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# LDC Agriculture: The Role of Incentives in Increasing Production

A Special Assessment

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**LDC AGRICULTURE:  
THE ROLE OF INCENTIVES  
IN INCREASING PRODUCTION**

Information available as of 13 May 1986 was  
used in the preparation of this Assessment.

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## KEY JUDGMENTS

Despite the impression created by the recent famines in Africa, overall LDC agricultural output has been rising rapidly over the past decade. Many countries—including most of those with large populations like India, China, Indonesia, and Brazil—have increased their ability to feed themselves and even to export foodstuffs. This trend is likely to continue over the next decade, because it has established a momentum of its own based on improved incentives for the farm sector that, in turn, promote overall growth. [redacted]

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The experience of the last several decades shows that LDCs made little or no progress in raising agricultural production unless they satisfied two criteria:

- Allowed for adequate incentives, or at least no disincentives, for their farmers.
- Provided adequate physical and political security for their farm sectors. [redacted]

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The role of incentives is the most important. The bulk of the countries in Asia and Latin America that have shown an ability to sustain increases in agricultural output are those that allow the greatest incentives for production. Chinese farmers responded with sharply increased output when the government increased the guaranteed price, relaxed production controls, and allowed farmers to cultivate private plots and market their produce. Perhaps the single worst policy disincentive to agricultural production is an overvalued exchange rate because it limits export markets and induces cheap food imports that can ruin local producers. [redacted]

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Physical security is also a prerequisite. In countries such as Ethiopia and Chad, where prolonged fighting has prevailed, farmers have little or no incentives to plant more than enough to feed their own families. Even at that, they face the dangers of looting or the requisitioning of their harvests. They also see little hope of getting any surplus to market or finding anything to buy with the proceeds if they did manage to sell extra produce. [redacted]

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The outlook for continued improvement in agricultural output is good. Incentives are now well established in a number of countries and are demonstrably effective. This probably will lead to eventual policy changes that favor the farmers in most of those countries that so far have fared poorly. [redacted]


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The implications for the United States of these trends are, on balance, favorable to US interests:

- As the agricultural sector develops in many LDCs, farmers gain more political influence, which reinforces their ability to get and keep positive incentives to production. This pattern has been clearest in Asia, particularly in India, South Korea, and Taiwan.
- The growing wealth of the farm sector also reduces the political tensions inherent in modernization, slows the movement of people into overcrowded cities, and tends to accelerate the expansion of the service industries that support or depend on agriculture. India and, more recently, China are good examples.
- New markets will be opened to US exporters of agricultural support products, such as tractors and chemicals.
- On the downside, rising LDC output will probably result in an international products market more likely to be affected by surpluses than by shortages over the next decade. 

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LDC trade in agricultural products probably will grow slowly over the next decade. The need to import will lessen as more countries move toward or attain self-sufficiency, and exports will be hampered by near stagnant developed country demand. US interests will be particularly affected in the grain trade, where much or most of any LDC export gains probably will be at the expense of United States and other developed country sellers. 

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## DISCUSSION

## Shifting Policies

1. In the late 1960s and early 1970s, LDC governments became concerned about their agricultural performances, which reflected years of faltering production and sizable jumps in food imports. This trend was the result of policies aimed at maintaining low food prices in urban areas and of bloated bureaucracies that siphoned off farm income through inefficiency and corruption. Those problems were compounded by a runup in world oil prices and an increasing LDC debt burden, which hiked fears of being unable to afford food imports. These concerns were especially strong in 1973 when a number of crop failures, combined with low global stocks, dramatically pushed up global farm prices. The resulting anxieties manifested themselves publicly in the World Food Conference held in Rome in 1974, but, more important, many LDC governments shifted their policies in favor of the farmer.

2. The LDC agricultural picture began to turn around in the mid-1970s with noticeable increases in agricultural output per capita (see table 1). The Asian countries did especially well; even Bangladesh joined India, Indonesia, and China in significantly increasing farm output and are now approaching basic self-sufficiency. Latin America made considerable progress, with the exception of some Central American and Caribbean countries hurt by domestic political strife and a depressed world sugar market. Only Africa and the Middle East, which together account for less than 20 percent of the population of the Third World, performed poorly. Many of these nations were adversely affected by political upheavals and war, such as the ex-Portuguese territories of southern Africa, the Horn of Africa, Lebanon, Iraq, Iran, and Afghanistan.

3. The overall improvement in LDC agricultural performance in the 1970s reflected a confluence of two key factors: (1) availability of high yielding varieties (HYVs) of wheat and rice seed adapted to Asian and Latin American conditions and (2) government

**Table 1** *Percent of increase*  
**LDCs: Trends in Per Capita**  
**Agricultural Production**

	1950s	1960s	1970s
China	10	3	30
Other Far East	5	12	21
South Asia	6	0	6
Latin America	7	2	7
Sub-Saharan Africa	3	-6	-6
North Africa	5	0	-10
Middle East	7	2	-2

reactions to growing domestic concerns about their ability to feed their populations. Following the introduction of HYVs in the mid-1960s, more than 40 percent of the rice and wheat areas in developing countries have been sown with HYVs, making HYVs the most widely and rapidly adopted technology in agricultural history. Although large-scale farmers adopted this new technology first, it soon spread to smaller scale farmers. India, for example, increased its grain production by nearly 40 percent in the early 1980s.

4. The disparities in agricultural performance among countries have become increasingly sharper over time, mainly because of differences in LDC government policies and in adoption of new technologies. An examination of 90 countries<sup>1</sup> indicates the following trends (see table 2):

- The bulk of the countries in Asia and Latin America have shown a clear ability to sustain, for

<sup>1</sup> Some 45 LDCs are excluded from this assessment. They have populations of less than a half million and/or territories of less than 10,000 square km (that is, leaving out the numerous island nations). Agricultural production data came from the US Department of Agriculture and the Food and Agriculture Organization.



