. Argentinian railroads have not generally been able to make necessary investments to offer reliable, efficient service. Thus, for most Argentinian grain shippers, railroads are not a viable, efficient transport mode.

After nationalization of the Argentinian rail system in 1949, freight traffic declined and large government subsidies were required to maintain the railroads. In 1992, the federal government elected to privatize the rail system offering 30-year operating concessions to five railroad

companies. Unfortunately, the privatization scheme provided little incentive for companies to invest in needed roadbed and track. It is estimated that the privatized system transported about 18 mmt during the latter 1990's with 8 mmt (45 percent) being grain/oilseed and associated products. It is estimated that 5 of the 8 mmt were destined to the Rosario area ports. The five privatized companies include Ferroexpreso Pampeano, Nuevo Central Argentina, Americana Latina Logistica, Ferrosur Roca and General Belgrano (Bolsa de Comercio de Rosario, 2000b).

The two most important grain and oilseed carriers are Ferroexpreso Pampeano (FEP) and Nueva Central Argentina (NCA). The Ferroexpreso Pampeano rail network is located largely in south Santa Fe, and south and east Buenos Aires provinces, but with a link between the Rosario and Bahia Blanca ports. In 1999, the FEP operated 2,260 rail cars (SAGPyA, 2001c). During the period August 1999 through August 2000, the Ferroexpreso Pampeano transported 2.34 mmt of grain/oilseeds and associated products out of a total 2.36 mmt of transported freight, hence 99 percent of their traffic was agricultural products. Leading transported commodities were sunflower (0.6 mmt), wheat (0.557 mmt), corn (0.473 mmt), soybeans (0.202 mmt), malt (0.2 mmt) and soya pellets (0.116 mmt). During this year, approximately 872 million metric ton-kilometers (mmt-km) were generated by Ferroexpreso Pampeano with an average distance of haul equal to 370 km and an average rate of \$0.0375/metric ton-kilometer (mt-km). Thus, on average, a rate equal to \$13.88/mt for a haul of 370 km. In contrast, the intrastate rail transport of grain sorghum in Texas over a similar distance in 1998 yielded a rate of \$0.0217/mt-km or about \$8/mt, a 40 percent discount to the average Ferroexpreso Pampeano rail rate (Bolsa de Comercio de Rosario, 2000b).

Nueva Central Argentina (NCA), the other major carrier of grain/oilseed and associated products in Argentina transported 3.5 mmt of freight over the eight month period extending from January 2000 through August 2000, with 2.44 mmt (70%) being grains/oilseeds and associated products. In particular, over this time period, an estimated 1.22 mmt of soymeal pellets were transported largely from the province of Tucuman to lower Parana River ports as were 0.262 mmt of soyoil, 0.487 mmt of soybean, and 0.360 mmt of corn. During this period, the Nueva Central Argentina generated 1,613 mmt-km at an average distance of haul equal to 461 km and an average rate of \$0.028/mt-kilometer. Thus, on average, a rate of \$12.90/mt for a haul of 461 km (Bolsa de Comercio de Rosario, 2000b). The NCA rail network extends from northwest Argentina (Tucuman, Santiago del Estro), through south Santa Fe and into the northeast Buenos Aires province. For large volume customers with efficient loading operations, the rate from Tucuman to Rosario during the peak period ranges between \$22-\$25/mt for 36 car trains that carry 50 mt per car. During off-peak, the rate is about 10 percent lower (Ferres). The NCA railroad operates 5,254 railcars (SAGPyA, 2001c).

Argentinian railroads operate comparatively low horsepower locomotives with small railcars and trains as compared to the United States. Most locomotives in Argentina have 1,500 to 2,000 horsepower while most engines in the U.S. have a minimum of 3,000 horsepower. The Argentinian grain cars typically transport 30 to 50 mt while the minimum grain car size in the U.S. is 90+ mt. Most grain trains in Argentina are limited to 30 to 40 cars while grain trains in the U.S. often exceed 100 cars. In addition, the average distance of haul is considerably longer for U.S. grain movements than those in Argentina. The average distance of haul for Argentinian railroads (360 km) is less than

the 420 km distance that U.S. railroads site as the minimum distance at which they can effectively compete with trucks for grain transport.

