United States
Department of
Agriculture

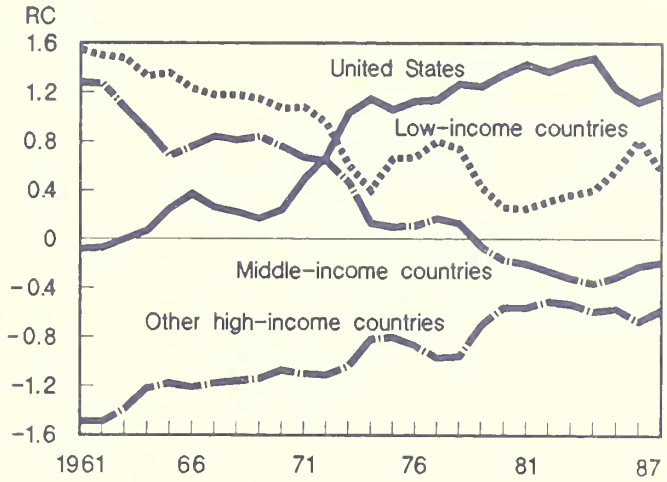
Economic
Research
Service

March 1989
October 198

World Agriculture

Situation and Outlook Report

Trends in Agricultural Competitiveness, 1961-87



New RC indicator shows LDC ag economies vulnerable to oil price shocks, recession, debt (p. 18).

World Agriculture Situation and Outlook . Agriculture and Trade Analysis Division, Economic Research Service, U.S. Department of Agriculture, March 1989.

Contents

Economics Editor
Arthur J. Dommen

Approved by the World Agricultural Outlook Board on March 20, 1989. The next summary of the *World Agriculture Situation and Outlook Report* is scheduled for release in September 1989. Summaries and full Situation and Outlook reports, including tables, may be accessed electronically. For details, call (202) 447-5505.

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Summary

For the industrialized countries (excluding the United States), 1988 growth of 3.9 percent turned out to be much better than expected. In 1989 and 1990, this strength will again be demonstrated by annual growth of around 3 percent. The tenor of the outlook suggests a reasonably favorable environment for U.S. agricultural exports.

The European Community (EC) outlook parallels that for developed countries, with 1988 growth reaching an unexpectedly strong 3.4 percent. EC growth will likely weaken somewhat to between 2.5 and 3.0 percent in 1989 and 1990. West Germany performed above expectations in 1988, with real growth likely to reach 3.4 percent; observers had previously thought 1-1.5 percent likely. About one-third of its growth comes from exports, and a record trade surplus is likely in 1988. Capital goods exports provide much of this strength. Current forecasts show growth of around 2.5 percent for both 1989 and 1990.

Japan performed well in 1988, with real growth exceeding 5 percent. Despite a higher value yen that appreciated an additional 3.9 percent, its trade performance stayed strong, with its trade surplus declining only 3 percent. This surplus should narrow further, but lower input prices (due to the higher yen) should help the domestic economy. Japan is therefore likely to register a growth rate between 3.5 and 4 percent in both 1989 and 1990. The outlook for U.S. agricultural exports to Japan remains good.

Overall, developing countries showed modest growth of 3.5 percent in 1988. While the situation in Africa is looking up, severe economic problems in Latin America will reduce developing countries' growth to 2 percent in 1989.

The four Asian "tigers" (South Korea, Taiwan, Hong Kong, and Singapore), powered by strong export performance, continue to show strong prospects for growth of 5 to 6 percent in 1989 and 1990. Although this would represent a slowing from 1988's growth of 8.9 percent, it would still exceed that of most countries. Thailand, with growth of 10 percent in 1988 and expectations of 7-9 percent in 1989 and 1990, could well become the fifth "tiger."

The Federal Reserve has *tightened monetary policy*, thereby pushing up interest rates. The Federal Funds rate has gone up almost 2 percentage points since the second week of February. The LIBOR 6-month rate on dollar assets also rose 1 percentage point in the same period. These rates should continue upward. Europe and Japan may well follow suit, but the differential in favor of dollar assets will remain, and could possibly widen.

Agricultural based exchange rate indices have been suggesting *dollar strength* in early 1989, with the real all-agricultural-product index for the first quarter about 2 to 3 percent higher than for the previous quarter. However, prospective changes in the dollar's value will probably not greatly influence the price competitiveness of U.S. agricultural exports. Any appreciation would be minimal, and the dollar (as measured by the all-agricultural-product index) remains some 25 percent below its early 1985 highs.

The World Economy and Exchange Rates

With the 6-year world economic expansion expected to continue (except for certain developing economies), business cycle theorists have some explaining to do. Overall, world real economic growth (excluding the United States) was a surprisingly strong 3.7 percent in 1988. While growth will probably slow in coming years, a recession is not in prospect. The consensus is that the world economy should grow about 3 percent in 1989 and 1990. With this continuing solid growth, world trade should register further gains. While not as spectacular as its 8-percent real growth in 1988, world trade is expected to grow about 5 percent in 1989 and 1990, thereby providing a healthy environment for U.S. agricultural and nonagricultural exports.

Analysts look for any revisions to this upbeat outlook to be on the down side. They point to significant trade imbalances among developed countries, the potential for U.S. dollar volatility, and intensifying debt problems among some developing countries (LDC's). Of these factors, the debt problem is proving most intractable. It remains the principal reason behind the severe economic conditions in many Latin American economies.

Inflation showed a strong upturn in 1988, nearly doubling for the world as a whole. In 1989 and 1990, prices should continue accelerating, particularly in Latin America. Expectations of higher inflation rates have led to monetary tightening and rising interest rates, especially in the United States and the United Kingdom. Should the U.S. Federal Reserve pursue further monetary tightening which is unmatched in Frankfurt or Tokyo, the interest rate differential in favor of dollar-denominated assets will widen, putting upward pressure on the dollar.

World Economic Activity

Developed Country Growth: Where Have Business Cycles Gone?

For the industrialized countries (excluding the United States), 1988 growth (3.9 percent) turned out to be much better than anyone could have expected. In 1989 and 1990, this strength will again be manifest. Growth is expected to be around 3 percent. The tenor of the outlook suggests a reasonably favorable export environment.

The European Community (EC) outlook parallels the overall developed country outlook, with 1988 growth coming in at an unexpectedly strong 3.4 percent. EC growth will likely weaken somewhat to between 2.5 and 3.0 percent in 1989 and 1990. West Germany provided a big surprise with 1988 real growth likely to reach 3.4 percent, whereas 1-1.5 had previously been thought likely. As much as one-third of West Germany's growth comes from exports, and a record surplus is likely in 1988. Much of this strength is anchored in capital goods exports. Current forecasts show growth of around 2.5 percent for both 1989 and 1990.

Japan showed a high performance, with real growth exceeding 5 percent in 1988. Despite a high-value yen that appreciated some 3.9 percent further in 1988, Japan's trade performance stayed strong, with its trade surplus declining only 3 percent. This surplus should narrow further, but lower input prices (due to the higher yen) should help the domestic side of the economy. On this basis, Japan should register between 3.5 and 4 percent growth in both 1989 and 1990. The outlook for U.S. agricultural exports to Japan remains good.

Developing Country Growth: Eyes on Latin America

Overall, it seems that the LDC's, which account for roughly two-fifths of U.S. agricultural exports, are growing at fairly reasonable rates, with 1988 growth of 3.5 percent. While the situation in Africa is looking up, however, the severe economic problems in Latin America will pull down growth overall for LDC's to 2 percent in 1989.

Latin America, which imports just over 13 percent of U.S. agricultural exports, registered one of the poorest economic performances in 1988, a contraction of 0.1 percent. At the same time, these countries have growth prospects of only 0.1 percent in 1989. They have a chance to recover in 1990, however, with a forecast 3.8-percent growth rate. Peru (with an expected 9-percent contraction in 1989 that would match its 1988 performance, and expected inflation of 1,000 percent); Mexico (expected to average -0.5 to -1.0 percent in 1986-90); and Brazil (with inflation perhaps approaching 5,000 percent, while the economy contracts in 1988 and 1989) are facing severe economic crises.

More positively, real gross domestic product (GDP) growth in Africa (importing some 6.5 percent of U.S. agricultural exports) is seen at around 3 percent in 1989 and 1990. Real per capita GDP growth for 1989 and 1990 is forecast at 0-1.5 percent in Latin America and under 0.5 percent in Africa.

World and regional economic growth

Calendar year	1984	1985	1986	1987	1988	1989	1990
	Percent change						
World	4.2	3.0	2.8	3.1	3.8	2.9	3.2
United States	6.6	3.0	2.8	3.4	3.8	2.9	3.0
World less U.S.	3.2	3.0	2.8	3.0	3.7	2.9	3.3
Developed countries	4.5	3.1	2.5	3.2	3.9	3.0	2.9
Less U.S.	3.4	3.3	2.4	3.1	3.9	3.1	2.8
EC-12	2.3	2.4	2.4	2.7	3.4	2.8	2.6
Japan	5.1	4.7	2.5	4.0	5.7	4.2	3.6
Developing countries	3.2	2.5	2.7	3.3	3.5	2.0	4.1
Latin America	3.5	3.7	4.1	2.6	-0.1	0.1	3.8
Africa & Middle East	1.1	0.0	-1.2	1.8	3.2	0.9	3.5
Asia	5.4	4.0	5.8	5.9	8.1	5.7	5.3
NIC's	8.9	3.7	9.9	11.5	8.9	5.9	4.7
CPE's	3.7	2.9	3.9	2.8	3.8	3.4	3.9

Sources: IMF, The WEFA Group Inc., ERS.

In contrast, the four Asian "tigers" (South Korea, Taiwan, Hong Kong, and Singapore), buying almost 12 percent of U.S. agricultural exports and powered by strong export performance, continue to show strong prospects for growth in 1989 and 1990, with growth between 5 and 6 percent. This would represent a slowing from 1988's growth of 8.9 percent, but would be above most countries. Thailand, with growth of 10 percent in 1988 and an expected 7-9 percent rate in 1989 and 1990, could well become the fifth "tiger."

Inflation

Worldwide inflation essentially doubled in 1988, and is expected to rise sharply again in both 1989 and 1990. LDC price stability in particular showed a marked deterioration in 1988, with the acceleration seen as continuing unabated in 1989 and 1990. Leading the way in all this are Brazil and Peru, both of which are on the road to hyperinflation (technically defined as inflation above 1,000 percent). Argentina also faces severe inflation in 1989 and 1990, but only in the 300-to-400-percent range.

Regions other than Latin America should see comparatively modest upward movements in prices. Asian LDC's look set for inflation of around 7 percent in 1988, a pace that should continue in 1989 and 1990.

Inflationary pressures seem to be building in the industrialized countries, with the most worrisome situations being in the United States, the United Kingdom, and Italy, where inflation is currently running at rates above the expected range of 3-to-3.5 percent for the group as a whole. Japan and West Germany are unlikely to see prices rise above 2 percent, but even this represents an increase over recent performance. The danger in these pressures stems from the threat they pose to stability in currency markets and industrial-country policy coordination that prevailed during the past year.

Commodity Prices

As can be seen from the table, both real and nominal nonfuel commodity prices turned upwards strongly in 1988. In the case of the LDC's, the increase in real prices amounted to nearly 10 percent (in nominal terms, 20 percent). The

Nonfuel commodity and manufactures export prices
(1985=100, U.S. $ terms)

	1984	1985	1986	1987	1988
			Nonfuel commodity prices		
All commodities	115.0	100.0	96.1	104.1	128.8
Developing countries	114.8	100.0	98.8	102.1	120.8
Developed countries	115.3	100.0	93.9	106.6	135.9
			Real nonfuel commodity prices 1/		
All commodities	114.1	100.0	83.0	80.5	92.1
Developing countries	113.9	100.0	85.3	79.0	86.4
Developed countries	114.8	100.0	81.1	82.4	97.2
			Manufactures export prices		
Developing countries	106.1	100.0	89.4	91.1	2/ 97.5
Developed countries	100.8	100.0	115.8	129.3	2/ 139.8

1/ Nonfuel commodity prices deflated by manufactures export prices for developed countries. 2/ Estimated.

Source: IMF, World Economic Outlook and International Financial Statistics.

general recovery in prices reflected better-than-expected world economic growth, plus short supplies of some commodities (particularly metals). It appears that for metals and agricultural raw materials, supply has been catching up with demand, while for foods, improved weather will forestall a repeat of last year's crop shortfalls. As a result, late 1988 and early 1989 data indicate that the rate of increase in these prices is slowing, but it remains good news for LDC's.

While this continued strength reinforces the notion that prices have passed through their low point and should edge upward in future, they are still quite depressed in real terms. The outlook does not show any major recovery, though stronger growth would have an upward influence. Both nominal and real prices are seen rising in 1989 and 1990, but at best real prices (assuming no stronger growth than already expected) are seen as rising 1 to 2 percent over both years. This holds for both the all-commodities and developing-countries indices. [Tim Baxter (202) 786-1706]

Dollar Exchange Rates

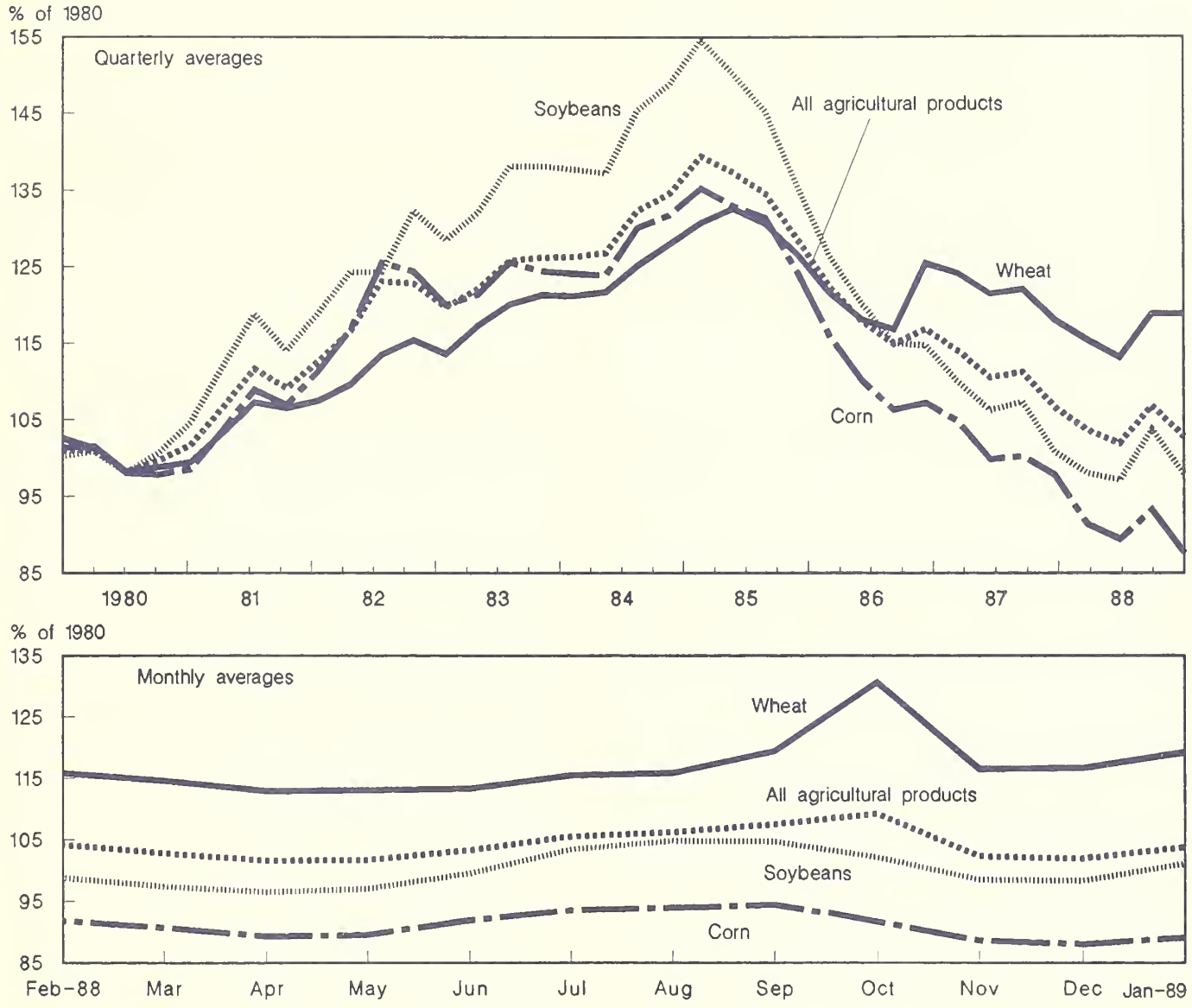
It is clear that the U.S. trade deficit will be with us for a while, particularly as long as the U.S. economy remains so strong. That, combined with the possibility of other countries raising interest rates out of inflation angst, should reduce the value of the dollar. Recent upward adjustments in U.S. interest rates notwithstanding, the current wisdom foresees a real dollar devaluation of about 5 percent in 1989. However, strong anti-inflation moves on the part of the Federal Reserve could well mean that in 1989 the dollar rises.

The Federal Reserve has tightened monetary policy, thereby pushing up interest rates. The Federal Funds rate has been driven up by almost 2 percentage points since the second week of February. Likewise, the LIBOR 6-month rate on dollar assets has been on the rise, having moved 1 percentage point in the same period. These rates should continue upward. Such movements may well be imitated in Europe and Japan, but the differential in favor of dollar assets will remain, and could possibly widen. Currently, dollar denominated assets return approximately 3.3 percent more than German marks, and 4.7 percent more than Japanese yen.

Until early February, the dollar exhibited unexpected strength, having risen some 7 percent (measured by the Federal Reserve indiex) since the beginning of December. From that peak, the dollar resumed a more familiar path and declined by just over 2 percent.

Not surprisingly, agricultural based exchange rate indices have also been indicating dollar strength in the early part of 1989, with the real all-agricultural-product index for the first quarter of 1989 about 2 to 3 percent higher than for the previous quarter. However, prospective changes in the value of the dollar will probably not greatly influence the price competitiveness of U.S. agricultural exports. Any appreciation

Real Agricultural Exchange Rates



would be minimal, and the dollar (as measured by the all-agricultural-product index) remains some 25 percent below its early 1985 highs. [Tim Baxter (202) 786-1706]

Energy Outlook

World total primary energy production, which dropped from its long-term peak of 6.4 billion metric tons of oil equivalent (mtoe) in 1979 to 6.2 billion mtoe in 1983, has recovered significantly, reaching an estimated 7.2 billion mtoe in 1987, despite falling prices for all types of energy. Primary energy production here includes oil and natural gas liquids, coal and lignite, dry natural gas, and hydroelectric and nuclear power (table).

The drop in energy production between 1979 and 1983 was principally due to the rapid fall in the demand for oil as its price skyrocketed in the second round of oil price increases, and the attempt by the Organization of Petroleum Exporting Countries (OPEC) to control oil production. The production and flow of oil from the producing to the importing countries was further disrupted by the 1980-88 war between Iran and Iraq.

The continuous fall in oil prices, from the average annual peak of over $34 per barrel in 1981 to $12.87 in 1988, forced both OPEC and other producers to increase oil output to maintain export revenues. It also increased demand for oil, but not enough to soak up the excess production capacity

Composition of world energy production, 1987

Source	Production	Share
	Million mtoe 1/	Percent
Crude oil and ngl 2/	3,010	43
Coal and lignite	2,172	31
Dry natural gas	1,558	22
Hydroelectric power	179	3
Nuclear power	144	2

1/ Mtoe = Metric tons of oil equivalent. 2/ Ngl = Natural gas liquids.

Source: Energy Info. Admin., U.S. Dept. of Energy, International Energy Annual, several issues.

and stop the price decline. By 1988, oil prices in real (IMF export unit values index) terms fell to the level of 1973, just before the first round of steep price increases.

In the latest attempt to force oil prices up again, OPEC representatives met in Vienna in the last week of November 1988 to establish a new production ceiling and apportion production quotas among its members. The new cartel ceiling was set at 18.5 million barrels per day (mbpd), about the same level as 1987 cartel production, but below 22.3 mbpd reached last October. The agreed target price was set at $18 per barrel. Saudi Arabia, the largest producer, retained the largest production quota (4.5 mbpd) and, after a prolonged and bitter debate, Iran and Iraq each received a quota of 2.6 mbpd.

By January 1989, oil prices inched up to an average of $15.70, but then began to slide down again. In an effort to help OPEC tighten petroleum markets and firm prices to the target level, some independent oil producers (including Angola, China, Egypt, Malaysia, Mexico, and Oman) and observers from a few other countries (including the USSR) met in London on February 22 and agreed to cut their exports by 5 percent during the second quarter of this year. In the past, such promises of cooperation between OPEC and independent producers have proved ineffective. But this time, by the beginning of March, the USSR announced a cut in its 1989 exports of close to 100,000 barrels a day.