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**Table 2**  
**LDCs: Agricultural Performance**

Clearly Worse		Clearly Improved		Fairly Good (Since early 1960s)	No Longer Clearly Improved or Fairly Good		Holding Their Own
Since early 1960s	Since early 1970s	Since early 1960s	Since early 1970s		Since mid-1970s	Since late 1970s	
Algeria	Angola	Ivory Coast	Argentina	Gabon	Bolivia	El Salvador	Burundi
Benin	Botswana	Rwanda	Chile	Kenya		Mexico	Cameroon
Burkina	Egypt	Libya	Colombia	Malawi	Lebanon	Nicaragua	Central African Republic
Ethiopia	Gambia	Swaziland	Uruguay			Venezuela	Chad
Ghana	Guinea-Bissau	Tunisia		Guatemala		Iran	Congo
Guinea	Liberia		Bangladesh				Niger
Lesotho	Morocco	Ecuador	Burma	Paraguay			Rwanda
Madagascar	Sierra Leone	Brazil	China	Pakistan			Uganda
Mali	Somalia	Panama	India				Costa Rica
Mauritania	Sudan	Indonesia	Saudia Arabia				Honduras
Mozambique	Tanzania	South Korea	Sri Lanka				Bhutan
Nigeria	Zambia	Malaysia					Fiji
Senegal	Zimbabwe	Philippines					Papua-New Guinea
Togo		Taiwan					Syria
Zaire	Dominican Republic						
Guyana	South Yemen						
Haiti							
Jamaica							
Peru							
Afghanistan							
Iraq							
Jordan							
Nepal							
North Yemen							

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a decade or more, increases in per capita agricultural output.

- The six most populous countries—China, India, Indonesia, Brazil, Bangladesh, and Pakistan, which account for some two-thirds of LDC population—each have increased per capita food production as well as overall agricultural output. For example, China used to import some 4 million bales of cotton annually; it now exports about 1 million bales.
- The countries with the poorest agricultural performance are concentrated in Africa. Of the 44 countries examined on that continent, 28 have been doing poorly, while only eight have improved consistently.
- The seven most populous African countries—Nigeria, Egypt, Ethiopia, Zaire, Morocco, Algeria, and Sudan—were on the clearly worsening

list. Together they account for more than half of the African population (excluding South Africa).

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### The Role of the Government

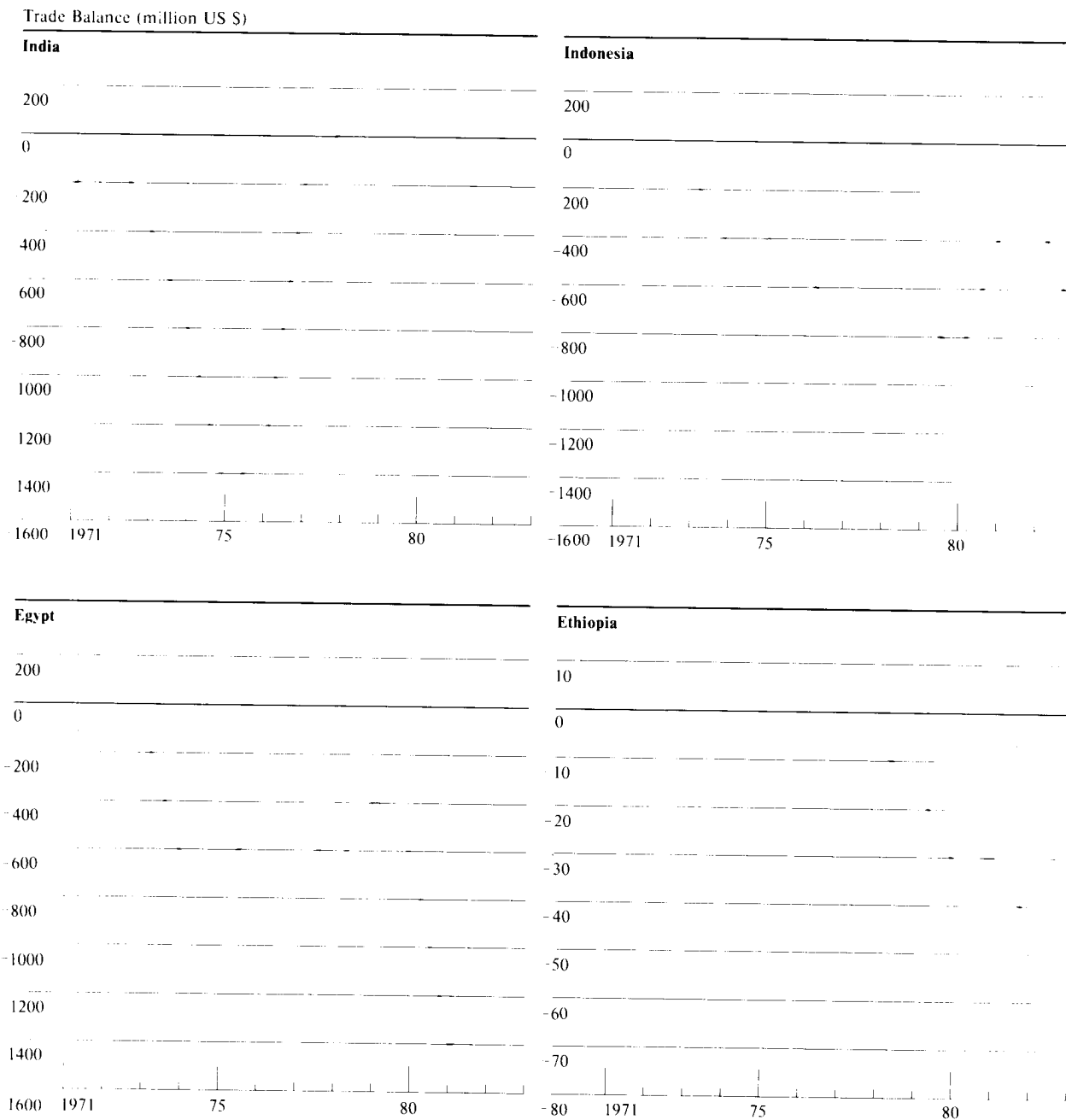
5. Our analysis indicates that LDC governments made little or no progress in boosting production unless they satisfied two criteria:

- *Security.* Prolonged strife and civil war have been the most common unsettling events on agriculture; for example, Afghanistan, Lebanon, Ethiopia, Angola, and countries in Central America all performed poorly. Working under such conditions, farmers were unable or unwilling to produce much more than they needed to meet their immediate family needs. Besides disrupting the agricultural production cycle from planting to harvesting, the disturbances interrupt normal

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**Figure 1**  
**Selected LDCs: Net Trade of Grains (SITC 04)**



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### Trends in LDC Agricultural Trade

LDCs as a group generally have run surpluses in their foreign agricultural trade, even though both exports and imports have risen sharply. These surpluses showed an upward trend from the mid-1960s until 1979, but a sharp deterioration occurred between 1980 and 1982, which created the first deficit in LDC agricultural trade in many decades. Imports jumped about 30 percent in 1980, largely because of poor weather throughout the Third World and a sizable rise in the purchases of oil-rich states. Imports began to fall by 1982, as improved weather enhanced growing conditions, and debt problems forced restrictions in foreign purchases. Since 1982, however, the LDCs have returned to agricultural trade surpluses. Imports have been held down by growing self-sufficiency and ongoing debt problems, while exports have been boosted by the industrial world's economic recovery (see table 3).

Much of the rapidly rising LDC imports of agricultural goods since the early 1970s reflects purchases by the oil-producing countries of the Persian Gulf region, Africa, and Latin America, which increased 50 percent faster than the LDC average. Saudi Arabia moved from eighth to second place in the listing of LDC importers of agricultural products. Even many of the oil-producing countries with reasonably fertile land moved well up the list. Because they could afford agricultural imports, they followed policies that promoted consumption while depressing domestic output of farm goods. Real farm prices in Mexico in the late 1970s, for example, were 25 percent below those in the 1950s. As a result, Mexico jumped from 10th to fifth place among LDC importers. Nigeria and Egypt also improved their standing, while India dropped from being the second-largest LDC agricultural importer in the early 1970s to 13th place in the early 1980s (see table 4).

The largest absolute increases in wheat consumption in the past 20 years have occurred in the traditional wheat belt of the Middle East and North Africa. The gap between production and consumption has widened throughout the region, especially in North Africa, where per capita wheat production has fallen. North Africa now imports about two-thirds of its wheat consumption. The demand for wheat has been spurred in the region by the most widespread and largest subsidies on bread among LDCs. Although Sub-Saharan Africa had the worst production record, its food imports from the developed world account for only about 10 to 15 percent of the LDC total, and Nigeria bought nearly half of the Sub-Saharan purchases.

marketing channels for farm goods. Often, farmers also face life threatening situations and the seizure of their crops.

- *Incentives, or at least, lack of disincentives.* Farmers have not really expanded output where government policies undercut the ability to achieve a reasonable return, and they have responded favorably and quickly to incentives such as high market prices. For example, Chinese farmers responded dramatically when the government increased the guaranteed price it paid them by more than 20 percent, relaxed its rigid production controls, and allowed farmers to cultivate private plots and sell their products in the market. In all Communist countries, the amount produced per acre on "private plots" is much greater than the output per acre of state run farms where workers receive few incentives.

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6. The need for security in LDCs is obvious, and the importance of incentives can be seen from the following examples:

- World Bank assessments have shown that their programs fail when governments do not provide adequate incentives for the farmer, and that they work when governments pursue policies favorable to the farmer.
- South Korea has a relatively poor natural environment for expanding agricultural production but has done well through an effective incentive system.
- Zaire has excellent natural resources, and prior to 1960 it did extremely well in raising production under the stability and incentives of the colonial system. That regime sponsored a highly successful cooperative agricultural system in the eastern part of the country, which involved several
- Kenya and Tanzania have similar climates, but Tanzania is favored by a lower population density. Kenya provided reasonably good incentives for the farmer, but Tanzania's policies resulted in disincentives. The result was fairly good agricultural performance in Kenya, nearly a 40-percent increase between 1971 and 1982, and a dismal outcome in Tanzania, nearly a 50 percent drop in crop production. The cities became dependent on foreign food aid.
- Ivory Coast raised the price it paid for rice to well above the world price and moved from being a net importer to a net exporter within a few years.

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**Table 3**  
**LDCs: Agricultural Exports, 1980-82**

Countries Exporting More Than \$1 Billion a Year Average, 1980-82			Countries Exporting \$500 Million to \$1 Billion a Year Average, 1980-82		Countries Whose Exports Declined, 1970-72 to 1980-82	Countries Whose Exports Rose Less Than 7 Percent a Year, 1970-72 to 1980-82	Countries Whose Exports Rose More Than 15 Percent a Year, 1970-72 to 1980-82
	Value (billion)	Average Annual Increase, 1970-72 to 1980-82		Average Annual Increase, 1970-72 to 1980-82			
Brazil	9.1	15	Guatemala	14	Algeria	Bahrain	Afghanistan
Argentina	5.7	14	Egypt	3	Angola	Bangladesh	Belize
China	4.6	16	Kenya	13	Iran	Benin	Chile
Thailand	3.8	21	Uruguay	14	Libya	Bhutan	Fiji
Malaysia	3.5	17	Costa Rica	13	Mozambique	Congo	Gabon
India	2.5	13	El Salvador	14	Nepal	Equatorial Guinea	Jordan
Colombia	2.4	16	Sri Lanka	7	Nigeria	Gambia	Kuwait
Indonesia	2.0	16	Dominion Republic		South Yemen	Guinea	Malawi
Philippines	1.8	13	South Korea	19		Iraq	Mali
Taiwan	1.7	17	Honduras	16		Jamaica	Papua New Guinea
Ivory Coast	1.7	18	Ecuador	11		Lesotho	Rwanda
Mexico	1.5	7	Ghana	7		Morocco	Saudi Arabia
Pakistan	1.0	15	Zimbabwe	12		Niger	Somalia
Other	26.4		Cameroon	13		North Yemen	Suriname
<b>Total</b>	<b>67.7</b>					Peru	Swaziland
						Senegal	United Arab Emirates
						Siera Leone	
						Sudan	
						Syria	
						Tanzania	
						Togo	
						Tunisia	
						Uganda	
						Venezuela	
						Zaire	
						Zambia	