Historically, the lower Parana River was an important port area for Argentinian exports/imports, however, as a result of neglect and lack of maintenance during the 1980's and early 1990's it became an expensive port area for grain ships to navigate. After years of neglect, the Argentinian government eliminated all expenditures on waterways and ports in 1990 and, by 1992, 20 percent of the Parana River buoys did not operate and draft ranged between 22 and 24 feet. Ships could navigate the river only during daylight hours and often 3 to 4 days were required for a ship to travel the 420 km from Buenos Aires to Rosario. Further, because of the diminished draft virtually no grain ship could be fully loaded at Parana River ports. And, in 1993, Panamax-sized vessels discontinued their navigation of the lower Parana River. In 1995, the Argentinian government granted a concession to a European firm (Consorcio Hidrovia S.A.) to dredge the Parana River to Santa Fe. The river was dredged to a depth of 32 feet to San Martin (north of Rosario), and to 22 feet beyond San Martin to Santa Fe. In addition, buoys and river markers were upgraded to facilitate 24-hour navigation on the Parana River. By 1997, it was estimated that freight rates for ocean-going vessels had declined up to \$6/mt as a result of river improvements with total annual transportation savings estimated at \$51 million.

Comparatively modest navigation improvements have been made above Santa Fe, however, the introduction of an American barge company (ACBL) in 1996, dramatically altered the efficiency of barge movements on the Parana-Paraguay Waterway. The Parana-Paraguay Waterway extends northward through Argentina, central Paraguay and into central-west Brazil. Argentinian and other South American barge companies had been offering service on the Parana-Paraguay Waterway but it was unreliable and generally expensive. ACBL invested in channel markers, introduced GPS to aid in river navigation, and provided intensive training to crews. As a result, time required for movement of product from the upper reaches of the Parana-Paraguay system to Rosario declined from about 60 days to 18-25 days. Similarly, barge rates declined and traffic increased. In general, Argentina transports little agricultural product on the upper Parana, however, small quantities of grains/oilseeds move from river ports at Reconquista and Resistencia to lower Parana River ports. Most agricultural product (soybeans and soymeal) moving on the Parana-Paraguay Waterway originate in Paraguay and move to lower Parana River ports or to Nueva Palmira, Uruguay. Lower Parana River ports are often a less attractive port area for Paraguayan and Bolivian shippers than Uruguay because of custom tax documentation required by the Argentinian government (Ferres). In 1999, an estimated 800 barges and 85 tow boats operated on the Parana-Paraguay Waterway. ACBL operated 160 barges and 7 tow boats in 1999. Barges operating on the Parana-Paraguay Waterway carry about 1,400 mt and move in tows including up to 10 to 12 barges (SAGPyA, 2001c).

Rumors circulating in October 2000 indicated that ACBL was selling or merging their Parana-Paraguay Waterway barge operations because of slow progress in development of the waterway. More recently, this rumor has been confirmed. ACBL has merged with a Chilean company (Ultra Petrol) and now goes by the name "UABL." The company is managed by Felipe Menendez, who

is part of the Menendez group which owns Ultra Petrol. Current rumor indicates UABL participates little in management of barge operations (Ferres).

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Table 1: Argentina: Corn Production and Disposition, 1990-2000

Year	Yield	Production	Exports	Domestic consumption
	mt/hectare	----- 1,000 mt -----		
1990	3.897	7,600	4,000	3,303
1991	4.417	10,600	6,070	4,401
1992	4.163	10,200	4,749	5,102
1993	4.167	10,000	4,100	5,766
1994	4.455	11,360	5,782	5,479
1995	4.111	11,100	7,494	4,308
1996	4.559	15,500	10,828	4,323
1997	6.098	19,360	12,222	6,350
1998	5.182	13,500	7,882	6,450
1999	5.548	17,200	11,700	5,816
2000	5.357	15,000	10,000	5,000

Source: USDA, Economic Research Service, Production, Supply and Distribution database.

Table 2: Argentina: Soybean Production and Disposition, 1990-2000

Year	Yield	Production	Exports	Domestic processed
	mt/hectare	----- 1,000 mt -----		
1990	2.421	11,500	4,401	7,827
1991	2.323	11,150	2,921	8,347
1992	2.316	11,350	2,274	9,121
1993	2.296	12,400	2,957	9,276
1994	2.193	12,500	2,614	9,843
1995	2.079	12,430	2,014	10,515
1996	1.806	11,200	750	10,983
1997	2.804	19,500	3,231	17,342
1998	2.449	20,000	3,200	17,460
1999	2.474	21,200	4,100	17,660
2000	2.538	25,000	5,500	19,670

Source: USDA, Economic Research Service, Production, Supply and Distribution database.

