United States Department of Agriculture
Economic Research Service
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Effect of Spain's Entry into the European Community on the Demand for Imported Corn

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EFFECT OF SPAIN'S ENTRY INTO THE EUROPEAN COMMUNITY ON THE DEMAND FOR IMPORTED CORN, by Stephen W. Hiemstra, Agriculture and Trade Analysis Division, Economic Research Service, U.S. Department of Agriculture. Staff Report AGES870916.

ABSTRACT

The U.S. share of corn exports to Spain is likely to drop from its fourth-place rank in 1984 because of Spain's entry into the European Community in 1986. Non-EC Spanish corn imports are expected to decline rapidly between now and 1995 because of the substantial price increases associated with the EC grain policy. Uncertainty exists, however, with respect to the precise level of imports. This report examines the structure of the Spanish corn market, reviews the policy changes outlined in the accession agreement, and analyzes the demand for imported corn. A segmented demand curve is used to study the effects of price changes on the various Spanish industries which use corn.

Keywords: Spain, corn, import demand, European Community, enlargement, agricultural policy, U.S. trade.

Notes: The peseta is Spain's official currency unit. This report uses these exchange rates:

Pesetas per U.S. dollar

1970	69.59	1975	59.77	1980	79.25
1971	65.90	1976	68.29	1981	97.45
1972	63.45	1977	80.91	1982	125.60
1973	56.85	1978	70.11	1983	156.70
1974	56.11	1979	66.15	1984	173.40

This report uses metric units. These conversions apply:

1 kilogram (kg) = 2.2046 pounds
1 metric ton (mt) = 2,204.6 pounds
1 liter (lt) = 1.0567 U.S. quarts
1 hectare (ha) = 2.471 acres

1301 New York Avenue, NW.
Washington, DC 20005-4788

October 1987

ACKNOWLEDGMENTS

Support for this study was provided, in part, by the Feedgrain and Livestock Project funded by the U.S.-Spain Joint Committee for Scientific and Technological Cooperation under terms of the 1983 Agreement on Friendship, Defense, and Cooperation Between the United States of America and the Kingdom of Spain. Jim Butcher and Whetton Reed, International Research Division, Office of International Cooperation and Development, U.S. Department of Agriculture, were instrumental in arranging financial and administrative support for this work. Reed Friend, Mark Newman, and Cheryl Christensen, Developed Market Economies Branch, Agriculture and Trade Analysis Division, Economic Research Service, provided administrative support and technical advice for the project.

Numerous colleagues reviewed early drafts of this study. Among them are Carlos Arnade, John Dunmore, Gene Hasha, Mike Herlihy, Dale Leuck, William Lin, and Jerry Sharples (in alphabetic order) of the Economic Research Service, Alan Riffkin of the Foreign Agricultural Service, Marshall Martin of Purdue University, and Luis Miguel Albisu of the Diputacion General de Aragon in Zaragoza, Spain.

Bonita Moore and Enid Hodes of the Economics Management Staff provided helpful editorial assistance.

ABBREVIATIONS

ACA	Accessory compensatory amount
ASF	African swine fever
CAP	Common Agricultural Policy
CIF	Cost, insurance and freight
ERS	Economic Research Service
EC	European Community
ECU	European Currency Unit
EMS	European Monetary System
FEFAC	Federation Europeene des Fabricants Agricole Comun
FAS	Foreign Agricultural Service
GNP	Gross national product
GATT	General Agreement on Tariffs and Trade
IMF	International Monetary Fund
MCA	Monetary compensatory amount
OECD	Organization for Economic Cooperation and Development
SENPA	Servicio Nacional de Productos Agrarios
STM	Supplementary trade mechanism

CONTENTS

SUMMARY

This paper analyzes the effect of Spain's entry into the European Community (EC) on U.S. corn exports. The analysis reviews the structure of Spanish feed and livestock markets, analyzes provisions of the accession agreement, and estimates corn imports from non-EC suppliers for 1995.

Spain was the fourth largest market for U.S. corn exports in 1984. Spain is a large market for corn because an arid climate makes corn and forage expensive to produce, consumer demand for meat is growing, and past policies have permitted domestic livestock producers to import corn during seasons of short supply. The major livestock products are pork, dairy products, chicken, beef, and eggs. Spain is also a major producer of isoglucose, a sweetener made from corn. These different uses of corn form three separate corn demand segments which reflect the likelihood of substitution away from corn as price increases occur.

Spain's entry into the EC in 1986 threatened the United States with a loss of this market by raising corn production and lowering corn consumption. The primary policy instrument responsible for this effect is the EC variable levy which has been used to insulate EC domestic corn prices from price changes occurring in the world market.

Although Spanish and EC producers benefit from a transition period of up to 10 years following enlargement, non-EC suppliers were immediately confronted with the variable levy on March 1, 1986. The price of imported corn rose roughly 55 percent after enlargement because of differences in the Spanish and EC threshold prices.

Concern over loss of access to the Spanish grain markets led to a series of discussions between the United States and the EC under Article 24-6 of the General Agreement on Tariffs and Trade. The agreement reached in these discussions permits Spain to import up to 2 million metric tons of corn and 300,000 tons of sorghum from non-EC suppliers, such as the United States, annually until 1991.

Spanish corn imports are expected to decline rapidly in coming years, although the precise level of imports remains uncertain. Projections of total Spanish corn imports in 1995 indicate corn imports from all destinations are likely to vary between 1.4 and 2.7 million tons in contrast to the 3.6 million tons imported on average from 1982 to 1984. The level of non-EC imports remains uncertain because it is unclear how the European Commission will administer the 24-6 agreement, how much corn will be imported from EC member states, and how much the use of corn substitutes in livestock and feed rations will grow.

The United States' competitive position in the Spanish corn market in the next decade can be improved by meeting the needs of Spain's poultry, starch, and isoglucose industries, by monitoring EC policy developments, and by improving the ability of U.S. producers to supply the preferred qualities of corn at a reasonable price.

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INTRODUCTION

Spain was the United States' fourth largest corn export market in 1984 with imports valued at $286.8 million. Corn exports made up about 35 percent of the value of U.S. agricultural exports to Spain that year which helped to make Spain the United States' ninth largest agricultural export market.

On March 1, 1986, Spain began to implement the agricultural provisions of its accession agreement with the European Community (EC). EC membership is expected to affect Spanish imports of U.S. corn through imposition of the variable levy, increased imports of grain from other member states, and intervention in livestock markets.

Concern over loss of access to the Spanish grain markets led to a series of discussions between the United States and the EC under Article 24-6 of the General Agreement on Tariffs and Trade (GATT). The agreement reached in these discussions permits Spain to import up to 2 million metric tons of corn and 300,000 tons of sorghum from non-EC suppliers, such as the United States, annually until 1991 at levy-reduced prices (Newman, 1987).

This paper analyzes the effect of Spain's entry into the EC on U.S. corn exports. It begins with an analysis of the supply and demand for corn in Spanish markets and the transition from Spanish to EC intervention policies. It then projects Spanish corn imports through 1995 and analyzes implications for U.S. corn exports.

SUPPLY AND DEMAND FOR CORN IN SPAIN

Factors influencing corn demand are in the medium term more important than supply factors in explaining the effect of EC membership on the Spanish corn market.

The price of corn imported from non-EC suppliers rose roughly 55 percent as Spain began participation in the Common Agricultural Policy (CAP) in March 1986. This price rose because the Spanish threshold price was substantially below the EC threshold price prior to enlargement and because no transition period applies to changes in the threshold prices. The corn price increase is expected to eliminate corn feeding to cattle and swine, to reduce feeding to broilers and layers, and to have little effect on industrial use. Demand is most elastic for swine and cattle, less elastic for broilers and layers, and least elastic for industrial users.

Relatively little change in the Spanish corn supply situation is expected to accompany enlargement in the short run. Spain is an arid country and most

corn is produced on irrigated land. Domestic support prices are expected to rise only 10 percent and little change in relative prices among the different crops is foreseen. Barley production is more likely than corn or wheat production to increase with enlargement because it can be grown in dry areas where few alternative crops are available and land resources may still be brought into production.

Determinants of the Demand for Corn

The demand for corn is derived from the demand for livestock and other products. The relatively modest income of Spanish consumers, $4,900 per capita in 1984 (International Monetary Fund) is responsible for meat consumption levels below levels in the United States and northern EC member states. Growth in meat consumption is closely linked to growth in consumer income and population (Tio, 1986, p. 78).

Personal income has grown rapidly in Spain since World War II. Over the 1965-73 period, growth in real gross national product (GNP) exceeded 4 percent every year and has averaged 1-2 percent since 1973 (OECD, 1985). The absolute level of income, however, remains low with a large segment of the population still employed in agriculture, a high proportion of personal income spent on food, and substantial unemployment associated with a slowdown in economic growth. Population growth has been fairly steady since 1960 at just over 1 percent annually in the 1960's and just under 1 percent annually in the 1970's (Tawil, 1986).

Although unemployment in Spain is high, EC membership is likely to hurt Spanish economic growth over the course of the transition period (Wall Street Journal, 1985; Lieberman, 1985). 1/ Spain has large banking, shipbuilding, steel, textile, and other industries that will have trouble competing in the EC market once historically high tariffs are eliminated. Spain is, therefore, likely to suffer a period of lower growth rates as these industries restructure to meet this new competition. This lower rate of growth during the adjustment period will translate into lower rates of growth in consumption of livestock and poultry products and, as a result, into a reduced rate of growth in the use of energy feeds, such as corn.

The demand for corn and corn substitutes depends on feed demand by cattle, swine, broilers, and layers, and on demand for food and industrial uses. Cattle and swine production is separated from broiler and layer production because cattle and swine can use a greater variety of feeding materials in meeting nutritional requirements than can poultry. At higher corn prices, nongrain feeds like manioc and sugar beet pulp can be substituted for corn in cattle and swine rations, but their high fiber content precludes use in poultry rations (Leuck, 1985, p. 15). For this reason, EC member states that specialize in swine and cattle production, such as the United Kingdom, the Netherlands, and West Germany, no longer import significant amounts of corn for livestock feeding (European Commission, 1986, p. 433).

1/ A recent study (Kaler and Ludolf, 1986) reviewed the EC and Spanish nonagricultural product tariff schedule changes accompanying enlargement and analyzed their effect on U.S. suppliers, given elasticities estimated in a study of U.S. import behavior. This study concluded that U.S. suppliers are likely to be disadvantaged by these changes primarily as Spanish suppliers displace U.S. suppliers from the EC market. The net benefit to Spain was, however, not assessed.

Table 1--Raw materials used in Spanish feed manufacturing, 1978

Item	Volume		Value	
	1,000 metric tons	Percent 1/	Million pesetas	Percent 1/
Cereal	5,602	62.2	62,788	51.1
Corn-imported	2,267	25.2	27,127	22.1
Corn-domestic	689	7.0	8,149	6.6
Barley	2,077	23.1	21,890	17.8
Oats	41	.5	410	.3
Other cereals	528	5.9	5,211	4.2
Alfalfa	207	2.3	1,962	1.6
Byproducts	1,026	11.4	14,854	12.1
Flour milling	504	5.6	5,073	4.1
Rice milling	45	.5	364	.3
Brewing	10	.1	92	.1
Sugar refining	114	1.3	843	.6
Manure	66	.7	813	.7
Fruit canning	8	.1	76	.1
Dairy processing	70	.8	2,497	2.0
Meat processing	125	1.4	2,497	2.0
Fish processing	68	.8	2,518	2.1
Wine production	15	.2	81	.1
Oilseed meal	1,623	18.0	32,665	26.6
Soybean meal	1,439	16.0	29,952	24.4
Other inputs	222	2.5	4,484	3.7
Minerals	319	3.5	6,046	4.9
Total	8,999	100.0	122,799	100.0

1/ Percentages may not sum to totals due to rounding. 2/ Includes molasses.
Source: (Ferrer-Falcon, 1980).

Substitution Effects in Livestock and Poultry Feeding

The speed and extent to which nongrain feed ingredients substitute for imported corn in Spanish livestock rations following EC membership and the expected grain price increases are an important area of controversy. Although Spain's feed-manufacturing industry is technologically advanced, the industry has little experience with cereal substitutes both in terms of farmer acceptance and knowledge of animal nutrition. It is, therefore, unclear as to what extent the industry will make use of the technically substitutable feed ingredients available.

In 1978, nongrain feeding ingredients made up 11.4 percent and imported corn made up 25.2 percent by volume of all raw materials used to manufacture Spanish livestock feeds (table 1). Limits on forage production and the small

Table 2--Production of compound feeds in Spain, 1979-83

Item	1979	1980	1981	1982	1983
			Percent		
Share of total production:					
Swine	38.9	39.9	37.2	36.1	33.0
Poultry	34.4	34.4	34.7	33.0	35.9
Broilers	14.3	14.9	15.3	14.6	16.3
Layers	16.2	15.5	16.0	15.2	15.6
Cattle	17.8	16.4	18.8	18.9	21.2
Beef animals	8.1	6.5	7.6	8.6	8.9
Dairy animals	7.2	7.0	7.9	7.8	9.2
Sheep and goats	3.7	3.7	3.9	4.5	4.3
Other species	4.8	4.7	4.3	5.4	5.1
Rabbits	4.0	4.1	3.8	4.7	3.9
Nutrient additives, etc.	.4	.8	1.1	2.1	.5
			1,000 metric tons		
Total production	10,475	11,232	13,142	13,190	12,432

Source: (Ministerio, 1984a, p. 595).

size of dairy herds, the importance of poultry production, and the almost uninhibited importation of corn prior to EC membership have motivated Spanish livestock producers to utilize a higher proportion of feed grains in mixed feeds than any other member state. The proportion ranged in the EC from 19.4 percent (Netherlands) to 59.2 percent (Italy) in 1980 (European Commission, 1986), while it was 62.2 percent in Spain in 1978, the closest comparable years (also see table 2).