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**Table 4**  
**LDCs: Food Imports From the Developed World**

	Million US \$			Share (percent)	
	Average 1970-72	Average 1980-82	Average Annual Change	1970-72	1980-82
<b>LDCs</b>	<b>5,481</b>	<b>34,148</b>	<b>20</b>		
Sub-Saharan Africa	661	4,445	21	12.1	13.0
Nigeria	94	1,861	35		
Other	567	2,584	16		
Middle East/North Africa	1,150	12,133	27	21.0	35.5
Egypt	206	2,083	26		
Algeria	129	1,361	27		
Libya	81	853	27		
Saudi Arabia	111	2,168	35		
Other Persian Gulf OPEC	227	3,067	30		
Other	396	2,601	21		
Latin America	1,404	8,205	19	25.6	24.1
Mexico	180	2,229	29		
Brazil	156	1,058	21		
Venezuela	160	1,182	22		
Other	908	3,736	15		
South Asia	526	1,484	11	9.6	4.3
India	245	663	11		
Other	281	821	11		
Far East	1,740	7,881	16	31.7	23.1
Hong Kong	178	879	17		
South Korea	30	1,631	18		
China	262	1,395	18		
Taiwan	276	1,232	16		
Singapore	108	574	18		
Indonesia	149	555	14		
Other	460	1,615	13		

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— Ghana's cocoa and coffee production plummeted for lack of price incentives in the 1970s. It accounted for 50 percent of global cocoa production in 1964 and only 20 percent in 1982.

— Argentina's wheat crops have fluctuated with changes in the real prices paid the farmer and the level of export taxes. [redacted]

7. Most observers, including the World Bank, conclude that overvalued exchange rates have been the single most important policy constraint on Third World agriculture in the past two decades. For exam-

ple, the Philippines' exchange rate was overvalued by 25 to 30 percent through most of the 1970s and Jamaica's by 35 percent in the early 1980s. Developing country governments maintained their overvalued exchange rates to help their emerging industrial and business sectors and to prop up urban consumer purchasing power and government revenues (see inset). [redacted]

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8. LDC farmers are penalized twice by overvalued exchange rates: their profits on exports are eliminated or reduced drastically, and their domestic markets are swamped by artificially cheap imports of food. Because most LDC agricultural sectors are still heavily

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**Nigeria: The Impact of an Overvalued Exchange Rate**

In 1976 Nigeria sought to improve urban diets by promoting the production of poultry. The International Institute of Tropical Agriculture began an innovative program to develop a new variety of high-yielding yellow corn to be used as poultry feed. The program got off to an excellent start and was accepted by many farmers. In April 1977, in an effort to lower urban food prices by cutting the production costs of poultry, Lagos removed all barriers to the importation of yellow corn. With the protection removed, the overvaluation of Nigeria's currency meant that US corn could be imported at nearly half the cost of locally grown varieties. As a result, the corn-growing effort was devastated.



oriented to subsistence—with few farm-to-market roads, little storage, and few processing facilities—it has been all too easy to beat local farmers out of their own urban markets, even in a period of sharply rising demand. 


**The Government—Technology Connection**

9. Technological advances have been among the most important elements in the expansion of agricultural production. Substantial gains have been made in all aspects of agronomy, but for the most part agricultural research has not been a major constraint. Most LDCs lag far behind in adopting new technologies and can make substantial advances by more effectively applying traditional agricultural methods. Experts estimate that LDC crop yields can be easily doubled on the best cropland, thus reducing the pressure on the most ecologically fragile lands. Few African crops have ever had any chemical fertilizer, and most African farmers are still planting the equivalent of precolonial US Indian corn. 

10. Essentially by using available technologies, Taiwan, since the 1960s, and China, in more recent years, have increased agricultural output. Significantly, the common ingredient has been a favorable incentive system. Cases indicating how important incentives have been in adopting new technology include:

- Dwarf high-yielding varieties of wheat were developed in Mexico but did not have much effect on production because of disincentives. India, however, adopted this strain and, with relatively high wheat prices, production soared.


- Research in Nigeria produced a new and highly productive variety of oil palm trees. But, because the price paid the farmers was much lower than the world price, they could not afford to plant and tend the new varieties. Planters in Malaysia, however, utilized the Nigerian research and significantly increased output. The Malaysian Government did not control prices, and farmers were paid near the world price.

- Improved seed capable of doubling yields on Ethiopia's small farms were developed 10 years ago, but low farm prices, government mismanagement, and internal strife prevented their broad adoption by farmers. 


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**The Government—Land Tenure Connection**

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11. Land tenure policies pursued by LDC governments also have played a major role in raising agricultural output when used in conjunction with incentives for production. Individual land ownership has prevailed in most LDCs for decades, but such farmers have failed to expand production much beyond their immediate needs unless they received sufficient income for their effort. Egypt, for example, carried out a substantial land reform program in the 1960s, but production was little affected because prices paid to the farmer often were half of international prices, even after considering input subsidies. 