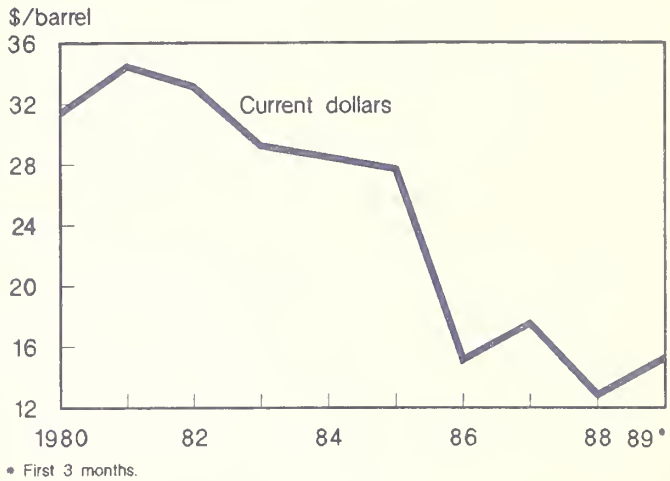
The energy outlook for the remainder of this year suggests that world energy supplies will keep growing at an annual rate of about 3 percent and oil supplies will increase by about 1.5 percent. If the OPEC members succeed in enforcing the new export quotas, and the independent oil producers cut their exports as agreed, the overhang of excess oil stocks may decline, and the average oil price may reach or surpass the OPEC 1989 target price, a great improvement over last year's $12.87 per barrel. [Francis Urban (202) 786-1705]

World Trade and Agricultural Policy

U.S. Agricultural Trade

U.S. agricultural exports in fiscal 1988 are expected to gain $2.7 billion over the last fiscal year because higher prices will more than offset a small drop in aggregate volume. Ex-

Crude Oil Prices



* First 3 months.

port volume is expected to fall slightly from fiscal 1988's 148 million tons as the U.S. share of world trade shrinks for some commodities and world trade declines for others. With world stocks declining, prices for wheat, corn, and soybeans will likely reach their highest levels since fiscal 1985. U.S. cotton and oilseed exports are expected to decline in value, but a $3.6-billion increase for grain and feed exports will more than offset the drop. Favorable exchange rates and relatively strong world economic growth will help push high-value exports above fiscal 1988's record $16.4 billion.

U.S. agricultural imports are forecast to match fiscal 1988's record $21 billion, unchanged from November's forecast. The U.S. agricultural trade surplus is expected to rise $2.7 billion to $17 billion in fiscal 1989.

U.S. *wheat and flour* exports should reach $6.2 billion, growing $1.7 billion from the year before despite a slight decline in volume. Strong wheat import demand from China and some South Asian countries has partially offset an expected decline in imports by the Soviet Union. Tight exportable supplies in many major competitor countries and the United States have strengthened prices.

Stronger *coarse grain* exports are forecast in fiscal 1989, as volume rises nearly 7 million tons. U.S. coarse grain exports will likely jump to 59 million tons, boosted by larger forecast Soviet imports and smaller production and supplies of coarse grain in Canada and Argentina. Reduced global supplies of feed quality wheat and of Australian sorghum are also supporting coarse grain exports.

Much of the expected increase over last year stems from sales to the USSR. As of mid-February, Soviet purchases of U.S. grain were already approaching the total for fiscal 1988, with purchases of corn running well ahead of the year before and the Soviets buying U.S. sorghum for the first time in more than a decade.

Several factors account for the heavy Soviet demand for coarse grains, including reduced domestic feed production and the push to increase meat output. In 1988, the USSR's production of both coarse grain and feed production were down from a year earlier. Furthermore, production of domestic oilseeds, a source of high protein feed, increased only marginally. Despite the reduced domestic supplies of feeds, significant emphasis remains on raising the amount of meat and livestock products.

U.S. exports of *oilseeds and products* in fiscal 1989 are now forecast at 21.8 million tons and $6.9 billion, down 7.7 million tons and $900 million from last year. World trade and U.S. exports are projected to fall because of a significant reduction in U.S. soybean production and ending stocks, record South American production and exports, and lagging European demand.

Largely because of reduced sales of U.S. oilseeds and products, the value of exports to the EC-12 will probably dip slightly in fiscal 1989, after rising $1.1 billion during the last 2 years. Slower European economic growth, large EC grain and oilseed crops, and further cuts in EC dairy production could push exports $200 million below fiscal 1989's $7.5 billion.

The EC's grain and oilseed crops in 1988 were the second largest ever, despite announced measures to curb output by means of a new stabilization program. U.S. exports of oilseeds and oilseed products will therefore decline. U.S. grain and feed exports to the EC will also be reduced by high EC grain output, ample stocks, and stagnant consumption. Prospects for U.S. oilseed exports in fiscal 1989 are further dampened by the recent strength of the U.S. dollar compared with European currencies, high prices for oilseed meals relative to grains and nongrain feeds, and reduced EC livestock production.

However, U.S. exports of horticultural products to the EC should continue strong this year. EC concessions under the U.S.-EC citrus agreement have lowered duties on grapefruit and reduced tariff quotas for almonds, lemons, sweet oranges, and frozen concentrated orange juice. The United States is expected to be the chief beneficiary of the reduced tariffs that took effect January 1, 1989. U.S. dried fruit exports, however, may weaken because of large EC supplies of raisins and prunes.

The fiscal 1989 forecast for total U.S. exports of *horticultural products* is up $400 million from fiscal 1988 levels. Export sales within this commodity sector continue to benefit from heavy promotional activity and relatively favorable exchange rates for the U.S. dollar.

Livestock, dairy, and poultry exports for fiscal 1989 should reach $6.2 billion, compared with $6.1 billion in 1988. While overall export performance of this product sector is expected to remain strong, some bearish factors exist.

Reduced availability of hides and skins due to the continuing decline in U.S. cattle slaughter, combined with a drop in demand for leather products, is expected to curb exports of hides and skins. A slowdown will likely occur in exports of live cattle; also, the hormone dispute with the EC will trim export sales of some meat products, like offals. On the plus side is an expected rise in beef exports due to increased import demand from Japan and South Korea.

The value of U.S. animal product exports to Japan should continue to expand in fiscal 1989, mainly because of more

International commodity prices

	Wheat				Corn		Soybeans	Soyoil	Soymeal 44%	
Year	U.S. 1/	Arg. 2/	Can. 3/	Aust. 4/	U.S. 5/	Arg. 2/	U.S. 5/	U.S. 6/	U.S. 6/	Ham.7/
					$/metric ton					
1980	176	203	192	175	129	159	272	522	217	271
1981	176	190	194	175	135	139	272	464	223	269
1982	161	166	165	160	110	109	233	404	197	233
1983	158	138	167	161	137	133	269	518	222	255
1984	153	135	166	153	138	132	271	678	184	210
1985	137	106	173	141	114	103	214	596	140	171
1986	117	88	161	120	89	83	200	361	174	197
1987	114	89	134	115	77	80	204	349	194	215
1988	146	125	177	150	107	105	287	519	259	285
Jan.	130	94	148	127	87	85	237	477	213	239
Feb.	132	106	151	135	88	86	237	458	203	233
Mar.	126	107	143	131	91	85	241	443	211	247
Apr.	128	108	145	133	90	81	254	474	220	258
May	130	107	152	131	90	79	271	516	247	275
June	151	125	166	158	118	121	345	606	320	336
July	151	141	209	157	130	131	335	646	284	311
Aug.	151	140	206	154	119	119	322	590	284	296
Sept.	160	152	202	160	122	121	321	552	292	318
Oct.	162	147	202	169	121	119	298	510	284	305
Nov.	165	152	203	171	114	117	288	470	274	300
Dec.	167	NQ	203	173	118	116	297	480	272	298

NQ = No quote.
1/ No. 2 hard winter, ordinary protein, f.o.b. Gulf ports. 2/ F.o.b. Buenos Aires. 3/ No. 1 western red spring, 13.5% protein, in store Thunder Bay. 4/ July-June crop year, standard white, f.o.b. selling price. 5/ U.S. No. 3 yellow, f.o.b. Gulf ports. 6/ Decatur. 7/ Hamburg, f.o.b. ex-mill.

beef sales. According to the recent U.S.-Japan beef and citrus agreement, Japan's beef import quotas will be enlarged by 60,000 tons per year through March 1991, when the quota will be eliminated. U.S. beef exports to Japan totaled 155,000 tons in fiscal 1988, or 70 percent of all U.S. beef exported that year (excluding offals).

The value of U.S. agricultural exports to Japan in fiscal 1989 is forecast to rise almost $1 billion from last year's record $7.3 billion. Value gains will be fueled by substantially higher U.S. export prices for wheat, coarse grains, and soybeans; increased exports of beef and oranges anticipated as a result of the new U.S.-Japan beef and citrus agreement; greater opportunities for U.S. exports of processed agricultural products stemming from the GATT-12 agreement; and expected generally strong growth in Japan's economy. As in 1988, Japan's rate of economic growth will likely outstrip that of any developed country. GNP growth is expected to slip from above 5 percent, but remain above 3 percent. [Stephen A. MacDonald (202) 786-1822]

GATT Mid-Term Review

The Mid-Term Review of the Uruguay Round of multilateral trade negotiations (MTN) was held in Montreal, Canada, on December 5-9, 1988. The United States sought agreement in each of the 15 MTN negotiating groups on a framework for continued talks—an agreed common approach to further negotiations in the 2 years remaining in the 1986-90 Uruguay Round.

While progress at the Mid-Term Review was widespread, with 11 of the 15 negotiating groups reaching agreement, the Trade Negotiating Committee (TNC) overseeing the MTN agreed to put the results so far achieved on hold until a high-level TNC meeting is convened in April 1989. During the interim months, Director-General of the General Agreement on Tariffs and Trade (GATT) and TNC Chairman Arthur Dunkel was to conduct consultations aimed at forging agreement in the four remaining areas—textiles and clothing, agriculture, safeguards, and trade-related aspects of intellectual property. The April TNC meeting could then review and adopt agreed measures in all 15 negotiating groups, thus achieving balanced progress.

U.S. Agricultural Framework Proposal

The United States presented its framework for agricultural reform at the November meeting of the Negotiating Group on Agriculture that led up to the Mid-Term Review. The United States called for reforms to end market-access barriers; grant equivalent treatment for all domestic and imported commodities and products; eliminate trade-distorting subsidies; and harmonize health and sanitary measures.

The U.S. framework proposal would have ministers amend the General Agreement to implement these agricultural reforms. Plans for individual countries that identify specific policy adjustments would be worked out in conjunction with guidelines agreed upon in the Negotiating Group on Agriculture.

These guidelines would have ministers agree to convert all non-tariff measures to fixed tariffs (tariffication) as an initial step in their phase-out and elimination; schedule the phase-out and elimination of all trade-distorting subsidies; strengthen rules concerning sanitary and phytosanitary measures; and establish an effective procedure for settling disputes. Direct payments unrelated to production and marketing decisions, as well as *bona fide* food aid programs, would be exempt from these reforms.

Under the U.S. proposal, sanctions could be taken for failure to comply with agreed country plans under these guidelines, although a safeguard regime set up during the implementation period could allow deviations from such plans when circumstances that the members agree constitute an emergency arise. Countries would be given credit in their country plans for measures adopted since the Punta del Este declaration that reduce support, subsidies, and protection; conversely, debits would be charged for measures that have worsened the situation since that time.

Once ministers consent to these long-term reforms, they could agree to freeze support, subsidies, and protection during 1989 and 1990. A surveillance mechanism like that of the implementation period would be used to monitor and evaluate adherence to the freeze. Countries would freeze all measures without prejudice to challenges of measures allegedly inconsistent with GATT, and would introduce no new measures that would circumvent the freeze.

Agriculture at the Mid-Term Review

At the Mid-Term Review, the United States and the EC could not overcome differences concerning the U.S. proposal to eliminate all trade-distorting subsidies in liberalizing world trade. The EC, while expressing its willingness to negotiate reductions in these measures, did not commit itself to their elimination.

The EC noted that the Punta del Este declaration opening the Uruguay Round does not call for elimination of subsidies, but rather for a "phased reduction in their negative effects." The United States rejoined that this does not rule out their elimination. However, the EC stuck to its stand despite U.S. willingness to negotiate a phase-out schedule that differs from the 10-year plan in the original U.S. proposal of July 1987.

Long-Term Measures

One paper from the Mid-Term Review provides a succinct summary of the U.S.-EC impasse, setting out two issues to

be resolved concerning long-term agricultural reform:

- "to decide whether the ultimate goal should be the elimination *or* the substantial reduction of trade-distortive support and protection"; and

- "whether this reduction or elimination should be realized through negotiations on specific policies and measures *or* through the negotiation of commitments on an aggregate measurement of support, the terms of which would have to be negotiated *or* through a combination of these approaches."

Thus, negotiators must first decide whether to adopt the U.S. approach to eliminate, or the EC approach to reduce, trade-distorting farm subsidies as the agreed framework for long-term agricultural reform.

The second issue highlights another difference manifest at the Mid-Term Review in the U.S. and EC approaches to long-term reform measures, namely how to remove long-term support. The U.S. approach emphasizes specific policy changes to eliminate all measures that cause trade distortions, such as border measures impeding market access and trade-distorting internal and external subsidies. The EC approach focuses more on reduction of overall internal support as indicated by some aggregate measure, such as a producer subsidy equivalent (PSE), that would lower government farm support without specifying a method.

Short-Term Measures

Another difference contributing to the U.S.-EC impasse was the EC interest in negotiating short-term agricultural reform measures first or separate from long-term reform measures. This runs counter to the U.S. focus on agreeing to long-term measures first or simultaneously with short-term measures. As in the case of long-term reform measures, any short-term reform package must delineate how to remove support.

Health Measures

The stalemate at the Mid-Term Review over elimination versus reduction of trade-distorting subsidies preempted discussion of the third agricultural trade issue called for in the Punta del Este declaration concerning sanitary and phytosanitary regulations and barriers. The United States seeks stronger GATT rules requiring national regulations to be scientifically justifiable; it also advocates the establishment of an effective multilateral process for resolving disputes concerning health-related measures.

Tropical Products

An agreement on tropical products was reached on the opening day of the Mid-Term Review. This agreement allows countries to implement their own proposals, leading to a variety of packages that eliminate tariff and non-tariff measures affecting unprocessed tropical goods; it also substantially reduces these barriers for semi-processed tropical products. Altogether the agreement is expected to affect $25-30 billion in tropical goods trade, covering 100 of the 270 tariff classifications initially identified by the GATT Secretariat as tropical products. The GATT estimates trade in tropical products at about $70 billion in 1987, near 3 percent of world trade. The package will be implemented provisionally in 1989 and 1990, and will become binding at the end of the Uruguay Round.

The accord included contributions from Canada, the EC, the Nordic countries, Switzerland, Austria, Japan, Australia, New Zealand, and the United States, as well as Brazil, Colombia, Mexico, the Philippines, Thailand, Nicaragua, and Malaysia. Thus, the tropical products agreement does not represent solely unilateral concessions from industrial to developing countries; rather it forms a multilateral agreement that contains concessions from developing countries as well as industrial ones.

The United States noted, however, that its tropical products offer remained tied to its agricultural reform proposal. This means that it will not implement any tropical goods concessions until the Negotiating Group on Agriculture has reached some agreement. However, about three-quarters of tropical goods imports enter the United States duty-free, and so are already relatively unrestricted.

Negotiations on tropical products encompass generally seven product groups: (1) tropical beverages; (2) spices, flowers and plaiting products; (3) certain oilseeds, vegetable oils, and oilcakes; (4) tobacco, rice, and tropical roots; (5) tropical fruits and nuts; (6) natural rubber and tropical wood; and (7) jute and hard fibers. GATT participants understand, however, that this is not a definitive listing, and that other products may be included later in the negotiations.

Among the larger traders, the EC and Japan offered to reduce duties on a fairly long list of tropical products. They also agreed to remove certain quantitative restrictions. At the September 1988 meeting of the Tropical Products Group, the United States offered to eliminate all market access barriers on an agreed list of tropical agricultural products—if other countries would do the same. For tropical nonagricultural products, tariffs would be reduced as much as possible. In Montreal, the United States offered to reduce by 25 percent tariffs on 49 tropical products. However, the United States will await a successful conclusion to the Mid-Term Review before implementing its package. At the April 1989 meeting, the TNC is expected to announce that balanced progress has been achieved in all 15 negotiating groups, including the Negotiating Group on Agriculture.

Other Negotiating Groups

While agreement proved difficult in four negotiating groups centered around the Negotiating Group on Agriculture (tex-

tiles and clothing, agriculture, safeguards, and intellectual property rights), the remaining 11 groups did achieve some progress at the Mid-Term Review.

- The Negotiating Group on Tariffs agreed to begin negotiations no later than July 1, 1989, aimed at tariff reduction or elimination within an overall reduction target of at least that achieved in the 1973-79 Tokyo Round of about 33 percent.
- The Negotiating Group on Non-Tariff Measures agreed that non-tariff barriers should be eliminated if possible or, if not, converted to tariffs. Participants will continue to seek a framework for negotiations that encompasses an appropriate means to achieve the broadest liberalization of non-tariff measures.
- The Negotiating Group on Natural Resource-Based Products agreed that negotiations should begin as soon as possible, with work on the three traditional GATT natural resource areas (fisheries, forestry, and nonferrous metals and minerals) being the most advanced. Relevant trade and barrier data are to be submitted by March 31, 1989, to advance such negotiations.
- The Negotiating Group on GATT Articles agreed to continue clarification of issues needing negotiation. So far, it has dealt with Articles XII, XVII, and XVIII, which concern balance of payments restrictions, state trading, and government economic assistance matters, respectively. Other articles discussed have included Articles XXI, XXIV, and XXVIII on national security matters, free trade areas, and tariff rate modifications. Specific proposals are to be reported by December 31, 1989.
- The Negotiating Group on MTN Agreements and Arrangements agreed to continue to improve, clarify, or expand agreements from the Tokyo Round as needed, in order to strengthen GATT and stabilize world trade.
- The Negotiating Group on Subsidies and Countervailing Measures agreed to continue negotiations on increasing subsidy discipline under a framework that will consider among their categories: (1) prohibited subsidies; (2) permitted subsidies; and (3) permitted subsidies that are nonetheless countervailable.
- The Negotiating Group on Trade-Related Investment Measures agreed to identify further restrictive trade measures that may or may not be covered under existing GATT articles, with an eye to avoiding their trade-distorting effects and elaborating new GATT disciplines as needed.
- The Negotiating Group on Dispute Settlement agreed to a long list of provisions to speed the GATT dispute settlement process, to be effective on a trial basis from the adoption of the Mid-Term Review agreements to the end of the Uruguay Round. The provisions include an automatic right to a panel with an overall timetable requiring panels to report within 15 months as well as agreement to accept standard three-member dispute panels and terms of reference generally.
- The Negotiating Group on Functioning of the GATT System (FOGS) agreed to inaugurate a Trade Policy Review Mechanism (TPRM), provisionally effective from adoption of the Mid-Term Review agreements. This TPRM will review national trade policies, starting with the United States, Japan, Canada, and the EC (as one entity) every 2 years. The 16 next largest traders will come under review every 4 years, and most remaining GATT members every 6 years. Furthermore, the GATT Contracting Parties will meet at the ministerial level at least every 2 years to help strengthen the GATT multilateral trade system; these meetings are expected to begin early this year.

In addition to the above groups reporting to the MTN Group on Negotiating Goods, ministers agreed to a framework in the Group on Negotiations on Services for further negotiations on trade in services. This framework will work toward transparency of regulations governing services, and affords national treatment to foreign as well as domestic suppliers of services. Results from the Mid-Term Review call for a draft agreement on services by the end of 1989. [Edward C. Wilson (202) 786-1689]

U.S.-Canada Free Trade Agreement Goes into Effect

After two and a half years of formal negotiations and intense debate in the legislatures of both countries, the U.S.-Canada Free Trade Agreement (FTA) went into effect on January 1, 1989. Work on the basic agreement was completed in October 1987, and it was signed by President Reagan and Prime Minister Mulroney in January 1988. The U.S. Congress added the implementing legislation and gave final approval to the FTA in September 1988.

Public debate over the agreement was much more intense in Canada than in the United States. The FTA became the main issue in Canada's national election. The election returned Mulroney and his Conservative Party to power. The Canadian Parliament approved the FTA on December 30, 1988.

