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Argentina's Grain Marketing System

Shasi Wilson Chiang
Oswald P. Blaich

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ABSTRACT

This report describes the Argentine grain marketing system as it developed under alternating periods that were market oriented and Government controlled. It describes the operations of the system from farm to export locations including such characteristics as storage, transportation, handling equipment, and ownership. It discusses various notions of efficiency and performance.

Keywords: Export grains, storage, transportation, port facilities, efficiency.

FOREWORD

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SUMMARY

The Argentine grain marketing system presents no unusual bottlenecks to servicing its export trade in most years. But, in years of exceptionally large crops, some difficulties could be encountered in moving the grain to port. Argentina normally moves most of its grain to export positions and into world trade within a few months after harvest. This practice is likely to continue with little delay even for moderately large crops since the system has some excess capacity. Argentina's export marketing policy is not likely to change drastically, merely as the result of a large crop.

The grain marketing system generally operates with moderate efficiency. It is a mixture of old and new. As older less efficient components have deteriorated or become obsolete, they were generally replaced by new, modern, and efficient ones.

Total grain storage capacity is relatively small. Combined onfarm, country elevator, and port capacity is somewhere between 17 and 20 million tons. 1/ This capacity represents about 50 to 65 percent of total annual production of the major export grains. Other major grain exporting countries such as the United States, Canada, and Australia have developed storage capacities equal to or above their annual production.

The average capacity of elevators ard equipment is relatively small, thereby limiting economies of size. For example, the 23 state-owned port elevators average only 47,000 tons compared to an average of 135,000 tons for port elevators in the United States, railcars are only about two-thirds the size of U.S. cars, and only a few of the docks can handle the large oceangoing grain tankers in service today.

The railway system, owned by the Government since 1946, is generally in poor condition. The majority of its tracks and grain cars are over 40 years old. Operating costs are high due to poor track condition, inefficient yard operations, and inadequate loading and unloading facilities. And, since these are no demurrage charges, there is little incentive to obtain quick turnaround of railcars; in fact, railcars are often used to augment the country's limited storage capacity.

The highway transportation system tends to be more efficient than the railroads, especially for the short hauls that characterize two-thirds of the grain movements. Of the total road system, 34 percent is paved, 25 percent is graded and graveled, and 43 percent is unpaved country roads. The trucking industry is considered to be reasonably efficient although many of the trucks are small by U.S. standards and annual operating mileage is low.

There remains a question as to why more investment in storage has not taken place, especially at country elevators. There is no general need for added storage because Argentina's

1/ All tons are metric measure.

grains move into world markets at a time when northern hemisphere supplies tend to be low, according to some experts. There is some pressure to sell as much of the crop as possible before northern hemisphere grains appear on the world market especially during seasons when the Argentine crop is large.

INTRODUCTION

Argentina is an important competitor in world trade in wheat, feed grains, and oilseeds, products of primary interest to the United States. When exceptionally large crops occur, the question often arises among U.S. exporters whether Argentina can store the excess grain or how quickly that crop can be moved to port positions and into export. This report explores those questions.

The grain marketing system has developed with varying degrees of Government control. Twice during the past 50 years the system was completely Government managed and controlled. These periods totalled about 15 years. For the intervening 35 years, the system was essentially market oriented although various aspects were regulated. Each such period had its influence on the system's structure and performance, but each period carried over some of the characteristics of the previous one.

A National Grain Board was first created in 1933. It was given some control over export sales and had the authority to fix minimum producer prices for wheat, corn, and flax. In 1946, however, all buying and selling of major grains was monopolized under the Argentine Trade Promotion Institute (IAPI). From there until 1955, most of the port, storage, and rail facilities were nationalized and the private merchants, brokers, and farmers' cooperatives acted primarily as commissioned agents of the IAPI. Following this was an 18-year period of private trading. However, most of the port facilities and the railways remained Government owned as they are today.

Argentina produces about 30 to 35 million tons of wheat, feed grains, and soybeans annually. About 5 million tons remain on farms where it is produced, about 8 million tons are marketed domestically, and some 17-22 million tons are moved each year to export locations (table 1). The volume of total grain production is about three times larger today than it was in 1960, but the exports are four times as large.

Most production of major export grains is concentrated in the provinces of Buenos Aires, Sante Fe, and Cordoba (fig. 1). This concentration of production means that nearly all of the grain is produced within 200 miles of a port and two-thirds of the grain is from areas inside a 150 mile radius from the ports. Cordoba and Santa Fe each account for over 20 percent of the total production of the major export grains, Buenos Aires for well over 40 percent, and the provinces beyond the 200 mile perimeter, account for the remainder (table 2).

MARKETING FACILITIES

Grain producers typically deliver their product to a country elevator where it is graded and sold. After cleaning, drying and famigating the grain is shipped to domestic millers, processors, and to port positions for export.

The Farm Level

Grain producers have not traditionally invested large amounts in onfarm storage. As late as 1960, 70 percent of grain was