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12. Land tenure is, nevertheless, a major element that makes up the incentive package for farmers. Peasants are most productive when they have a sense of permanency about the land they are working and have been much more inclined to make improvements. China, for example, offered farm families land leases of three years or less through its new "responsibility system." Even this short period was so attractive in comparison with the communal farms that the reform was a resounding success. Chinese leases now are being lengthened, many to 15 years. 

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13. In contrast, socialized state-run and cooperative-style farming systems in which land is not held by individuals have proved to be a production disincentive. Such a result occurred in a wide variety of settings, including Colombia's mixed economy in the 1950s and 1960s, Algerian socialism in the 1960s and 1970s, and Mozambique's centralization in the 1970s and 1980s. Most of Mexico's "ejido" cooperatives still are sunk in low-technology subsistence farming, five decades after "land reform" began. Tanzania tried to modernize its traditional agriculture by collecting its

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**Table 5**  
**LDC Agricultural Trends**

	Output Per Capita <sup>a</sup>			Trade—Agricultural Imports as a Share of Total Exports		
	1951-55 to 1961-65	1961-65 to 1971-75	1971-74 to 1981-84	1970-72	1980-82	Change
<b>Africa</b>						
Algeria	-2	-2	-2	21	25	+4
Angola	+2	0	-2	11		
Benin	-1	-1	-1	40	200	+160
Botswana		+1	-2			
Burundi	-1	+1	0	22	42	+20
Cameroon	+2	+1	-1	15	11	-4
Central African Republic		0	-1	26	27	+1
Chad		-2	0	42	17	-25
Congo			0	28	7	-21
Egypt	+1	0	-1	34	98	+64
Ethiopia	+1	-1	-1	12	23	+11
Gabon		+1	0	8	5	-3
Gambia		0	-2	31	120	+89
Ghana	+2	-2	-2	14	14	0
Guinea	0	-1	-1	18		
Guinea-Bissau			-1	333	133	-200
Ivory Coast	+2	+1	+1	19	18	-1
Kenya	+2	0	0	19	13	-6
Lesotho		-1	-2			
Liberia	-1	+1	-1	12	19	+7
Libya	-1	+1	+1	5	8	+3
Madagascar	+2	-1	-1	18	34 <sup>b</sup>	+16
Malawi	+2	+2	0	21	13	-8
Mali	-1	-1	-1	54	42	-12
Mauritania		-2	-1	17	43	+26
Morocco	-1	0	-2	34	43	+9
Mozambique	0	-1	-2	22		
Niger	+1	-2	0	24	21	-3
Nigeria	0	-2	-1	10	12	+2
Rwanda	-2	+2	0	18	34	+16
Senegal	+2	-2	-1	50	52	+2
Sierra Leone	+1	0	-1	28	58	+30
Somalia		0	-2	58	107	+49
Sudan	+1	0	-2	22	65	+43
Swaziland		+2	+2			
Tanzania	+1	0	-1	14	29	+15
Togo	0	-1	-1	27	43	+16
Tunisia	0	+2	+2	40	23	-17
Uganda	0	0	0	9	11	+2



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**Table 5 (continued)**  
**LDC Agricultural Trends**

	Output Per Capita <sup>a</sup>			Trade—Agricultural Imports as a Share of Total Exports		
	1951-55 to 1961-65	1961-65 to 1971-75	1971-74 to 1981-84	1970-72	1980-82	Change
	Upper Volta	+2	-2	0	72	113
Zaire	-2	-1	0	10	20	+10
Zambia	+2	+1	-1	7	8	+1
Zimbabwe	+2	+2	-2	3	3	0

<sup>a</sup> Scale for change in output per capita.

-2 = more than 15-percent decline.

-1 = 6- to 15-percent decline.

0 = 5-percent decline to 5-percent increase.

+1 = 6- to 15-percent increase.

+2 = more than 15-percent increase.

<sup>b</sup> Estimate.

small family farmers in "ujamaa" villages. Production fell because farmers preferred to work their garden plots instead of communal fields. [redacted]

#### Other Government Influences

14. Governments also have provided their farmers with many types of inputs—fertilizer, pesticides, seed, and credits—at less than market value. Although in theory these subsidies may seem to be an effective incentive, in practice they have not worked well. The main problem has been that governments usually acquire the inputs and decide who gets them. With the amount of subsidized products or credit limited, their distribution often becomes based on politics and graft. Because they are distributed by cumbersome bureaucracies, products such as seed often reach the farmer after the planting season, a common occurrence in Sudan, for example. Government buying agencies also have bought the wrong products. Guinea, for example, offered a subsidy for buying tractors during the 1970s, but the 4,000 tractors imported were too big for efficient use on Guinean farms. [redacted]

15. The effect of foreign food aid to LDC governments also has depended on price and other incentives. Food aid to LDCs has grown consistently in the past 30 years, reaching about \$3 billion in 1984. This form of aid has been highly controversial, in part because there have been many examples in which the aid has hurt domestic agricultural output. The record, however, has been mixed. In countries such as India in the

1970s and South Korea and Brazil earlier, food aid had a beneficial impact on the local farming sector. Through farm price supports, the government protected the farmer from the cheap foreign food aid being distributed to the poorer, usually urban, segments of the population. Meanwhile, the aid was increasing food markets. Although initially this new demand was met through aid, it could be tapped by the farmers once the aid was reduced. In contrast, especially in Africa, the food aid depressed local prices, and farmers remained unprotected from this cheap source of food. [redacted]

#### Favorable Political Consequences

16. In those LDCs where governments were able and willing to provide security and incentives to the farming community, the political-economic benefits have been substantial and widespread. Because a high proportion of LDC populations is rural, the linkage between agricultural progress and overall economic growth is strong. Indeed, for the many LDCs lacking the relatively sophisticated labor force to foster a sizable export-oriented industrial base, the only effective development alternative has been to rely heavily on agriculture and domestic markets. Kenya, Malawi, China, and India are among the countries essentially following that path. [redacted]