Although the FTA is not expected to have a significant impact on the magnitude and composition of U.S.-Canadian agricultural trade, some commodities, especially in border areas, may feel the impact of specific provisions. Canadian farmers and agricultural groups have voiced greater concern about the effect of the FTA, which could be interpreted as

marketing opportunities for some U.S. goods, such as wine and processed products.

Major Agricultural Provisions

Most of the agricultural provisions in the FTA will lower tariffs and ease quotas and other quantitative trade restrictions. Both countries will remove all agricultural tariffs within 10 years. However, during the first 20 years of the agreement, tariffs on some fresh fruits and vegetables could be periodically restored for up to 180 days, provided certain price and acreage provisions are met. Neither country can use direct export subsidies to export farm products to the other. Other provisions liberalize quantitative restrictions on Canadian poultry, eggs, and some grains, as well as red meat in both countries. Additional provisions aim at harmonizing the two countries' health and sanitary regulations. Import duties and other restrictions on U.S. wine will be eased.

Agricultural trade between the two countries was about $5 billion in 1987, with the United States having a $600-million surplus. Canada is one of the top five single-country markets for U.S. farm exports. The FTA should stimulate a modest expansion in trade between the two trade partners.

Issues Arising from the FTA

Farmers and agricultural groups on both sides of the border voiced reservations about the effects of the FTA on commodities of concern to them. In Canada, the FTA has already triggered several policy changes.

Most U.S. concerns have focused on grain trade, which could be affected by two FTA provisions. The first states that Canada will remove transportation subsidies on eligible grain and oilseed products exported to the United States through Canada's west coast ports. Even though this requirement will benefit U.S. producers by raising Canadian costs and perhaps reducing exports, some farm groups have questioned the failure to remove similar subsidies from exports through Great Lakes and St. Lawrence Seaway ports.

This provision returns the transportation subsidies to pre-1984 conditions, when Canada began allowing, among other things, transportation subsidies on products exported to the United States through west coast ports. Transportation subsidies on exports to the United States through Thunder Bay or Lake Superior have been in place since 1987, and are provided on grain used both domestically and exported.

The second provision concerning grain stipulates that Canada will remove its import licensing requirements for wheat, barley, and oats when U.S. support levels for these commodities are equal to or less than support in Canada. The method for calculating support levels is set out in a technical appendix to the FTA. U.S. legislation in the form of Section 22 of the Agricultural Adjustment Act of 1933 was amended in 1988 to exempt specified Canadian products from import restrictions. However, both countries retain the right to impose import restrictions on grains if imports increase significantly as a result of changes in support programs. Wheat growers are concerned that they will not gain access to the Canadian market if U.S. wheat support levels remain higher, while Canada will continue to have unrestricted access to the large U.S. market.

Some U.S. millers are concerned about increases in Canadian wheat flour exports. Canada has excess capacity in its flour milling industry. With recent changes in its two-price wheat system (see below), Canadian domestic wheat prices could fall. There is concern that Canadian millers will now be able to procure cheaper domestic wheat and use the excess milling capacity to produce and export more flour to the United States.

The broad list of Canadian concerns touches on a variety of commodities and policies. The most strident protests against the FTA have come from grape growers and wine producers, especially in Ontario. The FTA provides for the removal of discriminatory treatment in provincial pricing and distribution policies toward U.S. wine. Canadian grape and wine producers argued that removal of protection would put them out of business. The Federal and provincial governments have already put together assistance packages to compensate producers for taking vines out of production and future loss of income.

Canada changed its two-price wheat policy, at least partly in response to perceived pressure from the FTA provision that could force open its border to imports of U.S. wheat. Since April 1986, Canada's domestic wheat price has been considerably higher than export prices. The high price could not be maintained if wheat imports were allowed. Canadian millers have protested this policy for several years, and the possibility of U.S. wheat imports under the FTA provided further impetus to change. As of August 1988, domestic wheat prices are set for a 2-month period based on current prices in the "North American" market. If Canada removes import licenses because U.S. support levels are lower, Canadian wheat prices probably will fall to market-determined levels.

The provision that tariffs on all products are to be removed within 10 years has evoked strong concern from Canadian food processors. Because production and trade of numerous agricultural products in Canada are regulated by marketing boards—including manufacturing milk, poultry, eggs, wheat, barley, and many fruits and vegetables—processors must pay higher prices for raw materials than U.S. processors pay. The Canadians worry that once tariffs come off imported processed products, they will be unable to compete with U.S. producers.

Partly in response to these fears, Canada imposed new global quota imports of ice cream and yogurt in January 1988. The

United States is protesting this action in the GATT, and Canada is considering a similar action against U.S. ice cream quotas. [Carol Goodloe (202) 786-1610]

Food Aid Needs

The world food situation differs strikingly from last year, and yet the magnitude of world food needs remains almost unchanged. This is true in spite of major gains in agricultural production in Africa and Asia, regions that frequently experience production shortfalls. While cereal import requirements to sustain consumption are down 22 million tons from 1987/88, the shortfall in capacity to import these cereals is down by only 2 million.

The failure to make greater progress in reducing food aid dependency is largely the consequence of reduced production in North America. Low levels of stocks in relation to cereals use are boosting world prices and the import costs faced by food deficit countries.

The impact of world prices on assessed food needs varies greatly among countries and regions. Some large commercial importers in financial difficulty face cereals shortfalls. However, many of the smaller food deficit countries are enjoying favorable weather and have unusually low import requirements, allowing them to avoid the financial drain which would otherwise be imposed by high world cereals prices.

Cereals production has risen in the 55 countries[1] for which ERS assesses food needs (with the notable exception of Tunisia). Cereal output in 1988/89 should reach 320 million tons, up 10 percent from 1987/88. Overall, cereal shortfalls[2] are 17.4 million for 1988/89, 2.1 million under the assessment for 1987/88. Nutrition-based needs[3] are 35 million tons, up by 2.4 million from 1987/88.

Bountiful Harvests Bring Relief to African Nations

Crop conditions have been exceptionally good this year in much of Sub-Saharan Africa. Often, when the rains return following drought, they are accompanied by swarms of locusts. This associated threat to crops did not materialize this year because of the combination of favorable rainfall distribution and extensive spraying of locust swarms. Import requirements in Sub-Saharan Africa fell from 10.7 million tons to 5.4 million.[4] While only two countries (Burkina Faso and Uganda) had no import requirements in 1987/88, currently eight countries have none. In Sub-Saharan Africa the cereals shortfall is placed at 3.3 million tons, down 1.8 million from 1987/88.

Cereal production[5] in West Africa climbed from 12.4 million tons in 1987/88 to 14.3 million in 1988/89. Import requirements dropped by 824,000 tons, to 1.6 million. The cereals shortfall was 600,000 tons, down from 700,000.

In East Africa, the turnabout was even more dramatic. Cereal output climbed from 22.8 million tons to 35.4 million, import requirements dropped 2.8 million to 1.9 million, and the cereal needs dropped from 2.8 million to 1 million. Unfortunately, while Sudan has no cereals shortfall, continuing conflict deprives many of sufficient food to survive. While cereal production in Ethiopia is up by 1.5 million tons, import requirements are still 636,000 tons. The $28 million estimated to be available for commercial cereal imports purchases only 110,000 tons. Assuming a 295,000-ton drawdown in stocks, Ethiopia still has a shortfall of 232,000 tons.

Rising Import Costs Amplify Cereal Shortfalls

Low-income countries in Sub-Saharan Africa are minor participants in the world cereals market. But many frequent recipients of food aid in North Africa, Asia, and Latin America are also significant commercial importers. In North Africa, import requirements have increased by 1.1 million to 13 million, commercial import capacity has decreased by 1.9 million, and the shortfall has increased by 2.7 million. While stock adjustments reduced Asia's needs in 1987/88, they will increase needs in 1988/89. But stock changes are overwhelmed by overall Asian production increases, and the shortfall has dropped 4.9 million tons to 6.4 million. The cost of commercial cereal imports has jumped sharply. Asian commercial import capacity for 1988/89 equals 7.2 million tons, compared with 11.7 million in 1987/88. Latin American import requirements are 3.6 million tons, only 93,000 less than in 1987/88. Estimated commercial import capacity in Latin America is 19.8 million, down 2.5 million, and the shortfall is 1.9 million tons greater.

Among the 55 countries analyzed, Egypt, Bangladesh, India, the Philippines, and Peru are expected to make the largest commercial cereal imports in 1988/89.

In Egypt, commercial import capacity was estimated at $1.04 billion in 1987/88 and would purchase 6.7 million tons

[1] Egypt, Morocco, and Tunisia in North Africa; Benin, Burkina Cape Verde, Chad, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Senegal, Sierra Leone, and Togo in West Africa; Burundi, Central African Republic, Ethiopia, Kenya, Rwanda, Somalia, Sudan, Tanzania, Uganda, and Zaire in East Africa; Angola, Lesotho, Madagascar, Malawi, Mozambique, Swaziland, Zambia, and Zimbabwe in Southern Africa; Afghanistan, Bangladesh, India, Nepal, Pakistan, and Sri Lanka in South Asia; Indonesia, Philippines, and Vietnam in South East Asia; Dominican Republic, Haiti, and Jamaica in the Caribbean; Costa Rica, El Salvador, Guatemala, Honduras, and Nicaragua in Central America; Bolivia and Peru in South America.

[2] One measure of a country's food status is how far it falls short of maintaining recent levels of per capita consumption and cereals stocks. This "shortfall" is from a position of self-reliance, that is, from producing or commercially importing cereals for all uses.

[3] Nutrition-based needs are estimates of the cereals required to provide the minimum national per capita caloric requirements as estimated by the FAO.

[4] In computing regional import requirements, a country's negative import requirements are treated as zero.

[5] Cereal production is cereals plus the cereal equivalent of roots and tubers.

Table 1--Per capita additional food needs, 1988/89: Country rankings

Rank	Status quo Country	Need	Nutrition-based Country	Need
		$		$
1	Jamaica	79.42	Burundi	62.33
2	Costa Rica	60.01	Sierra Leone	60.25
3	Tunisia	56.75	Rwanda	51.40
4	Cape Verde	49.37	Jamaica	50.16
5	Swaziland	37.07	Costa Rica	44.29
6	Liberia	36.86	Mozambique	43.04
7	Egypt	33.40	Haiti	39.72
8	Haiti	23.39	Bolivia	38.63
9	Dominican Rep.	20.68	Liberia	32.76
10	Malawi	19.94	Honduras	32.63
11	Peru	19.83	Guinea	32.11
12	Sierra Leone	19.03	Cape Verde	30.86
13	Lesotho	16.25	Somalia	30.59
14	Mozambique	15.95	Lesotho	29.25
15	El Salvador	15.64	Malawi	27.32
16	Honduras	15.51	Ethiopia	26.62
17	Somalia	14.49	Peru	24.88
18	Bolivia	14.38	El Salvador	23.46
19	Zimbabwe	13.14	Nepal	23.36
20	Angola	11.90	Tunisia	22.89
21	Mauritania	11.85	Kenya	22.35
22	Nicaragua	11.37	Dominican Rep.	20.68
23	Afghanistan	10.69	Zimbabwe	20.05
24	Madagascar	10.67	Egypt	16.92
25	Senegal	8.38	Togo	16.58
26	Vietnam	7.85	Zambia	16.53
27	Guinea-Bissau	7.61	Ghana	15.92
28	Nepal	6.66	Bangladesh	15.18
29	Guinea	6.63	Madagascar	12.93
30	Sri Lanka	6.34	Chad	12.69
31	Bangladesh	6.28	Mauritania	11.85
32	Togo	5.53	Angola	11.33
33	Burundi	5.00	Benin	10.02
34	Zaire	4.56	Guatemala	9.35
35	Rwanda	4.40	Senegal	8.08
36	Pakistan	4.33	Philippines	7.94
37	Tanzania	4.13	Afghanistan	7.65
38	Cent. Afr. Rep.	3.78	India	6.22
39	Morocco	3.44	Zaire	5.84
40	Indonesia	2.65	Niger	5.32
41	Ethiopia	2.52	Guinea-Bissau	5.07
42	Guatemala	2.08	Pakistan	5.05
43	Philippines	1.66	Sri Lanka	5.02
44	India	1.09	Vietnam	4.92
45	Kenya	0.57	Sudan	4.75
46	Ghana	0.54	Cent. Afr. Rep.	4.54
47	Benin	0.44	Morocco	3.26
48	Burkina	0.00	Uganda	2.88
49	Chad	0.00	Tanzania	0.09
50	Gambia	0.00	Burkina	0.00
51	Mali	0.00	Gambia	0.00
52	Niger	0.00	Indonesia	0.00
53	Sudan	0.00	Mali	0.00
54	Uganda	0.00	Nicaragua	0.00
55	Zambia	0.00	Swaziland	0.00

of cereals. In 1988/89 that capacity is $1.34 billion, and will purchase 6.5 million tons. However, cereal production decreased by 342,000 tons, and import requirements increased by 1 million tons.

Despite the natural disasters of 1988, cereal production in Bangladesh increased by 156,000 tons. But growing population increased cereal use by 467,000 tons, and import requirements climbed to 3.2 million tons. Estimated 1988/89 commercial import capacity is $167 million, up $38 million. On the other hand, the tonnage purchasable increased only modestly, from 843,000 to 847,000 tons. After allowing for a 166,000-ton drawdown in stocks, the shortfall declined by one-half million tons, but is still 1.65 million.

India came out of the 1987/88 drought with a record cereals crop of 137.8 million tons, an increase of 18 million. With cereal import requirements only one-tenth of 1987/88's and reduced vegetable oil import needs, India is able to acquire its consumption needs commercially and has a shortfall of only 167,000 to assist in rebuilding stocks by 3 million tons. Peru has been far less fortunate. Cereal production was off slightly from 1987/88, and import requirements rose by 136,000 tons. But available foreign exchange plummeted from $3.1 billion to $1.8 billion. Commercial cereals import capacity for cereals went from $188 million to $92 million. Cereal tonnage purchasable went from 1.5 million tons to 534,000, 152,000 less than the amount purchasable at 1987/88 prices. The 1988/89 cereals shortfall is estimated to be 948,000 tons.

It was a mixed year for agriculture in the Philippines. Cereal output was up nearly 200,000 tons, but vegetable oil production was off 300,000. Cereal import requirements, at 1.36 million tons, are up by 760,000. Commercial import capacity for cereals is $221 million, compared with $268 million in 1987/88. Purchasable tonnage is 1.2 million, compared with 2 million in 1987/88. While the Philippines had no cereals shortfall in 1987/88, the current shortfall is 83,000 tons for consumption and an additional 197,000 for rebuilding stocks.

Weather is Critical Factor in World Price Increases

Sharply higher cereals prices in 1988/89 have resulted from an unprecedented 30-percent falloff in U.S. and Canadian production. Cereals in the rest of the world increased 2.2 percent in 1988/89, but total world production fell by 3.8 percent. While world cereals consumption increased slightly, stocks dropped from 400 million to 300 million tons. U.S.-Canadian stocks declined from 190 million to 87 million tons. The U.S. wheat export price (f.o.b. Gulf ports, hard red winter #2) was $120 per ton in 1987/88 and is presently about $160.

Analysis of the world cereals situation indicates that a production increase of 226 million tons (15 percent) in 1989/90 would be necessary to maintain consumption at the 1988/89 level of 1.66 billion tons and return stocks to the 1987/88 level of 400 million tons.

World prices of cereals may slip in 1989/90, somewhat reducing the cost of commercial cereal imports. The exceptionally favorable 1988/89 crop conditions in Sub-Saharan Africa are not expected to recur in 1989/90; therefore, more countries will again have cereal import requirements.

Nutrition-based needs follow the same pattern as cereals shortfalls because of the dominance of commodity price increases, but they are greatly amplified by the 20-million-ton increase in cereal use associated with attaining minimum caloric requirements. Stocks-adjusted nutrition-based needs equal 35 million tons, 2.4 million more than in 1987/88.

Considering historical consumption levels and stocks, 33 million tons is the maximum that could be absorbed in meeting status quo or nutrition-based additional cereal needs.

Cereal Needs in 1989/90

Assessed 1989/90 status quo needs (stocks adjusted) are 15 million, down 2.4 million from 1988/89. Status quo needs are up 1.7 million in Sub-Saharan Africa, largely because crop yields are expected to be on trend rather than exceptional as in 1988/89. Four countries are self-sufficient in cereals. Needs in Asia could fall by 1.6 million tons, with India anticipated to return to self-sufficiency. Normal production and an improved stocks situation in Pakistan reduces needs by 1.1 million tons.

Appraising Food Shortfalls

Many factors can be considered in appraising approaches to providing limited available food aid to developing countries.

Table 2--Regional cereal needs

	Cereal equiv. prod.	Commercial import capacity	Status quo			Nutrition-based		
			Import req.	Total use	Shortfall	Total use	Shortfall	Max.
1987/88								
Total	289.0	30.2	57.3	346.3	19.5	358.4	32.9	28.3
Percent of production					6.8		11.4	
Percent of use					5.6		9.2	
1988/89								
Africa	74.7	11.3	15.4	90.1	8.6	97.0	13.5	12.9
North Africa	15.2	8.5	13.0	28.2	5.3	25.6	2.7	5.3
Sub-Saharan	59.4	2.8	2.4	61.9	3.3	71.3	10.8	7.6
West Africa	14.3	1.3	0.5	14.8	0.6	17.2	1.9	1.5
East Africa	35.4	0.8	0.3	35.7	1.0	40.7	5.3	3.4
Southern Afr.	9.7	0.7	1.7	11.4	1.8	13.4	3.6	2.7
Asia	238.9	7.2	14.0	252.9	6.4	266.1	18.8	17.4
South Asia	180.2	4.2	9.1	189.3	3.9	203.6	16.9	14.0
S.E. Asia	58.6	2.9	5.0	63.6	2.5	62.5	2.0	3.4
Latin America	7.4	1.3	3.5	10.9	2.4	11.8	3.1	3.1
Caribbean	1.2	0.4	1.2	2.3	0.7	2.4	0.7	0.7
Central America	3.2	0.2	0.6	3.7	0.5	4.1	0.7	0.8
South America	3.1	0.6	1.8	4.9	1.1	5.4	1.6	1.6
Total	321.0	19.8	33.0	354.0	17.4	374.9	35.4	33.4
Percent of production					5.4		11.0	
Percent of use					4.9		9.4	
1989/90								
Africa	73.8	13.2	19.1	92.8	8.0	99.3	13.9	12.6
North Africa	16.3	9.9	12.7	29.0	2.9	26.4	0.7	2.8
Sub-Saharan	57.4	3.3	6.4	63.8	5.1	72.9	13.2	9.9
West Africa	13.6	1.5	1.7	15.2	0.7	17.5	2.5	2.1
East Africa	33.8	0.9	3.1	36.9	3.1	41.6	7.7	5.6
Southern Afr.	10.0	0.9	1.7	11.7	1.4	13.8	3.1	2.2
Asia	247.7	7.2	10.7	258.4	4.8	272.4	16.6	15.2
South Asia	188.4	3.5	5.0	193.4	2.5	208.6	14.9	12.1
S.E. Asia	59.3	3.7	5.7	65.0	2.2	63.8	1.7	3.2
Latin America	7.8	1.5	3.7	11.5	2.3	12.3	3.0	2.9
Caribbean	1.2	0.5	1.2	2.4	0.7	2.4	0.6	0.6
Central America	3.2	0.2	0.6	3.9	0.5	4.2	0.8	0.8
South America	3.3	0.8	1.8	5.2	1.1	5.7	1.6	1.5
Total	329.2	22.0	33.5	362.7	15.0	384.0	33.5	30.8
Percent of production					4.6		10.2	
Percent of use					4.1		8.7	

These range from quantitative factors, such as measures of relative needs, to more qualitative factors, such as recipient countries' efforts to maintain budgetary discipline and to implement self-help policies encouraging greater local production.

ERS has calculated additional food needs in per capita terms and ranked countries according to magnitude of per capita needs. This ranking provides a measure of the relative severity of additional food needs across countries and possible food assistance distributions.

Countries with similar absolute levels of additional food needs have quite different per capita needs. The wide margin between per capita measures reflects differences in the severity of the food problems these countries face and the manner in which the problem has been addressed.[6]

The pronounced disparity between the status quo and the nutrition-based results also points up the differences inherent in the two procedures. Countries like Jamaica, Costa Rica, and Haiti rank high in both status quo and nutrition-based per capita food needs. Generally, this means that food availability has recently been near that needed to achieve the FAO recommended minimum diet, either by commercial imports that are no longer affordable or by food aid. Jamaica, Costa Rica, and Haiti are long-term recipients of food aid.