Figure I. **Principal grain flows to ports.**

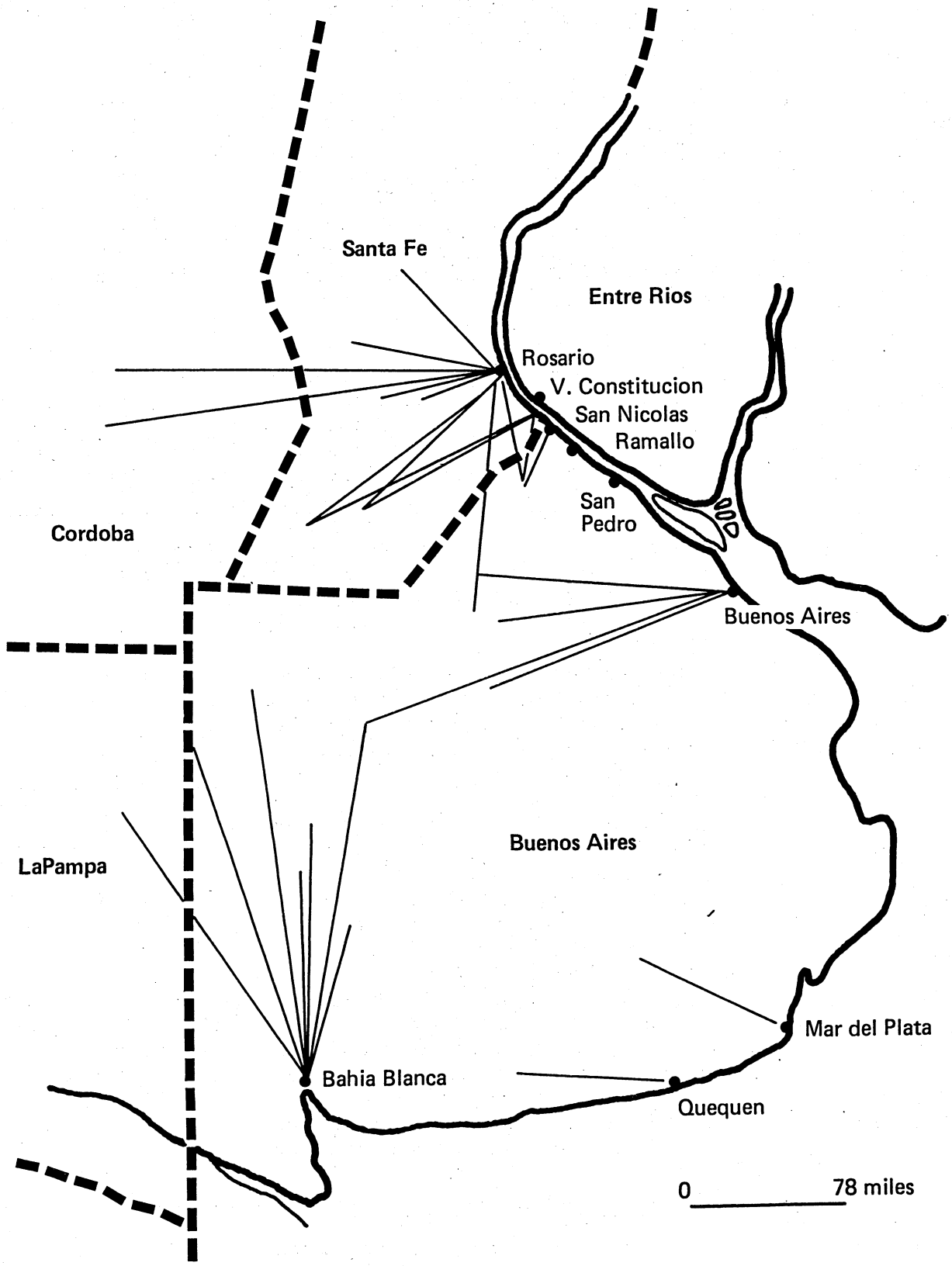

Table 1--Production and exports of major grains

Grain	1960		1970		1981	
	Production	Exports	Production	Exports	Production	Exports
	Million tons					
Wheat	5.84	2.43	7.02	2.29	7.78	3.85
Corn	4.11	2.21	9.36	5.56	12.90	9.10
Sorghum	.61	.06	3.82	1.99	7.55	4.94
Soybeans	.00	.00	.03	.00	3.77	2.19
Total	10.56	4.70	20.23	9.84	32.00	20.08

Sources: Bolsa de Cereales (1981) and Argentine Secretariat of Agriculture.

Table 2--Production of major export grains by province, 1981

Province	Wheat	Corn	Sorghum	Soybeans	Total of four
	Million tons				
Buenos Aires 1/	5.1	6.2	1.8	0.9	14.0
Cordoba 1/	.8	2.9	2.9	.7	7.3
Sante Fe 1/	1.6	2.6	1.1	1.8	7.1
Entre Rios	.1	.7	.5	--	1.3
La Pampa	.2	.3	.5	--	1.0
Other	--	.8	.8	.4	2.0
Total	7.8	13.5	7.6	3.8	32.7

-- = Not available.

1/ Grain production in these provinces is mostly within 200 miles of a port

bagged when threshed. If stored at all, the grain was placed on long wooden racks covered with tarpaulins. Very little grain is now bagged. Some of the large farms have bulk storage facilities made of concrete, steel, aluminum, or wood with capacities ranging from 10 to 100 tons. Permanent silos are often arranged in groups of four to eight with central bulk loading and unloading equipment.

Total bulk storage on farms was estimated at 1.4 million tons in 1960 (table 3). By 1969, it was estimated at 2.4 million tons and is now thought to be close to 5 million tons. This is sufficient for about 10-15 percent of an average grain crop.

Table 3--Farm storage: Number of units and capacity, 1960

Item	Storage units	Capacity
	Number	Tons
Silos:		
Buenos Aires province	1,826	1,008,033
La Pampa province	20	6,650
Sante Fe province	4	2,530
Cordoba province	4	2,155
Warehouses and other		407,270
Total		1,426,638

Source: National Grain Board.

Most bulk storage on farms is used for wheat and other winter crops since these do not usually require drying. About 70 to 80 percent of the summer crops, mainly corn, sorghum, and soybeans, require some drying which is usually done at an off-farm facility. Farm drying is considered too costly by most producers.

First Handlers

About 80 to 90 percent of the grain marketed is handled by registered merchants and cooperatives that operate country elevators. A little is moved directly from the farm to millers and exporters.