17. Peasants achieving higher yields on small plots have provided the bulk of the increased output. In land-scarce Asia, nearly all the increase in production

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**Table 6**  
**LDC Agricultural Trends**

	Output Per Capita <sup>a</sup>			Trade—Agricultural Imports as a Share of Total Exports		
	1951-55 to 1961-65	1961-65 to 1971-75	1971-74 to 1981-84	1970-72	1980-82	Change
<b>Latin America</b>						
Argentina	0	0	+2	8	6	-2
Bolivia	+2	+2	-1	20	12	-8
Brazil	+1	0	+2	11	10	1
Chile	0	0	+1	21	17	-4
Colombia	0	9	+2	12	16	+4
Costa Rica	0	+2	0	16	13	+3
Dominican Republic	-1	0	-1	16	22	+6
Ecuador	+2	+1	+2	11	7	-4
El Salvador	+1	0	-1	12	20	+8
Guatemala	+2	+1	0	10	11	+1
Guyana	+1	-1	-1	15	16	+1
Haiti	-1	-2	-1	34	66	+32
Honduras	0	0	0	11	15	+4
Jamaica	+1	-1	-2	28	27	-1
Mexico	+2	0	0	15	15	0
Nicaragua	+2	+1	-2	11	27	+16
Panama	0	+1	+1	31	37	+6
Paraguay	0	-1	+2	35	41	+6
Peru	+1	-1	-2	14	15	+1
Uruguay	-2	-2	+2	17	13	-4
Venezuela	+2	+1	-1	7	10	+3

<sup>a</sup> Scale for change in output per capita.  
 -2 = more than 15-percent decline.  
 -1 = 6- to 15-percent decline.  
 0 = 5-percent decline to 5-percent increase.  
 +1 = 6- to 15-percent increase.  
 +2 = more than 15-percent increase.

has been from tiny plots, often less than an acre. In African countries that were able to increase agricultural output significantly during the postcolonial years—including the Ivory Coast, Kenya, Malawi, and Zimbabwe—small-scale farmers have provided much of the increased output of crops, which had been previously grown mainly on plantations. Given their limited acreage and relatively low labor costs, small-scale farmers naturally are pushed toward achieving higher yields per acre than large-scale farmers. As such, peasant farmers are inclined to use high-yield systems such as intercropping, multiple cropping, and other

techniques that require attention to individual plants. In northeast Brazil, for example, farms of less than 25 acres produced three times more output per acre than farms of more than 1,250 acres.

18. In addition, LDC agricultural expansion has benefited the entire economy:

- As farmers become richer, they spend more on locally produced goods such as bicycles, textiles, and cooking utensils. A World Bank study examining Malaysian irrigation schemes, for example, showed that each dollar of increased production

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generated 75 cents of additional income elsewhere in the economy.

the government, for example, have been two to three times world prices.

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— In the successful agricultural countries, the movement to the cities also has slowed. India's rural-urban population distribution, for example, has changed little in the past 10 years. Studies there indicate that each farmer depends on four workers in transportation, marketing, and other support activities, thus generating substantial rural, nonfarm employment. A similar pattern appears to be developing in China.

22. Although relations between the farming community and the power elite develop in many different ways in various LDCs, successful rural sectors generally have resulted in:

— A more stable political milieu, because a large number of persons have a stake in the stability of the system.

— A tendency to overproduce agricultural products, because price and other incentives remain relatively high. Farm exports increase and imports are held down.

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Consequently, the widely accepted belief of the 1960s that poor LDCs can make significant economic headway only through large-scale and state-directed industrialization has proved wrong. In many cases, successful small-scale farmers have been the main spur to economic development.

### Outlook for Output Through 1996

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19. As LDC farming communities became more prosperous, they have attempted to enlarge their political influence in order to maintain and expand their improved conditions. A global pattern seems to exist in which farmers gain more political potency as their economy develops. In the poorest and least politically developed countries, rulers have tended to rely heavily on support from the cities and have paid little attention to the needs of the politically inactive rural areas, even though they may account for as much as 90 percent of the population. By comparison, farmers in the most sophisticated developed countries have a far greater political influence than their limited number would indicate.

23. Overall, LDCs probably will continue to make significant progress in expanding agricultural production during the next five to 10 years, largely because incentives for the farmer will be maintained throughout much of Asia and Latin America. The poor showing in Africa eventually will pressure governments there to adopt similar policies, although such changes will be difficult and politically risky. Although normally erratic weather patterns will mean that gains in output will not be smooth, increased irrigation systems and improved agricultural practices, especially in Asia, seem to have lessened the impact of severe weather on output. Thus, the amplitude of the cyclical production pattern probably will be less than in previous decades.

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20. The pattern of increasing political power of the farmer can be most clearly seen in Asia. In India, the growing number of families that own economically valuable farms largely vote for those candidates for office that seem to provide the best agricultural incentives. These voters were instrumental in defeating the Congress party in 1977 by supporting the Janata party candidates. A defeated Congress party won back farm votes by also promising a continuation of price incentives.

24. In the most populous LDCs that already are doing well, the momentum toward expanded output is likely to remain strong, barring major political upheaval or war. The level of agricultural sophistication is building in these countries, and the enhanced stake farmers have in the continuation of present incentives will maintain pressure on governments to keep or improve those policies. The major counterpressure will come from the need to keep subsidies at a reasonable level.

