virtually the monopoly of the public sector and subject to legal ceilings; real interest rates were often negative. By 1981, these reforms had created a spectacular stimulus to private banking activity and to financial inflows. However, after the economic recession of 1982-83 strict regulations on the financial sector were put in place.

Stabilization programme introducing fiscal and monetary reforms
Stabilization policies dominated policy-making during this period, as efforts were focused on reducing high rates of inflation. In order to eliminate the fiscal deficit, government spending was drastically reduced and tax reforms, including measures to increase tax collection, were implemented. Monetary policy gave the Central Bank control over the money supply.

Second phase of reforms (1984-1989)
The economic crisis of 1982–83 underlined weaknesses in macroeconomic policy and parts of the institutional setting, leading to the introduction of a further set of reforms:

- Further reforms in exchange rate policy were introduced, involving an initially large currency devaluation followed by the introduction of a flexible exchange rate system.
- An expansionary fiscal policy was initially pursued in response to the crisis, though as the economy recovered fiscal policy was adjusted to target key social expenditures.
- Bank regulation was improved and a major, IMF-supported, debt conversion programme was implemented (involving debt-for-equity swaps and allowing the Government to purchase its external debt in the secondary debt market).
- Tariffs were initially raised, before being gradually reduced to an average of 11 percent.
- During the 1990s, unilateral reductions brought import tariffs down to an average of 6 percent in 2003. Tariffs have also been decreased or eliminated as part of several bilateral trade agreements during the last decade.
- Further privatization of key businesses in industries such as energy, mining, steel and telecommunications took place.
- A more active policy of export promotion was initiated in 1985 and Prochile, the state export development agency, was strengthened.

Post reform period (1990-2000)
The post-reform period coincides with a return to democratic government after 1990, and has not involved any major macroeconomic policy changes. It was also associated until 1997 with a period of fast economic growth. GDP grew at an average annual rate of 7.8 percent and GDP per capita at an average rate of 6 percent. Since 1998, and as a consequence of lower international economic activity, the economy has grown at a slower rate (2–3 percent), raising unemployment to nearly 10 percent.

Economic growth during and after structural adjustment has been significant and without precedence in the country (Table 4). Since 1994, inflation has been at the one-digit level and decreasing over time. This was in line with the drastic reduction in the fiscal deficit and rapid export growth. Investment as a percentage of GDP has also doubled since the pre-reform period.

TABLE 4
Main macroeconomic indicators 1973-2001

	1970-73	1974-81	1982-83	1984-89	1990-2001
GDP growth (average rate)	1.1	7.3	-8.5	6.4	5..3
Fiscal deficit (% of GDP)	10.2	0.5	3.0	0.5	-1.8
Average inflation rate	182	133	21.9	20.4	10.5
Total investment (% of GDP)	12.8	16.9	14.8	19.2	25.4
Unemployment rate	4.4	6.8	18.4	10.4	7.5
Exports (mill US$ FOB)	406	2 203	3 768	5 347	13 322
Imports (mill US$ CIF)	515,8	2 703	3 244	4 108	13 155

Source: Portilla, 2000; Banco Central, 2002.

Agriculture sector reforms
Agricultural policies have generally been reformed according to an orthodox free market philosophy. However, following the economic crisis of 1982-83, some interventions took place to reflect the heterogeneity within rural areas and to protect traditional agricultural activities from international price fluctuations and from foreign dumping and subsidies.

Main agricultural policy reforms 1974-1981
Land tenure
Expropriations as part of the agrarian reform introduced in the late sixties ended and a process of redistribution of nationalized lands followed in order to restore confidence. About 45 thousand small family farm units were created and about a quarter of the land was returned to the original owners. However, the structure of land tenure changed drastically and continued to do so as a result of land sales by the new smallholders who were under financial pressure due to a lack of technical assistance and expensive farm credit. Also, a law that made it possible to subdivide and sell the lands of the ethnic minorities replaced previous legislation designed to protect these lands.