Countries like Burundi and Rwanda have per capita nutrition-based needs that greatly exceed their status quo needs. This wide discrepancy indicates a serious gap between recent estimates of per capita food intake levels and the supplies needed to meet FAO recommended minimum caloric levels. This gap has not been filled in the recent past by commercial imports or by food aid.

Conversely, countries like Egypt and Swaziland have per capita status quo needs that are much higher than nutrition-based needs. In these countries, domestic production, commercial imports, or food aid donations have pushed per capita intake levels close to or above the FAO minimum. Food assistance to these countries using the status quo estimates would support consumption above the FAO recommended minimum.

Only 3 of the 55 countries analyzed have neither status quo nor nutrition-based additional food needs in 1988/89. The three countries (Burkina Faso, Gambia, and Mali) each had exceptionally good crops in 1988/89. The 14 countries dropped from the report were those in which food shortfalls are relatively infrequent. Six of 55 countries have no nutrition-based needs compared with 22 of the 69 countries analyzed in 1987/88. [Ray W. Nightingale (202) 786-1680]

[6] Adjustments were made in both cereal shortfalls and nutrition-based indicators to compensate for the different proportion of the diet made up by the staples analyzed in the report. The percentage of the diet covered—derived from the 1979-81 FAO Food Balance Sheets—must be factored into the estimates to prevent biasing per capita aid needs upward or downward for countries with a large or small proportion of their diets made up of the staples analyzed. Other things being equal, a country with 75 percent of its staple diet covered would have a greater per capita food need than a country with 50 percent of its staple diet covered. To incorporate this adjustment, per capita food needs are calculated as follows: Estimated food need ($)/(percent of diet composed of commodities analyzed in this report/group mean percent of diet covered)/population.

Competitiveness

by
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Competitiveness has been a mainstay of economists at least since Adam Smith argued against the mercantilist policies of his day in *The Wealth of Nations*, published in 1776. Instead of storing up hoards of bullion, nations had an interest in free trade. Since nations are not equally suited to produce all goods, Smith reasoned, they tend to specialize by producing the goods they can produce most efficiently, obtaining other goods through trade and thereby increasing their wealth.

Given its resource base, a country has an opportunity to produce a varied mix of goods, some much more efficiently (in terms of resource cost) than others. When trade opens up, a country will produce and export those goods which it produces most efficiently. Conversely, it will import and either cut back production or cease production altogether of those goods it finds most costly to produce. This was the basis for the notion of comparative advantage.

Comparative advantage became an important concept in trade theory, where it found usefulness as a statement about what trade patterns ought to be in a world where prevailing prices were not distorted by government intervention. Unfortunately, governments soon found as much interest in manipulating the prices of goods as they had in hoarding bullion in mercantilist days. In today's world, differences in relative costs and relative prices seem more a matter of government policies and marketing strategies than of natural resource endowments.

Webster's defines competition as "the effort of two or more parties acting independently to secure the business of a third

party by offering the most favorable terms." Competitiveness, in this sense, is a statement about differences in market prices, government interventions and everything else factored in. The following articles all deal with various aspects of competitiveness.

Vollrath's article opens the discussion by asking the question: How can we measure competitiveness? Costs of production underlie competitiveness. Although knowing whose costs of production are lowest will not necessarily tell us who will win the market, it does tell us who starts out with a big advantage over other competitors. One way for a nation to gain or improve on its agricultural competitiveness is to become more efficient—to lower the overall cost of producing a commodity relative to costs in other countries. The article by Trapido and Krajewski (using the example of soybeans in the United States, Brazil, and Argentina) tells us how important it is to consider the full range of such costs of production before deciding who is competitive.

Vollrath develops indicators of competitiveness other than *comparative costs of production. Relative export advantage* and *revealed competitiveness* cast competitiveness within the comparative advantage framework of relativity, while at the same time showing a country's trade performance as it is, rather than as it ought to be.

The articles by Parker and Gardner provide excellent examples of how government policies can influence a country's competitive position either for good or for bad. Government intervention can turn a country like Saudi Arabia, which might be expected to be an importer of a commodity like wheat, into an exporter of that commodity, gaining *market share* at the expense of more efficient producers. But domestic policies can limit the export potential of even relatively efficient producers, as in the case of artificially low producer prices for cotton in Egypt.

Finally, Vocke's article provides yet another view of competitiveness—production efficiency and competitiveness in factor markets. The changing cost picture of raw materials used in fertilizer manufacture affects the competitiveness of traditional exporters of these inputs. Policies and development strategies also play a major role here.

Indicators of Competitiveness

by
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Abstract: Four indicators of competitiveness used in world agricultural trade analyses—comparative costs of production, market share, relative export advantage, and revealed competitiveness—are defined and discussed. Trends in some of these indicators over 1961-87 are analyzed with particular reference to wheat relative export advantage and revealed agricultural competitiveness for the United States, other high-, middle-, and low-income countries.

Keywords: Agricultural trade, exports, imports, competitiveness, costs of production, market share, revealed comparative advantage.

Competitiveness can be broadly defined as the ability to sell commodities to overseas buyers at prices as low as or lower than those of other potential suppliers while earning at least opportunity cost returns on domestic resources used to produce and market these commodities. This definition highlights competition in both commodity-input markets and between domestic and foreign economies.

Competitiveness can be measured using four indicators: comparative costs of production, market share, relative export advantage, and revealed competitiveness. All four indicators have their attractions as well as their drawbacks.

Comparative costs of production provide perspectives about competitiveness at a single point in time. While market share identifies a given level of competitiveness, market share trend analyses enable assessments of how competitiveness changes through time. Competitiveness can also be measured within a comparative advantage framework using relative export advantage and/or revealed competitiveness.

Comparative Costs of Production

Comparative costs of production is a frequent starting point for analyses of competitiveness. Production costs concepts are well integrated into the body of economic theory. We

know, for example, that if producers are no longer able to cover their variable costs because prices have fallen below some minimal level, they will be forced to stop producing and will exit the industry.

International comparisons of crop and/or farm enterprise budgets usually focus on variable rather than total costs because of the difficulty in measuring and allocating owned-inputs related to land, labor, capital, and management. Yet, some of these owned- inputs are classified as variable and are, therefore, relevant to analyses of competitiveness and responsiveness.

Comparative studies of costs of production which focus on relative average rather than relative marginal costs are conceptually flawed. The theoretical concept of competitiveness is built upon relationships between supply curves (marginal costs), not average costs.

The USDA crop enterprise budgets are based upon average costs using full probability national random sampling procedures. Biased analyses may result when comparing USDA numbers with foreign cost data because most countries gather information on only a few farms and/or in the highly productive agricultural regions.

Indeed, there is a wide distribution of unit costs from farm to farm and from one producing region to another in every country, as the following article by Trapido and Krajewski shows. Most cost of production studies, however, disregard cost distributions. Single point estimates are clearly inappropriate for making meaningful country comparisons.

The current emphasis at the USDA is on the development of cumulative costs of production distributions using the Farm Level Budget Generator. Information is being organized so that detailed analyses can be made about the structure of production for such different types of operations as the large, highly specialized commercial farmer, the family farmer with multiple enterprises, the small hobby farmer, etc. If comparable data systems existed elsewhere, it would be possible to identify what kind of "representative" farm was most competitive in which country. But, foreign cost distributions are generally not available.

Furthermore, a host of factors other than farm variable costs determine country/commodity competitiveness. The relative efficiencies of the marketing, transportation, and technology-generating infrastructure directly influence the ability to compete in the international market. Comparative costs of production studies do not take these considerations into account. A single focus on international costs of production comparisons, therefore, restricts the ability of analysts to identify changing patterns of competitiveness.

Market Share

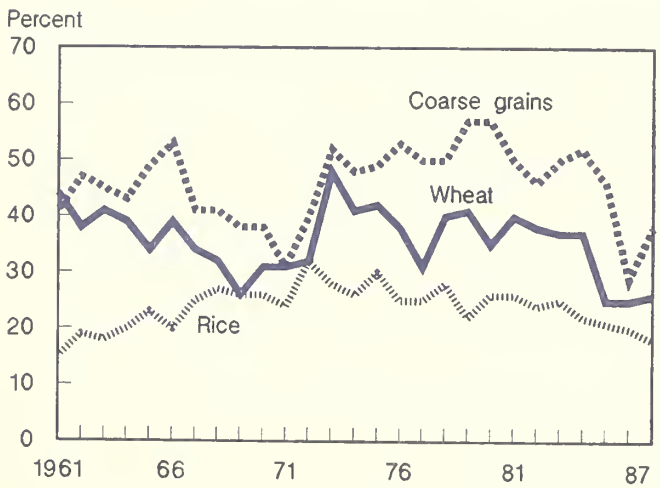
Competitiveness is often defined as the ability to attain and maintain a given share of the world export market. Time series analyses of agricultural market shares provide useful perspectives about changing U.S. agricultural competitiveness (see, for example, (1)). Shifts in *market share* reflect how well a country's exports of a particular commodity are competing with like commodities exported by other countries.

The United States improved its "competitive position" in grains during the early 1970's on the basis of the market share measure. The U.S. share of the wheat and coarse grain market improved and there was a continued, steadily rising market share for its rice during this period (figure 1). Early-1970 increases in market shares corresponded with sharp drops in the value of the U.S. dollar in the international market, especially between 1971 and 1972 when the United States devalued its currency.

Generally, the United States is better able to expand its market share for agricultural commodities when the world economy and global trade are booming than when they are contracting. The U.S. agricultural sector responds to growth in world demand because of its abundant land resource base and efficient transportation infrastructure.

The world experienced a recession in 1981-82, and the value of the U.S. dollar increased sharply relative to other currencies between 1980 and 1985. Growth in world trade and global prosperity stopped abruptly in the early 1980's, and surpluses of agricultural products enlarged stock inventories. Not surprisingly, the United States lost market share for wheat, coarse grains, and rice during this period.

Figure 1
U.S. Commodity Market Shares



Relative Competitive Advantage and Comparative Advantage

According to economic theory, comparative advantage-based trade which is unobstructed by market distortions enhances both domestic and foreign economic well-being because it permits better use of the world's land, labor, and capital. Countries that base their production upon comparative advantage can specialize in what they do best—and most efficiently—and not waste resources on productive activities that are inefficient for them.

Trade theory also shows that global communication improves with free trade, resulting in additional exchange at lower prices. The consequence of unfettered trade is that welfare gains are achieved through exporting and importing activity. But, policymakers rarely consider the concept of comparative advantage when evaluating policy alternatives—because of the difficulty, if not impossibility, of quantifying it.

Competitiveness, defined in terms of market share, is frequently used in policy analysis, partly because of its easy calculation. However, having a high or increasing market share for a commodity in which a country has a comparative disadvantage usually has negative effects on a country's economy. The foreign exchange earnings foregone by the Government of Egypt by not shifting resources to extra long staple (ELS) cotton production, where a comparative advantage is presumed to exist, are estimated by Gardner in a following article.

Relative export advantage and *revealed competitiveness* are two new measures of competitiveness that provide another dimension to analyses of changing trade patterns (see box). Positive relative export advantage and revealed competitiveness values indicate that the country or region in question possesses a relative competitive advantage for the particular commodity being investigated. Conversely, negative values indicate a relative competitive disadvantage.

Trends in revealed competitive advantage indexes capture changes in the structure of trade, analogous to the way in which dynamic comparative advantage is affected by shifts in relative supply and relative demand.

Relative export advantage and revealed competitiveness are not usually equivalent to actual comparative advantage because of the existence of market distortions, many of which arise from government interventions. But, they enable evaluation of competitiveness within the context of country and commodity interdependence. This is especially important today because of growing linkages among nations and economic sectors.

Market share, relative export advantage, and revealed competitiveness measure the ability of a particular country to compete internationally in a specified commodity area. However, relative export advantage and revealed competitiveness, unlike market share, also reflect the ability of a particular country to compete for resources to be used in the specified commodity area. It is this latter aspect—with its implicit focus on relative efficiency—that distinguishes relative export advantage and revealed competitiveness from market share, and links these two measures of competitiveness to the notion of comparative advantage.

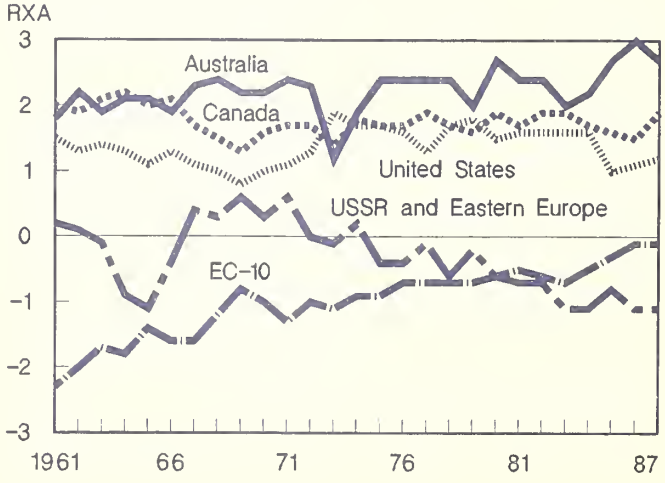
In common parlance, goods that have positive relative export advantage and/or revealed competitiveness values are generally more efficiently produced than other traded goods on average. These goods, therefore, tend to be exported. In contrast, goods that have negative relative export advantage and/or revealed competitiveness values are usually less efficiently produced than other traded goods on average. Hence, these goods tend to be imported.

Relative Export Advantage: The Wheat Subsector

While relative export advantage values for U.S. wheat have consistently been greater than zero (figure 2), falling within the one to two range every year since 1961, except 1969, competitive pressures do exist. Both Australia and Canada, which together supply about one-quarter of the world market, typically reveal higher wheat relative export advantage rankings than the United States, which typically supplies about 40 percent. Growth in world agricultural demand, a developed infrastructure, advances in agricultural technology, and the ability of the U.S. farmer to compete in the domestic economy for productive resources largely explain the underlying strength in U.S. relative competitive performance in wheat and other agricultural commodities.

However, the United States should be particularly concerned about increasing agricultural relative export advantage patterns that characterize the EC-10. The EC-10 revealed rela-

Figure 2
Wheat Relative Export Advantage



tive competitive disadvantages for most agricultural commodities throughout the past quarter century. Yet, their export market shares in agriculture are rising because of large subsidization. Economic welfare is diminished in the United States, Europe, and throughout the world when countries attempt to specialize production and concentrate resources in areas in which they have comparative disadvantages.

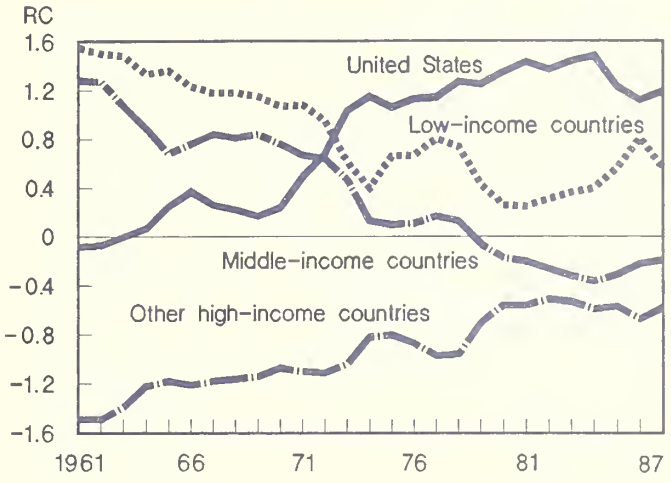
Revealed Competitiveness: Total Agriculture

Revealed competitiveness is a better measure of relative competitive advantage when the focus of attention is on aggregate commodity groupings. By taking both exports and imports into account, revealed competitiveness is able to capture intra- industrial trade. Intra-industrial trade occurs when there is two- way trade; that is to say, when a country both exports and imports the same commodity type. The revealed competitiveness indicator directly encompasses both supply and demand effects. It is, therefore, more consistent with economists' theoretical concept of comparative advantage than is relative export advantage.

We applied revealed competitivenesss to total agriculture in the United States, other high-income countries, middle-income countries, and low-income countries.[1] The low- and middle-income groupings, in contrast to the United States and the other high- income grouping, show declines in revealed agricultural competitiveness (figure 3). However, the low-income countries' long-run downward revealed competitiveness trend reversed itself in 1974 and, after a 3-year resumption of its downward trend during 1978-80, again proceeded to rise until this past year.

The downward trends in revealed agricultural competitiveness in low- and middle-income countries occur not only because of shrinking relative agricultural export supply, but also because of rising relative agricultural import demand. This finding is consistent with the observation that developing countries represent an important source of future import demand for agricultural commodities because growth of agricultural supply within these countries is being outstripped by growth in domestic agricultural demand.

Figure 3
Revealed Agricultural Competitiveness



We know that the composition of agricultural imports changes as low- and middle-income countries experience economic growth. India, for example, whose agricultural imports from the United States were dominated by food grains in the 1960's, is a big market for oilseed products in the 1980's. In other countries, feed grain imports have replaced food grain imports as the demand for meat increases. Revealed competitiveness takes such structural changes into account.

The trends in revealed competitiveness in low- and middle-income countries described above contrast with the situation in the United States, where growth in relative agricultural import demand is falling while growth in relative agricultural export supply is rising. These findings suggest that developing countries will provide a market for a wide range of U.S. agricultural products, unless their ability to purchase imports is constrained, as it was by recent oil price shocks and debt repayment problems.

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[1] The following 19 countries comprise the other high-income countries category: Australia, Austria, Belgium-Luxembourg, Canada, Denmark, East Germany, Finland, France, Iceland, Italy, Japan, Netherlands, New Zealand, Norway, Saudi Arabia, Sweden, Switzerland, United Kingdom, and West Germany. The middle-income category includes the following 30 countries: Algeria, Argentina, Brazil, Bulgaria, Chile, Costa Rica, Greece, Hong Kong, Hungary, Iran, Iraq, Ireland, Malaysia, Mexico, Panama, Poland, Portugal, Rumania, Singapore, South Africa, South Korea, Soviet Union, Spain, Syria, Taiwan, Trinidad, Turkey, Uruguay, Venezuela, and Yugoslavia. The low income category includes the following 61 countries: Afghanistan, Arab Republic of Yemen, Bangladesh, Benin, Bolivia, Burkina Faso, Burma, Cameroon, Chad, Colombia, Dominican Republic, Ecuador, Egypt, El Salvador, Ethiopia, Ghana, Guatemala, Guyana, Haiti, Honduras, India, Indonesia, Ivory Coast, Jamaica, Jordan, Kenya, Kuwait, Liberia, Libya, Madagascar, Malawi, Mali, Mauritius, Morocco, Mozambique, Nepal, Nicaragua, Niger, Nigeria, North Korea, Pakistan, Papua New Guinea, Paraguay, People's Republic of China, Peru, Philippines, Rwanda, Senegal, Sierra Leone, Somalia, Sri Lanka, Sudan, Tanzania, Thailand, Togo, Tunisia, Uganda, Vietnam, Zaire, Zambia, and Zimbabwe.

Four Indicators:

Comparative costs of production is typically defined as:

$$CCP^{i}_{a}{}^{j} = AVC^{i}_{a}/AVC^{j}_{a}$$

where AVC refers to average variable costs, subscript *a* to any particular agricultural commodity, and superscripts *i* and *j* to the home country and the competing country, respectively.

Market share is defined as:

$$MS^{i}_{a} = XS^{i}_{a}/XS^{w}_{a}$$

where XS refers to exports and superscript *w* to the world.

Relative export advantage and revealed competitiveness cast competitiveness within the comparative advantage framework of relativity. Relative export advantage is defined as the country- to-rest-of-the-world logarithmic export ratio of a particular commodity relative to exports of all other goods:

$$RXA^{i}_{a},^{r}_{n} = Ln[(XS^{i}_{a}/XS^{i}_{n})/(XS^{r}_{a}/XS^{r}_{n})]$$

where superscript r refers to the rest of the world and subscript *n* to a commodity composite aggregate, excluding *a*.

Revealed competitiveness is defined as the logarithmic ratio of relative export advantage to relative import share where relative import share is defined as the country-to-rest-of-the-world import ratio of a particular commodity relative to imports of all other goods:

$$RC^{i}_{a},^{r}_{n} = Ln[[(XS^{i}_{a}/XS^{r}_{a})/(XS^{i}_{n}/XS^{r}_{n})] /[(MD^{i}_{a}/MD^{r}_{a})/(MD^{i}_{n}/MD^{r}_{n})]]$$

where MD refers to imports.

Both relative competitiveness measures are expressed in logarithms in order that index values greater than zero signify relative competitive advantage, and index values less than zero denote relative competitive disadvantage. For more detail, see (2).