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21. Even authoritarian LDC governments must deal with the political power of the farmer. Rulers in South Korea and Taiwan have found that they have a substantial ally in the rural community and have tried to maintain that allegiance through greater farm incentives. When farmers in these two countries believed that they were not enjoying a fair share of the benefits from rapid economic growth, they argued successfully for assistance via price supports and protection from import competition. Rice prices paid by

25. Additional countries, especially those in Africa, will most likely tilt slowly toward more favorable agricultural policies. Continuing outside pressure and the internal recognition that past policies have failed, will be the most important influences in helping to move governments toward more pragmatic policies. Many LDC leaders seem to be realizing they cannot afford the burden of inefficient government bureaucracies and ponderous state enterprises. They have also seen how government price incentives in China and elsewhere have boosted agricultural production and

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general economic growth. For instance, Algeria, Mozambique, Nigeria, and Mexico are now exploring ways of correcting past problems. [ ]

26. By and large, however, policy changes are likely to be adopted slowly because many Third World regimes feel threatened by a loss of political control caused by a diffusion of economic power. In addition, governments are having a difficult time in effectively shedding long-established policies. Algeria, for example, began to alter its stifling agricultural policies in 1980, but, in practice, the old system has remained difficult to change. Deeply rooted bureaucracies will remain a major factor in slowing the effective implementation of new policies. An abrupt policy shift would be needed to lead to a substantial and rather quick improvement in agricultural conditions. In most cases, such a dramatic shift would entail a peaceful political revolution, as in China. [ ]

27. Population pressures probably will not be a major constraint on progress in agriculture in most countries. Indeed, most of the gains have come in Asian countries, which have been forced to adopt intensive-style farming because of high man-to-land ratios. In contrast, although much of the increased African output has been a result of additional acreage, that continent has had the worst production record. With many African countries now reaching the point at which the land worked under traditional agriculture practices can no longer feed the population, they are beginning to be forced to alter their techniques. Although this process will be painful, it probably is the only means to significant increases in output. [ ]

28. In some countries, land resources may be too meager for the bulk of the present population to rely on agricultural pursuits. For example, in countries of the Sahel, production costs are too high to sustain many commodities. These relatively few countries will either remain on the dole, strike it rich—a la Saudi Arabia—and thus be able to afford agricultural imports, or will see a migration of their population to nearby countries with richer natural resources. [ ]

29. Technology will continue to help boost LDC agricultural output. New tillage methods, more productive and drought-resistant seed, and improved pesticides and animal feeds are coming into use. Besides the constant flow of new technologies emanating from developed country laboratories, research performed by LDC institutions has climbed sharply. LDC expenditures on agricultural research have tripled during the 1970s—in part paid for by much higher international aid—and have reached a level

exceeding the combined similar spending of the Governments of the United States and Canada. These LDC outlays are now producing a steady stream of technologies tailored to that part of the world (see inset). [ ]

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#### LDCs: Improved Agricultural Technologies

- New sorghum varieties have been developed that may well double grain yields in the Sahel and triple yields in large parts of East Africa.
- New Nigerian white corn varieties have yielded 9 tons per hectare, against a national average of less than 1 ton.
- New high-yielding peanut varieties are highly promising for both Africa and South Asia.
- New cold-tolerant chickpeas can double yields in Syria.
- Much of West Africa could become self-sufficient in rice by shifting from upland to swamp production; it will require different varieties, fertilizer and pesticides, and effectively organizing to drain the swamps.
- Soil scientists have discovered that trace minerals are a key to permanent cropping in the Amazon Basin; due to the high rainfall and acid soils, the trace minerals rapidly leach out and literally starve the crops after a few seasons. The researchers are now in their 13th year of growing crops on the same fields in the Peruvian Amazon, with yields averaging more than 10 tons per hectare per year from triple-cropping grains and oilseed. Local farmers have duplicated their success.
- Thousands of hectares of useless sawgrass have been reclaimed in the Pacific Basin with the leucaena leucocaphala, a leguminous fast-growing tree from Central America. The same tree fixes nitrogen in the soil and is being more widely used to fertilize food crops in African alley cropping systems. India is using the tree's leaves as a dry-season feed source for new dairy industries in arid areas.
- In Latin America, scientists have created a new high-yielding forage crop for the region's huge acid-soil savannahs out of a native weed that thrives in the severe dry seasons.
- A new electrostatic backpack sprayer has drastically cut the volume of pesticide that LDC farmers have to carry to their fields to protect them from insects and diseases—thus reducing costs while helping to improve yields.

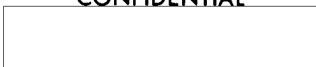
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**Farm-Related Possibilities of Genetic Engineering**

- Soil bacteria that will produce extra nitrogen to nourish plants, which would sharply reduce the need for chemical fertilizers.
- The power to tailor plants for greater utility—perhaps salt-tolerant rice for coastal marshes, drought-resistant cereals, and the first crop plants to offer complete protein.
- Faster growing trees could allow farmers to tap biomass energy value from trees and shrubs on marginal land.
- Higher milk output, a lower ratio of fat to lean meat, and animals resistant to a wide variety of diseases.
- Major victories against diseases such as malaria and river blindness, which sap the energies of farm labor forces in Third World countries, and East Coast fever, which limits cattle production in East Africa.

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30. The productivity potential of these new farm technologies, great as it is, may eventually be dwarfed by the possibilities of genetic engineering. Aided by techniques such as cloning, embryo transfer, tissue culture, protoplast fusion, and recombinant gene transfer, scientists are making progress in altering nature's hereditary blueprints to produce organisms vastly more useful to humans. Genetic engineering already has produced the world's first fully safe vaccine against foot-and-mouth disease, one of the most pervasive and costly livestock diseases in the world (see inset).

**Outlook for Trade**

31. LDC trade in agricultural products probably will grow slowly in the next 10 years. Overall, imports will likely increase much more slowly than in the 1970s, mainly as a result of improved self-sufficiency in food crops. In addition, the oil-producing states will not continue to boost their imports. The most expansionary LDC markets will be those Far Eastern countries whose economies are growing rapidly but that have severe natural resource limitations.