Table 3: Argentina: Wheat Production and Disposition, 1990-2000

Year	Yield	Production	Exports	Domestic processed
	mt/hectare	----- 1,000 mt -----		
1990	1.912	10,900	5,592	4,530
1991	2.171	9,880	5,780	4,578
1992	2.333	9,800	5,850	4,265
1993	2.021	9,700	5,009	4,298
1994	2.216	11,300	7,318	4,314
1995	1.911	8,600	4,483	4,165
1996	2.239	15,900	10,198	5,095
1997	2.596	14,800	10,666	4,548
1998	2.416	12,400	8,400	4,145
1999	2.553	15,500	11,600	4,075
2000	2.640	16,500	12,000	4,500

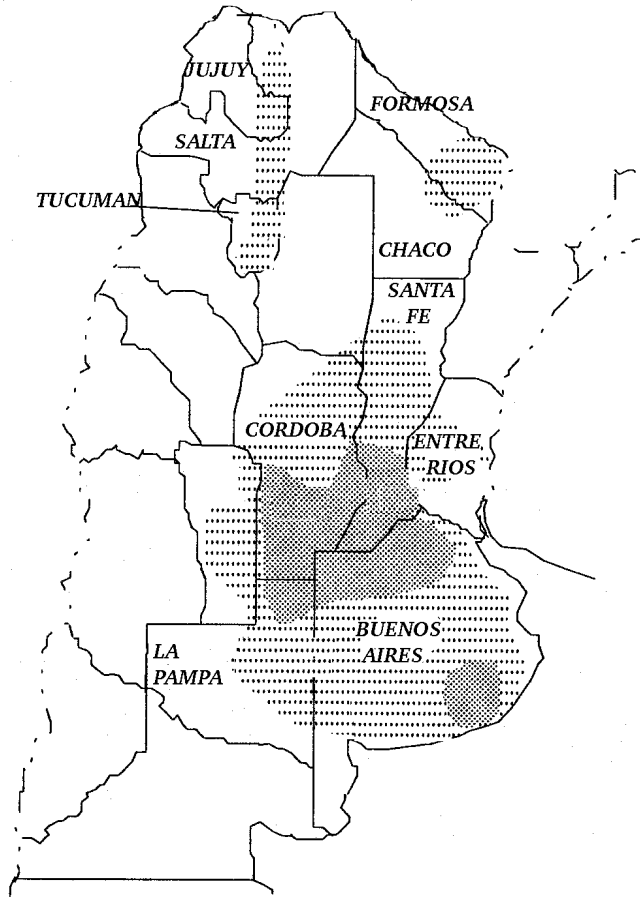
Source: USDA, Economic Research Service, Production, Supply and Distribution database.

Table 4: Argentina: Exports of Grain, Oilseeds, Soymeal, and Vegetable oils, in metric tons, 1998



Port	Wheat	Corn	Sunflower	Sorghum	Soybean	Soymeal	Vegetable oils
Bahia Blanca	3,951,381	1,319,914	189,884	63,237	61,053	857,401	485,198
Quequen	3,086,655	1,577,766	119,330	--	50,512	368,112	329,700
Mar del Plata	68,524	97,905	--	--	--	--	--
Buenos Aires	154,812	810,622	4,560	--	8,295	290,047	191,312
C. Del Uruguay	11,663	10,072	--	--	34,025	--	--
Diamante	203,131	357,912	--	40,565	174,265	--	--
Ramallo	16,990	73,150	--	3,850	--	--	--
Santa Fe	108,405	32,197	--	25,826	14,408	--	--
Rosario	1,165,550	3,374,230	105,706	907,505	1,501,766	2,149,050	955,623
S. Lornezo/S. Martin	1,163,170	3,716,133	34,750	305,524	1,105,487	10,351,160	1,962,171
San Nicolas	35,148	173,076	--	--	--	--	--
San Pedro-Terminal	197,229	549,582	--	--	220,114	--	--
V. Constitucion-SP	58,500	216,672	--	5,500	23,750	--	--
Total	10,221,158	12,309,231	454,230	1,352,007	3,193,675	14,015,770	3,924,004

Source: Dirección de Mercados Agrícolas y Agroindustriales, SAGPyA.