Soybean Costs of Production in Argentina, Brazil, and The United States: A Regional Farm Budget Analysis

by
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Abstract: This article examines regional cost data for the traditional and expansion areas in each of the three major soybean-producing nations of the Western Hemisphere. These data show that production costs vary as much within a single country as between countries. It is also possible to identify the soybean production areas in the United States, Brazil, and Argentina that appear to be most likely to bear the adjustment costs resulting from short-run changes in soybean prices.

Keywords: Soybeans, cost of production, trade, competitiveness.

The past decade has witnessed dramatic changes in world production and trade of soybeans and soybean products. While soybean production in Brazil and Argentina has expanded steadily, the soybean sector in the United States has begun to contract. The objective here is to examine the likely impact of changes in world prices on the regional production of soybeans.

Soybean Production Costs: United States

From the early 1950's until the late 1970's, soybean area planted in the United States increased steadily (6). Following a peak in 1979 of 28.9 million hectares (ha), the trend then reversed, and the total area planted fell to 24.5 million ha in 1986. At the same time, the improvement in yields over 1950-85 has been steady. To some degree, it has also offset the recent decline in area planted, so that the level of production in the 1980's has remained stable at about 50 million tons.

There are four principal soybean-producing regions in the United States. The most important in terms of area and production is the Corn Belt-Lake States, with about 60 percent of area planted. The next most important regions are

the Southeast and the Delta, each with about 16 percent of area planted. The Northern Plains region follows with about 8 percent of area planted.

The growth in area since the 1950's has not been equal among these regions. While the total national area has expanded about fourfold, the area expansion in the Corn Belt-Lake States has been considerably less. As a result, the percentage of U.S. production in the Corn Belt-Lake States has been declining steadily since the 1950's. By 1980-85 the Corn Belt-Lake States region made up only 54.4 percent of U.S. production, compared with 74.5 percent in 1950-54.

Regional differences in yields provide an important source of variation in average production costs. In 1980-85, yields ranged from 1.38 tons per ha in the Southeast to 2.31 tons per ha in the Corn Belt-Lake States, a difference of 67 percent. Using USDA cost of production data for 1986 (7) and yield data for 1983-85 (to maintain consistency with data available for Brazil and Argentina), the average variable cost of producing a ton of soybeans in each U.S. region is shown in the top panel of table 1. These data demonstrate that the average variable cost of soybean production ranges from a low of $57 per ton in the Corn Belt-Lake States region to a high of $113 per ton in the Southeast.

The contributions of different components to the variable and fixed costs of production are illustrated in table 2. Both actual dollar costs and percentages are presented. The most important component of variable costs in all U.S. regions is agricultural chemicals, consisting of herbicides, insecticides, and fungicides (but not fertilizer). These chemical inputs make up between 33 and 38 percent of variable costs, depending on the region. The cost of farm labor (custom

Table 1--Soybean-producing regions of the United States, Brazil, and Argentina, 1986/87, ranked by average variable cost of production 1/

Country and region	Total variable cost	Yield	Average variable cost	Area planted	Percent of area planted	
					By region	Cumulative
	$/ha	Tons/ha	$/ton	1,000 ha	Percent of country	
United States:						
Corn Belt-Lake States	123.33	2.168	57	15,078	60	60
Northern Plains	101.59	1.721	59	2,103	8	68
Delta	132.06	1.564	84	3,822	15	83
Southeast	167.69	1.484	113	4,250	17	100
Brazil:						
Sao Paulo	193.74	1.895	102	484	5	5
Parana	193.74	1.810	107	2,025	21	26
Mato Grosso do Sul	193.74	1.753	111	1,229	13	39
Mato Grosso	264.11	2.051	129	747	8	47
Rio Grande do Sul	193.74	1.359	143	3,496	37	84
Minas Gerais	264.11	1.831	144	400	4	88
Brazilia	264.11	1.831	144	41	0	88
Santa Catarina	193.74	1.322	147	413	4	92
Goias	264.11	1.702	155	647	7	99
Maranhao	264.11	1.560	169	7	0	99
Bahia	264.11	1.302	203	63	1	100
Argentina:						
Santa Fe, Northwest	95.04	2.162	44	273	10	10
Cordoba	95.04	1.952	49	427	16	26
Buenos Aires, West	95.04	1.619	59	101	4	30
Buenos Aires, North	160.08	2.334	69	1,241	46	76
Santa Fe, South	160.08	2.244	71	612	23	99
Buenos Aires, Center	160.08	1.831	87	51	2	2/ 101
					Percent of combined area	
Combined:						
Santa Fe, Northwest	95.04	2.162	44	273	1	1
Cordoba	95.04	1.952	49	427	1	2
Corn Belt-Lake States (U.S.)	123.33	2.168	57	15,078	40	42
Northern Plains (U.S.)	101.59	1.721	59	2,103	6	48
Buenos Aires, West	95.04	1.619	59	101	0	48
Buenos Aires, North	160.08	2.334	69	1,241	3	51
Santa Fe, South	160.08	2.244	71	612	2	53
Delta (U.S.)	132.06	1.564	84	3,822	10	63
Buenos Aires, Center	160.08	1.831	87	51	0	63
Sao Paulo	193.74	1.895	102	484	1	64
Parana	193.74	1.810	107	2,025	6	70
Mato Grosso do Sul	193.74	1.753	111	1,229	3	73
Southeast (U.S.)	167.69	1.484	113	4,250	11	84
Mato Grosso	264.11	2.051	129	747	2	86
Rio Grande do Sul	193.74	1.359	143	3,496	9	95
Minas Gerais	264.11	1.831	144	400	1	96
Brazilia	264.11	1.831	144	41	0	96
Santa Catarina	193.74	1.322	147	413	1	97
Goias	264.11	1.702	155	647	1	98
Maranhao	264.11	1.560	169	7	0	98
Bahia	264.11	1.302	203	63	0	2/ 98

1/ Crop year. 2/ Rounding error.

Sources: United States: (7); Brazil: (1) and (2); Argentina: (1).

operations, fuel, lube, electricity, repairs, and hired labor) varies from about 25 to 40 percent, depending on the region. Cost of seeds, the next most important cost item across all regions, makes up 15 percent. Fertilizers, lime, and gypsum constitute major costs in the Southeast (27 percent) and Corn Belt-Lake States (12 percent).

Fixed costs are divided into general farm overhead, taxes and insurance, and interest payments. In all regions interest payments are the largest item, generally about 50 percent of the fixed cost. The rest of the fixed cost is split fairly evenly between general overhead and taxes and insurance. Overall, the share of fixed costs as a percentage of total cash expenses is least in the Southeast and Delta, mostly because of lower tax and interest payments.

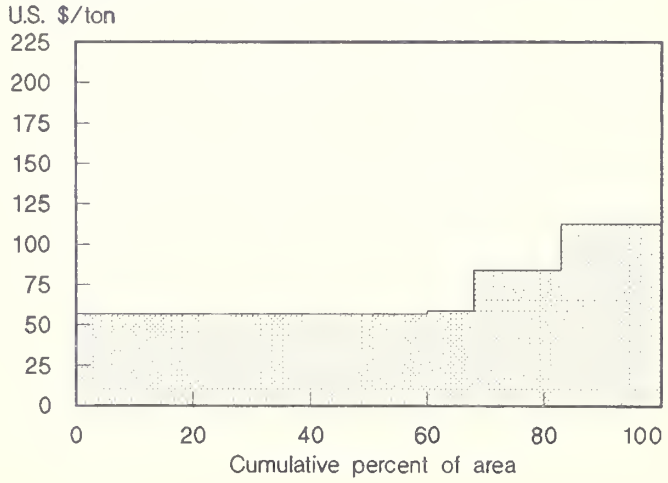
Figure 1 shows that the Corn Belt-Lake States and Northern Plains regions are low-cost producing regions ($50-60 per ton), but make up about 70 percent of U.S. area. When the Southeast and Delta regions are included, the average variable cost increases sharply to $110 per ton.

This analysis demonstrates that there are important regional differences in the cost of producing soybeans in the United States. Given the substantial portion of U.S. soybean area outside the Corn Belt-Lake States region, use of data from this region alone may be inappropriate for making comparisons with Brazil and Argentina.

Soybean Production Costs: Brazil

Soybean production in Brazil has risen steadily since the 1970's (6). As in the United States, the area planted to soybeans has expanded beyond the traditional region to new areas. The traditional region is centered on the south of Brazil and includes the states of Rio Grande do Sul, Santa Catarina, Parana, and Sao Paulo. These states accounted for almost 91.8 percent of area harvested in 1977, but less than 63.5 percent in 1986. The area of expansion in Brazil has been the center-west (Mato Grosso, Mato Grosso do Sul, Goias, and Brazilia) and the east (Bahia and Minas Gerais).

Figure 1
Distribution of Soybean Costs of Production, United States



Fully 60 percent of the Brazilian area planted in soybeans is located in the expansion areas. Therefore, it is no more correct to talk of the traditional region as typical of Brazilian production than it is to talk of the Corn Belt-Lake States region as typical of U.S. production.

It is instructive to examine the differences in yields across regions. Yields ranged from 1.3 tons per ha in Bahia and Santa Catarina to over 2.0 tons per ha in Mato Grosso. Higher yields do not correlate well with the regions where the most area is planted. In fact, the Rio Grande do Sul area, the largest area harvested in Brazil, has one of the lowest average yields (table 1). This is a significant difference from the U.S. case, where the bulk of production is in a region of high yields (Corn Belt-Lake States).

Combining regional yield and cost data for Brazil indicates that the average variable cost of production of soybeans varies tremendously, from $102 per ton in Sao Paulo to $203 in Bahia. These figures are derived by taking cost of production data for the two regions available (south and center-west) and then dividing by yield estimates at the state level to estimate variable cost per ton (table 1).

The feature that stands out in Brazil is the importance of fertilizer, lime, and gypsum. In the south, 27 percent of variable costs are allocated to these inputs; in the center-west, that figure jumps to 40 percent. Brazilian producers face high fertilizer costs for two reasons. First, prices are high due to the large imported component of fertilizer production. Second, the soils in the Brazilian soybean regions require large amounts of fertilizer and lime. Also, long distances and high transportation costs add considerably to fertilizer prices in the Brazilian center-west.

While the percentage of cost attributed to chemicals (pesticides and herbicides) is lower (22-24 percent) than in the United States, these charges are more than offset for Brazilian producers by the high costs of fertilizer, lime, and gypsum, so that the variable cost expenditure per ha in Brazil far exceeds that in the United States. It should be noted that fuel, lube and electricity, hired labor, and miscellaneous items are all included under custom operations in Brazil.

There are also major differences in the composition of fixed costs. While taxes and insurance are a major factor in the United States, in Brazil almost all of the fixed cost is split between general farm overhead and interest payments. However, the fixed cost payments are not as great as in the United States. Relative to U.S. producers, Brazilian producers have low fixed costs and high variable costs.

Table 2--Farm budgets for soybeans, United States, Brazil, and Argentina 1/

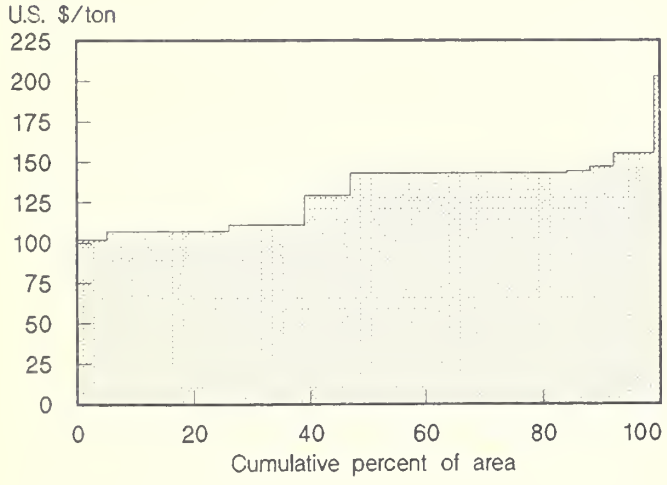
Item	United States				Brazil		Argentina	
	Corn Belt-Lake States	Southeast	Northern Plains	Delta	Southern	Center-west	Buenos Aires North	Buenos Aires West
	$/ha							
Cash expenses:								
Seed	22 (18)	20 (12)	16 (15)	21 (16)	40 (21)	36 (14)	18 (11)	19 (20)
Fertilizer	14 (11)	36 (21)	8 (7)	11 (8)	39 (20)	80 (30)	0 (0)	0 (0)
Lime and gypsum	2 (1)	10 (6)	0 (0)	1 (1)	13 (7)	27 (10)	0 (0)	0 (0)
Chemicals	46 (37)	55 (33)	34 (34)	51 (38)	46 (24)	57 (22)	57 (35)	31 (33)
Custom operations	8 (6)	14 (8)	9 (9)	13 (10)	50 (26)	56 (21)	50 (31)	28 (29)
Fuel, lube, and electricity	12 (10)	11 (7)	14 (14)	11 (9)	2/ (0)	2/ (0)	2/ (0)	2/ (0)
Repairs	15 (12)	17 (10)	18 (18)	17 (13)	2 (1)	3 (1)	2/ (0)	2/ (0)
Hired labor	4 (3)	4 (2)	4 (4)	4 (3)	2/ (0)	2/ (0)	2/ (0)	2/ (0)
Miscellaneous	1 (1)	0 (0)	0 (0)	2 (2)	2/ (0)	2/ (0)	36 (22)	17 (18)
Technical services	0 (0)	0 (0)	0 (0)	1 (1)	3 (2)	4 (2)	3/ (0)	3/ (0)
Variable cash expenses 4/	123 (100)	168 (100)	103 (100)	132 (100)	194 (100)	264 (100)	160 (100)	95 (100)
General farm overhead	30 (19)	15 (26)	27 (22)	17 (29)	53 (43)	53 (46)	61 (89)	61 (93)
Taxes and insurance	39 (25)	15 (26)	31 (25)	14 (24)	3 (2)	2 (2)	3/ (0)	3/ (0)
Interest	90 (56)	27 (48)	64 (52)	27 (47)	67 (54)	59 (52)	7 (11)	5 (7)
Fixed cash expenses 4/	159 (100)	57 (100)	121 (100)	58 (100)	123 (100)	114 (100)	68 (100)	65 (100)
Total cash expenses	282 (100)	225 (100)	224 (100)	190 (100)	317 (100)	378 (100)	228 (100)	160 (100)
Percent variable	(44)	(75)	(46)	(70)	(61)	(70)	(70)	(59)
Percent fixed	(56)	(25)	(54)	(30)	(39)	(30)	(30)	(41)
Harvest period price ($/ton)	166	178	162	179	224	214	143	186
Yield (tons/ha)	2.56	1.45	2.32	1.28	1.62	2.16	2.50	1.70
Average total cost ($/ton)	111	155	96	148	195	175	100	94

Note: Cost data are for 1986/87 and 1987/88 crop years. All cost data converted at official exchange rates. 1/ Numbers in parentheses are percentages. 2/ These items are included in "Custom operations." 3/ These items are included in "General farm overhead." 4/ May not add to 100 because of rounding.

Sources: United States: (6); Brazil: (2) and (5); Argentina: (1).

Figure 2

Distribution of Soybean Costs of Production, Brazil



Regional cost data for Brazil can be viewed in figure 2, which illustrates that regional differences in costs are not as great in Brazil as in the United States. While 40 percent of Brazilian production is produced at $110 per ton or less, the next 40 percent is produced with an additional cost of only about $30 per ton (that is, at less than $140 per ton).

In absolute terms, these cost figures indicate that Brazil's cash expenses are high relative to the United States and that Brazil's soybean expansion has occurred despite high variable costs of production. Other factors not considered here must, therefore, be found to explain the emergence of Brazil as a major force in world soybean production. One obvious hypothesis is that the low cost of land is driving the expansion of soybeans in Brazil.

Soybean Production Costs: Argentina

Soybean production in Argentina developed later than in the United States and Brazil (8). The area planted during 1983-85 was about one-third of that in Brazil, and one-eighth of that in the United States. However, Argentina has the smallest population and limited domestic demand for soybeans; it therefore has large exportable surpluses available.

As in Brazil and the United States, Argentina has a traditional area and an expansion area. The traditional soybean area comprises the north of Buenos Aires Province and the south of Santa Fe Province. Although this region accounted for nearly 100 percent of area planted in the 1970/71 crop year, that figure had fallen to 68 percent of production by the early 1980's. While regional data are lacking for the last 2 crop

years, it appears that the area planted along the Santa Fe-Buenos Aires axis comprises about 70 percent of the total.

The provinces of Cordoba, northwest Santa Fe, and central and western Buenos Aires have expanded production. As shorter cycle varieties of soybeans are introduced to Argentina, the possibility arises that new areas will come into production in the south of Buenos Aires Province (Tres Arroyos, Balcarce), one of the most important wheat-producing regions in the country.

Argentina has the least variation in yields by region of the three countries. Yields in the traditional Santa Fe-Buenos Aires region are well above 2 tons per ha. Even the low yields in areas to the center and west of Buenos Aires are higher (1.6-1.8 tons per ha) than the low-yield regions in the United States (1.5 tons per ha) and Brazil (1.2-1.3 tons per ha). Furthermore, farm data for the western region for the most recent crop years show that yields have increased dramatically (3). It therefore seems likely that yields in the marginal areas can still be improved by better crop management.

Even though differences in yields are relatively small, evaluating costs of production on the basis of the traditional area runs the risk of missing data from the regions where the expansion or contraction in production is most likely to occur. Costs per ton range from a low of $44 in northwest Santa Fe Province to a high of $87 in central Buenos Aires Province. These cost figures were generated by taking estimates of variable costs for two regions available in local farm publications (north of Buenos Aires Province-Pergamino) and the west of the province (Pehuajo) and dividing by the yields for the six different production zones most similar to the regions where cost data were available (table 1).

The breakdown of the cost of production for the two regions available for Argentina indicate relatively low costs of production. Fertilizer, lime, and gypsum are not generally used, thus eliminating a major cost. In Argentina, field preparation, weeding, and harvesting constitute the principal costs. It should be noted that farmers in Argentina typically contract out their harvesting for a share of the crop (usually 10-12 percent), so that harvesting costs are listed under miscellaneous costs rather than custom operations.

Obtaining data for fixed costs in Argentina proved to be difficult because these figures are not usually reported in farm publications and survey data were not available. In addition, soybean production has been particularly popular among contract farmers, who have low fixed costs because of their limited capital investment in land and machinery. However, it appears that these costs are low by comparison with the United States, but comparable with Brazil.

When the variable cost data for Argentina are examined, they reveal significant regional differences in the average cost of soybean production. However, these differences are not as great as in the United States or Brazil. The first 26 percent is planted at the very low cost of less than $50 per ton. Roughly the next 50 percent is planted at an additional cost of $20 per ton, or a total of $70. The remainder is planted at only slightly higher cost (figure 3).

National Comparisons

Figure 4 summarizes the average variable cost data for a total of 21 regions (37.5 million ha) in the three countries. The six Argentine production regions are among the lowest cost regions. However, the U.S. Corn Belt-Lake States regions compare favorably with the best of Argentina's production areas. Given the wide advantage in U.S. shipping costs (4), the implication is that even the best soybean

Figure 3
Distribution of Soybean Costs of Production, Argentina

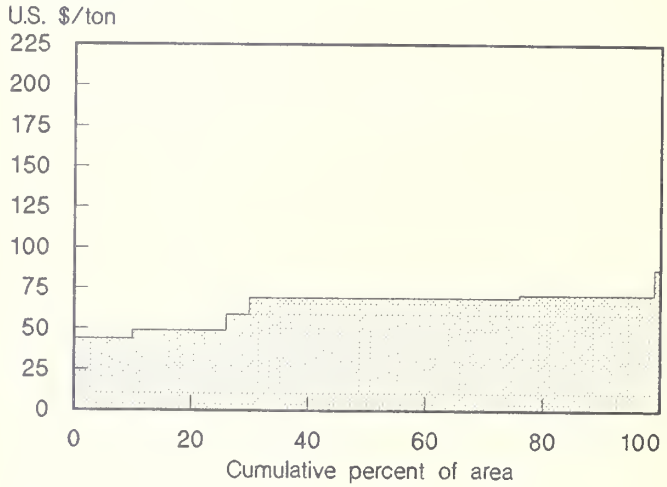
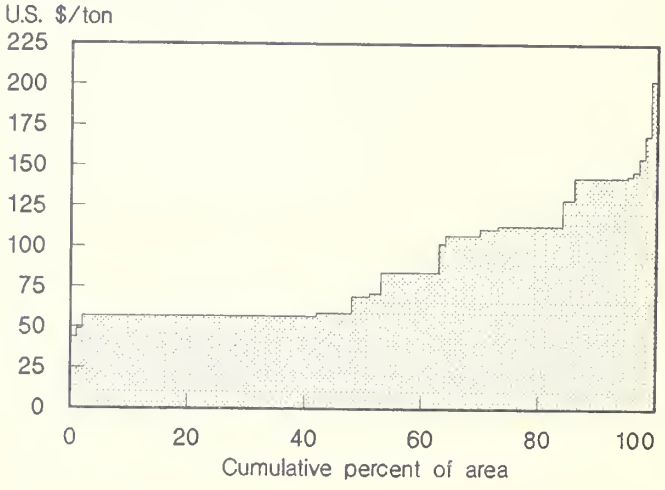


Figure 4
Distribution of Soybean Costs of Production, All Regions



region of Argentina is at a competitive disadvantage against the U.S. Corn Belt-Lake States region.