Spain's sophisticated feed-manufacturing industry makes rapid changes in livestock rations feasible. The changes accompanying enlargement will likely vary by region and by season. Regional variation can be attributed to differences in the availability of locally produced corn, byproduct feeding materials, and port facilities; differing rates of regional development of intensive livestock enterprises; and a general tendency of farmers to specialize either in crop or livestock production rather than to combine the two. The well-developed pork and poultry enterprises in Catalonia, for example, owe much to the generally advanced industrial development, a strong demand for livestock products derived from the concentration of population, and the close ties with U.S. feed-manufacturing firms. Seasonal variation arose in the past because import restrictions were placed on corn when barley surpluses accumulated and French corn would enter the Spanish market during the harvest season.

Table 3--Andalusia: Spanish swine and broiler least-cost feeding rations, June 1985 1/

Ingredients	Actual price	Price bounds for market hogs 2/		Price bounds for broilers 3/	
		Lower	Upper	Lower	Upper
	Pesetas per kilogram				
Barley	22.50	19.62	23.53	--	22.42
Molasses	14.00	--	23.31	--	--
Wheat bran	19.00	--	20.90	--	--
Sunflowerseed meal 38%	21.00	17.28	27.74	--	--
Soy meal 44%	33.00	22.58	38.75	20.78	34.43
Spanish corn	29.50 *	--	23.35	16.25	29.57
Sorghum 4/	900.00 *	--	23.11	--	--
Soft wheat	24.50 *	--	23.37	--	23.80
Alfalfa	19.50 *	--	4.77	--	--
Lard	88.00 *	--	23.35	87.14	129.07
Fish meal 63%	73.00 *	--	48.77	61.39	90.14
Powdered milk	110.00 *	--	37.36	--	40.24
Meat flour 45%	40.00	--	--	--	--

* Considered for the ration. -- = Not applicable. 1/ Mineral supplements excluded from table. 2/ Market hogs 30 kilograms to slaughter. Ration cost: 23.71 ps/kg. 3/ Ration cost: 34.15 ps/kg. 4/ The price was set unrealistically high to exclude sorghum from the ration.

Source: A consultant on ration formulation in Spain.

A given feed ingredient is included in the ration when its market price falls within the price bounds derived from the linear programming analysis and is excluded otherwise. Table 3 lists sample least-cost rations for market hogs and broilers for two firms in Andalusia. 2/ Andalusian barley is the primary energy source for the swine ration, and Andalusian corn is the primary energy source for the broiler ration. No U.S. corn enters either ration. Andalusian sunflowerseed meal enters the swine ration in limited quantities, but soybean meal, locally crushed but mostly of U.S. origin, is the dominant protein source for both the swine and broiler rations. Sunflowerseed meal and barley are avoided in broiler rations because of their black color and high fiber content.

Imported corn is the primary energy source in Catalonian swine and broiler rations, but U.S. corn did not appear to be price competitive in 1985 (see table 4). 3/ Argentine corn (flint varieties) was used exclusively in the

2/ Andalusia is an important corn production region in south-central Spain. Andalusia produced 19 percent of Spain's 1982 crop (Tawil, 1986).

3/ Catalonia is an important livestock region in northeastern Spain dependent on imported corn and soybeans for its feed rations. Catalonia produces 35-40 percent of Spain's commercial feed (Vandenberghe, 1981, p. 30).

Table 4--Catalonia: Spanish swine and broiler least-cost feeding rations, September 1985 1/

Ingredients	Actual price	Price bounds for market hogs 2/		Price bounds for broilers 3/	
		Lower	Upper	Lower	Upper
		Pesetas per kilogram			
Barley	23.65	--	9,999.00	--	--
U.S. corn	28.50	15.00	40.00	--	--
Wheat	26.75 *	--	20.00	--	--
Soy meal 44%	30.80	--	9,999.00	--	--
Meat and egg flour 45%	37.00	--	6,000.00	--	--
Lard	77.70 *	1.00	1.50	2.00	3.50
Argentine corn	28.40	--	--	--	9,999.00
Soy meal 48%	35.00	--	--	--	9,999.00
Fish meal 60%	56.20	--	--	--	3.00

* Forced into the ration. -- = Not available. 1/ Mineral supplements excluded from table. 2/ Ration cost: 28.63 ps/kg. 3/ Ration cost: 352 ps/kg.
Source: A manufacturer of mineral supplements in Spain.

broiler ration presumably because of its dark, yellow color and the Spanish preference for yellow chicken meat. U.S. corn (dent varieties) was, however, used in the swine ration along with local barley and feed wheat. Soybean meal, largely of U.S. origin, was the primary energy source for both rations and competed successfully with fish and meat meals.

Spain's participation in the CAP probably rules out the rations given in tables 3 and 4. Prior to accession, Spain subsidized exports of cereal substitutes, such as sugar beet pulp. Such subsidies are not permitted under the CAP. Furthermore, if domestic corn prices in Spain rise to the EC threshold price (an increase of roughly 55 percent), then imported corn falls out of three out of four of these rations seasonally whenever EC corn becomes unavailable.

Income Effects in Livestock and Poultry Feeding

The increase in grain prices, which will accompany Spain's participation in the EC, will not only induce a substitution away from grain in feed rations, it will also likely result in income effects. Income effects are likely to the extent that feed manufacturers are unable to substitute away from high-priced grain and the higher grain prices are passed along to livestock and poultry producers in the form of higher feed prices. The extent to which feed prices are likely to rise depends heavily on the structure of the Spanish livestock and poultry industries.

Swine. Policies designed to improve swine husbandry and marketing affected the Spanish industry more than did swine support price policies over the past

two decades (Kelch, 1982, pp. 46-48). Improvements in swine health and nutrition, breeding stock, and incentives for marketing leaner pigs made it possible for swine slaughter to triple while herd size did not quite double. More recently, structural policies have encouraged vertical integration of farrowing and finishing activities within an enterprise to reduce the likelihood of transmitting African swine fever (ASF) between enterprises. Feed cooperatives that either own swine operations outright or provide feed and technical advice to their members encourage vertical integration. The importance of these cooperatives in the Spanish market and the scarcity of forage crops have meant that vertical integration is almost always synonomous with increased confinement feeding and greater reliance on manufactured feed.

In Spain, the Servicio Nacional de Productos Agrarios (SENPA--a government intervention agency) has in the past intervened to support official prices by purchasing pork when prices fall below the reference price and by selling stocks or importing pork when prices rise above reference levels (Kelch, 1982, p. 48). By contrast, EC intervention is optional and can take the form of purchases, aids for private storage, or export refunds when prices fall below the "sluicegate" price. When prices rise above the sluicegate price, stocks can be released or pork can be imported. EC support prices are substantially above those in Spain, but EC market prices are substantially below official prices because the EC has increasingly not intervened (European Commission, 1981b; Ministerio, 1985, p. 105).

Spanish pork production more than doubled from 1970 to 1982, rising from 492,000 to 1,115,000 tons. Spain has remained roughly self-sufficient in pork production throughout the 1980's. In 1982, pork accounted for 44 percent of total meat production and 21 percent of the value of livestock products (202 billion pesetas in 1983), making it Spain's single most valuable livestock product (tables 5 and 6).

Milk. The Spanish dairy industry uses a higher proportion of manufactured feeds than industries in other West European nations because Spain's generally arid climate limits forage production to certain northern coastal areas. Given current trends in technological and structural adjustment, the Spanish industry is expected to make more efficient use of manufactured feed in the future.

In 1982, dairy enterprises with fewer than 10 cows made up 93 percent of the dairies surveyed in the census of agriculture in contrast with 53.2 percent in other EC member states (Diputacion, 1985, p. 339). 4/ Spanish cattle suffer from disease problems, including tuberculosis, mastitis, and brucelosis, particularly in the northern provinces where electrical power is not available. Spain experiences annual milk surpluses from spring through summer and deficits from fall through winter (Ministerio, 1985b, pp. 59-60). Milk production increased more than 50 percent in 1970-82, rising from 4,895,000 liter to 6,481,000 liters (Tawil, 1986). Spain has been roughly self-sufficient in fluid milk production since the early 1960's, although per capita consumption remains below that of northern EC member states. In 1982, milk accounted for 19 percent of total expenditures for livestock products (188 billion pesetas), making it Spain's second most valuable livestock product (see table 5).

4/ The average Spanish dairy operation has seven cows, while the EC-10 has an average of 14 (Tio, 1986, p. 61).

Table 5--Spain: The value of selected agricultural inputs and products

Item	1970	1975	1980	1983 1/
		Billion pesetas		
Agricultural production	469	910	1,856	2,581
Crops 2/	250	509	1,042	1,404
Cereals	31	67	183	160
Industrial crops 3/	16	34	69	116
Forages	4/	2	3	4
Vegetables	42	88	174	245
Wine and products	13	31	86	86
Oil crops	14	30	54	114
Citrus crops	12	22	47	102
Livestock products 2/	185	350	675	980
Meat	84	191	381	574
Milk	31	67	136	188
Eggs	21	32	64	87
Wool	1	1	2	2
Forestry products	22	32	99	147
Total input cost 2/	104	222	544	900
Seeds	5	10	18	24
Mixed feeds	52	107	262	463
Fertilizer	17	38	83	107
Energy	8	21	53	103

1/ Preliminary. 2/ Total includes items not listed. 3/ Cotton, sugar, tobacco, etc.

Source: (Ministerio, 1984b).

Cattle. The higher price supports offered under the CAP are likely to increase the rate of structural and technological adjustment in the dairy and beef industries and, as a consequence, to stimulate even greater use of manufactured feeds because of Spain's limited forage production potential.

The close tie that exists between Spain's beef and dairy markets produced some tension between EC and Spanish negotiators because of the cost and social importance of these policies. The EC unsuccessfully attempted to persuade Spain to purchase surplus beef stocks as a prerequisite for EC membership. As a means of discouraging intervention buying, it also discouraged expansion of Spanish beef production by refusing to certify Spanish slaughterhouses under EC health regulations (Eroski, 1985).

Beef production increased a modest 36.2 percent in 1970-82, rising from 308,200 tons to 419,900 tons. Although occasionally self-sufficient, Spain often imports 5-10 percent of its total beef supply. Beef accounted for 16.6 percent of Spain's total meat production in 1982 and 15 percent of the value

Table 6--Spain's self-sufficiency ratios in grains, oilseeds, meats, poultry, and eggs 1/

Product	1980	1981	1982	1983	1984	1985
	Production as a percentage of use					
Wheat	136	83	97	83	101	101
Rice	131	120	108	60	114	114
Corn	36	26	31	30	53	51
Barley	117	79	79	86	113	91
Rye	126	85	75	99	100	NA
Oats	93	89	97	101	158	NA
Sorghum	38	8	21	9	21	33
Pork	99	100	97	99	100	99
Beef	97	100	93	96	91	99
Poultry	99	99	99	99	99	98
Eggs	106	103	104	103	101	101
Oilseeds	16	18	14	22	24	36
meal	97	98	104	102	94	84

NA = Not available. 1/ Marketing years beginning in year shown.
Source: Supply-utilization tables from the Foreign Agricultural Service, U.S. Department of Agriculture.

of livestock products (151 billion pesetas in 1983), making it Spain's third-most valuable livestock product behind pork and milk.

Broilers. Spain has one of the most efficient broiler industries in Western Europe and is likely to remain a big corn user. The dry climate reduces energy requirements and disease problems. Price stabilization, modern husbandry techniques, and close links to the feed manufacturing industry accelerated the rate of technological advance (Lopes, 1979).

The broiler industry has been Spain's largest consumer of imported corn because of Spanish consumers' preference for yellow chicken meat. Birds require a compact, low-fiber, high-energy diet if they are to perform well (National Research Council, 1977, p. 4). As much as 40 percent of the volume of high-energy swine rations and 70 percent of poultry rations have normally come from corn (Kelch, 1982, pp. 48-49; Del Valle-Pintos, 1985, pp. 1-5). Wheat and sorghum are preferred as corn substitutes in poultry rations over barley, rye, oats, and nongrain feeds because of their low-fiber content. Since there is little sorghum production in the EC, EC feed wheat is the most likely substitute to enter Spanish poultry rations after EC enlargement. Limits on the availability of feed wheat will, however, invariably lead to continued use of corn in broiler rations.

Although Spain intervenes to stabilize broiler prices, neither Spain nor the EC provides broiler price support. Previous attempts to support broiler

prices failed because of the short life-cycles of the birds and the rapid accumulation of stocks. The only support for broilers under the CAP is an export refund, like that for pork, calculated from a sluicegate price designed to reimburse producers for the high cost of EC grain (European Commission, 1981b, pp. 32-34). Although this refund appears to have a subsidy component (Magiera, 1982), French producers benefiting from this subsidy have recently gone bankrupt (Agra Europe, 1986, pp. m/3-m/5).

Spanish broiler production almost doubled in 1970-82, rising from 499,000 tons to 849,000 tons. Spain has remained roughly self-sufficient in broiler production throughout the 1980's. In 1982, broilers accounted for 34 percent of total meat production. In 1983, they accounted for 12 percent of livestock product value, making it Spain's fourth-most valuable livestock product (see tables 5 and 6) (Tawil, 1986).

Layers. Spain's egg industry is highly efficient and is likely to remain an important market for imported corn. Corn is an important input in egg production because it is easily digested, it is high in both yellow pigment and vitamin A, and it has a good proportion of proteins (Mainardi, 1984, p. 110). In 1983, layers were the fourth largest consumer of mixed feeds in Spain behind swine, cattle, and broilers (see table 2).