Figure 1: Corn Growing Areas in Argentina



Legend

-  Major growing areas
-  Minor growing areas

Corn Crop Calendar for most of Argentina

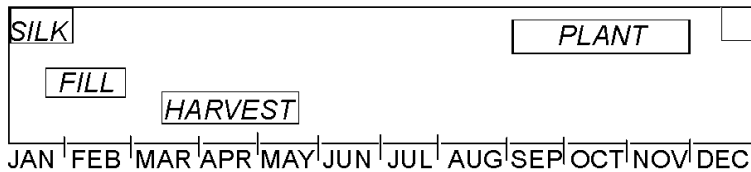
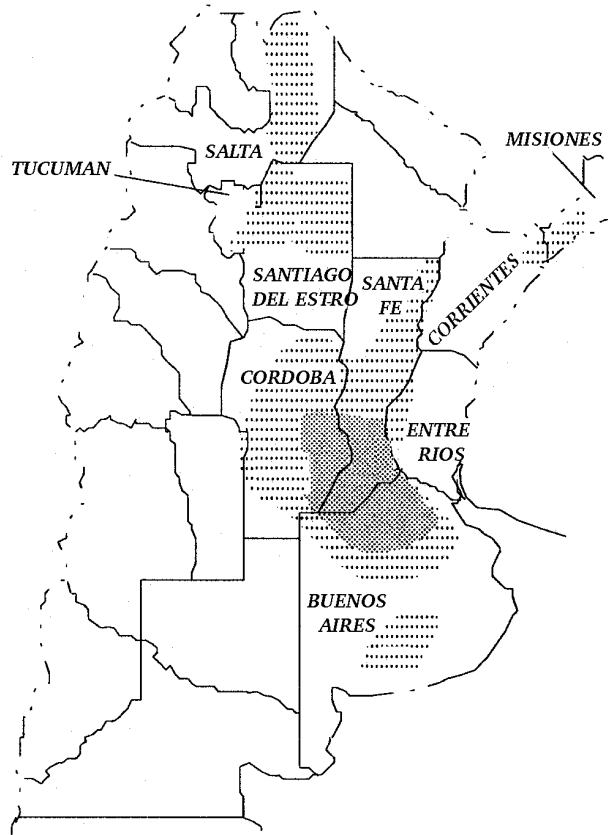




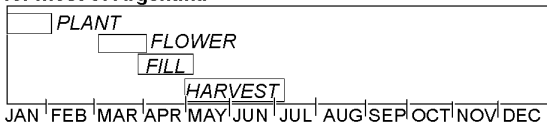
Figure 2: Argentina: Soybean



Legend

-  Major growing areas
-  Minor growing areas

Double-cropped (after wheat) Soybean Crop Calendar for most of Argentina



Soybean Crop Calendar for most of Argentina

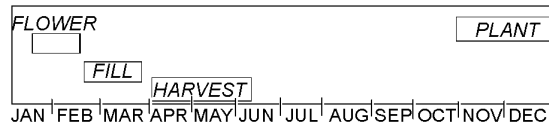
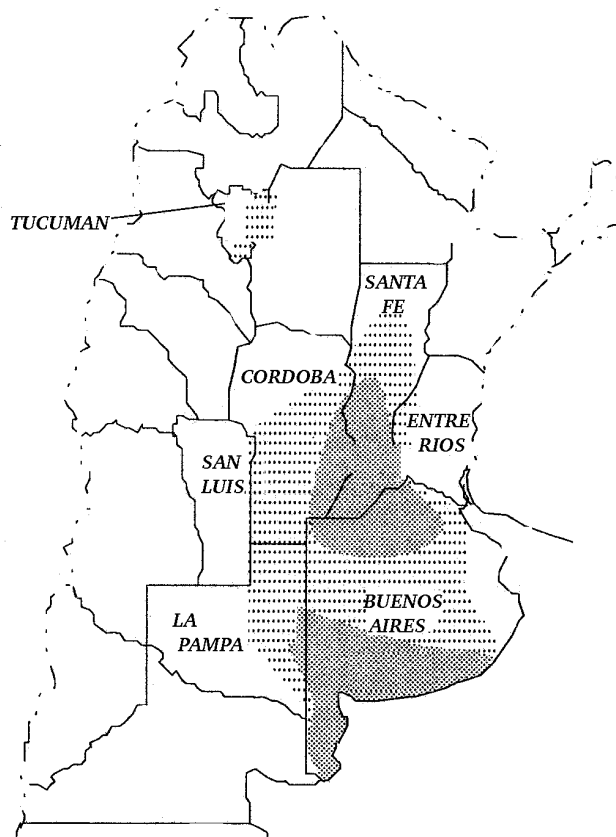


Figure 3: Argentina: Wheat



LEGEND

- Major growing areas
- Minor growing areas

Winter Wheat Crop Calendar for most of Argentina

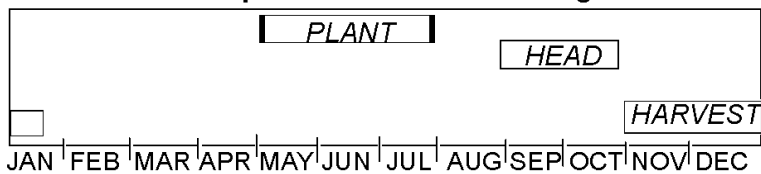


Figure 4: Argentina Ports



Figure 5: Lower Parana River Port Area