There were approximately 700 local grain cooperatives and 1,300 independent merchants involved in grain marketing in 1980. The year-to-year volume handled by them ranged from 15 to 20 million tons. The merchants often take title to the grain when they receive it, but the cooperatives usually do not. Most cooperatives and grain merchants also provide a wide range of farm supplies and services to farmers (table 4).

In 1976 most of the country elevator storage capacity was concentrated in the Pampa region where 90 percent of the grain is produced (table 5). Buenos Aires province, alone, accounted for over 5 million tons, nearly 55 percent of the national capacity. Sante Fe and Cordoba provinces had less than 2 million tons each.

Ownership of country elevators has traditionally been split between private buyers, cooperatives, and the National Grain Board. Most of the latter facilities are in turn leased to private merchants.

A 15-percent increase in country elevator storage capacity occurred between 1975 and 1981 (table 6). Almost 60 percent of the total of 1.11 million tons of country storage owned by

Table 4--Farm supplies and services provided by cooperatives and grain merchants, Sante Fe, 1974

Supply/Service	Cooperatives	Grain merchants
	Percent reporting	
General stores	89	14
Seed	97	91
Pesticides	97	68
Fertilizer	75	52
Fuel	82	28
Feed	56	18
Machinery	60	21
Insurance	71	68
Livestock auction	7	0

Source: Original, derived from Estudio de Factibilidad Para un Plan Nacional de Almacenamiento y Conservacion de Granos.

Table 5--Country elevator storage capacity, by province, 1976

Region and province	Merchants and cooperatives	National Grain Board		Total
		Elevators	Underground silos	
	1,000 tons			
The Pampa region:				
Sante Fe	1,681	85	87	1,853
Cordoba	1,663	103	139	1,905
Entre Rios	231	11	--	242
La Pampa	287	56	--	343
Buenos Aires	4,781	180	367	5,328
Outlying regions:				
Formosa	6	--	--	6
Tucuman	4	--	--	4
Santiago de Estado	39	--	--	39
Chaco	73	4	--	77
Corientes	28	--	--	28
Misiones	18	--	--	18
Total	8,811	439	593	9,843

-- = not available.

Source: Original, derived from Estudio de Factibilidad Para un Plan Nacional de Almacenamiento y Conservacion de Granos.

Table 6--Ownership of country elevator storage capacity

Ownership	1960	1965	1975	1981
		Millions tons		
Private 1/	1.03	1.16	8.81	10.50
Public	1.90	1.08	1.04	1.11
Total	2.93	2.24	9.85	11.61

1/ It is not clear whether the 1975 and 1981 figures include bag-storage bulk. The 1960 and 1965 numbers are thought to represent bulk storage only.

Sources: Original, derived from Foreign Agricultural Service, USDA, and National Grain Board.

the National Grain Board in 1981 was in underground silos. Most of this was reported to be in poor condition. At the same time, 75 percent of the above-ground storage was also reported in poor condition.

The average storage capacity of country elevators is relatively small; the 62 elevators owned by the board in 1981 averaged only 5,500 tons. In 1975 almost 74 percent of the storage units owned by the private sector had less than 4,500 tons of capacity and nearly 20 percent of the storage was in installations ranging from 4,501 to 10,500 tons (table 7). The latter, however, represented 42 percent of total storage in private hands. There is a legal minimum requirement of 1,500 tons of storage capacity for country elevators that handle grain destined for export; approximately 93 percent of the country facilities qualify.

Besides storage, country elevators weigh, analyze, and condition the grain owned or held in trust. Conditioning includes drying, cleaning, insect and pest control, and related functions to assure that quality is maintained. Techniques for preventing weevil and other contamination consists mainly of fumigating with methyl bromide. However, the Board maintains "hospital elevators" to which seriously infected grains are moved for treatment.

Most country elevators had some type of cleaning equipment in 1960. At that time, drying facilities were almost nonexistent. By 1975, however, 73 percent of the country elevators had some facility for drying. The country's total drying capacity today exceeds 24,000 tons per hour for an average of 10 tons per hour per facility.

Grain is now weighed and graded while in the arriving or departing container--a truck or railcar. Grading had been the

Table 7--Distribution of size of privately owned grain storage capacity, 1975

Tons per installation	Proportion of installations	Storage capacity: Total volume	Storage capacity: Share of total volume
	Percent	1,000 tons	Percent
Less than - 750	15.8	76	1.2
751 - 4,500	57.7	22	34.3
4,501 - 10,500	19.7	2,309	35.8
10,501 - 21,750	6.0	1,420	22.1
21,751 or more	.8	427	6.6
Total	100.0	6,444	100.0

Source: Estudio de Factibilidad Para un Plan Nacional de Almacenamiento Conservacion de Granos, p. 116.

sole responsibility of the board until 1979, when private elevator operators were delegated the responsibility. Any disagreements concerning grade are adjudicated by an arbitration board.

Grain Exporters

Although the Government owns most port facilities, private traders have always handled most of the grain for export. During market-managed periods from 1946 to 1955 and 1973 to 1975, private traders served simply as commissioned agents for the board. But, during the intervening market-oriented years, most of the export transactions were also handled by them.

Although 37 private grain exporters operate in the country, exports by the top eight represent 72 percent of the total wheat exports, 55 percent of total corn exports, and 76 percent of total grain sorghum exports (table 8). Of the eight largest, four are multinational firms and four are domestic firms. In addition, two of the major cooperatives also export a relatively large share of the total grain exported. Taken together, the two cooperatives and the eight top private exporters account for 90 percent of the wheat exports, 75 percent of corn exports, and 90 percent of grain sorghum exports.