Eggs are sold competitively on both the Spanish and EC markets without domestic price intervention and are viewed as processed feed grains in EC policy, the same as pork and broilers (European Commission, 1981b, p. 32).

Egg production almost doubled in 1970-82, rising from 600,200 million dozen to 1,016,800 million dozen. Spain typically exports 1-5 percent of its production. The Netherlands is its primary export market. In 1983, eggs accounted for 87 billion pesetas in sales making eggs Spain's fifth-most valuable livestock product (see tables 5 and 6).

Poultry and Livestock Industries' Importance. The importance of poultry products, the dietary requirements of poultry, the technological and structural changes in cattle and swine production, and the scarcity of Spanish forage products all suggest Spain's increased use of manufactured feeds. The dietary requirements of the different animal species suggest that the value of corn differs by specie and that corn's value is highest for use in poultry rations and lowest for cattle and swine rations.

The top five livestock products, pork, dairy, beef, broilers, and layers, accounted for 76.1 percent of the total value of livestock products in 1983. These livestock consumed 90.2 percent of total compound feed production (see tables 2 and 5). The remaining species, sheep, goats, and rabbits, feed primarily on forage and grass products and have little effect on the corn market.

Food and Industrial Uses of Corn

The absence of good corn substitutes for industrial uses suggests that corn will continue to be used in industrial production despite of the price increases accompanying enlargement. Industry uses corn to produce cooking oil, syrup and sweeteners, alcohol, starch, and related products. Spaniards consume relatively little corn meal or fresh corn (Ministerio, 1984a, p. 657).

Corn will likely remain the preferred input of Spanish starch manufacturers for the coming decade. It has a higher starch content than wheat or potatoes, and it is simpler and less costly to manufacture. 5/ Some EC member states have responded to the price incentive to manufacture starch from wheat, but the transition to using wheat is incomplete even in the most advanced countries. Consequently, it is unlikely that current trends in Spain's starch production will be significantly altered until after the transition to full participation in the CAP (Leuck, 1986).

Spain produced 113,000 metric tons of the liquid sweetener isoglucose in 1984, and it will be the largest isoglucose producer in the enlarged EC. Under terms of the accession agreement, Spain will be allowed to produce 83,000 tons of isoglucose annually (Tio, 1986, pp. 165-67). The Commission regulates isoglucose production because the availability of a low-cost sugar substitute raises the cost of supporting the price of beet sugar.

Structure of Supply

General climatic constraints restrict corn production in Spain to irrigated land where it competes with other high-valued crops. In view of the relatively small price changes confronting producers with enlargement, Spain's membership in the EC is not expected to increase corn production significantly (Peterson, 1983).

Spanish Corn Production

Spanish agriculture is not well positioned to supply the inputs required to produce additional livestock products as consumption increases (Tio, 1986, pp 78-80; Mahlau, 1985, pp. 26-30). Three general characteristics of Spanish agriculture are important. First, except in the northwest coastal area, irrigation is required to sustain reasonable yields. Second, Spain is mountainous and has the second highest elevation of any country in Europe after Switzerland (Tio, 1986, p. 53), which makes it difficult in many areas to use modern machinery, chemical inputs, and high-yielding crop varieties. Third, the cropping patterns within Spain's agroclimatic regions often differ. They reflect organizational problems, such as a separation of plots within farms too small to mechanize, a need to spread out labor use over the year, and farm managers' risk-averse behavior.

Corn production grew from 1.8 million tons to 2.3 million tons in 1970-82 (table 7). During that period, the total production area declined from 539,000 hectares to 418,300 hectares, while yields increased from 3,427 kilograms per hectare to 5,570 kilograms per hectare. Area in irrigation also declined, from 304,500 hectares to 269,700 hectares. Yields on irrigated land rose from 1,391 kilograms per hectare to 1,931 kilograms per hectare. The portion of production originating on irrigated land rose from 75 percent to 83 percent, reflecting both increasing yields and a more rapid withdrawal of dryland acreage from production (Tawil, 1986, pp. 32-33).

Irrigation is critical to Spain's corn production. The total area in irrigated crops rose from 1,437,200 hectares to 2,039,100 hectares during 1970-82, while the irrigated area devoted to grains declined from 52.8 percent to 41 percent. The crops increasing in irrigated acreage included sugar

5/ Unlike the poultry producers, starch manufacturers prefer dent corn varieties that contain more starch than flint varieties.

Table 7--Spain: Corn supply and utilization

Year beginning July 1	Production	Stocks 1/	Import	Exports	Utilization	
					Feed	Total
		1,000 metric tons				
1970	1,848	--	2,008	--	3,461	3,856
1971	2,056	--	2,081	--	3,770	4,137
1972	1,922	--	2,754	1	4,311	4,675
1973	2,038	--	3,769	1	5,446	5,806
1974	1,992	--	4,057	1	4,328	4,529
1975	1,794	1,519	3,181	1	5,504	5,799
1976	1,545	694	3,735	1	5,100	5,405
1977	1,892	568	4,611	2	5,600	6,013
1978	1,969	1,056	4,299	1	6,150	6,603
1979	2,212	720	4,500	1	6,200	6,645
1980	2,314	786	4,251	1	6,000	6,518
1981	2,157	832	5,599	2	7,000	7,544
1982	2,330	1,042	4,829	1	6,980	7,500
1983	1,803	700	3,595	2	5,478	5,984
1984	2,505	112	2,400	2	4,065	4,735
1985	2,860	280	2,700	2	4,850	5,558

-- = Nil or negligible. 1/ Beginning of year stocks.
Source: Foreign Agricultural Service, U.S. Department of Agriculture.

beets, sunflowerseed, and other crops--primarily horticultural and tree crops. Irrigated production of cotton, potatoes, and tomatoes declined in percentage terms. Among the grains, wheat, corn, and rice produced on irrigated land declined, while barley production increased in percentage terms. In terms of acreage, wheat and rice increased slightly, while barley production almost doubled (Tawil, 1986, pp. 23 and 25). The irrigated area in corn production declined from 304,500 hectares to 269,700 hectares in 1970-82, with corn losing out to barley, fruit and vegetable, sugar beet, and sunflowerseed production.

Spanish Imports of EC Corn

The EC-10 has never been self-sufficient in corn production since its formation and little incentive has existed to ship corn to Spain. France was, however, an important supplier of the Spanish market before formation of the CAP in the early 1960's and is expected to export corn to Spain following enlargement.

The level of EC self-sufficiency in corn production has been as high as 88 percent (table 8). EC self-sufficiency levels have increased, however, more because of declining consumption (down from 30.0 to 23.3 million tons) than from increasing production (up from 18.1 to 21.6 million tons). If other member states are to supply the Spanish market, then either EC corn production and imports must increase or use must decrease in other member states.

Table 8--EC-10's self-sufficiency ratios for grains, oilseeds, meats, poultry, and eggs 1/

Product	1980	1981	1982	1983	1984	1985
	Production as a percentage of use					
Wheat	125	122	134	119	144	125
Rice	83	75	71	75	NA	NA
Corn	64	67	79	81	88	87
Barley	110	109	114	103	127	119
Rye	105	96	95	96	NA	NA
Oats	99	97	100	93	NA	NA
Sorghum	72	80	87	83	83	84
Pork	101	103	101	103	102	102
Beef	102	103	102	105	111	108
Poultry	108	112	114	109	108	108
Eggs	102	103	104	104	102	102
Oilseeds	10	17	17	22	26	33
Meal	59	60	55	57	52	54

NA = Not available. 1/ Marketing years beginning in year shown.
Source: (Foreign Agricultural Service, U.S. Department of Agriculture, 1986).

Table 9 shows intra-EC corn trade. France is the EC's largest corn exporter, exporting most of its annual surplus to other member states. Although France exported substantial quantities of corn to Spain in the 1960's, more recently France's exports to Spain have been virtually nil. These data suggest that if the EC price policy is to increase intra-EC corn trade with Spain, then recent trading patterns within the EC will have to be substantially altered.

U.S. Competitiveness in the Spanish Import Market

Competition between EC and non-EC suppliers in the Spanish market will disappear after enlargement because of the implementation of the CAP grain policy. This will leave non-EC suppliers a much smaller portion of the market. Since Spanish corn users will not gain the advantage of low world prices, price competition in the Spanish corn market will be less important and nonprice competition more important after enlargement.

The U.S. share of the Spanish corn market declined dramatically just prior to enlargement. This decline can be attributed to price changes, quality-control problems, product differentiation on the part of competing exporters, and Spanish preparation for the enlargement.

The price of U.S. corn rose in 1983 above that of Argentine and Spanish corn in the Spanish market for the first time since 1970 (fig. 1). The high price of U.S. corn can be attributed to a high-valued U.S. dollar and a grain policy

Table 9--Intraregional corn trade in the European Community, average 1981-83

EC importers	Top six exporters and other exports of EC countries							Total imports
	France	Bel-Lux	Nethrlds	Italy	Germany	Ireland	Other	
	1,000 metric tons							
Belgium-Luxembourg	567.2	0	12.1	37.4	0.7	0	1.5	2,729.0
Denmark	102.6	0	.3	3.0	5.7	0	0	195.0
France	7.5	0.7	0	1.2	4.8	0	0	666.7
Germany	559.6	.4	1.5	23.2	0	0	0	1,901.2
Greece	47.3	0	0	92.0	0	0	0	319.7
Ireland	158.1	.8	0	0	1.1	0	3.2	168.2
Italy	305.6	.3	0	0	0	0	28.1	1,877.1
Netherlands	795.5	726.3	0	15.1	27.0	0	.3	2,338.9
Portugal	.1	0	0	0	0	0	0	2,462.5
Spain	.4	0	0	0	2.0	0	0	4,905.2
United Kingdom	550.0	97.2	134.6	9.4	7.1	6.2	3.8	2,053.5
Other	91.5	1.8	5.1	24.6	18.3	0	18.9	53,653.8
Export totals	3,185.4	827.5	153.6	205.9	66.7	6.2	55.8	73,270.8

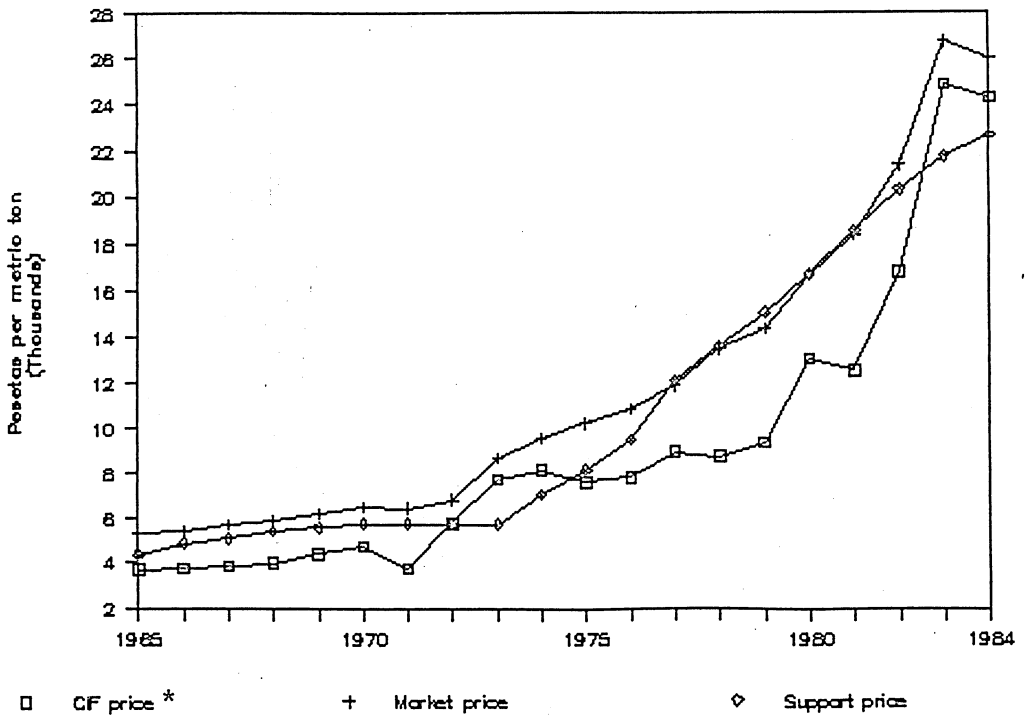
Source: Author's tabulation of U.N. trade data.

that allowed the U.S. loan rate to become a floor on the world market. High U.S. interest rates in the 1980's have also raised the cost of storing and shipping corn. These factors contributed to a decline in the U.S. share of the Spanish corn import market, from 93 percent in 1981 to 67 percent in 1985.

Spanish grain handlers have recently complained about receiving low-quality shipments of U.S. corn (Sinclair, 1986; Johnson, 1986; and McDonald, 1985). Low quality has typically been described as high-moisture, molded, broken or powdered, and soiled corn. These are graded using U.S. quality grading standards, which specify maximum limits on moisture, brokens, foreign material, and damaged corn, and minimum limits on corn weight with six standard grades--U.S. No. 1 to 5 and U.S. sample grade (FGIS, 1985; Hill, 1979).

The U.S. grading standards do not, however, distinguish all the quality attributes desired by Spanish corn importers. Spanish users also distinguish between "dent" corn, which is high in starch content, and "flint" corn, which has a higher protein and carotene content. This is because broiler and layer industries are important corn users and their customers insist on yellow chicken meat. These attributes favor Argentine exporters who handle primarily flint corn and disadvantage U.S. exporters who handle primarily flint corn. Spanish buyers also consider appearance to be a quality factor (Albisu, 1986).

Figure 1--Spanish corn prices, 1965-84



* $CIF Rotterdam price converted to pesetas.