At the other extreme, as indicated in figure 4, the last 25 percent of production in these three countries is produced at a variable cost of over $110 per ton. The center-west of Brazil and the southeastern United States produce at these high costs. Significant world price movements would be most likely to affect these regions, rather than the U.S. Corn Belt-Lake States, the traditional areas of southern Brazil, or any Argentine production areas.

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Using Policies and Technology To Boost Wheat Production—The Example of Saudi Arabia

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Abstract: A combination of favorable winter climate, irrigation, and government subsidies make for a conducive setting for wheat production in Saudi Arabia. Large subsidies have encouraged development of these resources. Production reached a record 2.8 million tons in 1988, 20 times the level a decade earlier. Higher yields have maintained profitability despite recent subsidy reductions.

Keywords: Saudi Arabia, wheat, irrigation, self-sufficiency, subsidies, exports.

Saudi Arabia has achieved great success in producing wheat and reaching self-sufficiency in this commodity. High procurement prices and input subsidies have encouraged intensive use of modern technology for wheat production through contracts for teams of skilled technicians from other countries. Recent price reductions have not lowered production, because returns from wheat are still better than for alternative crops.

Development of the new wheat belt, extending from the vast farms south of Riyadh north to the Iraqi border, has given Saudi geography a new dimension. Winter rainfall in this region averages about 8 inches, and much of the runoff from the mountains is trapped in underground reservoirs. This natural resource provides a conducive setting for wheat cultivation, with planting in December and January and harvest in May and June. The winter weather is usually cool and therefore favorable for wheat. Underground water is available for irrigation, and elaborate subsidies encourage agricultural development despite recent concern over declining water reserves.

The intense interest in modern farming today differs greatly from the situation that existed 15 years ago. Saudi agricultural policy was not very dynamic before the changes generated in the late 1970's, when the country began looking for ways to invest its mushrooming petroleum revenues in developing its economy. Gains from the early 1970's through 1988 were dramatic. According to the Ministry of Agriculture and Water, Saudi wheat production zoomed in the early 1980's and reached 2.54 million tons by 1986, and rose further to 2.8 million tons in 1988.[1]

[1] All years are calendar years.

The Saudis' big push for wheat production in the 1980's had many objectives. First, it could reduce the nation's dependence on imports, thereby improving its food security. Imports of wheat and wheat flour increased sharply in the 1970's and peaked at 1.1 million tons in 1981. Second, it could diminish food import dependence as an item considered in negotiations where petroleum prices were discussed. Ministry officials reported that they wished to bury all suggestions by foreigners that the price of oil be linked with the price of a bushel of wheat or a liter of milk. Third, it could add more than $1 billion to the rural economy, providing a way to distribute petroleum wealth to rural residents. Early plans to boost wheat production did not evaluate the cost to the Government or the addition to the budget deficit, because of the great interest in providing quick returns to farmers. Fourth, it would provide profits and incentives for new cropland development. Fifth, it has made Saudi Arabia a major wheat supplier to the other members of the Gulf Cooperation Council (GCC).

Wheat Self-Sufficiency Drive Implemented In 1980, Achieved In 1984

In the 1970's, the EC and the United States were the major sources of Saudi imports of wheat flour. Combined imports of wheat and flour reached 1.1 million tons in 1980, and appeared to be on a sharp upward trend. The Saudi Government wanted to reduce that dependency and announced a high wheat procurement price of 3,500 riyals ($1,050) per ton for domestic wheat in 1980. This did not immediately increase production because it took time to develop new cropland and acquire foreign technology. In 1982 and 1983, domestic output began to make a dent in imports, and by 1985 had virtually replaced imports of wheat for food. During 1985-88, most of the imports consisted of seed wheat and small imports of special types of flour.

Saudi imports of wheat used for food virtually ended in 1986, but imports of wheat seed now average about 150,000 tons annually. Government programs provided free certified wheat seed to farmers during 1980-84 through plans to maintain yields with U.S. seed of proven value. Beginning in 1985, the Government provided certified seed from the United States at a reasonable price, and development of a domestic seed industry began.

In addition to the high procurement price, incentives for wheat production were enhanced by promises of real estate wealth, subsidies, and turnkey irrigation projects. Production doubled, rising to 417,000 tons in 1982 and 817,000 tons in 1983. As the base grew, the rate of gain slowed, but still remained high. In 1984, wheat production reached 1.4 million tons, exceeding domestic use and making Saudi Arabia self-sufficient. Incentives were now too great, and efforts by planners to slow wheat cultivation proved ineffective. The wheat area and production advanced to 674,000 ha and 2.5 million tons in 1986, making it by far the leading crop. The rapid strides in production led to the accumulation of large wheat stocks during 1984-86, before Government efforts to export the surplus became effective.

Success in Production Triggers Price Reductions

By 1984, it became apparent that the high price would soon cause overproduction of wheat, and pressure mounted to reduce the procurement price. It was reduced to $540 per ton in 1984, but the momentum was too strong to stop. King Fahd agreed to maintain the 1984 price until 1988, when the price was further lowered to $400 per ton for 1989 marketings by six large commercial farmers. It remains to be seen how much the price reduction will affect output. Although large public corporations account for less than half of total production, they had greatly contributed to gains in 1986-88. Some farms may be divided to make them eligible for the higher prices still paid to farmers running smaller operations.

Overproduction showed that planners clearly failed to take into account the response from investors and farmers. The subsidies were so lucrative that developing a wheat farm became the fad of the wealthy, including many of the royal family. The subsidies did not require the investor to live on the farm, but they did mandate proper development of cropland. This was done by the teams of technicians and consultants who supervised foreign laborers doing the work on new wheat farms.

Reductions in the wheat price reflected concern over the rising budget deficit, lower petroleum export earnings, and depletion of underground water reserves. Despite reduced price incentives, 1988 production was about 2.8 million tons—a result of irrigation projects in place before the price change and a profit margin that is still comfortable. The 1988 harvest was more than double the amount Saudi Arabia needs for domestic use. Further expansion in wheat area is expected to bring a harvest of about 3.1 million tons in 1989.

Why Saudis Prefer Wheat to Alternate Crops

As wheat production continues to exceed domestic use, Saudi planners are seeking ways to shift some land to other crops, but have had little success so far. However, irrigated cropland now planted in wheat could be used to expand barley production instead. The same areas of irrigated land and same growing seasons make it easy for farmers to substitute barley for wheat. Barley production, estimated at only 12,000 tons in 1986, rose to about 186,000 tons in 1988. Yet, this was only about half the original target. The barley procurement price was raised to 1,000 riyals ($267) per ton in 1987. The price increase, plus a campaign to encourage large wheat farmers to plant some barley, caused the expansion in area planted in barley.

But barley production remains small relative to imports of over 7 million tons in 1986 and 1987. Barley is by far the leading item on Saudi Arabia's $4.2 billion annual agricultural import bill, and such continued large imports concern policymakers who claim food self-sufficiency. In 1988, barley imports tumbled to about half the 1987 peak of 7.8 million tons, largely because of a cut in the import subsidy. The import subsidy on barley was reduced from $81 to $27 per ton in September 1987, and terminated in January 1989.

Changes in import policy designed to boost domestic barley production have not yet had the desired result. While the Government's recent actions reversed the boom in Saudi barley imports, they are unlikely to lead to self-sufficiency. Over 94 percent of the 1988 barley supply was imported, and the recent drop in imports may be partially attributed to large stocks accumulated before the subsidy reductions. Also, the 50-percent subsidy for barley use by farmers and feed lot operators remains intact.

The 1988 procurement price of $533 per ton for wheat was twice that of barley, although the wheat price for large commercial farmers has since been lowered. Still, under current conditions, the profits from wheat are clearly much greater. Small farmers still obtain the high price, and they account for about 40 percent of the wheat deliveries to the General Grain Silos Organization (GGSO), Saudi Arabia's public agency for marketing wheat. Yields are higher for the high-yielding varieties of wheat developed in Mexico than the best varieties of barley, even when barley is grown under the same irrigated conditions as wheat. The average wheat yield was about 4 tons per ha in the last 2 years, which was about double that for barley.

Technology for Hire Promotes Wheat Production

Many Saudi wheat farms cover more than 2,000 acres, allowing owners to contract with technical service firms. They plant the crop with large tractors pulling a drill planter. Overhead revolving irrigation rigs water the young plants steadily. The modern systems provide just the right amount of moisture for wheat plants during the winter. Good showers come at times during the winter to supplement the irrigation systems.

Input subsidies cover over half the cost of growing wheat. Unit production costs declined as area planted and technology use increased. Production costs per ha in 1988 were about 10 percent below 1981. Government subsidy transfers on seed, fertilizer, and other items fell 50 percent between 1981 and 1988 (table 1).

Subsidies cover all wheat seed costs except those for local transport. High-yielding seed varieties developed in Mexico account for most of the wheat planted, with the Yecoro Rojo variety comprising about 95 percent of the crop. Significant varieties among the remaining 5 percent include West Bread 911, Pro Bread, and Vanern.

Subsidies cover 50 percent of the cost of fertilizer for all crops. Local factories at Damman and Jubail provide

Table 1--Wheat financial statistics, Saudi Arabia, 1981-88

Item	1981	1982	1983	1984	1985	1986	1987	1988
Area (1,000 ha)	74	157	288	485	578	674	673	687
Yield (tons/ha)	2.69	2.66	2.84	2.89	3.54	3.77	3.86	4.04
Production (1,000 tons)	199	417	817	1,402	2,047	2,544	2,600	2,775
Producer price ($/ton)	1,035	1,021	1,013	567	552	540	533	533
					$/ha			
Gross revenue	2,783	2,712	2,874	1,639	1,955	2,038	2,059	2,153
Producer subsidies:								
Fertilizer	20	21	21	20	20	19	19	18
Credit	18	19	21	22	22	23	23	19
Electricity	15	16	16	17	19	16	15	15
Irrigation	102	104	101	89	76	75	73	67
Machinery	55	53	53	59	33	32	32	31
Technology and labor	75	78	78	79	79	82	76	72
Seed	55	52	53	51	24	22	21	20
Other	67	60	50	55	40	40	38	43
Total	407	403	393	392	313	309	297	285
Producer costs:								
Fertilizer	40	42	42	43	44	46	44	44
Machinery	169	179	172	191	186	183	176	167
Labor	95	94	79	78	67	65	64	63
Technology	151	155	156	157	159	164	151	164
Irrigation	133	138	109	144	132	125	121	129
Other	125	121	101	111	81	80	77	85
Total	713	729	659	724	669	663	633	631
Producer net revenue	2,070	1,983	2,215	915	1,286	1,375	1,426	1,522

Sources: Ministry of Agriculture and Water, Riyadh; Agricultural Trade Officer, Jeddah; Arieb Co.; and ERS estimates.

nitrogenous fertilizer. Phosphate and potash fertilizer imports provide the ideal nutrient mix for wheat plants. Small amounts of liquid fertilizer are often used with irrigation water. Fertilizer accounts for only about 14 percent of the expenses of growing wheat.

Mechanization is evident in all phases of Saudi wheat farming, from development of irrigation to planting, fertilizing, and harvesting. Virtually all of Saudi Arabia's wheat crop is harvested by combine, with even small farmers hiring custom harvesters. Greater construction of storage facilities on farms has been encouraged to relieve the shortage of space at public warehouses. Payments of $24 per ton per year are guaranteed to farmers with modern metal storage facilities.

The Expensive Wheat Export Boom

Subsidies on wheat currently total about $2 billion a year, accounting for about 15 percent of the Government's annual budget deficit of $13 billion. However, the Government has reduced the expenses it incurred through the high wheat procurement price and subsidies from an average of $1,256 per metric ton in 1981 to about $715 in 1988 (table 2). With an export price of about $120, this still leaves the Government with a loss of nearly $600 for each ton exported. The Government also sustains expenses for storage, arranging export sales, and shipping.

The price received by farmers declined from $1,080 in 1981 to $533 in 1988, while net producer costs (after subsidies), declined from $211 to $98 per ton. The farm profit remained above $400 per ton in 1988.

Eliminating the wheat and barley subsidies and importing all wheat and barley requirements would cost roughly $1 billion annually at current prices. The Saudis assign a high priority to food security and consider self-sufficiency in wheat worth the high cost. Yet, producing the extra 1.5 million tons for export at a loss of over $1 billion is considered a luxury that could be phased out. However, a massive diversification program for agriculture must be planned before any real reduction in wheat output can be arranged. Wheat cultivation and marketing have become a part of rural prosperity. Even many bedouins are now listed as wheat farmers.

Domestic Demand Flat

The rapid growth of wheat consumption, from 390,000 tons in 1973 to 1.1 million tons in 1980, representing a doubling in per capita terms (table 3), resulted from rising demand

Table 2--Estimated wheat profit, Saudi Arabia, 1981-89

Item	1981	1982	1983	1984	1985	1986	1987	1988	1989
					$/ton				
Producer price	1,035	1,021	1,013	567	552	540	533	533	485
Producer cost	211	200	165	163	118	110	102	98	98
Farm profit	824	821	848	404	432	430	431	435	387
Government cost	1,256	1,270	1,292	803	731	738	730	715	665

Sources: Ministry of Agriculture and Water, Riyadh; Agricultural Trade Officer, Jeddah; Arieb Co.; and ERS estimates.

Table 3--Wheat supply and distribution, Saudi Arabia, 1966-87 and 1988 estimate

Year	Production	Stocks Begin	Stocks End	Imports	Exports	Total availability	Feed use	Seed use	Waste	Non-food use	Consumption Total	Consumption Per capita
						1,000 tons						Kg
1966	149	120	150	234	0	353	37	10	15	63	290	51.5
1967	150	150	235	327	0	392	38	8	19	65	327	56.5
1968	130	235	220	190	0	335	33	9	13	54	281	47.3
1969	150	220	250	258	0	378	38	8	16	62	316	51.8
1970	135	250	350	388	0	423	34	7	21	61	362	57.6
1971	72	350	370	294	0	346	18	5	15	38	308	47.7
1972	39	370	390	384	0	403	10	5	17	31	372	55.9
1973	64	390	390	366	0	430	16	7	17	40	390	56.9
1974	153	390	410	509	0	642	38	5	26	70	572	80.9
1975	132	410	400	540	0	682	33	6	27	66	616	84.6
1976	93	400	400	664	0	757	23	6	30	59	697	90.2
1977	125	400	450	767	1	841	31	6	36	73	768	92.8
1978	120	450	400	730	2	898	30	7	34	71	827	94.7
1979	141	400	589	1,022	2	972	35	7	47	88	884	97.3
1980	142	589	480	938	19	1,170	36	7	43	86	1,084	115.1
1981	199	480	250	893	5	1,317	50	16	44	109	1,208	123.8
1982	417	250	150	811	7	1,321	104	29	49	182	1,139	112.8
1983	817	150	100	620	23	1,464	204	49	57	310	1,154	110.5
1984	1,402	100	500	481	42	1,441	210	63	75	348	1,093	101.2
1985	2,188	500	1,165	172	88	1,607	256	89	94	439	1,168	104.7
1986	2,544	1,165	1,550	150	745	1,564	235	124	65	424	1,140	99.0
1987	2,600	1,550	1,400	154	1,300	1,604	270	135	50	455	1,149	101.0
1988	2,800	1,400	480	160	2,040	1,640	205	165	40	410	1,230	103.1

Sources: Ministry of Agriculture and Water, Riyadh; Agricultural Trade Officer, Jeddah; and ERS estimates.

stemming from the influx of 4 million foreign workers. As petroleum revenues declined after 1981, the number of foreign workers also fell sharply through 1983. Since domestic demand for wheat has flattened out, producers cannot argue that high production must be maintained to satisfy it.

Temporary construction workers departed in greater numbers than skilled workers. The mix of foreign workers in 1988 contains more people with high incomes and a low propensity to purchase more bread. Domestic demand for food made from wheat has been steady in the last 4 years, ranging from 1.1 to 1.3 million tons. Demand for a wide array of bakery products is increasing, while consumption of traditional bread shows little change.

Export Markets Diversified

As output expanded and requirements stagnated, the GGSO launched a drive in 1986 to boost exports (table 4). Wheat exports rose from 88,000 tons in 1985 to about 1.3 million tons in 1987. Saudi hard red winter wheat is considered to be of excellent quality, partly because of the use of high technology in harvesting. Exports in 1988 likely exceeded 2 million tons, including considerable shipments to the USSR, and to new markets in Asia and Latin America.

Saudi Arabia gave wheat to some countries and sold much of the remainder of the exports at prices slightly below the world average. Its announcements of gifts and special sales have been abundant. However, actual shipments for a given year often differ from the amounts implied in news releases. For example, the gift of 300,000 tons of wheat to Egypt included 148,600 tons in deliveries during 1986, but no further deliveries were listed by Egypt. Jordan, apparently the top consistent market, was a customer for 200,000 tons of Saudi wheat annually during 1986-88.

The USSR emerged as the top customer in 1988, buying 600,000 tons and taking delivery of half that amount. Saudi Arabia initially sold 50,000 tons of wheat to Eksportkhleb, the Soviet public firm responsible for grain trade, as part of the program to sell more wheat to selected oil exporters. Further sales to the USSR appear likely in 1989.

A new thrust for Saudi wheat exports in 1987 and 1988 was to make new sales to non-OPEC petroleum exporters. Norway became a new market for Saudi wheat, buying over 41,645 tons in 1987, and over 50,000 tons in 1988. The contract with international wheat marketing firms resulted in larger wheat sales to Europe in the last two years. Portugal was a market for over 172,644 tons in 1987, and about 234,000 tons in 1988.

New sales to EC members, as well as to Iraq, Colombia, and Ethiopia, may keep 1989 exports above 1.8 million tons. Italy and the United Kingdom were new markets in 1988. GGSO efforts to sell wheat in South America resulted in a sale of 23,000 tons to Colombia in 1988.

Table 4--Changes in Saudi Arabia's wheat situation and policies between 1971 and 1988

Item	1971-73	1974-78	1979-81	1982-83	1984-86	198
Wheat production (1,000 tons)	58	126	161	617	2,045	2,60
Producer price (riyals/ton)	1,100	1,700	3,500	3,500	2,000	2,00
($/ton) 1/	335	510	540	538	537	53
Consumption (1,000 tons)	357	628	1,059	1,144	1,140	1,171
Stock change	Slight rise	Steady	Sharp decline	Further decline	Sharp rise	Decline
Marketing of wheat and products	Private firms import mostly wheat flour. Government import subsidy implemented.	Flour imports by private firms rise. Small private wheat imports with subsidy.	Flour imports reach peak. Public imports begin. 3 new flour mills open and public sales begin to compete.	Flour imports fall to less than half 1980 peak. Wheat imports steady near 1981 peak.	Wheat imports decline sharply as domestic production skyrockets in response to high price policy. Flour imports.	Wheat se imports Wheat fl imports banned. Bakery p imports high.
Consumer subsidies	Free market for bakery products. Import subsidy for wheat flour imports. Subsidy for grocers small.	Flour import subsidy up.	Bread price declines as subsidized local flour begins to replace dominance of imported flour.	Bread price stable. Flour prices decline. More subsidies for importers and grocers.	Bread price declines slightly. Variety of local products up. Local flour crowds out imports.	----Brea Subsidy consumer buy brea less tha third co subsidiz flour. bakeries
Estimated cost of production subsidies to Saudi Government ($ million)	3	71	198	762	1,543	1,978
Export activity	Nil	Nil	Small volume of wheat flour	Flour exports	Wheat exports begin to rise.	Delays in shipments over.

1/ At current exchange rates.

Sources: Ministry of Agriculture and Water; Agricultural Trade Officer, Jeddah; and ERS estimates.

Saudi wheat shipments to members of the GCC have increased markedly, reducing Australia's dominance in these markets. GCC members accounted for about one-fourth of Saudi wheat exports in 1987, and one-sixth of the 1988 volume. Shipments of over 60,000 tons were reported for two GCC markets in 1988—Kuwait and the United Arab Emirates (UAE). Exports to Bahrain and Oman were each in the vicinity of 40,000 tons a year during 1986-88.