Port Facilities

Some of the grain exporting ports of Argentina are directly on the Atlantic Ocean, some are at the mouth of the River Plate, and some are upstream on the Parana River (fig. 1). The largest in terms of storage capacity and volume exported is at Rosario, upstream on the Parana River. It services much of the northern part of the grain-producing region. The second largest is the port of Bahia Blanca on the Atlantic Ocean serving the southern part of the grain-growing region. The

Table 8--Major grain exporters, 1979

Item	Wheat 1/		Corn		Sorghum	
	Quantity	Share	Quantity	Share	Quantity	Share
	1,000 tons	Percent	1,000 tons	Percent	1,000 tons	Percent
Corporations:						
Bunge	648	16	268	5	75	2
Cargill	491	12	628	10	376	10
Continental	309	7	497	8	403	10
Dreyfus	69	2	295	5	58	2
La Plata	400	10	586	10	411	11
Nidera	339	8	339	6	485	12
Sasetin	442	11	2/ 390	7	853	22
Genaro G.	303	7	261	4	317	8
Sub total	3,001	72	3,265	55	2,978	76
Cooperatives:						
ACA	391	10	776	13	269	7
FACA	259	6	458	8	223	6
Sub total	650	16	1,234	21	492	13
Total above	3,651	88	4,499	76	3,470	89
Total exports	4,190	100	5,875	100	3,900	100

1/ Bread wheat only.
2/ 1978 data.
Source: National Grain Board.

port of Buenos Aires, located near the mouth of the River Plate and serving the central part of the region, is the third largest. Besides these three major grain ports, there are two others on the Atlantic Ocean, nine others along the Parana River, and a minor port on the Uruguay River.

Maintenance and construction of the government owned facilities are the responsibilities of several agencies (table 9). This division of responsibility sometimes leads to problems of coordination and timeliness in making repairs and improvements. Authorization was granted to the private sector in 1979 to construct and operate terminal elevators at port locations. Since then five private elevators totalling 133 thousand.

The tons of storage capacity have been built. There are also Government plans to sell or lease some of its currently owned facilities.

Storage capacity at ports more than doubled from 1954 to 1975, with nearly two-thirds of the increase occurring before 1967 (table 10). There has been very little increase since 1975

Table 9--Division of responsibility for improving port elevator facilities, 1981

Type of improvement	Department responsible	Under
Construction of export grain elevators	Department of Grain Elevator Construction	Under Secretary of Public Works
Selection of sites and site planning	National Grain Board	Secretary of Agriculture and Livestock
	General Port Administration	Secretary of State for Maritime Affairs
	Department of Port Construction and Navigable Waterways	Secretary of State for Maritime Affairs
	Department of Grain Elevator Construction	Undersecretary of Public Works
Access roads	General Port Administration	Secretary of State for Maritime Affairs
	National Highway Administration	Secretary of Transport and Public Works
	Provincial Highway Administration	Secretary of Transport and Public Works--Provinces
	Municipal Public Works Administration	Secretary of Transport and Public Works--Municipalities

although new construction has displaced almost completely the outdated storage facilities. More than one-third of current storage capacity at the ports is in underground silos. While the elevator capacity has increased since 1967 from less than 10 million to 1.3 million tons, the underground capacity remained essentially unchanged.

Underground facilities generally consist of V-shaped concrete trenches with a bottom-center discharge onto draw-off belts. The covering is a concrete shell arched over the trench. The fill and discharge operations are relatively slow and there is difficulty in keeping the facilities watertight.

There are 23 major port elevators with an average size of 47,000 tons. This is quite small compared to an average of about 133,000 tons in the United States.

Table 10--Grain storage capacity at the ports, 1954-81

Item	1954	1967	1975	1981
		Thousand tons		
Elevators	894	985	1,152	1,303
Underground silos	--	1,467	1,503	1,503
Farm-type silos	--	195	--	--
Bag storage	896	541	--	51
Unaccounted storage	--	--	1,345	1,143
Total	1,790	3,188	1/ 4,000	1/ 4,000

1/ Approximated.

Sources: National Grain Board, Argentine Ministry of Economy, Department of Port Construction and Navigable Waterways.

The volume of grain handled at most port elevators has been limited by the comparatively short work week. An 87-hour work week was still in use at most of the ports, during 1979 except at Rosario and Villa Constitucion. These two operated a 102-hour work week. Plans are underway to implement the longer work schedule at the others.

Data on handling capacity was not generally available on the recently constructed port elevators owned by the private trade. The exception was a floating elevator located on the Mitre Channel of the Parana River. This elevator has a storage capacity of 1,500 tons and transfers grain from barges to cargo ships at the rate of 500 tons per hour.

The weighing system used depends mainly on the size of the port elevator. At the smaller facilities, full railcars and trucks are weighed upon arrival and again when they are emptied. Large facilities use an inhouse scale system to which grain is first transferred before being placed in storage.

Quality control and grading at the export level is the responsibility of the National Grain Board which issues certificates of quality for all grain exported. The board is also responsible for determining seasonal adjustments in grade tolerances and the discounts permitted for deliveries deviating from tolerance limits.

The port of Rosario has the largest total storage capacity and is among the more efficient. It has six elevators with a total capacity of 311,000 tons, a track and rail unloading capacity of nearly 2,000 tons per hour, and a shiploading capacity exceeding 11,000 tons per hour (table 11).

Table 11--Port of Rosario, major grain handling, characteristics, 1979

Item	Characteristics
Number of units	6
Storage capacity	391,000 MT 1/
Truck receiving capacity	3,950 TPH 1/
Rail receiving capacity	3,975 TPH
Ship loadout capacity	11,350 TPH
Height of spouts to pier	12-25 meters
Depth alongside pier	18-28 feet
Length of pier	150-260 meters
Length of shipping capacity	65-260 meters

1/ MT = metric tons; TPH = metric tons per hour.