32. Export growth also will be stifled, as much of the expected increase in LDC demand will be met domestically. The near stagnant developed country demand for grains and tropical products, however, will likely persist. LDC sugar exports could fall further

unless developed countries reduce or eliminate their domestic subsidies. At best, exports of major commodities, including coffee, tea, cocoa, cotton, rubber, and vegetable oils, will rise 1 to 2 percent a year. Much of the increased LDC grain exports will result from taking markets away from the United States and other major developed country exporters.

33. A few LDCs will continue to dominate the export markets. For many tropical products, the small number of efficient producers—such as Malaysia, Thailand, and the Ivory Coast—probably will expand their share of the market (see inset). Some countries will do well in small niche markets like bananas and pineapples. The many LDCs that lack the capacity to export manufactured goods will have to depend mainly on domestic market development if they are to expand economic activity.

34. In general, global agricultural markets are much more likely to be affected by surpluses than shortages. Although occasional tight markets are inevitable, the tendency toward greater domestic incentives for the farmer will mean that many countries will be producing more than they need in some product lines and trying to dispose of the excess on international markets. This tendency will hold down global agricultural prices. The LDCs that suffer the most are those that rely heavily on agricultural sales for foreign exchange and are unable to compete effectively for global markets.

**Implications for the United States**

35. On balance, the continuing agricultural progress in LDCs will be mutually beneficial for the United States and the Third World. It will surely enhance the group's political stability. Although many overriding factors could upset the political balance in LDCs, the growing prosperity of the farming community will play an important fundamental role in containing the political tensions that normally accompany modernization. Agricultural gains would slow the movement to the cities, provide an alternate political base outside the cities, and develop a fairly large group with an increased stake in a stable political-economic system. These benefits will mainly flow to the populous countries of Asia and Latin America that have already achieved forward momentum in the agricultural sector.

36. In some countries, however, governments will be facing a period of significant change in agricultural techniques, which could have a destabilizing effect analogous to the "enclosure movement" in England.

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LDC Trends in Market Share

Cocoa

West African countries, such as Ghana, Togo, Benin, and Cameroon, depend on cocoa for 10 to 45 percent of earnings but probably will continue to lose market shares to Brazil and the wealthier Asian producers. Since 1980, production has fallen 16 percent in West Africa, but it has risen 79 percent in Asia—largely because of a tripling of output by Malaysia.

Sugar

Because of high production in Brazil, Asia, and the European Community, sugar prices have been pushed to their lowest level in real terms since the 1930s. This has severely hurt exports and earnings in scores of sugar-exporting countries, particularly smaller ones such as Belize, Fiji, and the Dominican Republic, where sugar accounts for 35 to 90 percent of earnings. Meanwhile, the sugar-producing giants—Brazil, India, and China—have boosted production 35 to 65 percent since 1980.

Cotton

In the past four years, Chinese cotton production has almost doubled to 21.3 million bales—nearly a third of global output. During crop year 1979-80, China imported 20 percent of the cotton traded on the world market, but this year it is expected to account for 5 percent of world exports—a trend the Chinese Government intends to encourage. In addition to taking traditional US markets, these exports will hurt Pakistan, Egypt, Nicaragua, Paraguay, Mali, and Sudan, where cotton exports accounted for 10 to 50 percent of earnings in 1983.

Rubber

Major expansion plans by the three largest producers—Malaysia, Indonesia, and Thailand—will keep supplies plentiful. Smaller producers, such as Sri Lanka and Liberia that respectively depend on rubber for 11 and 17 percent of export earnings, will be less able to boost volume to compensate for low prices.

Most of these countries will be in Africa, but they also could include Nepal and the Philippines. The major problem will be the need to replace traditional agricultural techniques with more sophisticated means so that agricultural production can keep up with population. In some of these cases, the shift to more intensive production will cause wrenching societal changes as nomads are forced to settle and as shifting agriculture evolves into fixed fields.

37. The most serious distribution problems will occur in those countries unable or unwilling to provide

physical security and incentives to farmers. Many countries providing both have easily made the change to intensive land techniques. India is the prime example, especially because it had to make the shift at the same time there were fears that the "green revolution" would result in many landless peasants wandering the countryside. The key issue is how to encourage the LDC tilt toward pragmatic agricultural policies while helping to lessen the fears as to political instability.

38. Expansion of LDC agriculture will have a mixed impact on US international trade interests. LDCs almost certainly will become increasingly competitive in export markets in which the United States is the principal world supplier—including wheat, corn, soybeans, and rice. India, China, Thailand, and Brazil have already taken sales away from the United States. Although these and other LDCs probably will not match the United States in export volumes, they will take away markets from the US farmer and put downward pressure on agricultural prices. In addition, the United States will be pushed further into being a swing supplier in global grain markets, the same role the Saudis have played in crude oil markets. During the years when there are market stringencies, US farm sales soar, and, when surpluses occur, US exports plummet. LDC suppliers of farm products will be selling whatever they have on hand beyond domestic needs at prices probably below those of the United States. The resulting sizable swings in demand and prices caused by the new LDC producers will further complicate the planning problems of those US farmers, the bulk of whose output is sold abroad.

39. Trade tensions are likely to rise between the United States and those LDCs competing with US farmers. Agriculture everywhere is a highly political issue as farm lobbies are very powerful. As the United States becomes more of a swing producer, the trade issues are likely to be especially acute. When markets are in surplus, the subsidies LDCs pay their farmers for higher output will become a clear trade irritant, especially because the LDC governments probably will be selling their commodities at relatively cheap prices in order to secure foreign exchange.

40. At the same time, US manufacturers will benefit from increased sales to the more prosperous LDCs. They will be selling more agriculture-related products—such as tractors, chemicals, and pumps—as well as general goods and services to meet the needs of an expanding economy. On balance, overall US exports should benefit from the increased LDC agricultural output, but they will shift from farm commodities to manufactures and services.

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