Grants of wheat to Bangladesh rose from 60,000 tons in 1985 to over 100,000 tons in 1987, but declined in 1988. Saudi Arabia also granted wheat to Afghan refugees in Pakistan. Sudan received 50,000 tons in 1988. Grants to Mali, Mauritania, Niger, Nigeria, and Chad in 1987 ranged from 3,000 to 12,000 tons each, and small cash sales were listed for Namibia and Kenya.

The great Saudi expansion in wheat production in the 1980's was unusual, but did not lower total U.S. exports to Saudi Arabia. U.S. exports of wheat and flour declined from a peak value of $55 million in 1981 to an average of $30 million annually during 1985-88. Yet combined exports of wheat seed, irrigation equipment, and other inputs used in wheat cultivation in Saudi Arabia rose to over $160 million in 1983, and remained in the vicinity of $110 million annually during 1985-88.

Immediate Drop in Production or Exports Unlikely

Saudi wheat production is expected to rise to about 3.1 million tons in 1989, even with the subsidized price reduced by one-fourth for seven commercial farming companies which account for about one-third of the crop. Efforts to stem the loss from the current system of subsidies for wheat cultivation, marketing, and subsidized bread will bring changes in policy, possibly in late 1989. Some program to provide more incentives for farmers to switch from wheat to barley or forage crops is likely, but the change will not be dramatic in any given year.

Saudi Arabia may remain a significant exporter as world wheat prices rise. First, the strong lobby of influential commercial farmers will resist efforts to reduce the subsidy for wheat production. Second, Saudi Arabia seeks to remain a major supplier of wheat for other GCC members and Jordan. Third, exports of Saudi-grown wheat satisfy some domestic policy goals while simultaneously fulfilling food aid commitments.

If world prices decline significantly in the future and carryover stocks become a problem, Saudi Arabia may put more pressure on farmers to grow less wheat and shift to alternative crops. This would eventually mean smaller exports. Whatever happens to world prices, Saudi Arabia will probably lower wheat subsidies and introduce subsidies and marketing innovations for other crops. The thrust for future gains in agricultural production will likely be focused on alternative crops, possibly including horticultural items.

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Implications of Changes in Egypt's Cotton Policy

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Abstract: Historically, cotton has been one of the main engines of Egypt's economic growth, and a prime source of foreign exchange earnings. Egypt is a major producer of high-quality ELS cotton, and its exportable surplus has a major impact on the global fibers market. However, Egyptian cotton production has slipped as the nation has come to depend more on other sources of foreign exchange, such as petroleum and tourism. The impacts on export earnings of two policy scenarios designed to shift existing resources into higher ELS production, exploiting Egypt's comparative advantage, are calculated.

Keywords: Egypt, cotton production, trade, comparative advantage.

With Egypt's domestic cotton production now well below the level achieved in the mid-1970's, government authorities reluctantly face the prospect of importing cotton to meet domestic textile needs. The nation is simultaneously experiencing a critical foreign exchange shortage, and the Government has been reluctant to develop a two-way trade in cotton by importing cheaper grades for domestic use and continuing to export high-quality, premium-priced ELS cotton.

A primary factor in declining cotton production has been the steady erosion of procurement prices paid by Government agencies to cotton growers in comparison with world market prices, as the Government has sought to maximize revenue from cotton exports. Official cotton procurement prices declined from about 71 percent of world market prices in 1972 to 41 percent in 1986 (6). As their returns declined, farmers increasingly shifted from cotton to more profitable crops (such as vegetables) which are not regulated by the Government. This cotton supply shortfall corresponds with rising domestic demand, fueled partly by the rapidly growing (2.6 percent annually) population of 54 million.

Cotton is Egypt's most valuable agricultural export and a major source of Government revenue. Export earnings were approximately $500 million in 1986, accounting for nearly two-thirds of agricultural exports and nearly 20 percent of total exports. Furthermore, other major sources of foreign exchange are much more volatile than earnings from cotton exports. The main sources are: remittances from workers abroad ($2.8 billion in 1987); oil revenues ($1.2 billion); Suez Canal earnings ($1.1 billion); and tourism ($375 million). In recent years, cotton exports have fared *relatively* better than other foreign exchange earners, with world ELS cotton prices falling less rapidly than oil revenues and remittances (15).

The decline in exportable supplies is especially troubling for Egypt since ELS cotton is about the only globally traded agricultural commodity for which it possesses a comparative advantage. Egypt has accounted for nearly 50 percent of world production in the 1980's (table 1). Meanwhile, overall food self-sufficiency has slipped to about 50 percent, and Egyptian agricultural policies have remained unresponsive to this decline. Self-sufficiency rates continue to diminish for

Table 1--World cotton production and Egypt's share, 1981-87

	All staple lengths			ELS varieties		
Year	World	Egypt	Egypt's share	World	Egypt	Egypt's share
	--1,000 tons---		Percent	--1,000 tons-		Percent
1981	14,040	529	3.8	285	155	54
1982	15,351	499	3.2	251	118	47
1983	14,696	460	3.1	233	112	48
1984	14,707	400	2.7	240	107	45
1985	19,029	399	2.1	251	111	44
1986	17,443	435	2.5	243	92	38
1987 1/	15,420	407	2.6	272	109	40

NA = Not available. 1/ Data source changed reporting method for ELS varieties after 1987.

Source: Calculated from (5).

such basic foodstuffs as wheat (22 percent), sugar (52 percent), corn (66 percent), and vegetable oils (34 percent), crops for which Egypt does not hold a comparative advantage (9, 14). The International Monetary Fund (IMF) is now encouraging the Government to eliminate consumer subsidies to economize on foreign exchange spent to import an array of foodstuffs, and to earn additional foreign exchange by producing and marketing more ELS cotton.

Cotton Production Policy Controls

Through its monopolies, the Egyptian Government dominates every phase of cotton production, including supply of inputs, crop procurement, exports, and price-setting. The Ministry of Agriculture and Food Security determines how much crop area is allocated to cotton, and compliance is mandatory. Although substantial penalties can result for farmers who do not comply, many try to avoid or minimize compliance in order to grow more profitable crops such as corn and vegetables (1).

Because agricultural production policy centers on cotton, cotton area largely determines the patterns and rotation schedules of other crops. Cotton production remains tightly regulated, while controls on most other crops are gradually being lifted. Because of the importance of cotton revenues, the Government seeks to maintain those revenues by keeping producer prices low and enforcing minimum acreage levels.

In 1986, the Ministry of Agriculture and Food Security allocated 23 percent of cotton area to ELS varieties and the remainder to shorter staple varieties (table 2) (13). The opportunity cost of allocating a relatively small fraction of the total cotton area to ELS varieties for export, and a larger fraction to shorter staple cottons for domestic use, will be examined in more detail below.

Although irrigation water is provided at no cost and inputs such as fertilizer and pesticides are highly subsidized, cotton is one of the most costly crops to produce in Egypt, due partly to high labor requirements which constitute about 60 percent of the production cost. The high labor costs mean that alternative crops like corn leave the farmers with much higher net returns (16).

Only the strict minimum acreage controls set by the Government have partially maintained cotton production levels. These regulations are enforced by the rural credit banks and the agricultural extension service, which is often viewed by farmers as more of a rural police force than a promoter of agricultural progress.

Without such stringent enforcement by the authorities, many more Egyptian farmers would have dropped cotton production entirely. In early 1987, at the strong urging of international monetary authorities, the Government raised its cotton procurement price by 20 percent. However, net returns to farmers from cotton still remain far too low in relation to other crops to stimulate domestic production (13).

The system of forced crop procurement has been criticized for many years by both international donors and many prominent Egyptian agriculturalists. Early in 1987, as part of an agreement on economic reforms with the IMF, the Government reluctantly began to liberalize cotton policy, including the 1987 price increase. Other liberalization measures have not been specified, so their impact cannot yet be assessed.

Production and Yield Trends

The area devoted to cotton production has been declining since the 1950's, when it topped 800,000 ha. During the 1980's, cotton area reached 500,000 ha only once, and has generally averaged about 450,000 ha (table 2). Because of declines in cotton area, Egypt's share of world production of ELS cotton has slipped. Although Egypt commanded a dominant 40-percent share of world ELS production in 1987, its share was 54 percent as recently as 1981 (table 1).

In sharp contrast, Egypt's cotton yields climbed steadily as improved varieties, especially Giza, have been developed and diffused. Average yields for all varieties have ap-

Table 2--Egypt's cotton area, yields, and exports, 1981-87

Year	Area			Yield			Exports		
	ELS	Other	ELS share	ELS	Long staple	Average	ELS	All	ELS share
	1,000 feddans 1/		Percent	Metric cantars per feddan 2/			1,000 tons		Percent
1981	378	886	30	8.20	8.59	8.50	79	124	64
1982	291	887	25	8.10	8.38	8.47	92	196	47
1983	269	797	25	8.30	8.55	8.64	83	206	40
1984	288	710	29	7.44	8.19	8.02	71	181	39
1985	286	698	29	7.78	8.09	8.11	75	122	61
1986 3/	252	829	23	7.20	8.18	8.05	69	182	38
1987 4/	NA	NA	NA	NA	NA	NA	66	142	46

NA = Not available.
1/ 1 feddan = 1.04 acres. 2/ 1 metric cantar = 50 kilograms. 3/ Preliminary, subject to revision. 4/ Estimated.

Sources: Area and yields derived from (7); exports from (5).

proximately doubled since the 1950's and hovered above 1,000 kilograms/ha during the 1980's.

These impressive yield increases have occurred despite the reported tendency of Egyptian farmers to divert Government-subsidized fertilizer to more profitable crops and to over-irrigate cotton with free irrigation water. During the 1980's, however, yields have flattened out (table 2) for both long staple and ELS varieties, indicating that farmers are indeed diverting inputs intended for cotton to alternate crops (10, 11).

Egyptian farmers do not obtain the highest yields possible. Although ELS yields are above the international average, they remain well below yields recorded under irrigated conditions in similar climatic regions of Israel and the United States (5). However, given the extensive regulation, the performance of Egyptian cotton producers may be economically rational. There appears to be broad scope for cotton farmers to respond to higher procurement prices (10).

Domestic Cotton Consumption

In addition to providing revenue, another key goal of Egyptian cotton policy is the provision of affordable clothing to Egypt's large, predominantly low-income, population. This goal constitutes a plank of the social contract by which the Government provides highly subsidized food, clothing, and shelter to large segments of its population (4). This policy has led to continuous growth in textile use, driven by relatively low domestic textile prices, as well as rapid population growth. Regulation of producer cotton prices and controls on consumer prices for textiles manufactured in public sector mills keep prices low. The public sector mills, which run substantial losses, account for 90 percent of Egypt's textile production.

The social contract policy has also led to ever larger food imports during the last decade, with imported foodstuffs now accounting for about 50 percent of total consumption. It is noteworthy that the same Government planners who do not hesitate to import other agricultural commodities to satisfy domestic needs have demonstrated a reluctance to import cotton (2, 3).

Although Egypt is using World Bank assistance to modernize its industrial sector, the textile industry has not been included, nor are any consumer price increases planned despite the urgings of the IMF and donor nations. Meanwhile, domestic cotton consumption grew from 280,000 to 300,000 tons annually in the early 1980's, and continues to expand more rapidly than population due to low regulated domestic prices for finished textiles.

Trade Policies Affecting Cotton

Because Egyptian ELS cottons are among the premium varieties available, Egypt has no problem finding hard currency buyers for these products, and wields considerable power in setting ELS prices (13). The Government has monopolized exports of cotton since 1961. Export price setting is a largely political process based on an annual assessment of world supply-demand conditions by Government officials, subject to approval by the Ministries of Economy and Finance. Export prices are declared in U.S. dollars at the beginning of each marketing year, and they are not allowed to decline. However, prices are sometimes increased if market conditions warrant it (13).

In the 1980's (with the exception of 1981), Egyptian ELS cottons have commanded a price premium of between 75 and 100 percent relative to short staple cottons (table 3) (6). Egypt's ability to influence prices is a reflection of its dominance of the global ELS market. The strong demand for Egyptian cotton ensures that almost the entire export allocation of ELS cotton is sold within a few days of being offered (13).

The Government gives first priority to assuring adequate domestic supplies of cotton, contributing to declining export volumes for both ELS and other cottons. In the last 2 years, the Egyptian Cotton Authority has cautiously experimented with a two-way trade, importing small amounts of U.S. cotton to increase exports of higher-valued ELS cotton. In 1987, this trade resulted in an estimated $250 per bale net foreign exchange gain (13).

However, this practice is meeting strong resistance from both the Ministries of Agriculture and Industry (13). The Ministry of Industry wants to protect the supply of relatively low-priced domestic cotton for its mills so that it will not have to deal with the higher and possibly more volatile prices of imported cotton. The Ministry of Agriculture fears the introduction of cotton pests through infested cotton imports into Egypt.

Another constraint to reforms in policies affecting cotton trade is the important role of Egypt's long-standing bilateral barter agreements with Eastern Europe and the USSR. The bilateral protocols absorb cotton exports that might otherwise be sold in the hard currency markets. These agreements are an important feature of Egypt's trade policy because they allow Egyptian exports of certain manufactured goods which would not otherwise be competitive on the world market.

Potential for Expansion of ELS Production and Trade

Egypt holds a strong comparative advantage in the production of ELS cotton. According to virtually all analysts, only certain regions of the United States can produce cotton of similar quality for similar production costs. With the possible exception of rice, ELS cotton is the only globally traded commodity for which Egypt holds a comparative production advantage (2).

Egypt can produce ELS cotton on virtually all land currently allocated to cotton production. The physical infrastructure, including transportation of inputs, irrigation systems, ginning and storage facilities, and marketing facilities, have all demonstrated the capacity to support over 500,000 ha of cotton production. Much discussion now surrounds the use of imports to allow production of higher value crops and make better use of the production resource base, and cotton policy is a recurring topic in this discussion (14).

However, Egypt faces severe constraints in total availability of agricultural land. Cotton now occupies one-sixth of the agricultural land base of just over 2.5 million ha. Virtually every hectare is already double- or triple-cropped (13). Therefore, total cotton area could only be expanded at the sacrifice of food crops—a trade-off that would pose political problems for a Government that already imports half its food supply. For this analysis, therefore, it is assumed that total cotton area must remain fixed, with only the share allocated to ELS varieties subject to change.

Potential Foreign Exchange Gains

Two scenarios demonstrate the potential foreign exchange impacts of allocating more area to ELS cotton:

- Scenario A calls for shifting 50 percent of cotton area to ELS varieties in 1986 and 1987, with no change in yield. All increased production of ELS cotton is exported at prevailing prices in the respective years, with an equal quantity of medium- and long-staple cotton imported at prevailing prices for domestic use.

Table 3--Selected prices of cotton, c.i.f. Northern Europe, 1983-86

Marketing year	Egyptian cotton 1/ Giza 81/69 FG	Giza 70 FG	Outlook Index A 2/	Outlook Index B 3/
		U.S. /lb		
1983/84	134.07	162.33	87.61	80.29
1984/85	136.06	167.14	69.10	59.40
1985/86	111.27	147.04	48.88	40.88
1986/87	112.59	146.94	62.38	55.34
1987/88	145.11	181.68	72.14	67.36

1/ Official exchange rate basis. 2/ Grade SLM 1-1/16" / M 1-3/32". 3/ Grade "coarse count."

Source: (5).

- Scenario B calls for shifting 75 percent of cotton area to ELS varieties, with the remaining assumptions the same as in Scenario A.

Reference prices at which Egypt imports medium- and short-staple cotton in each scenario are based on the A index, c.i.f. Liverpool, adjusted for transportation to Alexandria (table 3). In calculating Egypt's potential earnings from additional exports of ELS cotton, all sales are assumed to be for hard currency, based on c.i.f. Liverpool ELS prices, adjusted for transportation to Alexandria. Because of Egypt's large power in the ELS market, it is assumed that foreign demand for its ELS cotton is completely elastic, with all increased output exported without lowering the world price. Similarly, it is assumed that increased Egyptian import demand for shorter staple cottons will not change world prices.

The potential foreign exchange gains of a shift to 50 percent ELS area were significant in 1986 and in 1987. In both years, net foreign exchange gains would have been about $300 million, representing roughly a 15-percent increase in total export earnings in each year. Shifting to 75 percent ELS area would yield foreign exchange gains of nearly $510 million in 1986 and $420 million in 1987. The potential foreign exchange gains under both scenarios might be enhanced if the use of U.S. export credits available to Egypt for cotton imports in 1986 and 1987 were taken into account.

While the shift towards greater ELS cotton production would have improved the Government's net foreign exchange position, it would also have led to other political and budgetary costs. Use of more relatively high-priced imported shorter staple cottons to meet domestic mill demand would require either higher consumer prices for textiles or enlarged subsidies to textile mills. Higher consumer prices violating the Government's social contract could have unacceptable political consequences.

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Table 4--Egyptian cotton utilization and alternate scenarios, 1986 and 1987 1/

Year and alternate scenarios	Production			Consumption 2/		Exports		Potential net foreign exchange savings 3/
	Total	ELS	Other	ELS	Total	ELS	Total	
	1,000 metric tons							$ million
1986:								
Actual	432	92	340	23	279	69	182	--
A. If 50% ELS	432	216	216	0	279	216	216	339
B. If 75% ELS	432	324	108	0	279	324	324	509
1987:								
Actual	407	109	298	43	300	66	142	--
A. If 50% ELS	407	204	204	0	300	204	204	296
B. If 75% ELS	407	305	102	0	300	305	305	418

-- = Not applicable.
1/ The alternate scenarios are defined as:

A. "If 50% ELS" implies the same actual cotton production base, with a shift to 50 percent ELS production, all of which would have been exported at prevailing prices, and an equal quantity of medium and long-staple cotton which would have been imported at prevailing prices.

B. "If 75% ELS" implies the same actual cotton production base, with a shift to 75 percent ELS production, all of which would have been exported at prevailing prices, and an equal quantity of medium and long-staple cotton which would have been imported at prevailing prices.

2/ Not accounting for changes in stocks, which are only slight since stocks approached nil during this period.
3/ Calculated net foreign exchange effects of exporting 100 percent of ELS production and importing similar quantities of long- and medium-staple cotton at respective world prices; adjusted to reflect c.i.f. prices for imports, and f.a.s. prices for exports.

Source: Data in tables 2 and 3.

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Third World Increasingly Competitive in Nitrogen Fertilizer Industry

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Abstract: The Third World's nitrogen fertilizer industry, from ammonia production to mixed fertilizer preparation, is developing rapidly despite higher investment cost than in developed countries. Countries fortunate enough to have natural gas are expanding their ammonia/urea production capacity and their exports are altering international trade patterns. To better supply the fertilizer needs of their farmers, their intermediate and mixed fertilizer sectors are also expanding.

Keywords: Fertilizer production, trade, ammonia, urea, developing countries.

Third World interests in the nitrogen fertilizer industry range from production of ammonia, the basis for manufacturing nitrogen fertilizer, to preparation of mixed fertilizers. These interests, influenced by industrialization and agricultural productivity, are restructuring the world's nitrogen fertilizer industry, particularly ammonia production.

The location of ammonia production is tied to supplies of low-cost natural gas. Once produced, ammonia is transported as needed to supply the intermediate and mixed fertilizer production sectors of the industry. The facilities for these sectors can be located wherever demand for fertilizer exists because of the easy transferability of the production technology on which they are based. The size of the fertilizer market to be served and availability of investment capital greatly influence the growth of these facilities.

Energy is Key to Ammonia Production

Ammonia is produced by combining nitrogen and hydrogen under high pressure and temperature. The nitrogen is obtained from the air, and is therefore readily available anywhere in the world. Hydrogen can be obtained from a number of sources, including natural gas, naphtha, fuel oil, and coal. Until 30 or 40 years ago, coal was a major raw material in ammonia production. For the last three decades, however, natural gas has been the most economical source of energy and hydrogen in making ammonia. Investment in plants using other sources of energy and hydrogen is higher because more complex facilities are required (table 1). For example, in a coal ammonia plant, coal grinding equipment is needed and gas purification is more complicated. Ammonia plants are increasingly constructed in countries with low-cost natural gas supplies, shifting the location of ammonia fertilizer production in the world.

New Plant Construction Restructuring Ammonia Industry

Before 1960, developed countries produced much of the world's ammonia. During the 1960's and 1970's, the ammonia industry expanded rapidly, with the centrally planned and developing countries playing larger roles (table 2). The ammonia industry in the developing countries with natural gas supplies is continuing to expand. (See appendix table for a country listing of natural gas reserves.)