One of the six elevators is a durable concrete silo with three mechanical scales, one for receiving trucks and two for loading ships. However, there are no dumping facilities, trucks have to be unloaded by shovel. Another of the older installations is also of durable concrete construction. Here, however, the condition of the dock is poor and the spouts do not extend well into the ship thereby limiting the size of ships that can be conveniently loaded. A third unit suffers from old, outdated equipment.

One of the medium-size elevators at Rosario has recently been modernized and is equipped to service a storage annex which expands its total capacity from 32,000 to 54,000 tons. Grain is moved to and from the annex by a reversible conveyor belt. Even so, bottlenecks still occur in receiving due to the mismatched capacities of the drag conveyors and the elevator legs.

One of the six units at Rosario is leased to Paraguay. It has a 21,000-ton storage capacity of which an 8,000-ton portion is a concrete underground silo. The rest consists of a number of sheds in front of the elevator, reached by conveyor belts. Although the pier is 256 meters long, the largest at any of the facilities, only small ships can be serviced since the spouts are generally too low.

The biggest facility has a storage capacity of 125,000 tons. This was recently enlarged by 56,000 tons with the addition of an underground unit. The facility is in two parts, the one with a capacity of 75,000 tons receives by truck and rail, while the other receives only by truck. Unloading of trucks at the latter is sometimes delayed when ships are in port to be loaded. This is due to limited conveyor capacity which

allows only two of the four legs to be used for loading while simultaneously receiving trucks. The pier can handle two ships of under 150 meters or one if it is longer than that.

The Port of Bahia Blanca has a total storage capacity of 206,100 tons consisting of two main elevators and a third smaller unit (table 12).

The port has two loading piers and three berthing sites. However, access to the berth for large ships is difficult due to the slip-basin arrangement that allows little maneuvering room. In addition, constant channel and berth dredging is required due to heavy silting. The berths can load two ships simultaneously, but the effective capacity of the piers is reduced when vessels must remain at berth until high tides allow sufficient draft. There are other problems at Bahia Blanca. In the grain reception area, congestion often results from malfunctioning of the electronic weighing equipment in which case trucks have to be weighed on scales located away from the receiving area. One of the units receives railcars but has no berth so that grain has to be transfered for loading at another unit. At another berth, the loading spout is too low to reach across a ship.

The Port of Buenos Aires has a total storage capacity of 170,000 tons in one large concrete elevator (table 13). The shipping gallery berths three to five ships at one time. The volume of throughput in the old section of the elevator is limited by shipping capacity, while throughput in the new section is limited somewhat by receiving capacity.

Other grain ports have a combined storage capacity of just under 400,000 tons, about one-third of the total port capacity (table 14). But, because of their small individual size and their limited capacities for loading and unloading, these

Table 12--Port of Bahia Blanca, major grain handling, characteristics, 1979

Characteristics	Measurement
Number of units	3
Storage capacity	206,100 tons
Truck-receiving capacity	2,800 tons/hour
Rail-receiving capacity	3,000 tons/hour
Ship-loadout capacity	5,400 tons/hour
Length of pier	223-330 meters
Height of spouts	15.0-23.6 meters
Depth alongside pier	30-40 feet

Source: National Grain Board.

Table 13--Port of Buenos Aires, major grain handling capacities, 1980

Characteristics	Measurements
Number of units	1
Storage capacity	170,000 tons (20,000 under construction)
Truck-receiving equipment	Old: 2 hoist units, 1,000 tons/hour New: 2 platform scales, 600 tons/hour
Rail-receiving equipment	16 hoppers, 4 conveyors, 500 tons/hour each
Ship-loadout equipment	Old: 4 conveyors, 450 tons/hour each New: 2 conveyors, 1,200 tons/hour each
Height of spouts	19.6 meters
Barge unload	Portable pneumatic
Depth alongside pier	30 feet
Ship loadout capacity	4.2 million tons/year

Source: National Grain Board.

ports cannot serve the large grain tankers in service today. Several are outdated and inefficient in their operations.

GRAIN TRANSPORTATION

Truck and rail have dominated the internal movement of grains. Virtually all grain is moved from the farm to the first handler by truck. In addition, trucks account for approximately 58 percent of the grain movement to the ports (table 15). Most of the remainder moves to port by rail since only 2 percent moves by barge.

Rail Transportation

Rail lines radiate like spokes of a wheel from all major ports. For the most part, they were built specifically for the movement of commodities from the producer by the most direct route to the nearest port with few interconnections between cities.

Before 1946, ownership of most of the railways was in foreign hands. Four of the six major companies were British, one was French, and one was State owned. In 1946, they were nationalized and, in 1969, the system was renamed the Argentine Railways. Despite the operational consolidation, the system still consists of six different lines with three different gauges of tracks. This limits interchangeability of equipment.

Rail yards and lines were built early in the century to handle all export grain, then amounting to about 10 million tons. In the late 1970's, the railroads still handled about 10 million tons although rail shipments represented only about 40 percent of the grain exported.