Spurred on by a large foreign debt, Argentina has been the most aggressive supplier, competing with the United States for the Spanish corn market in recent years (Shane, 1987). In 1985, Argentina supplied 1 million tons of corn or 26 percent of total Spanish imports (Mackie, 1987). Argentina is highly competitive in the Spanish market because it exports the flint corn preferred by most Spanish importers. Contributing to this advantage are strict quality-control standards in marketing and an administrated exchange rate which is adjusted to compensate for changing competitive conditions.

Spanish entry into the EC will affect U.S. corn exports by lowering Spain's total non-EC import requirement and by reducing the price competition between EC and non-EC suppliers.

TRANSITION FROM SPANISH TO EC INTERVENTION POLICIES

Spain's accession agreement with the EC focuses on the transition arrangements that apply to intra-EC trade. It provides no transition for non-EC suppliers. Non-EC corn suppliers, for example, were immediately subject to an EC threshold price 55 percent higher than the corresponding Spanish price. The EC grain policy accordingly provides a strong preference to corn users to purchase EC grain, regardless of world prices.

EC and Spanish Grain Policies Compared

The threshold price is the operative policy instrument in EC corn markets. The EC is less than self-sufficient in corn production, which means that the corn price will remain at or near the threshold price for most of the year.

Only during the harvest season will prices fall close to the domestic support price.

Grain Price Policies

Two distinctions exist between the Spanish and the EC support price policies. First, domestic support prices differ slightly. The difference for corn is roughly 10 percent from the price levels determined prior to the signing of the accession agreement. Second, the Spanish support system was based on a low-threshold price (that is, lower than domestic support prices), while the EC support system is based on a high-threshold price (that is, higher than domestic support prices). The difference between the Spanish and the EC threshold prices for corn is about 55 percent. Consequently, the chief effects of the transition from the Spanish to the EC system bear on third-country suppliers rather than on domestic producers.

The EC cereals policy is built around several key prices. Intervention is required at a base intervention price for soft wheat, barley, corn, and rye. The base intervention price is based on a "normal" market price in the EC's chief surplus region: Orleans-Ormes, France. The target price is based on the cost of transporting grain from Orleans-Ormes to the EC's most grain-deficit area: Duisburg, West Germany. The target price is set roughly 20 percent above the base intervention price for feed grains. The base intervention price and the target price both apply strictly to domestically produced grain. Because imported grain is a substitute for domestically produced grain, imported grain must be restricted in order to defend the base intervention and target prices. This is done with a threshold price. The threshold price equals the target price less the cost of transshipment through Rotterdam, the trading margin, and the cost of shipment from Rotterdam to Duisburg. The difference between the threshold price and the world price is determined daily and is called the "variable levy," an import tax, which is applied to all non-EC imports.

Under this framework, market prices in the EC normally fluctuate within the band established by the base intervention (floor) price and the threshold (ceiling) price for grain. Individual grain prices vary from this price according to their relative feeding values and supply-demand conditions. Intervention agencies can support the intervention price by purchasing grain for storage and by providing export subsidies. They can defend the threshold price by selling stocks or by importing grain. Support prices are adjusted monthly to reflect storage costs (European Commission, 1981a, pp. 9-16).

Monetary Considerations

Spain will not participate in the European Monetary System under current plans, and Monetary Compensatory Amounts (MCA's) will be used in trade with other EC member states. MCA's work to correct price differences from arising due to exchange rate changes in trade between member states. Prices are calculated in European Currency Units (ECU). 6/ When prices are lower in Spain than in its trading partner's country, Spanish exports are taxed (a

6/ The EC maintains a special currency for trade in agricultural products known as the ECU to prevent unwarranted arbitrage among member states. The ECU is converted into domestic currencies at two slightly different agricultural commodity rates, one for crops and another for livestock. All intervention prices and trading values are expressed in ECU's.

negative MCA). The opposite occurs when Spanish prices are higher. Consequently, exchange rate changes do not provide a price advantage to either trading partner. MCA's are paid into and out of the European Agricultural Guidance and Guarantee Fund.

Spain's Accession Agreement for Feed Grains and Livestock

Spain's accession agreement with the EC provides for Spanish markets to integrate with the Common Market over a 7- to 10-year period (Friend, Schwartz, and Newman, 1986). The transition arrangements apply exclusively to intra-EC trade. Imports from non-EC countries are immediately subject to the EC variable levy.

The agreement outlines sensitive and nonsensitive commodities. Some livestock and dairy products, and bread-quality wheat are considered sensitive. Grains and oilseeds are generally considered nonsensitive, although special provisions apply to oil crops because they compete with olive oil, a sensitive commodity (Home Grown Cereal Authority, 1985).

Feed Grains

In the case of feed grains, the transition to full participation in the CAP is eased by the convergence of Spanish and EC prices over the 7-year period. EC prices are immediately adopted for prices varying by less than 3 percent. The difference is narrowed by 1/7 during the first year. The difference is narrowed by 1/6, 1/5, 1/4, 1/3, and 1/2 in subsequent years until the prices vary by less than 3 percent and EC prices prevail (Agra Europe, 1985, p. 13). Non-EC trade is subject to the variable-levy system and, as such, does not enjoy the benefit of a transition period.

Spanish trade is governed by Accessory Compensatory Amounts (ACA's) during the transition period to preserve the integrity of support prices in Spain and the other EC member states. An ACA is a levy designed to defend intervention prices within EC markets and is equal to the difference between the price in one member state and the price in another. When the Spanish price lies below the EC price both expressed in ECU's, Spanish exports are taxed (negative ACA) and Spanish imports are subsidized (positive ACA) by an amount equal to the difference between the two prices. The opposite applies when Spanish prices are higher (Home Grown Cereals Authority, 1985, pp. 3-6).

Livestock Products

The demand for poultry and livestock products links consumer demand to the demand for feed grains. Feed grain subsidies are, accordingly, a cost for livestock producers and changes in Spanish agricultural policy have their greatest effect on livestock markets.

Livestock product markets are divided into sensitive and nonsensitive commodities in the accession agreement. Sensitive commodities are subject to an initial 4-year standstill period during which existing trade relationships and policies will be maintained. The transition to EC policy instruments begins for sensitive commodities after the standstill period. Nonsensitive commodities are subject to transition arrangements like those outlined for feed grains.

Supplementary trade mechanisms (STM's) are employed for intra-EC trade in sensitive commodities. STM's are quantitative restrictions on EC exports to

Table 10--Quantitative restrictions on Spanish imports of sensitive grain and livestock products from other member states under Spain's accession agreement with the EC

Commodity	1986 quantity	Share of increase over previous year		
		1987	1988	1989
	Metric tons	Percent		
Fresh or dried milk for human consumption	160,000	10	12.5	15
Milk or cream in small packages	40,000	10	12.5	15
Butter	1,000	15	15.0	15
Live cattle (head)	12,000	10	12.5	15
Beef and veal	2,000	10	12.5	15
Cheese	14,000	15	15.0	15
Bread wheat	175,000	15	15.0	15

Source: (Federation Europeene des Fabricants Agricole Comun, 1985).

Spain during the standstill period that cushion the shock of EC membership in these markets. Most dairy products, beef, veal, bread wheat, and live cattle are the primary livestock and feed products affected (table 10).

Pork. The swine industry is likely to reduce its demand for corn significantly under the terms of the accession agreement. The price of imported corn will rise relative to EC barley, forcing livestock producers to pay more for their feed. Spanish producers will not, however, receive higher prices because the African swine fever (ASF) quarantine restricts their ability to export pork and the domestic market is already satiated (Peterson, 1983).

Pork markets are provided a 7-year transition period in the accession agreement. Spain will retain its current policies during the first 4 years, and pork exports to other member states are not permitted because of ASF. The agreement specifies no conditions for removal of this quarantine. EC member state exports to Spain will be subject to an ACA calculated on the basis of the grain required to produce a kilogram of pork in the exporting member state (that is, a grain-equivalent basis). Spain can impose quantitative restrictions on third-country imports to support domestic prices for up to 10 years (Ministerio, 1985, pp. 105-108 and pp. 176-77). Whether or not quantitative restrictions are imposed, Spanish pork will be protected from imports by an ACA-adjusted, levy-protected sluicegate price and will be eligible for EC export restitution in trade with non-EC countries.

The Spanish Ministry of Agriculture plans a 4-year ASF eradication program, but no EC assistance is outlined in the accession agreement (FAS, 1986, p. 11;

Diputacion, 1985, pp. 306-308). Because swine production is Spain's leading livestock industry, the ASF quarantine is a severe restriction. Because Spain cannot export pork to other member states and is normally self-sufficient in pork production, EC intervention to support Spanish pork prices can only take the form of subsidized export to third countries or intervention buying for storage and resale in the Spanish market.

Milk. Corn use in dairy production is also likely to decline as dairy producers switch from imported corn to cheaper EC barley, find it difficult to compete with imported EC dairy products, and need to adjust to higher EC dairy intervention standards. 7/

Spanish dairy product prices will converge to EC price levels over a typical 7-year transition period. During this transition, ACA's and MCA's will be used to defend the intervention prices. STM's are employed for certain key dairy products (see table 10) to limit imports from other EC member states. Dairy products are protected by EC variable levies throughout the transition period and are eligible for export restitutions (Ministerio, 1985, pp. 87-93).

The dairy agreement disadvantages the Spanish industry because it establishes a low-production threshold (750,000 metric tons at the farm level) and EC regulations require a higher level of butterfat than previous national regulations (3.7 percent versus 3.2 percent) (Ministerio, 1985, pp. 87-93; Diputacion, 1985, pp. 340-342; and The Economist, 1986, pp. 22-26). The agreement may furthermore encourage dairy imports from other member states that have more favorable climates and lower production costs.

Beef. Spanish beef producers will be disadvantaged by EC dairy quotas, EC coresponsibility levies, the lower EC intervention price for beef, and competition from EC beef imports. Corn use in dairy production will decline with dairy production and as cheaper barley enters cattle rations.

Beef prices converge to EC prices in a typical 7-year transition period, with ACA's and MCA's to defend the price structure. Differences in production aids will converge in a similar fashion. The transition period is extended to 10 years for reconciliation of program inconsistencies, and an "escape clause" permits Spain to suspend the agreement when substantial industry damage is threatened.

STM's apply during the first 4 years (see table 10). The Common Customs Tariffs are immediately adopted for trade with third countries. Note that the CAP imposes a 20-percent ad valorem tariff on beef imports (Ministerio, 1985).

Broilers and Layers. Corn use in broiler and layer production could rise with EC membership. Birds make more efficient use of grain than do pigs or cattle. Poultry product prices may accordingly rise less rapidly than those associated with pigs or cattle, stimulating greater consumption of poultry products. Because birds require a low-fiber diet, corn is preferred over barley and other substitutes in poultry rations. Corn sales may accordingly rise with greater consumption of poultry products.

7/ This is the standard analysis (Agra Europe, 1980). Peterson (1983), by contrast, argued that dairy production would expand substantially after EC enlargement.

Because broilers are sold competitively within the EC and Spanish markets without price support, accession requires few changes. Broiler and eggs trade during the 7-year transition will be managed like pork trade. ACA's will be calculated on a grain-equivalent basis, with separate calculations made for different species (Agra Europe, 1985, p. 26). Broilers and eggs will receive an ACA-adjusted, levy-protected sluicegate price and will likewise be eligible for EC export restitutions in trade with third countries (Ministerio, 1985, pp. 109-115; European Commission, 1981b, pp. 32-34).

Convergence of Spanish and EC Intervention Prices

Price Changes

Three sets of prices for the 1985/86 crop year are pertinent to analysis of the changes arising from Spanish membership in the EC. The first set of prices (pre-enlargement prices) was announced by the Spanish Ministry before the accession agreement was signed. The second set of prices (transition prices) was announced by the European Commission after the agreement was signed and determined to be the set used during the first year of the transition. The third set of prices (EC prices) was announced by the European Commission for use in all other EC countries.

Consequently, two sets of price changes accompany enlargement: the one that came into effect on March 1, 1986, as Spain adopted the EC transition prices and the one phased in over the transition period as Spanish transition prices give way to EC prices (table 11). 8/

Production Effects

The transition from Spanish to EC prices will mean a price increase for most crops, but will not significantly alter the relative profitability of crops except for sunflower and sugar beets. Since Spanish yields are much lower than average EC yields, the largest effect of this price increase is likely to increase the net investment in Spanish agriculture.

This section compares pre-enlargement Spanish support prices with EC support prices for the 1985/86 season to determine the changes in cropping patterns likely to accompany enlargement, setting aside the effects of the transition period.

Crops. Changes in the level of price support given the different Spanish crops clearly vary. The five prices showing the largest increases are: olive oil (79 percent), sunflowerseed (68 percent), rice (43 percent), barley (16 percent), and sorghum (16 percent) (see table 11). By contrast, the price increase for corn is only 10.2 percent. Because corn is an imported product, the threshold price indicates more accurately than the base intervention price the market corn price after accession. Because the same analysis applies to sorghum, no change in crop ranking is implied.

Spain's membership in the EC will also affect the profitability of crops. If production costs do not vary with enlargement, then changes in gross revenue

8/ The accession agreement specifies transition mechanisms and not a set of prices. (EC support prices for the year following the transition period have yet to be determined.) Consequently, EC support prices for the 1985/86 are substituted in the analysis as a proxy.