Table 1--Advantages of natural gas over other sources of energy and hydrogen for ammonia production

	Investment costs for facilities	Energy used in ammonia production
	Index: Natural gas = 100	
Natural gas	100	100
Naphtha	115	109
Heavy fuel oil	160	116
Coal	200	141

Source: (7).

Table 2--Construction of new ammonia plants by country group

	1960-64	1965-69	1970-74	1975-79	1980-84	1985-89
	Number of plants					
Developed countries	19	63	41	41	28	7
Developing countries	9	20	25	34	29	25
Centrally planned economies 1/	21	32	40	46	30	3
Total	49	115	106	121	87	35

1/ For purposes of comparison only. Fertilizer production and trade by centrally planned economies are not considered in this article.

Source: (11).

Low-Cost Natural Gas in Third World

Natural gas is often associated with crude petroleum, and is sometimes an unwanted coproduct burned off into the atmosphere (an operation called flaring). About 6 percent of the world's natural gas production is flared, enough to produce the world's current output of ammonia (7). Natural gas prices are often significantly lower than the equivalent international price of fuel oil, especially if the only alternative use of the gas is to export it as liquid natural gas. Liquefying natural gas is a capital-intensive industry, and as much as 25 percent of the gas is used in supplying energy for liquefaction, refrigeration, storage, and transportation.

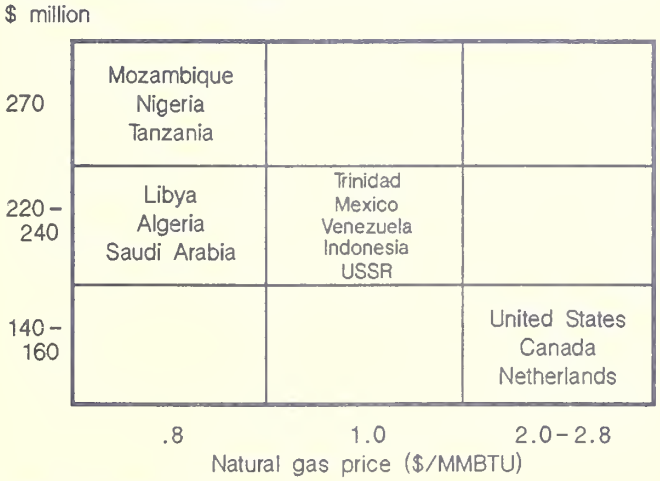
In energy-importing developed countries where the substitution of natural gas for fuel oil use (such as in power stations) would decrease fuel oil imports, the natural gas price is likely to be equivalent in BTU terms to the price for heavy fuel oil. For ammonia producers in these countries, this means that their competitors in the developing countries will be using less expensive natural gas. However, the cost of building plants in remote areas is higher because roads, ports, railways, and so on would have to be constructed along with the plant and facilities, substantially raising the initial cost (figure 1). Also, operating costs are higher in developing countries because plants are not operated as efficiently.

A recent World Bank analysis of future needs for world ammonia production estimated that 56 new plants will be needed by the mid-1990's (7). This study speculated that perhaps seven of these plants might be constructed in developed countries, 14 in centrally planned countries, and the remaining 35 (60 percent) in developing countries. These plants will be large and very expensive to construct.

Technical Changes Have Increased Plant Size

Technical advances have steadily reduced the energy needed to produce ammonia (table 3). These advances have also increased the scale of operation. A particularly large jump in plant size occurred after 1963, when the centrifugal compressor replaced reciprocating compressors driven by electric motors (table 3). Energy previously wasted in obtaining hydrogen from natural gas is now recovered as high pressure steam used to drive these centrifugal compressors. The scale of these facilities requires large capital investments. In addition, these plants frequently form part of an industrial complex used to produce urea, which is made from ammonia and pure carbon dioxide. The necessary carbon dioxide is available as a byproduct at ammonia plants, but is seldom available elsewhere at a reasonable cost.

Figure 1
Low Natural Gas Prices Offset by High Ammonia Plant Investment Costs In Developing Countries*



* Selected countries; see appendix table.

Urea is the predominant nitrogen fertilizer in developing countries. It has a higher nitrogen fertilizer content per unit than the other solid nitrogen fertilizers, thereby reducing the costs of handling and transporting each unit. However, these advantages are partially offset by the fact that plant uptake of nitogen from urea is less efficient than from other nitrogen fertilizers.

Third World countries do not use ammonia directly as a fertilizer because storage and application equipment are very expensive and require large fields to be cost-effective. Solid fertilizer materials such as urea are more practical, and can be used in mixed fertilizers.

Urea Plants Are Also Expensive

A manufacturing rate of urea of less than 300,000 tons per year is usually not economical. Investment costs for building such plants are high, especially in developing countries lacking adequate infrastructure. For example, one estimate placed the investment cost to construct a urea plant at a developed country site with adequate infrastructure at $205 million and working capital at $15 million per year, compared with $375 million and $25 million at a site in a developing country (5). (This was for a 1,650 ton per day plant, operating at 90 percent of capacity for 330 days per year for a total output of 490,050 tons.)

There are three main sources of financing for fertilizer plants (8). Roughly one-third of the fertilizer plants being built in developing countries are financed by the World Bank, which provides about 30 percent of the investment requirements of these plants. The second source of financing is the commercial market—for example, a consortium of banks funding a particular project. A third source is the suppliers of plants and machinery who, usually backed by commercial banks, provide credit on guarantees from the local government.

Facilities to prepare mixed fertilizer must also be financed. For nitrogen fertilizer to be fully effective in raising yields,

Table 3--Decline in energy use per ton of ammonia produced and increase in plant size, 1955-82

	Energy consumption	Plant size
	Million BTU/ton ammonia	Tons/day
Before 1955	56	--
1955-1960	49	90-270
1960-1962	45	90-325
1963-1965	44	--
1965-1975	39	550-1,550
1975-1982	37	1,000-1,350
Present	22-27	1,000-1,350

-- = Not available.

Sources: Energy consumption (7); plant size (3); except for present, which based on Harry Baumes, ERS, personal communication.

the other essential nutrients must also be available to the crop. Key to this is use of fertilizers of phosphorous and potash mixed with nitrogen (box 1).

Mixed Fertilizer Options

The size of market and the type of product demanded determine the kind of investment that is most appropriate for a given country. If the fertilizer market to be supplied is less than 5,000 tons per year, perhaps only facilities for receiving and distributing bagged fertilizers can be justified. If the market ranges from 5,000 to 25,000 tons, facilities for receiving bulk fertilizers for bagging may be most appropriate. Above 25,000 tons per year, production of mixed fertilizers by bulk blending or granulation may be reasonable (4) (box 2).

Above 100,000 tons per year, manufacture of intermediate fertilizer products may become feasible if raw materials are available or can be imported. Use of imported ammonia, however, is limited to the manufacture of ammonium nitrate, phosphate, or sulfate because of the lack of low-cost carbon dioxide.

Mixed fertilizers are prepared in two ways: bulk blending and granulation. Bulk blending consists of mechanically mixing single-nutrient granular fertilizer materials. Blending facilities are less costly than those for granulation (table 4).

Granulation plants prepare mixed fertilizers using processes that combine the single-nutrient fertilizer materials into new granules, each containing all of the nutrients. The more expensive granulation facilities can use cheaper intermediate fertilizer materials, thus lowering variable costs.

With compaction granulation, dry nongranular materials are mixed, pressed, and crushed into small particles. In steam granulation, heat and moisture are used to agglomerate and compact dry materials into granules. The chemical granulation process is similar to steam, except that ammonia is reacted with phosphoric and/or sulphuric acid.

Despite Progress, Fertilizer Production Lags Use

Fertilizer production is now increasing rapidly in the developing countries, 10 percent annually, but not as rapidly as consumption (table 5). Many Third World countries are becoming more dependent on imports as they raise agricultural productivity through increased fertilizer use. Many of these countries are therefore investing to further increase their nitrogen production.

Another option is to make better use of current supplies of nitrogen fertilizers (see box 3). Any improvement in the efficiency with which nitrogen fertilizers improve crop yields would reduce the energy and capital costs incurred in the production and distribution of nitrogen fertilizer.

Industry Growth Limited by Capital

The Third World's nitrogen fertilizer industry, from ammonia production to mixed fertilizer preparation, is developing rapidly. Countries fortunate enough to have natural gas are expanding their ammonia/urea production capacity, and their exports are boosting economic development and altering international trade patterns. To better supply the fertilizer needs of their farmers, the intermediate and mixed fertilizer sectors are also expanding. This expansion requires capital, more than for equivalent facilities in developed countries. Investment capital is scarce in these countries.

In addition to fertilizer facilities, many related investments must be made if everything is to go smoothly. For example, each ton of fertilizer might expand grain production by 5 to 10 tons. Most of this production will be moved to consumers elsewhere. Thus, greater fertilizer use also requires improving transportation and other facilities for handling the increased output.

References

1. "Economic comparison of selected NPK fertilizer production alternatives." *Agro-Chemical News In Brief*, Vol XI, No. 2, April 1988.

Table 4--Low investment costs make blended fertilizers cheaper

	Fixed costs 1/	Variable costs 2/	Bagged costs
	Index: Bulk blending = 100		
Bulk blending	100	100	100
Compaction granulation	264	93	102
Steam granulation	302	94	105
Chemical granulation	448	96	114

1/ Estimated fixed capital investment for facility for 120,000 ton/year at 75 percent utilization in millions of 1987 dollars: bulk blending, $3.2; compaction granulation, $8.7; steam granulation, $10.4; chemical granulation, $16.4. 2/ See box 2 for actual costs.

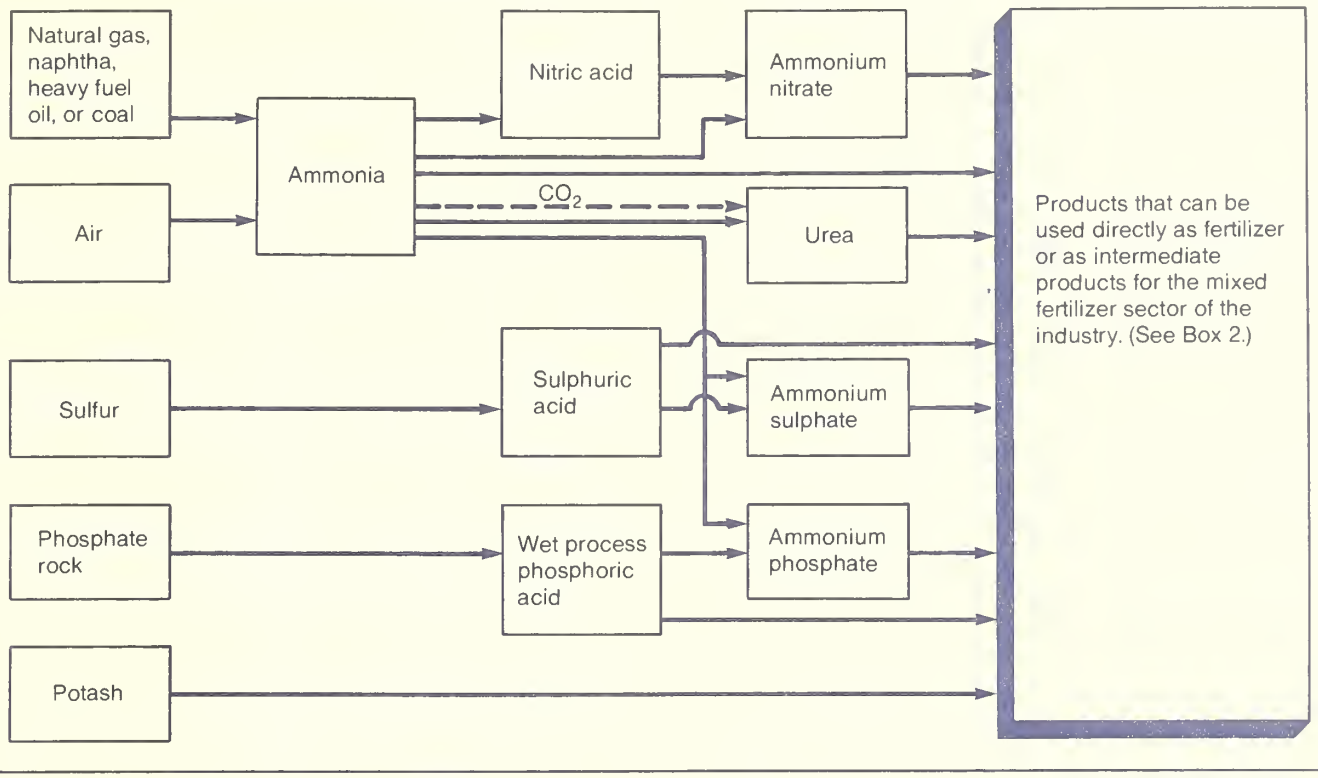
Source: (1).

Table 5--Nitrogen fertilizer production, use, and trade have increased sharply since the early 1960's

	Average 1961-63	Average 1984-86
	1,000 metric tons	
Production:		
Developing countries	970	14,984
Developed countries	9,856	24,954
Centrally planned economies	2,816	33,056
Consumption:		
Developing countries	1,918	17,381
Developed countries	8,167	22,381
Centrally planned economies	2,892	29,754
Imports:		
Developing countries	1,237	5,321
Developed countries	1,150	7,926
Centrally planned economies	588	2,727
Exports:		
Developing countries	178	2,523
Developed countries	2,725	8,776
Centrally planned economies	242	4,651
	Kg/ha	
Consumption per hectare:		
Developing countries	3	26
Developed countries	22	58
Centrally planned economies	7	78

Source: (2).

Box 1 Nitrogen Fertilizer Manufacturing Flow



Box 2 Alternative Processes for Preparing Mixed Fertilizers

Estimated raw material cost for various NPK production processes for a 15-15-15 mixed fertilizer (15% N, 15% P_2O_5, 15% K_20) in developing country location

	Bulk blending	Compaction granulation	Steam granulation	Chemical granulation
		$US/ton 15-15-15		
Granular urea ($US 130/ton)	5.2	-	-	-
Granular diammonium phosphate ($US 215/ton)	71.2	-	-	-
Granular ammonium sulphate ($US 95/ton)	33.7	-	-	-
Granular muriate of potash ($US 105/ton)	26.7	-	-	-
Prilled urea ($US 125/ton)	-	16.6	16.6	13.1
Nongranular monoammonium phosphate ($US 200/ton)	-	60.8	60.8	-
Standard ammonium sulphate ($US 80/ton)	-	23.0	23.0	-
Standard muriate of potash ($US 95/ton)	-	24.3	24.3	24.3
Ammonia ($US 135/ton)	-	-	-	17.1
Sulphuric acid ($US 80/ton)	-	-	-	20.8
Phosphoric acid ($US 170/ton)	-	-	-	51.5
Conditioning clay ($US 40/ton)	0.6	0.6	0.6	0.6
Conditioning binder ($US 300/ton)	1.5	1.5	1.5	1.5
Total	138.9	126.8	126.8	128.9

Source: (1).

Box 3 IMPROVING NITROGEN FERTILIZER UTILIZATION; THE CASE OF IRRIGATED RICE PRODUCTION

Traditional irrigated rice production gives modest yields while maintaining soil fertility. The use of the new semi-dwarf, high-yielding varieties increases yields with nitrogen fertilizer, regardless of the season of planting or amount of nitrogen. However, experiments show that only 25-30 percent of the urea broadcast on rice fields goes to increased yields (6); the rest is lost in various ways.

Experiments show that slow-release, sulfur-coated urea can raise utilization to 46-78 percent and that deep placement of urea supergranules (10-15 cm below the soil surface) can raise utilization to 75-85 percent (5). These experimental results demonstrate the extent to which improved practices would allow present supplies to increase rice output, but there are other considerations.

While deep placement is scientifically sound, it remains economically impractical for most farmers. The general recommendation is that fertilizers that are applied before transplanting should be mixed thoroughly enough with the soil during harrowing or weeding to minimize nitrogen losses through air action.

Nitrogen losses can be further reduced by preventing the field from drying out, because water keeps the air from moving into the soil. The less air in the soil, the smaller the losses to the atmosphere.

Slow-release urea is expensive, but farmers can use ordinary urea in split applications at transplanting and at panicle initiation to make the most efficient use of the nitrogen applied. Another practical step is to keep the fields free from weeds so they do not compete with the rice for the added nitrogen.

Farmers can also use higher doses of nitrogen during the dry season to maximize the crop's response to the fertilizer. Sunlight is higher and the leaves are shorter and more erect during the dry season. Plants do not grow as tall during the dry season, reducing lodging even with higher rates of nitrogen fertilizer. The additional tillers produced as a result of nitrogen fertilization are mostly productive since there is less shading during the dry season.

Source: (10).

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Appendix table--Natural gas and investment information by country

	Percent of world gas reserves	Natural gas price	Ammonia plant investment 1/	Urea plant investment 2/
	Percent	$/million BTU	$ Million	
USSR	39.9	1.0	240	360
Iran	12.6	.8		360
United States	6.2	2.5	145	220
Qatar	3.8			
Algeria	3.5	.8	240	360
Canada	2.9	2.0	158	250
Mexico	2.4	1.0	220	320
Saudi Arabia	2.4	.8	240	360
Norway	2.3	3.0		230
Netherlands	2.1	2.8	155	230
Venezuela	1.7	1.0	220	320
Nigeria	1.5	.8	270	400
Kuwait	1.2	.8		360
Indonesia	1.1	1.0	230	350
Australia	1.0	2.0		260
China	.9	1.7		360
Iraq	.9	.8		360
UK	.8	2.8		230
Libya	.6	.8		360
India	.5	2.8		360
Bangladesh	.4	1.0		360
Romania	.3	2.5		320
Sharjah	.3			
Thailand	.3	3.0		350
New Zealand	.2			
Bolivia	.2			
Bahrain	.2			
Egypt	.2			
Burma	.2	1.0		370
Brunei	.2			
Colombia	.1	1.0		360
Brazil	.1	2.8		320
Chile	.1	.8		360
Ecuador	.1			
Dubai	.1			
Oman	.1			
Syria	.1	.8		360
Angola	.1	.8		400
Cameron	.1			
Congo	.1			
Ivory Coast	.1			
Tanzania	.1	.8	270	400
Afghanistan	.1			
Malaysia	N	1.0		350
Pakistan	N	1.0		360
Turkey	N	2.8		360
Gulf Emirates	N	.8	240	360
Trinidad	N	1.0	220	320
Mozambique	N	.8	270	400
Argentina	N			320
Japan	N	3.5		220

N = Negligible.
1/ 1,000 ton/day. 2/ 1,670 ton/day.

Source: (7).

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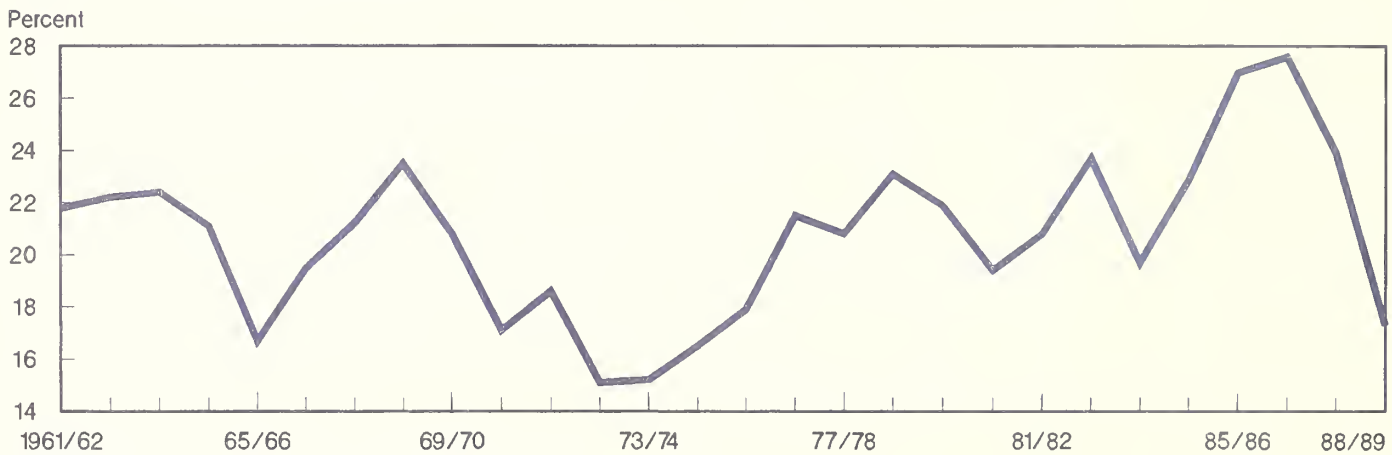

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