Table 14--Lesser grain ports: Storage and handling facilities, 1980

Ports	Storage	Receiving	Shiploading
	1,000 tons	Tons per hour	
Handling capacities:			
Quequen			
Unit 1	80,000	1,400	2,200
Unit 2	13,000	340	850
San Nicolas	67,500	1,050	1,200
Sante Fe			
Unit 1	50,000	490	700
Unit 2	14,000	170	300
Villa Constitucion	55,000	1,900	1,000
Mar del Plata	25,000	480	700
Concepcion de Uruguay	23,200	1,000	1,000
Diamante	20,000	500	1,000
Barranqueras	19,600	300	500
San Lorenzo			
Unit 8	8,000	180	480
Unit 10	7,200	500	400
San Pedro	7,500	450	1,000
	Depth alongside pier	Length of pier	Height of spouts
	Feet		
Loading characteristics:			
Quequen			
Unit 1	30	324	22
Unit 2	--	--	--
San Nicolas	33	141	25
Sante Fe			
Unit 1	20	263	19
Unit 2	--	--	--
Villa Constitucion	33	165	20
Mar del Plata	27	250	NA
Concepcion del Uruguay	21	99	16
Diamante	19	177	20
Barranqueras	11	--	NA
San Lorenzo			
Unit 8	28	80	21
Unit 10	25	NA	16
San Pedro	35	190	24

-- = Not available.
Source: National Grain Board.

Table 15--Volume and percentage of grain entering ports by rail, truck, and barge, 1979

Port	Share			Volume
	Rail	Truck	Barge	
	Percent			1,000 tons
Bahia Blanco	48	52	0	3,984
Barranqueras	0	99	1	96
Buenos Aires	62	36	1	2,381
Concepcion del Uruguay	0	100	0	10
Diamante	1	99	0	96
Mar del Plata	0	100	0	43
Quequen	1	99	0	1,028
Rosario	57	43	0	4,009
San Lorenzo	5	95	0	217
Sante Fe	22	78	0	801
Villa Constitucion	29	71	0	1,527
San Nicolas	6	94	0	778
San Pedro	0	100	0	301
Ramallo	0	100	0	7
Total	42	58	2	15,278

Source: National Grain Board.

Problems in coordinating the rail system have always been encountered. The three different gauges prevent easy transfer of grain from one system to another. There were 21,630 miles of track in 1979. Of this, 68 percent was 40 years or older, 12.5 percent was 20 to 40 years old, 8.5 percent was 10 to 20 years old, and only 10.9 percent was laid in the previous 10 years. The condition of the tracks generally is poor and needs upgrading. This condition results in average operating speed of only 6.25 miles per hour as well as frequent derailments and the imposition of axleload limits.

A shortage of usable railcars has been a perennial problem. The total fleet consists of about 12,200 cars in various states of repair. Some 85 percent of the fleet is for use on the wide-gauge track only. Nearly 60 percent of these are over 40 years old, unbraked, in very poor condition, and with side-doors. Only 21 percent of the wide gauge boxcars are less than 10 years old and 13 percent are hopper cars.

About 575 grain cars are for use on the medium-gauge lines, representing 5 percent of total number of cars available in the system. Approximately 61 percent of these had air brakes and automatic center couplings, similar to the more modern ones used on the wide track. The older medium-gauge cars are also badly in need of maintenance. Hopper cars accounted for only 9 percent of the total.

Grain cars for standard-gauge track amounted to 11 percent of the total number available. This gauge track had the highest percentage of modern cars and also the highest percentage of hopper and braked cars.

The railcars are not as efficient as they might be. The average boxcar in Argentina is much smaller than those used in the United States: 45-50 tons of capacity compared to 75 tons. Hopper cars are much like the U.S. version, except that they have hand wheels and only on one side for opening and closing their gates rather than power controls on both sides.

During harvest, farmers and first handlers often encounter shortages of cars to move grain away from country elevator locations. However, the Argentine Department of Transport and Public Works points out that these shortages are not necessarily due to an insufficient number, but more so because the cars are often used for long periods for storage. In addition poor scheduling, lack of interchangeability among the gauges, and poor track conditions also contribute to slow turnaround time and reduced car availability.

The average turnaround time for cars varies considerably with the type of car (table 16). Ordinary boxcars are the least efficient requiring up to 20 days turnaround on some lines. The hoppers are generally more efficient and required only 3-10 days of turnaround. The delay in turnaround was indeed affected by intentional and inadvertent use of cars for storage. On the one hand, the loading and unloading facilities at some port locations were not particularly efficient. This problem was amplified by the fact that there was no demurrage charge for grain left in cars at the terminals. Thus, when port storage was inadequate to handle a large in-flow of grain, it was simply left in the cars at no direct cost to the shipper or receiver until space was

Table 16--Turnaround time by type of railcar, wide-gauge lines, 1979

Type of railcar	Railline			
	Roca	Sarmiento	Mitre	San Martin
	Days			
Boxcar	19.5	14.1	16.6	12.6
Grain bins	16.1	6.2	10.7	8.0
Grating grain bins	10.5	5.7	8.0	17.1
Converted grain bins	10.2	4.1	8.7	9.7
Hopper	10.4	3.5	9.2	10.1
Multiple use	19.6	7.0	11.0	10.3

Source: Ferrocarriles Argentinos.

available. Demurrage is not charged for railcars since both the cars and elevators are Government owned. Trucks, however, do receive demurrage and so are given unloading preference.

Although a relatively high number of railyards serve the ports, the cars generally spend a considerable amount of time being processed or waiting to be processed. Grain cars frequently remain in the yard as long as 3 days, in part due to a regulations requiring that 2.5 times the elevator's unloading capacity must be held each day in the yard.

The yards were built around the turn of the century and are generally in poor condition. They consist of numerous small bowls of short track used for receiving, classifying, and departuring operations. Trains arrive from various directions on different gauges of track resulting in inefficient movements from one size track to another. Arrivals and departures are slowed by antiquated signal and control systems and switching is frequently interrupted for long periods due to a shortage of switching locomotives. In addition, some of the yards do not have adequate holding space for empty and full cars and most of them are served by ladder tracks instead of the more efficient loop tracks.

The use of unit or block trains (in which only one type and grade of grain is shipped) could increase the loading and unloading rate, but these are not utilized extensively due to a lack of country-loading facilities and a lack of coordination between the National Grain Board and the Argentine Railways.