Table 11--Changes in Spanish intervention prices due to enlargement, 1985/86

Commodity	Intervention prices: Spanish: Pre-enlargement	Spanish: Transition year	European Community 1/	Changes in intervention prices: due to EC membership 2/	due to the transition period 3/	Total
	Pesetas per metric ton			----------Percent----------		
Soft wheat	24,100	24,753	25,908	2.71	4.67	7.50
Durum	n.a.	29,523	45,059	NA	52.62	52.62
Barley	22,250	23,436	25,908	5.33	10.55	16.44
Rye	22,900	24,120	26,166	5.33	8.48	14.26
Corn	23,500	24,753	25,908	5.33	4.67	10.25
Sorghum	22,250	23,436	25,908	5.33	10.55	16.44
Rice	31,650	34,363	45,363	8.57	32.01	43.33
Sunflowerseed	45,150	50,866	75,757	12.66	48.93	67.79
Sugar beets	6,335	6,928	5,904	9.36	-14.78	-6.81
Cotton	118,500	131,720	138,636	11.16	5.25	16.99
Olive oil	183,500	187,278	327,747	2.06	75.01	78.61
Beef and veal	392,000	425,149	266,414	8.46	-37.34	-32.04
Pork	174,000	293,572	293,572	68.72	0	68.72
SMP	n.a.	352,003	251,282	NA	-28.61	-28.61

n.a. = Not available. NA = Not applicable. SMP = Skim milk powder. 1/ EC support prices at the official exchange rate, 144.382 pesetas per ECU. 2/ Initial changes due to Spanish EC membership. 3/ Later changes due to the convergence of the Spanish intervention price to the EC intervention price after enlargement.

Sources: (Foreign Agricultural Service, U.S. Department of Agriculture, SP5061, 1986; Agra Europe, 5-9-86; and Agra Europe, 5-2-86).

are correlated with changes in profitability. Assuming that production costs do not vary with enlargement, there is only one change in the ranking of irrigated crops: sunflowerseeds replace soft wheat as the fourth-most profitable crop. On dryland, the ranking of sunflowerseeds rises from eighth to sixth place (replacing soft wheat), and sugar beets move from ninth to eleventh place behind oats and rye. These changes suggest that production of sunflowerseeds, oats, and rye is likely to increase relative to other crops and production of soft wheat and sugar beets is likely to decrease relative to other crops. The incentive to cutback on sugar beet production is particularly strong.

Of these changes, the increased production of sunflowerseed and the decreased production of soft wheat affect U.S. exports the most because they have the greatest potential to substitute in livestock rations in place of U.S. products. Sunflowerseed meal substitutes for soybean meal and wheat substitutes for corn in livestock rations. Using the threshold price for corn does not alter this assessment, which suggests that corn will not benefit from a relative price increase.

Table 12--Spain: 1982 production, gross revenue per hectare, and yields of selected crops compared with EC yields

Commodity	Spanish production in 1982	Gross revenue per hectare at EC support prices 1/		Difference between average EC-10 and Spanish yields 2/
		Total	Increase	
	1,000 hectares	--1,000 pesetas--		Percent
Soft wheat	2,661.8	448.2	18.3	60.9
Durum wheat	126.3	886.6	323.5	NA
Barley	3,615.2	453.4	51.8	58.6
Oats	441.5	363.2	113.2	68.2
Rye	211.9	267.7	26.1	74.0
Corn	418.3	1,355.0	87.5	16.4
Sorghum	27.4	1,292.5	147.7	-7.7
Rice	67.6	2,695.9	756.0	-17.5
Sunflower	76.0	485.6	187.2	66.6
Sugarbeets	190.3	214.7	-21.5	26.8
Cotton	46.5	3,985.9	287.8	NA
Olive oil	153.5	3,812.2	1,617.0	NA

NA = Not available. 1/ Gross returns are calculated by multiplying intervention prices prior to EC membership by average yields (see table 11). 2/ Average for 1980-82. A positive number indicates EC yields are higher.
Sources: (Foreign Agricultural Service, U.S. Department of Agriculture, SP5061, 1986, and Tawil, 1986).

These price increases are expected to stimulate increased production. 9/ Self-sufficiency ratios suggest that corn, oats, sorghum, and sunflowerseed producers have anticipated this stimulus (see table 4). These changes will have a positive effect on corn production, but the effect remains uncertain because production costs vary among crops, crops compete for land use, and the EC guarantee threshold policy limits new production. Guarantee thresholds now exist for cereals, durum wheat, rapeseed, and sunflowerseed production, but not all of the thresholds established pose a binding constraint (European Commission, 1985, pp. 22-23).

The large differences between Spanish and EC crop yields suggests that new investment may make substantial yield improvement feasible (table 12). Corn is likely to benefit from new investment. The distribution of crop acreage is, however, unlikely to change, except inasmuch as program crops become more profitable than nonprogram crops.

An earlier USDA study of the effects of EC membership on Spanish grain production concluded that wheat production would likely decrease and barley production would likely increase. Little change in the outlook for corn

9/ Stanton (1986) provides a review of the literature on the costs of production for Spanish corn, barley, and wheat.

production and consumption was expected with EC membership because the EC at that time was deficient in corn and other feed grain production. Higher feed grain prices in Spain following accession were, however, expected to slow the growth of feed grain use in livestock rations (Peterson, 1983, pp. 67-68).

Livestock. Higher budgetary costs have motivated the EC to retreat increasingly away from intervening in livestock markets. The European Commission has not intervened recently in these markets. Livestock support prices provide little information as to the outcome of the enlargement.

Effects of the Transition Period

The transition arrangements allow some commodities to adopt EC prices sooner than others, depending upon how much Spanish and EC prices differ and upon the sensitivity of the crop involved. Since the transition arrangements affect only intra-EC trade, their significance to non-EC suppliers, such as the United States, is minimal.

The accession agreement can specify different transition periods for each commodity in the agreement because of two provisions. First, although most commodities have a transition period of up to 7 years, sensitive commodities can have a transition period of up to 10 years. Second, the accession agreement mandates a conversion of intervention prices that ends when Spanish prices come within 3 percent of EC prices. When this point is reached, the EC intervention price is adopted immediately. Since the difference between Spanish and EC intervention prices varies by commodity, some commodities will converge to EC prices sooner than others.

Table 13 shows the conversion path of selected commodities, assuming no changes from the EC's original 1985/86 price package. Among the grains, corn and wheat are the first to converge on EC prices in 1988/89, followed by barley, rye, and sorghum in 1990/91. Durum and rice, by contrast, converge to EC price levels in the seventh year of the transition (1992/93).

Effects on U.S. Corn Exports

The accession agreement will affect U.S. corn exports to Spain by lowering the total Spanish demand for corn imported from third countries. It will accomplish this result by raising the Spanish threshold price from roughly 10 percent below Spanish domestic support prices to 39.8 percent above the 1985/86 EC support price. The cost of imported corn in the Spanish market accordingly rose approximately 55 percent during the 1985/86 crop year. The domestic support price of corn rose, by contrast, only about 5 percent (see table 11).

The price increase will result in lower U.S. corn exports for several reasons. The move from a low to a high threshold price will raise domestic corn prices for most of the marketing year, but not by as much as the increase in the price of imported corn. This increase in the domestic price will motivate the use of substitutes, such as EC-produced barley and wheat, for corn in general and will encourage the use of EC-produced corn before any third-country corn is imported. EC-produced corn will come from increased trade with other member states and increased Spanish production. The domestic price increase will also discourage consumption of livestock products inasmuch as consumers substitute other products whose price are unaffected by the higher price of corn inputs. Only when domestic corn supplies are exhausted

Table 13--Convergence path of Spanish to EC intervention prices, selected crops 1/

Commodity	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93
				Pesetas			
Soft wheat	24,918	25,083	25,908	25,908	25,908	25,908	25,908
Durum	31,742	33,962	36,181	38,401	40,620	42,839	45,059
Barley	23,789	24,142	24,495	24,849	25,908	25,908	25,908
Rye	24,412	24,705	24,997	25,289	26,166	26,166	26,166
Corn	24,918	25,083	25,908	25,908	25,908	25,908	25,908
Sorghum	23,789	24,142	24,495	24,849	25,908	25,908	25,908
Rice	35,934	37,506	39,077	40,649	42,220	43,792	45,363
Sunflowerseed	53,355	55,844	58,333	60,822	63,312	65,801	68,290
Sugar beets	6,782	6,635	6,489	6,343	5,904	5,904	5,904
Cotton	132,708	133,696	138,636	138,636	138,636	138,636	138,636
Olive oil	201,325	215,372	229,419	243,466	257,513	271,559	285,606
Beef and veal	402,473	379,796	357,120	334,443	311,767	289,090	266,414
Pork	284,765	284,765	284,765	284,765	284,765	284,765	284,765
SMP 2/	337,614	323,226	308,837	294,448	280,060	265,671	251,282

1/ Assumes no change in the EC 1985/86 price package. 2/ SMP = Skim milk powder.

will corn be sold domestically at the threshold price. Consequently, the EC policy insures that domestic and imported (non-EC) corn never compete on the basis of price.

DEMAND FOR IMPORTED CORN

The above analysis suggests that Spain's entry into the EC will have important effects on the Spanish corn market. Domestic support prices will rise about 10 percent from pre-enlargement prices. Market prices will rise even more as the price of imported corn is fixed roughly 55 percent above its previous level. The higher price of imported corn is expected to force corn out of cattle and swine rations and to reduce its use in poultry rations. Feed wheat, barley, and nongrain feeds are likely to replace corn in these rations. This result is consistent with the EC's objective of giving EC producers preference over non-EC suppliers.

This section analyzes Spain's demand for non-EC corn imports in 1995, given past trends, policy changes, and other analysis. Two estimations are presented. The first projects livestock, poultry, and industrial use to 1995 and derives corn demand with and without EC membership from these projections. Import demand is then computed by subtracting projected corn production. The second uses an import demand model to project corn imports in 1995 with and without EC membership. Following the estimations is a discussion of implications and sources of remaining uncertainties.

Empirical Considerations

The projections given below use supply and utilization data prepared by the Foreign Agricultural Service, U.S. Department of Agriculture, for 1965-84. Pre-1965 data were not available for all the explanatory variables. Data after 1984 were affected by the enlargement and, hence, should not be included in a study anticipating the enlargement's effects.

Table 7 reveals that corn imports and utilization peaked in 1981 and have largely declined since then. The declining feed demand for corn reflects substantial increases in Spanish barley production and utilization as well as the high corn prices associated with the high-valued U.S. dollar from 1981-85. Declining corn imports can also be attributed to increased Spanish corn production brought about by policy initiatives and favorable weather during this period.

The significant changes that occurred in Spanish corn imports from 1981-85 complicate analysis of this market. The analysis hangs critically on the choice of a base year. To avoid the biases inherent in choosing a single base year, average imports for the 3 years, 1982-84, were selected as a base.

Segmented Demand Estimate of Imports in 1995

Import demand can be derived from the accounting identity: imports equal utilization plus exports minus stocks and production. Because Spain holds few stocks and does not export corn, future imports can be estimated by projecting utilization and subtracting projected production (Sarris, 1981, p. 90; Labys, 1973).

The first projection is calculated using this approach. The effect of enlargement is measured by hypothesizing a segmented demand curve, estimating the magnitude of each segment, and subtracting the corn uses expected to be lost as prices increase with enlargement (see appendix).

Projecting Corn Imports without Enlargement

In the case where Spain does not enter the EC, corn imports can be estimated by projecting total utilization and subtracting projected production. Total corn demand is assumed to be divided among three distinct consuming groups: cattle and swine use, broiler and layer use, and industrial use. Each is projected to 1995.

Industrial corn use is reported as a residual in the supply-utilization tables assembled by the Foreign Agricultural Service, USDA. Data for 1965-84 are used to project a linear trend to 1995. Industry is projected to use 863,000 tons of corn in 1995.

Total feed use is projected to 1995 by calculating average feed use per animal unit for 1965-84 data and multiplying this average by a projection of animal units in 1995. French feed conversion ratios are then used to divide cattle and swine use from broiler and layer use because Spanish ratios are unavailable. Adding cattle and swine use (5,803,000 tons) to broiler and layer use (3,463,000 tons) results in an estimate of 9,266,000 tons for total feed use in 1995.

Table 14--Projection of Spanish corn imports from all suppliers to 1995 under alternative assumptions 1/

Year	Projected corn imports from non-EC suppliers			
	Without enlargement		With enlargement	
	Segmented demand estimate	Import demand estimate	Segmented demand estimate	Import demand estimate
	1,000 metric tons			
1985	5,032	3,277	868	385
1986	5,245	3,566	919	940
1987	5,459	3,855	968	1,169
1988	5,672	4,143	1,018	1,399
1989	5,886	4,432	1,068	1,628
1990	6,099	4,721	1,117	2,051
1991	6,313	5,010	1,167	2,184
1992	6,526	5,299	1,216	2,316
1993	6,740	5,588	1,265	2,449
1994	6,953	5,877	1,315	2,582
1995	7,167	6,165	1,364	2,718

1/ These projections may be substantially altered in the post-enlargement case as the EC price policy changes, France increases its corn exports to Spain, and new corn substitutes enter Spanish livestock rations.

Sources: Author's calculations (see app. tables 2, 4, and 5).

Total use is obtained by summing industrial and feed uses. Total use in 1995 is expected to reach 10.1 million tons.

Corn production is projected using a linear trend computed from data for 1965-84. Production is projected to be 3 million tons in 1995.

Corn imports are computed by subtracting production from total utilization. In the absence of enlargement, imports are estimated to be 10.1 minus 3, or 7.1 million tons in 1995 (table 14).

Projecting Corn Imports with Enlargement

Enlargement is expected to alter corn demand, but production is expected to continue on trend. The effect of enlargement is accordingly determined by subtracting from total demand the segments of the market for which use is discontinued because of the price increases mandated by the CAP.

EC membership is expected to raise Spanish corn prices sufficiently to render the feeding of corn to cattle and swine unprofitable (see appendix). Because cattle and swine are projected to consume 5.8 million tons of corn in 1995, this implies that our estimate of corn imports should be lowered to 1.4 million tons (see app. table 2) before accounting for intra-EC trade and substitution of feed wheat in poultry and egg rations. Reasonable assumptions about these two factors reduce non-EC imports to nil.