Liberalization of agricultural prices, marketing and privatization
With no further intervention by the public sector, the State Marketing Agency (ECA) was closed in 1981. State-owned farms were sold and public sector enterprises, such as cold storage plants, slaughterhouses, and the National Seed Company were privatized. In 1980, only 43 out of 500 formerly nationalized companies remained under public sector control. Controls over exports and imports, including all non-tariff interventions, were eliminated, and tariffs were unified and rapidly reduced to 10 percent by 1979. Subsidies on agricultural inputs were also eliminated. With the liberalization of the exchange rate, agricultural prices were now largely determined by the market. A study coordinated by the World Bank (1992) concluded that the distortions in agricultural prices previously created by macroeconomic policies and industrial protectionism had had a much larger (negative) impact on the performance of agriculture than direct interventions in agricultural pricing policy.

Rural credit
Special credit lines for agriculture were eliminated as were the ceilings on interest rates. The private sector share in the supply of agricultural credit increased from 9

percent in 1974 to 76 percent in 1981. The principle of non-discrimination between economic sectors required that interest rates be determined by the market. INDAP, the institution within the Ministry of Agriculture in charge of aiding small farmers, was given the responsibility of providing credit to small farmers.

Labour policies
During the agrarian reform process, about 280 thousand farm workers had been organized under 800 communal syndicates, grouped into 85 federations and five national confederations. After 1973, collective bargaining was suspended and non-affiliated peasants were no longer obliged to contribute to the syndicates. By 1982, the number of affiliated peasants to syndicates had decreased to 25 thousand, and the size of cooperative membership had diminished from 90 000 in 1973 to 12 000. As a result of new farm labour regulations, the number of permanent farm workers declined sharply in favour of temporary workers.

Main agricultural policy reforms (1984-1989)
After the economic crisis of 1982-83, a number of more interventionist agricultural policies were introduced.

Price band mechanism
A price band mechanism involving floor and ceiling prices for wheat, sugar and edible oil was introduced, and expanded later to include wheat flour and oilseed cakes. The purpose was to eliminate extreme price fluctuations for these sensitive commodities without isolating domestic prices from longer-term movement in international prices. In general, the bands have protected farmers rather than consumers, except for some years in the case of sugar. Chile's price band system has recently been challenged under WTO rules as a result of a petition by Argentina and has also been challenged by the on-going negotiations for a free trade agreement with the United States of America.

Public procurement agency
A public procurement agency (COTRISA) was created to support the price stabilization scheme for wheat, Chile's single most important agricultural crop.

Safeguards and international market distortions
Since 1986, legislation has allowed additional tariffs when allegations of foreign dumping or distortions in import prices which may cause severe damage to domestic production have been accepted by the Anti-monopoly Commission. These safeguards have been applied for restricted periods of time to wheat flour, rice, powdered milk and sugar.

Decrease in government's role with respect to agricultural research and extension
During the reform period, agricultural research and extension came under pressure from fiscal reforms and reductions in public sector spending. Public provision of extension services to small farmers was replaced by private consulting services with only a fraction of their cost being subsidized. Large farmers were serviced by the National Institute of Agricultural Research.

Export promotion
Tax rebates on agricultural exports were implemented from 1985, and in 1991 were estimated to be equivalent to only 2 percent of agricultural exports, but this may have provided some stimulus to non-traditional exports. The system was abandoned in 2002 as part of the Uruguay Round negotiations. There was very little direct benefit to small farmers, given their small participation in exports, although they may have benefited as farm labourers, for example, in the fruit sector.

Irrigation policy
Subsidies for investment in irrigation were introduced, and between 1983 and 1989, amounted to US$34 million, benefiting 900 farmers and including about 300 000 hectares. Only about 4 percent of this amount benefited peasant farmers. After 1990 the programme was widened to include more small farmers.

Other reforms
Social reforms were initiated in the mid-1970s as part of structural adjustment. However, the main reforms were introduced in the 1980s with the principal purpose of targeting the poorest segments of society, especially in the poorest geographical areas, and of improving the efficiency of social services. An initial survey showed that in the late 1970s, 21 percent of the population was classified as extremely poor, and concluded that the main social programmes did not reach the poorest people[3]. Programmes focused on human capital investments, including investments in nutrition and education.