Truck Transportation

The pattern of roads is similar in appearance to the rail network; all of the major ones radiate to one or another of the port cities. In 1979, there were approximately 71,000 miles of roads of which 34 percent were paved, 25 percent were graded and improved, and 41 percent were unimproved. The main roads to the ports and major cities are two-lane with additional lanes in the proximity of the large urban centers. Roads are generally in good condition, although at greater distances from Buenos Aires or Rosario the quality decreases.

The grain is usually hauled either by grain merchants or the cooperatives who operate their own trucks or by other firms specializing in trucking. The latter are mostly short-haul, single vehicle operators but a few are multi-unit, long-distance haulers. Commercial trucks (both light and heavy) account for 25 percent of road traffic.

Trucks generally operate at a high cost because dirt roads in farm areas are rough and dusty thus increasing maintenance and operating costs and reducing the useful life of the vehicles. Another reason is the limited use of each truck. Trucks average only 61,000 miles a year compared to 160,000 miles in the United States.

Access to Major Ports

Some of the newer ports are served mostly by truck. The port of Rosario is served by road as well as by wide-and standard-gauge tracks of the Mitre and Belgrano railway lines. During peak periods, approximately 560 railcars and 600 trucks can be unloaded per day.

The road system leading into Rosario provides an excellent link from Santiago del Estero to the south, Sante Fe province to the north, and from Cordoba and parts of Buenos Aires province to the west.

Movement of grain trucks on the approach to Rosario is regulated. Trucks are directed to gather at a National Grain Board yard which holds 300 trucks. From this point, they are directed to various elevator units.

The port of Bahia Blanca is served only by road or wide-gauge tracks. In 1979, the rated capacity for grain reception was estimated at 300 railcars and 600 trucks per day.

Rail receiving and classification yards at Bahia Blanca appear sufficient for present requirements, but delays sometimes occur due to poor maintenance. In 1977, a peak of 260 railcars per day had been reached but the average was only 200 cars per day. A 14-track bowl is used for receiving, dispatching trains, shunting, car storage, and car maintenance, and repairs. Each track has a 20-to 30-car receiving-departing capacity. One switching locomotive switches grain cars at the elevator and shunts the empty grain cars for their return destination.

Roads to Bahia Blanca come from the large grain producing area in the southeast and west of Buenos Aires province. The roads, for the most part, are less than 20 years old and are all paved. Grain trucks entering the port area meet at the National Grain Board's waiting and classification yard where documents are controlled, grain is classifying and outgoing trucks are weighed prior to entering the receiving section at the elevator. This yard generally receives only 400 to 500 trucks per day.

The port of Buenos Aires is served by all six railroads including the medium-gauge, Urquiza line. However, there are no medium-gauge lines in the port area. Thus, grain arriving there must be transferred to other gauge railcars before entering.

Grain car arrivals at Buenos Aires sometimes exceed the storage capacity at the port and therefore cannot be unloaded. Such delays are in part due to the incongruity of the scheduled work hours for the port elevators and railroads. The railroads operate 24 hours a day, 7 days a week, while the port elevators operate only 114 hours per week during peak periods. Thus, grain often remains unloaded for as long as 1 week and, at times, as many as 350 cars wait in line.

The road system to the port of Buenos Aires is generally good although traffic jams occur during rush hours and there are some capacity limitations through towns and at rail crossings. Excellent connections are provided by the road system from southwest Buenos Aires province from the producing areas of the northwest and along the river.

Barge Transportation

The main inland waterway is the Parana River, which leads from northern Argentina to the port of Rosario and others on the River Plate estuary. The Parana River is navigable for barges over much of its length.

Barges have generally remained uncompetitive for grain transportation. A regulation that requires a minimum number of laborers on board has tended to make barges more costly than they would be otherwise. However, a more cogent reason is the fact that very little export grain is produced up river or in areas not accessible to a deep port by rail or truck. Should grain production spread northward to areas inaccessible to oceangoing vessels, barges could become more popular.

EFFICIENCY OF THE SYSTEM

Fixed costs are a large portion of the total cost of operating a grain marketing system. For this reason, full use of capacity and, in general, economies of size are important factors in determining costs. This makes costs sensitive to the levels of congestion, delays, and poor coordination of the flow of grain from the farm to final loading onto ships. The costs are affected seasonally and vary according to the size of the crop and the volume to be exported.

Port Efficiencies

Most costs at port elevators are fixed because of the relatively large investment in structures and machinery. Variable costs such as labor, fuel, fumigants, and maintenance are small by comparison.

For any given investment, economies of size may be achieved in fuller use of receiving and loading capacity. The average size boxcar in Argentina is smaller than in the United States. This small size raises unit costs since positioning and handling of small cars requires approximately the same amount of time as for larger ones. Inefficiencies also occur in loading. The relatively shallow depth at loading piers limits the size of the ship to be loaded.

Congestion at port raises the average cost due to the demurrage accruing from poor coordination. This added cost occurs frequently when arrival rate of grain is not fully synchronized with the storage or loading capacity of the elevator. To cope with this situation during peak periods, the National Grain Board passed Regulation number 1,825 in January 1977 which, among other things, established quotas on the delivery of grain to the ports to more nearly match arrival of ships and port capacities.

The turnover ratio varied widely from port to port (table 17). The most efficient operations were at the port of Villa

Table 17--Annual turnover ratios at major Argentine grain ports, 1980

Port	Annual turnover ratio
Rosario	15.2
Bahia Blanca	10.8
Buenos Aires	11.7
Quequen	6.2
San Nivolas	6.6
Sante Fe	5.3
Villa Constitucion	26.4
Mar del Plata	.8
Diamante	2.4
San Lorenzo	24.8
San Pedro	40.3
All ports	12.1

Source: National Grain Board.