Implications for Consumption of Livestock and Poultry Products

Linear projections sometimes result in unrealistic results. In this case, projections of animal units could result in excessive estimates of per capita consumption of livestock products because Spain's livestock and poultry consumption is assumed not to change with EC membership.

The projections presented in the above section imply per capita consumption of 11.3 kilograms of beef, 39.5 kilograms of pork, 28.6 kilograms of poultry meat, and 19.2 kilograms of eggs, if population growth is assumed to be the same as for 1960-81. These consumption estimates suggest a substantial slowing of the rate of growth in consumption of all products when compared with 1965-82. In 1995, Spain is expected to consume substantially less beef, more pork, about the same amount of poultry, and slightly more eggs than United States in 1980-84 (USDA, 1985). If the absolute level of U.S. consumption is seen as a dietary upper bound, a slowing in the rate of consumption growth as Spanish consumers approach U.S. levels is to be expected.

Import Demand Estimates for 1995

When domestic production is determined primarily by policy decisions, supply can be considered to be exogenously determined and import demand can be measured directly. Abbott (1979, p. 27) provided this specification for agricultural imports:

$$Q = f(P, E, A, D, S, Pop, I, t, AU)$$

where:

P = world price	S = stocks
E = exchange rates	Pop = population
A = aid shipments	I = national income
D = domestic production	t = trend
Q = total quantity imported	AU = animal units

Abbott's specification requires adjustment when applied to the Spanish corn market. Spain receives no aid shipments. Domestic prices are strongly influenced by exchange rates and international prices, making it unnecessary to include exchange rates and international prices separately. Since corn demand is derived from the demand for livestock products, the population and national income variables affect corn demand through the animal units variable.

The import demand for corn accordingly reduces to a function of these variables: domestic corn production, animal units, and domestic corn prices. The domestic stock variable has not proven to be statistically significant. The trend variable has been dropped, corn prices were lagged one period to account for the lagged response of domestic international prices, and a barley price was added to pick up relative price changes. In this manner, equation 1 was obtained (see app. table 3 for elasticities).

$$\begin{array}{rl} M = & -0.78\ PROD + 0.52\ AU^{**} - 0.41\ CP^{*} + 0.27\ BP + 477.8 \\ \text{(t-statistics)} & (-1.42) \quad (6.00) \quad (-2.10) \quad (1.16) \quad (0.81) \\ & R2 = .85,\ \text{adj } R2 = .81,\ F(4,15) = 22^{**} \end{array} \qquad (1)$$

where:

M	= corn imports (FAS marketing year data, 1965-84)
PROD	= domestic corn production (FAS marketing year data)
AU	= animal units (beef, pork, and broiler slaughter weighted by U.S. feeding values)

CP = lagged domestic, annual market corn prices (Tawil, 1986)
BP = current, annual market barley prices (Tawil, 1986)
* = significant at α = 0.05 level ** = significant at α = 0.01 level
Prices are expressed in pesetas/ton; quantities are expressed in 1,000 tons.

The signs on the variables given in equation 1 appear reasonable. The negative sign on PROD reflects the role of domestic corn production as the principal substitute for imported corn (and the other way around). The positive sign on AU is expected because corn use grows with increases in livestock and poultry inventories. The negative sign on the market price of corn (CP) comes about because domestic and world market corn prices have been closely linked (see fig. 2): when the world corn price increases, Spanish corn imports decrease. The domestic price of barley (BP) is positively correlated with corn imports because corn imports have been restricted when domestic barley prices have been depressed. Equation 1 accordingly appears to be consistent with the structure of Spanish feed and livestock markets.

Two alternative specifications for this equation were considered. The first was derived by substituting a livestock price index and per capita GNP for the animal units variable. This specification permitted a more detailed analysis of policy changes, livestock markets, and economic growth in the corn model. Unfortunately, the coefficient on the livestock price index variable was seldom significant and that of per capita GNP, although typically significant, is more difficult to project than growth in livestock inventories. This approach was subsequently abandoned.

The second specification was derived by substituting the ratio of domestic to cost, insurance, and freight (CIF) corn prices in place of the absolute level of market prices. This specification permitted the use of relative rather than absolute prices, a longstanding practice in the trade literature, and served to deflate the prices used. The use of a threshold price and variable levies both in Spanish and EC price policies, however, eliminates price competition between domestic and imported corn. Relative prices have not, therefore, served an allocative function. The use of relative prices does not improve the statistical properties of an equation under these circumstances.

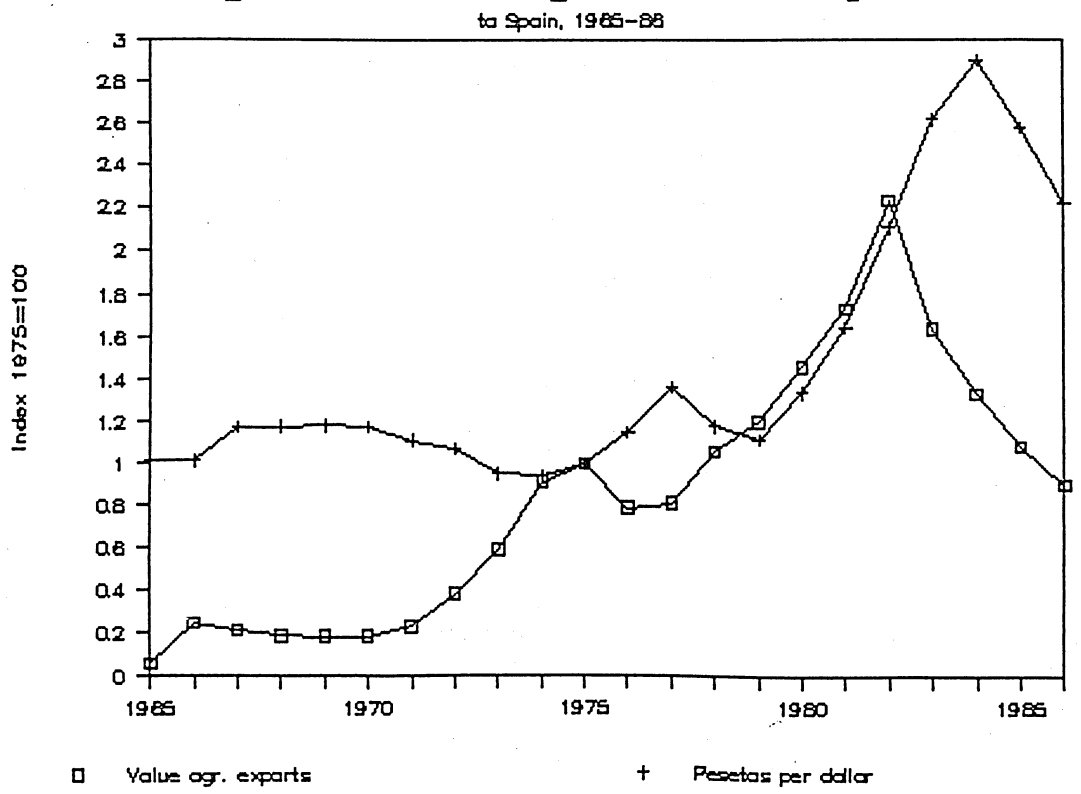
The chief weakness of the specification chosen is that it underspecifies livestock markets. The animal units variable is assumed to represent both the livestock price and consumer income effects. The specification is, however, easy to work with and understand, has price elasticities of import demand consistent with other recent studies (Davison and Arnade, 1987; Cesal, 1987), and allows livestock assumptions to be incorporated.

Further weaknesses in the specification stem from its statistical properties. While the animal units and corn price variables have statistically significant coefficients, the other coefficients do not. They were included, however, to satisfy analytical needs. Multicollinearity also posed a problem, which is why the corn price was lagged one year. The specification proved nonetheless robust in the sense that elasticities showed relatively little variation among alternative specifications.

Projection of Imports without EC Membership

The import demand equation (equation 1) is used to simulate Spain's import demand with and without enlargement. This section reviews the assumptions

Figure 2--U.S. agricultural exports



made for the case when Spain does not join the EC (also see app. tables 3, 4, and 5).

Animal units are projected using a linear trend in data for 1965-84. Plotting actual animal units against trend shows small cyclical deviations around the trend line. Although the deviations recently have been at the low end of this cycle, the decline is small and consistent with past movements around trend. In a normal economy, Spanish livestock product consumption is expected to rise with increases in population and personal income along current trends: Spanish per capita consumption is low relative to neighboring EC member states, except for Portugal.

Corn production is likewise projected using a linear trend in data for 1965-84. Plotting actual corn production against trend shows small deviations from trend due to policy changes and normal year-to-year rainfall variation. Increased production is expected because of continued increases in irrigated acreage, farm consolidation, and greater fertilizer use.

No change in corn and barley prices is assumed in the absence of EC membership. This assumption is reasonable because the Spanish Government regulates these prices in the short term to meet production targets.

Non-EC Spanish corn imports in 1995 without EC membership are stated as a percentage increase over the base period, 1982-84. Spanish corn imports during the base period averaged 3.6 million tons annually (see table 7). Projecting a 64.4-percent increase (see app. table 3) over the base period yields imports of 6.2 million tons in 1995 (see table 14).

Projection of Imports with EC Membership

A different set of assumptions are employed in the case of EC membership. The growth in animal inventories is assumed to slow because of weakening demand and higher feed costs.

Economic growth is expected to decline as consumers pay more for their agricultural products under the CAP and industry is forced to vie in the more competitive EC market. This expectation follows from the lackluster growth performance of the United Kingdom and Greek economies after they joined the Common Market. 10/

Corn prices are assumed to rise to the EC threshold price. Since Spain is a net corn importer, imposing of the CAP will initially raise Spanish market prices to the EC threshold price. Later, corn prices can be expected to fall seasonally to the EC intervention price as corn, barley, and feed wheat enter the Spanish market from other member states and the Spanish crops are harvested. Since the speed and magnitude of this decline is not easily estimated, corn prices are assumed to remain at the threshold level until 1995.

Barley prices are assumed to remain at the EC domestic support price. Since Spain and other member states are barley exporters, ample barley supplies will depress prices to the intervention level. Barley prices are accordingly assumed to rise from Spanish to EC support price levels.

Livestock prices are also expected to rise with enlargement as producers attempt to pass on the increased cost of feeding higher priced EC grain. Production is, however, not expected to exceed self-sufficiency, and no EC intervention in livestock markets is assumed. Consequently, consumer resistance to livestock product price increases is expected, and the rate of growth in consumption of livestock products is expected to slow.

The projected increase in animal units is cut in half to account for a slower growth rate in the Spanish economy and higher livestock prices. This assumption implies growth in per capita consumption of roughly 0.75 percent annually or a rate just below the 1-percent rate of growth in population assumed over the estimation period.

Non-EC Spanish corn imports in 1995 with EC membership are stated as a percentage decrease under the base period. Projecting a 27.8-percent decrease (see app. table 3) yields non-EC Spanish corn imports of 2.7 million tons in 1995 following EC membership (see table 14).

Trade Creation and Diversion

The import demand approach given above suggests that Spain will import 2.7 million tons of corn in 1995 with EC membership instead of 6.2 million tons had it not joined. This estimate compares with average annual imports of 3.6 million tons (see table 7) over the base period (1982-84). Thus, a loss of 1.9 million tons of existing trade or 4.5 million tons of potential trade to non-EC corn exporters takes place as a result of Spain's entry into the EC.

10/ Details of the United Kingdom's experience are discussed in: (Owen, 1983; Tio, 1986, pp. 20-21). Greece's experience is reviewed in: (Georgakpopoulos, 1985). With respect to Spain, see: (Wall Street Journal, 1985).

Comparison of the Two Projections

Two estimation procedures, the segmented demand and the import demand approaches, were used above to project Spain's corn imports in 1995. The segmented demand approach projected corn imports of 7.1 million tons without EC membership and 1.4 millions with it. The import demand approach projected imports of 6.2 million tons without membership and 2.7 million tons with it. The segmented demand approach accordingly projected a larger fall in corn imports (5.7 million tons) than the import demand approach (3.5 million tons). Why does this discrepancy arise?

The discrepancy arises from different implicit assumptions. The import demand estimate assumes a linear demand curve, while the segmented demand approach assumes a convex curve with three demand segments. The import demand approach also makes assumptions about income effects of enlargement which could not be included in the segmented demand estimate. These income effects account for a large share of the total drop in demand with enlargement. Furthermore, the import demand approach allows gradual substitution along the demand curve as prices change, while the alternative approach permits no price response within a demand segment: the response to price is all or nothing (see appendix). This is an important point because if the price response within the segment is gradual and more than half of the quantity demanded by layer and broiler producers is eliminated, then the import demand estimate for 1995 declines to nil. The alternative approach accordingly places a much greater emphasis on price effects than the import demand approach in projecting imports. The import demand approach, by contrast, relies heavily on income effects.

Since poultry and layer producers are likely to substitute gradually away from corn as the import demand approach assumes, why is the import demand projection higher than that of the segmented demand approach? The best explanation is that the import demand approach estimates a demand curve from historical data which do not exhibit price variation comparable to that accompanying enlargement. The estimated price elasticity is, therefore, too inelastic. This conclusion is reflected in the estimates. The price elasticity estimate based on the import demand approach is -0.87, compared with the -1.57 imputed from the segmented demand estimates (see appendix and app. table 3).

A second explanation is that a shift in the demand curve accounts for the difference between the two import estimates. Such an explanation is plausible because corn prices tend to lower barley prices under the former Spanish policy due to the cheap imports, while barley prices tend to bring down corn prices under the EC policy due to production surpluses. Because barley prices are higher relative to corn in the EC than outside the EC, the corn demand curve shifts to the left with enlargement. Shifts in the demand for livestock products with higher grain prices also shift the corn demand curve to the left. Either explanation, measurement error or an unexplained shift in the demand curve, is sufficient to conclude that the import demand approach overstates corn demand.