Constitucion, San Lorenzo, and San Pedro with the amount of grain each handled in a year in excess of 25 times their respective capacities. The least efficient one was Mar De La Plata with a turnover of less than 1.0. Turnover at the three large ports was in the 10 to 15 range.

Single commodity elevators are usually more efficient because they require less coordination than multicommodity ones. However, since harvests do not occur throughout the entire year, most of major port elevators were not single commodity houses although some concentrated more on some grains than on others (table 18). Among the lesser ports, some tended to specialize while others also conducted a substantially mixed business.

Grain arrives at export points in a definite seasonal pattern. However, the harvest period for any one crop varies from north to south and the harvests for different commodities are staggered enough to extend the shipping season and arrivals at port of one grain or another through much of the year even though onfarm and country elevator storage is limited. Thus, during the first quarter of the calendar year, the flow is mostly wheat, while in the third quarter it is mostly soybeans and coarse grains. Corn and soybeans dominate in the interim periods. At Bahia Blanca, wheat accounts for 48 percent of all grain receipts and 50 percent of its total annual volume is received in the first quarter of the year. At Mar del Plata and Quequen, 90 percent of the grain handled is wheat and 55 to 65 percent of their annual export business is handled in the first quarter. At Sante Fe, which handles mainly soybeans, about 75 percent of its annual volume is

Table 18--Mix of grains handled at various ports, 1979

Port	Wheat	Corn	Sorghum	Soybeans
	Percent of total at port 1/			
Rosario	20	36	14	29
Bahia Blanca	48	10	40	0
Buenos Aires	8	54	17	14
Quequen	89	2	0	0
San Nicolas	2	63	0	35
Sante Fe	4	4	90	2
Villa Constitucion	11	59	16	15
Mardel Plata	100	0	0	0
Diamante	0	29	55	16
San Lorenzo	10	29	0	61
San Pedro	5	63	10	22

Source: National Grain Board.

exported during the second and third quarters. However, at the port of Rosario, there is a nearly even temporal distribution of grains exported; 55 percent of its exports leave in the first half of the year and 45 percent in the second half.

There have been some changes in the share of export grains handled at different ports (table 19). Buenos Aires and the other ocean ports seem to have decreased their export share, while the percentage of grains exported from upriver ports has increased substantially. In 1976-81, the upriver ports accounted for over 50 percent of all grain exports whereas 5 years earlier the share had been just over 40 percent. Much of this growth is due to increases in soybean production. Even so, the volume increased at all ports except Mar del Plata.

The monthly throughput for all Argentine ports from 1979 to 1980 averaged only 28.6 percent of the monthly maximum (table 20). However, this varied widely from month to month as indicated by a standard deviation of nearly 28 percent. At 10 of the 11 major ports, the ratio was higher during 1977-1980 than during the earlier years, 1973-1975. This higher ratio indicates improved efficiency despite greater month-to-month variation at nine of them.

Different transportation systems generally have different cost functions. Higher fixed costs and lower operating costs per ton-mile are usually associated with more complex systems such as railroads while it is less so for trucks and barges.

Table 19--Percentage of grain exports by port area

Port area	1973-75 average	1976-80 average
	Percent	
Upriver ports	41	51
Buenos Aires	30	22
Ocean ports	29	27

Source: Data from National Grain Board.

Table 20--Ratios of monthly throughput to maximum throughput, weighted by annual production of all grains

Port	1973-1975		1977-1980	
	Monthly average throughput ratio	Standard deviation	Monthly average throughput ratio	Standard deviation
	Ratio	S.D.	Ratio	S.D.
Rosario	0.266	0.101	0.475	0.234
Bahia Blanca	.364	.161	.490	.279
Buenos Aires	.450	.179	.454	.277
Quequen	.173	.094	.229	.191
San Nicolas	.128	.086	.210	.258
Sante Fe	.193	.168	.224	.234
Villa Constitucion	.235	.104	.460	.278
Mar del Plata	.219	.256	.044	.081
Diamante	.014	.019	.028	.144
San Lorenzo	.150	.200	.188	.195
San Pedro	.271	.216	.342	.268
All ports	.224	.191	.286	.279

Source: Data from Foreign Agricultural Service, USDA, and National Grain Board.

Rail and truck rates for grains are regulated and adjusted seasonally. They are generally about 15 to 20 percent higher from April to May, after corn, grain sorghum, and soybean harvests begin, than they are during the January-February period following wheat harvest. Truck rates tend to be lower for hauls of less than 150 miles while rail rates tend to be lower for the greater distances (table 21). The fact that two-thirds of the export grain is produced within 150 miles of a port is one reason why the trucking industry has thrived and rail service has been uncompetitive for much of the grain

Table 21--Truck and rail rates, January 1980

Distance (km)	Truck	Rail
	1,000 pesos/100 kg	
100	14.19	18.00
150	12.15	20.30
200	22.11	22.70
250	25.15	25.10
300	28.18	27.60
400	34.56	32.60
450	37.29	34.70
600	46.40	42.00

Source: National Grain Board.

handling. The breakeven point varies, however, with the time of year, the type of grain, and the applicable rates.

The railroads have tried to compete with trucks through seasonal rate adjustments and discounts. For example, in June 1980, a 13-percent discount was offered on shipments of 90 tons; an additional 12 percent was offered for 200 tons or more. When these discounted rates are compared with truck rates at that time, the breakeven point for the two modes of transportation was reduced to 140 miles.

This breakeven analysis suggests that the overall system is reasonably efficient in moving grain from first handler to port. As indicated earlier two-thirds of the grain is produced within the 150-mile distance from ports. This concentration of production coincides with the average percentage of grain moved to the ports by truck during that period.

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