What if the substitution away from corn in cattle and swine rations is less than complete? Indications are that the substitution away from corn will take place to the advantage of barley, because the usual corn deficit drives corn prices to the threshold price while the usual barley surpluses drive barley prices to the intervention price. Since there is no disadvantage to using

barley in cattle and swine rations, corn will likely leave and barley will likely enter the rations.

Will rising livestock product prices, induced by the increasing cost of grain, motivate Spanish consumers to shift to other livestock products that use grain less intensively? The import demand approach assumes a reduced rate of growth in consumption of livestock and poultry products, but does not distinguish effects by species. Birds do convert feed into output more efficiently than swine or cattle. The effect of high grain prices remains unclear, however, because poultry producers are less able than swine or cattle producers to use cheaper grain and nongrain feeds.

Implications and Sources of Continuing Uncertainty

The estimations computed above suggest that non-EC Spanish imports in 1995 will range between 1.4 and 2.7 million tons, compared with average imports of 3.6 million tons from 1982 to 1984. The chief implication of this result is that Spanish corn imports will continue to decline as time passes.

While few analysts question the direction of Spanish corn imports, considerable controversy exists over their eventual level. This controversy stems in part from the high degree of sensitivity of projections to reasonable changes in assumptions about the variables. In particular, these factors contribute to continuing uncertainties over administration of the 24-6 agreement, the use of corn substitutes, and intra-EC grain shipments.

How the 24-6 agreement reached between the United States and the EC will be administered poses an obvious source of uncertainty. Although the agreement specifies that Spain will import 2 million tons of corn and 300,000 tons of sorghum annually through 1990, Spain imported little corn under a similar agreement in 1986. The European Commission was accordingly obliged to purchase this grain directly in order to honor the agreement struck. How corn shipments will proceed under the 24-6 agreement and what will take place after the agreement expires remain uncertain.

The use of corn substitutes in feed rations poses another obvious source of uncertainty in the Spanish corn market. Before entering the EC, the Spanish Government provided an export subsidy to producers of corn substitutes, such as sugar beet pulp and olive byproducts, to encourage the use of domestically produced barley in feed rations. This policy and the availability of cheap imported corn meant that there was little incentive to use corn substitutes in cattle and swine rations. Now that Spain participates in the CAP, export subsidies of this sort cannot be provided. Imported corn prices rose substantially, creating strong incentives to use corn substitutes in feed. The level to which corn substitutes will enter feed rations is, however, unstudied and unknown.

The course of changes in intra-EC grain trade is another important source of uncertainty. French producers may supply the entire Spanish demand for corn. This could be done by planting additional acreage or by diverting corn currently available from sale in other markets. This latter option is possible because generous quantities of EC feed wheat and barley are available which can substitute for corn in some uses. Given Spanish import demand roughly consistent with the amounts shown in table 14, past experience with EC enlargements suggests that much or all of this demand will soon be satisfied by other member states. Exactly how much corn intra-EC trade will supply to

the Spanish market remains uncertain. The level of intra-EC trade is, however, critically important because grain imported from other member states will tend to keep Spanish corn prices below the threshold price and, as a consequence, to prevent imports of non-EC corn.

In the projections given, answer to these uncertainties were handled primarily by assumption. Reasonable changes in the mix of these assumptions were found to yield substantially different results. Projecting Spain's corn imports to 1995 accordingly remains a highly speculative enterprise.

CONCLUSIONS

The objective of this report was to analyze Spain's demand for imported corn due to its entry in the European Community. The report analyzed the composition of Spanish feed and livestock markets, reviewed provisions of the accession agreement, and analyzed the effect of enlargement on Spanish corn imports.

Analysis of Spanish feed and livestock markets suggests that it is useful to divide the market for corn into three demand segments according to the number of corn substitutes available to each segment. Swine and cattle feeders have the most alternatives to corn, followed by poultry feeders and industrial corn users.

Analysis of the accession agreement between Spain and the EC suggests that the price of imported corn will immediately rise 55 percent, while the price of EC corn will show little change. EC corn is, therefore, likely to be used before any corn is imported.

Because the EC cannot supply all current Spanish corn users at a reasonable price, corn use is likely to decline substantially for some sectors. For instance, livestock feeders will likely give up corn entirely, poultry users will likely give up some use, and industrial users will likely continue to use corn. Some corn may accordingly continue to be imported. Projections of total non-EC Spanish corn imports in 1995 range between 1.4 and 2.7 million tons.

Close study of the strengths and weaknesses of these projections suggests that several factors will have an important influence on the U.S. competitive position in the Spanish corn market. The first factor, which is likely to alter substantially the Spanish import demand for corn, is the way in which the accession agreement is administered. The 24-6 agreement negotiated between the United States and the EC provides for Spanish importation of 2 million tons of corn and 300,000 tons of sorghum annually until 1990. No provisions were made for 1990 to 1995 of the transition period. Second, the Spanish demand for corn is likely to be increasingly concentrated in the starch, isoglucose, and poultry industries where fewer corn substitutes can be used. The demand for corn substitutes, such as citrus pulp, corn gluten, and oilseed meal, is likely to rise with enlargement as the prices of these products fall relative to corn and their use becomes more attractive to swine and cattle feeders. Third, as corn users bid up the price of corn in the Spanish market, an undetermined amount of French corn is likely to be imported before any non-EC corn is imported. Inasmuch as higher EC corn price induce new production, it is unclear how much corn Spain will actually import from other member states.

In view of these considerations, any estimation of Spanish corn imports in 1995 is highly speculative: results vary dramatically as assumptions change.

Several other factors will also affect the U.S. competitive position in the Spanish corn market after enlargement. It is useful, for example, to note that efforts to eradicate African swine fever are unlikely to affect the future demand for corn because corn will be priced out of swine rations. Eradication efforts will, however, have an important effect on the overall demand for energy and protein feeds. It is also important to point out that introducing the EC variable levy cuts off competition between EC and non-EC corn suppliers and reduces the role of price in competing within the EC market. As a consequence, nonprice competitive elements are becoming increasingly important in the Spanish market. The premium for efforts to increase the quality of export grain will, however, come in the form of retained market share rather than increased price or expanded sales.

While the market for U.S. corn exports to Spain is likely to decline rapidly, other marketing opportunities will be created by these changes. Spain is likely to increase its imports of cheap nongrain corn substitutes because of their energy content and exemption from the variable levy. These substitutes include corn gluten, corn gluten feed, milling byproducts, citrus pulp, and manioc. Because these cereal substitutes are high in energy but may not contain as much protein as corn, Spain's imports of high-protein products are also likely to increase. Oilseeds and oilseed meals are the most likely products to benefit from this development.

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APPENDIX: AN ANALYTICAL FRAMEWORK

Spain's pre-1986 corn policy provided domestic support price during the harvest season and a slightly lower threshold (import) price during periods when domestic feed grains were not available (Kelch, 1982, p. 31). As a result, prices generally rose in the fall harvest season and declined later in the year, after accounting for inflation. This pattern was altered in 1983 and 1984 when the U.S. delivered corn price rose above the domestic support price due to the high-valued U.S. dollar (see figs. 1 and 2).

By contrast, the EC CAP supports corn prices both during and after the harvest season with threshold prices substantially above domestic support price levels. Consequently, producers able to supply corn under the threshold price, rather than simply at the support price, can still profitably produce corn because the EC is a net corn importer. A much higher level of protection is thus afforded EC farmers than Spanish farmers.

Appendix figure 1 summarizes the structure of supply and demand in the Spanish corn market and EC-Spanish corn price policies. Several items are worth highlighting. The price support for Spanish farmers increases following entry to the EC, as prices move from the Spanish support price (P2) to a point between the EC support (P3) and threshold prices (P4), the lower and upper bounds on EC market prices. These prices were 20.8 pesetas (P1), 23.5 (P2), 25.9 (P3), and 33.0 (P4) in 1985/86 at the official exchange rate. 1/

Second, the demand for corn is segmented into three parts, from the most to the least elastic: demand by cattle and swine producers (D1), demand by broiler and layer producers (D2), and demand by industry (D3). This level of precision is possible because Spanish feed manufacturers are able to mix nutritionally equivalent feeds from lower cost raw materials on short notice as prices change. In 1985, D2 lay between 29.57 and 23.35 pesetas per kilogram in Andalusian swine and broiler rations (see table 5). The average market price during the year was 26.36 pesetas (the intersection of S1 and D2). 2/

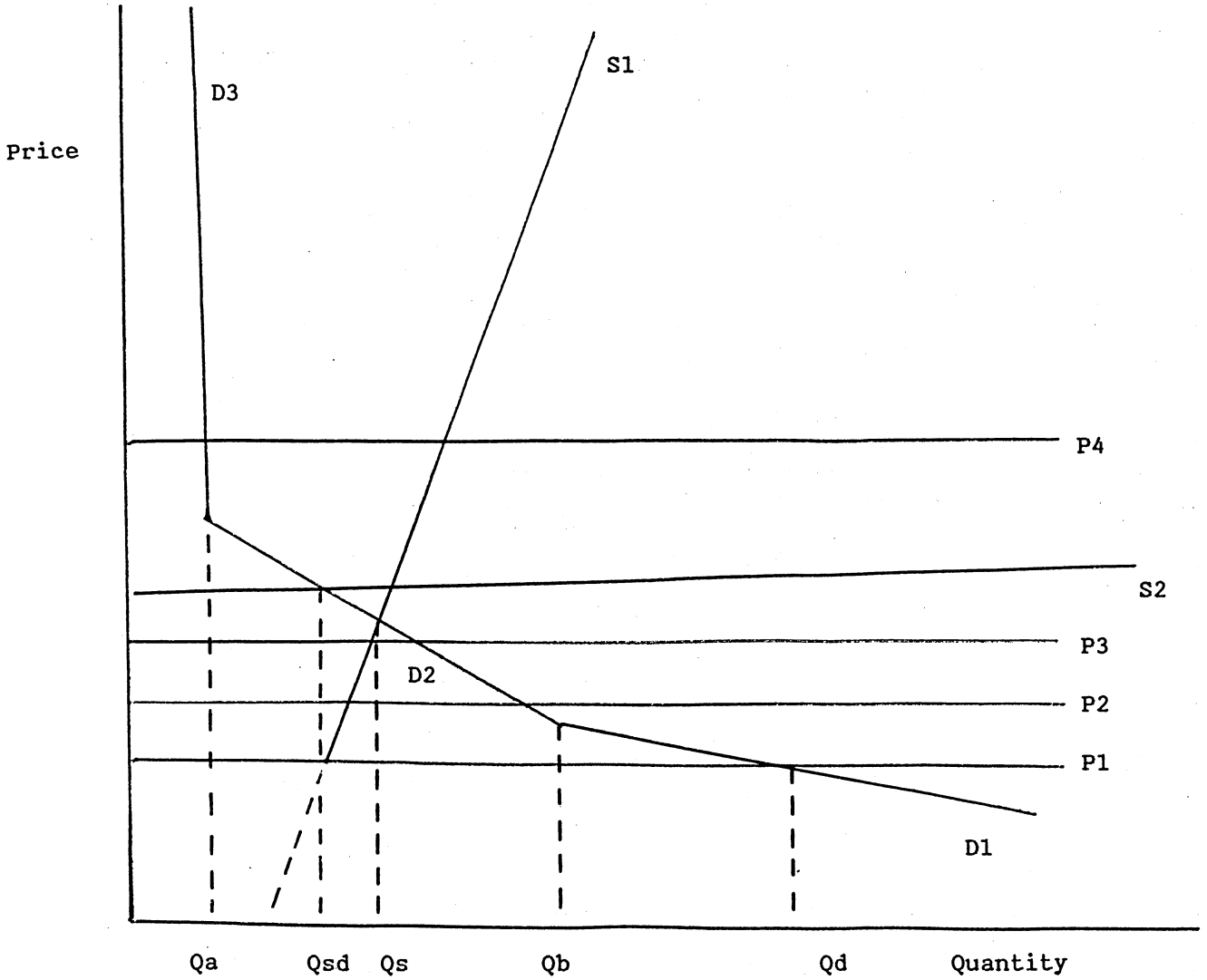
Third, depending on the extent of supply shifts with seasonal deficits and weather conditions, Spain will import corn from third countries, such as the United States. Cattle and swine producers, having the most elastic demand, are likely to substitute other, less-expensive energy sources for corn. Broiler and layer producers, having a less elastic demand, may substitute other energy sources. Industrial users of corn, having the most inelastic demand, will likely not switch to alternative energy sources, due to the relative inferiority of corn substitutes in processing starch, syrups, and other industrial corn products.

Fourth, the price at which imported corn will be allowed to enter the Spanish market rises from the Spanish (P1) to the EC (P4) threshold price because of the protection the EC variable levy provides to domestic prices. The Spanish market price must accordingly rise to the EC threshold price (P4) for imports to begin. This will happen seasonally when the EC supply is exhausted and periodically when, as in the summer of 1986, drought accelerates the seasonal supply exhaustion.

1/ 144.382 pesetas per ECU.

2/ (Ministerio, 1984a). Note that the quantities reported in appendix figure 1 refer to the base years, 1982-84, used later in this study so that there is not an exact correspondence between the prices and the quantities used to construct the graph.

Appendix figure 1--Changes in corn supply and demand associated with Spain's entrance into the European Community



Key: P1 = Spain's threshold price
P2 = Spain's support price
P3 = EC support price
P4 = EC threshold price
S1 = Spanish supply before enlargement
S2 = EC-12 supply after enlargement

Average quantities over the 1982-84 base period (see table 7):

Qa = 565,000 = Quantity utilized by industries
= (Mean of total utilization less feed utilization)
Qb-Qa = Quantity utilized by poultry and egg producers
Qd-Qb = Quantity utilized by cattle and swine producers
Qb = 3,800,507 = Estimate based on French feed conversion ratios given in (Neville-Rolfe, 1980)
Qs = 2,212,667 = (mean production)
Qd = 6,073,000 = (mean total utilization)
Qsd = Equilibrium quantity after enlargement

The existence of the convex demand curve shown in appendix figure 1 can be validated empirically in a number of ways. One method is to compare a fitted demand curve with actual corn consumption. If the residuals show actual values below the fitted curve for median values and above the curve for high and low values, then convexity may exist. Note that the convex demand curve holds neither changing income nor relative prices constant. Corn prices simply vary within certain bounds on a particular demand segment. A simple regression of inflation-adjusted prices on total corn consumption is, therefore, the most appropriate test of the convexity hypothesis.

Corn consumption = -0.644677 corn price + 11375.1
(t-statistic) (-17.19) (27.25)
R2 = 94, Adj R2 = 93, F(1,21) = 295 (1)

Based on data for 1960-85 on Spanish corn utilization (FAS) and market corn prices (Spanish Ministry).

Appendix equation 1 was used for this test. The fitted curve and actual values are plotted in appendix figure 2. 3/ The residuals suggest a linear rather than a convex function.

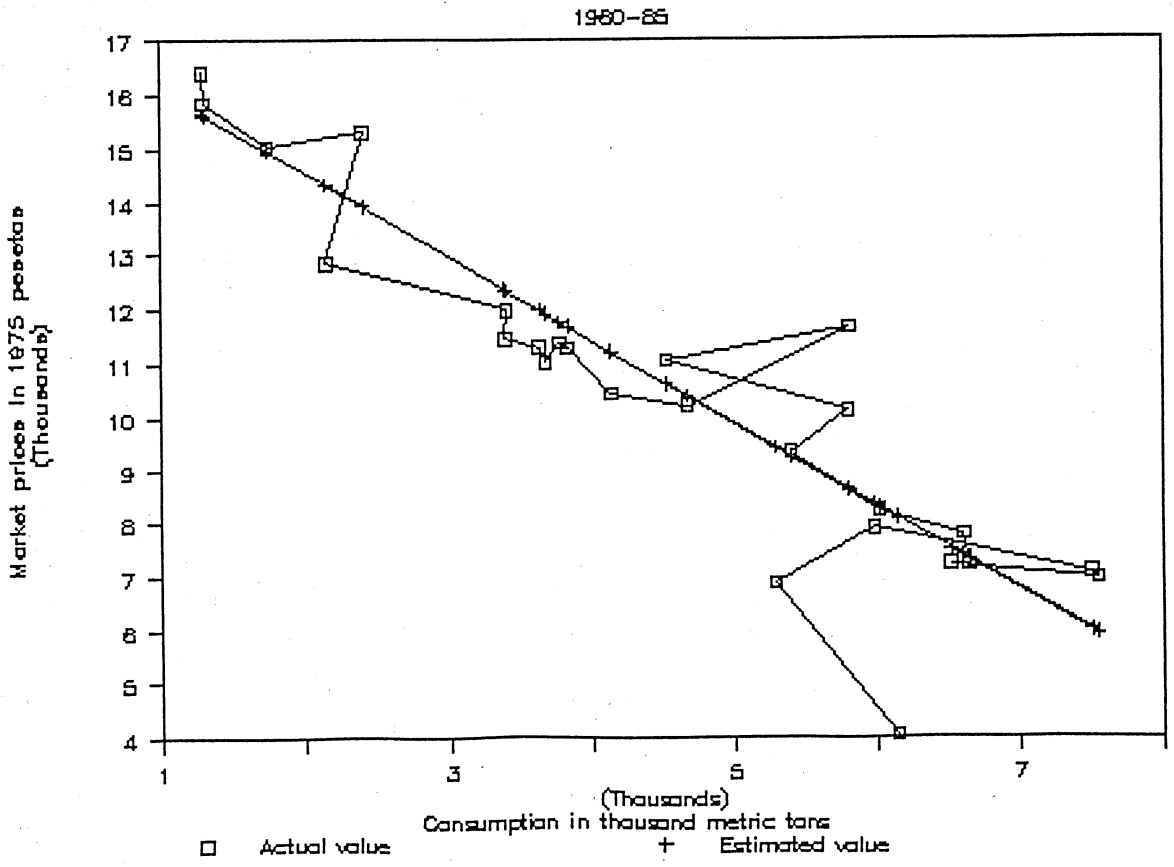
The price elasticity of domestic demand corresponding to appendix equation 1 is -1.57, too high to be an average over the entire range of possible values suggested in appendix figure 1. 4/ The data appear to cover only one demand segment adequately, the points influenced by swine and cattle consumption. This segment is the most elastic and does not represent the response to price changes of the other segments of the demand curve. Because this approach does not validate the convexity hypothesis, other arguments about the shape of the curve need to be reviewed.

Empirical validation of the convexity hypothesis normally hinges on the existence of different substitutes for corn in different uses. The starch industry may, for example, place a different value on corn as an input because its production process allows fewer alternative inputs than does the broiler industry. Three related arguments support this position. First, the nutritional requirements of the various species of livestock and poultry differ, which means that the feeding efficiency of substitutable feeds also differs. The strongest demand for corn therefore exists for the livestock/poultry species with the fewest alternative feeds. Second, as a consequence of variations in the feeding efficiency of different animals, linear programs of their feed rations show corn entering and leaving rations at different prices. Third, since corn enters and leaves animal feed rations at different prices, elasticity estimates based on livestock rations show diverse demand elasticities for corn among different livestock and poultry species (McKinzie, 1986). Each of these observations is related, and each supports the convexity hypothesis.

3/ Equation 1 was estimated using corn consumption and market corn prices deflated by the consumer price index for the period 1960-83. Data for 1973, 1984, and 1985 were omitted in the computations because of structural changes occurring in those years.

4/ Using the assumptions in text for base year consumption (5.5 million tons), price changes (39.8 percent), and 1995 corn production (2.9 million tons), this elasticity suggests that Spain will export 0.9 million tons of corn in 1995.

Appendix figure 2--Spain's corn demand,



APPENDIX TABLES

Appendix table 1--Spain: Computation of animal units for Spain

Year	Slaughter			Layers in production	Animal units 1/
	Cattle	Swine	Total poultry		
	1,000 head slaughtered		Metric tons	1,000 head	Thousand
1965	1,143	2,957	234,000	38,000	5,078
1966	1,243	4,160	306,000	42,000	6,433
1967	1,348	4,916	353,000	40,000	7,281
1968	1,445	4,953	351,000	41,000	7,393
1969	1,482	5,266	386,000	42,000	7,892
1970	1,666	6,024	499,000	43,000	9,410
1971	1,733	5,912	477,000	45,000	9,264
1972	1,489	5,666	554,000	49,000	9,592
1973	1,713	7,396	600,000	38,000	10,918
1974	1,915	9,464	649,000	40,000	12,589
1975	2,038	8,031	631,000	47,000	11,939
1976	1,855	8,512	695,000	50,000	12,569
1977	1,882	9,816	735,000	52,000	13,608
1978	1,775	10,953	755,000	49,000	14,197
1979	1,744	12,683	748,000	49,000	14,972
1980	1,907	13,198	762,000	52,000	15,549
1981	1,923	14,036	885,000	52,000	17,009
1982	1,893	15,161	849,000	55,000	17,282
1983	1,890	15,090	813,000	48,000	16,850
1984	1,840	15,635	800,000	46,000	16,938

1/ Animal units = (1 * cattle) + (0.5 * swine) + ((poultry/75)/1.6 kg/hd) + (layers/75).

Sources: (Tawil, 1986; and Ensminger, 1983).

Appendix table 2--Spain: Segmented demand projection, corn imports from non-EC suppliers to 1995 under alternative assumptions

Year	Corn utilization			Projected corn production	Projected corn imports	
	Cattle and swine 1/	Poultry and layers 1/	Industrial		Without EC membership 2/	With EC membership 3/
	1,000 metric tons					
1985	4,164	2,671	613	2,416	5,032	868
1986	4,327	2,751	638	2,470	5,245	919
1987	4,491	2,830	663	2,525	5,459	968
1988	4,654	2,910	688	2,580	5,672	1,018
1989	4,818	2,989	713	2,635	5,886	1,068
1990	4,982	3,069	738	2,689	6,099	1,117
1991	5,146	3,148	763	2,744	6,313	1,167
1992	5,310	3,227	788	2,799	6,526	1,216
1993	5,474	3,306	813	2,853	6,740	1,265
1994	5,639	3,385	838	2,908	6,953	1,315
1995	5,803	3,463	863	2,963	7,167	1,364

1/ Total feed use was projected by multiplying a projection of animal units times the average corn use per animal unit for the years 1975-85. Use by species was calculated from the total by applying French livestock feeding ratios (Spanish ratios are unavailable). Conversion from liveweight to dressed weight assumes: cattle (59.0%), swine (70.4%), poultry (72.1%), and eggs (90%). 2/ Total utilization less production. 3/ Total corn use minus cattle and swine use.

Appendix table 3--Spain: Elasticity estimate of changes in corn imports in 1995 with and without EC membership, base = 1982-84

Variables	Demand elasticities		Independent variable changes by 1995--		Total change in corn imports-- 1/	
	Total	Import	Without EC membership	With EC membership	Without EC membership	With EC membership
			Percent			
Corn production	-0.16	-0.43	2/ 33.9	33.9	-14.6	-14.6
Animal units	1.27	1.83	3/ 43.2	4/ 21.6	79.0	39.5
Corn price	-.87	-1.31	0	5/ 49.8	0	6/ -65.3
Barley price	.53	.77	0	7/ 16.4	0	12.6
Total change	NA	NA	NA	NA	64.4	-27.8
Difference with EC membership	NA	NA	NA	NA	92.2	

NA = Not applicable. 1/ The total demand elasticity is calculated using total corn consumption instead of corn imports as the dependent variable. The number cited is the import demand elasticity multiplied by the independent variable change by 1995. 2/ Average production 1982-84 was: 2,213 (1,000 metric tons). Projected production is: 2,963. (2,963 - 2,213)/2,213 = 33.9 percent change. 3/ The increase in animal units to 1995 is: (24,385 - 17,023)/17,023 = 43.2 percent. 4/ The growth in livestock consumption is assumed to be cut in half by slower growth in the economy and higher livestock prices. 5/ Because Spain is a net corn importer, post-enlargement corn prices rise from the Spanish support price to the EC threshold price. 6/ Because the threshold price was used to make this estimate, the estimate is likely to be an upper bound. 7/ Because Spain is often a barley exporter, barley prices rise only from the Spanish support price to the EC support price following EC membership.

Appendix table 4--Spain: Estimated total import demand for corn without EC enlargement

Year	Independent variables 1/					Corn imports from non-EC suppliers
	Constant	Animal units	Corn production	Corn price (t-1) 2/	Barley price (t) 3/	
	Number	Thousand	1,000 metric tons	Pesetas per metric ton		1,000 metric tons
1985	478	17,986	2,416	26,010	22,000	3,277
1986	478	18,626	2,470	26,010	22,000	3,566
1987	478	19,266	2,525	26,010	22,000	3,855
1988	478	19,906	2,580	26,010	22,000	4,143
1989	478	20,545	2,635	26,010	22,000	4,432
1990	478	21,185	2,689	26,010	22,000	4,721
1991	478	21,825	2,744	26,010	22,000	5,010
1992	478	22,465	2,799	26,010	22,000	5,299
1993	478	23,105	2,853	26,010	22,000	5,588
1994	478	23,745	2,908	26,010	22,000	5,877
1995	478	24,385	2,963	26,010	22,000	6,165

1/ Imports = 477.83 + 0.5185 animal unit - 0.7846 corn production - 0.4100 corn price + 0.2743 barley price 2/ Market price for the 1984/85 crop year. 3/ Market price for the 1985/86 crop year.

Appendix table 5--Spain: Estimated total import demand for corn with EC enlargement, 1985-95

Year	Independent variables 1/					Corn imports from non-EC suppliers
	Constant	Animal units 2/	Corn production 3/	Corn price (t-1) 4/	Barley price (t) 5/	
	Number	Thousand	1,000 metric tons	Pesetas per metric ton		1,000 metric tons
1985	478	17,277	2,416	30,837	22,250	385
1986	478	17,615	2,470	30,837	23,789	940
1987	478	17,954	2,525	30,837	24,142	1,169
1988	478	18,292	2,580	30,837	24,495	1,399
1989	478	18,631	2,635	30,837	24,849	1,628
1990	478	18,969	2,689	32,858	25,908	2,051
1991	478	19,308	2,744	32,858	25,908	2,184
1992	478	19,646	2,799	32,858	25,908	2,316
1993	478	19,985	2,853	32,858	25,908	2,449
1994	478	20,323	2,908	32,858	25,908	2,582
1995	478	20,662	2,963	32,858	25,908	2,714

1/ Imports = 477.83 + 0.5185 animal unit - 0.7846 corn production - 0.4100 corn price + 0.2743 barley price. 2/ Spain's growth in animal units without enlargement (see appendix table 4) divided by 2. 3/ EC threshold price for the 1985/86 crop year adjusted to reflect, albeit imperfectly, the effect of reduced-levy corn prices (reduced 14 ECU per metric ton) agreed upon in the 24-6 negotiations. The final agreement under 24-6 required the levy to be reduced until the specified quantities of corn and sorghum find buyers rather than reducing the levy a specified amount. 4/ Domestic support prices during the transition period.

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