The main components of social reforms can be summarized as follows:

- *Social expenditure rationalization* to ensure fiscal sustainability. In the early 1970s, social expenditure represented nearly 20 percent of the GDP and led to large fiscal deficits.
- *Reduction of universal social programmes* and their replacement with targeted programmes and means-testing.
- *Creation of compensatory social programmes* to help the families affected by the economic crisis of the early 1980s, including monetary transfers and employment programmes.
- *Decentralization of public sector services*, such as education and primary health care.
- *Greater participation of the private sector* in the production and delivery of social services.

A number of pre-reform programmes were re-designed to improve food security, health and nutrition among the poorest children and households. These included the Health Control and National Feeding Programme (PNAC); the School Feeding Programme (SFP); Pre-School Centres; Monetary Transfers; Family Subsidies (SUF); the Assistance Pension (PASIS) and employment programmes.

Programmes to help poor farmers, implemented by the Institute for Agricultural Development of the Ministry of Agriculture (INDAP), consisted mainly of providing technical assistance and low-cost loans to small farmers.

[3] National Planning Office, 1975.

CONSEQUENCES OF REFORMS: INTERMEDIATE VARIABLES

Trends in international and domestic prices

After the opening of the Chilean economy at the end of the 1970s, domestic agricultural prices have responded to movements in international agricultural prices and to changes in the real exchange rate and average protection levels. Table 5 summarizes the evolution of average real domestic wholesale agricultural prices in Chilean pesos and the corresponding average border prices expressed in US dollars.

Decomposition of price changes

Since the economic crisis of 1982–83, the domestic prices of wheat and maize have generally followed changes in world prices. However, during the 1984-89 reform period a depreciating exchange rate helped to offset the negative impact on prices of tariff reductions and other policy effects, whilst in the post-reform period an appreciating exchange rate had the opposite effect (Table 6).

For sugar, the domestic price has followed changes in the border price, except during the crisis period when the world price fall was not transmitted to the domestic market. Tariff reductions have prevented domestic prices from rising as much as they might otherwise have done.

The domestic price of beef has moved in line with the border prices, except in the post reform period where the world price increase was offset by a fall in the exchange rate and further tariff reductions. In the first stage of reforms the increase in the domestic price was much larger than that of the border price due to import restrictions imposed on sanitary grounds. This effect is captured by the column "Change in policies and other effects" (Table 6).

TABLE 5

Domestic and border prices for main agricultural products 1965-2001 (period averages)

	1965-1973	1974-1981	1982-1983	1984-1989	1990-2001
Real domestic prices (Ch$ Oct. 2002/tonne)					
Wheat	53 995	150 750	143 170	176244	119 849
Maize	67 723	121 111	120 330	130 703	94 546
Sugar	93 314	193 558	221 085	295 730	217 716
Milk	62 611	190 610	230 829	263 142	301 183
Beef	510 153	1 242 885	1 145 229	1 408 557	1 265 902
Potatoes	39 822	98 933	129 548	106 904	100 110
Beans	207 174	502 086	321 367	503 920	508 425
Apples	365 337	221 718	143 150	119 400	115 105
Border prices (US$/tonne)					
Wheat	59	178	174	162	153
Maize	49	139	142	164	127
Sugar	82	419	270	259	336
Milk	49	102	126	107	176
Beef	747	894	886	739	1 092
Potatoes	45	431	432	225	262
Beans	262	468	280	455	561
Apples	165	334	401	373	494

Source: National Institute of Statistics, Central Bank of Chile.

TABLE 6
Decomposition of price changes for main commodities 1965-2000

	Period	Change in domestic price	Change in world price	Change in exchange rate	Change in tariff	Change in policies and other effects
Wheat	1965-73	-5.59	1.84	5.89	8.26	-21.57
	1974-81	16.32	14.4	5.12	-36.28	33.07
	1982-83	12.76	-9.08	14.61	29.39	-22.15
	1984-89	-0.82	-0.04	7.12	-3.04	-4.86
	1990-00	-3.64	-2.5	-2.12	-1.38	2.79
Maize	1965-73	16.45	-9.6	5.89	8.26	11.9
	1974-81	-7.55	23.04	5.12	-36.28	0.56
	1982-83	15.49	0	14.61	29.39	-28.5
	1984-89	-1.28	-0.64	7.12	-3.04	-4.73
	1990-00	-4.93	-3.32	-2.12	-4.64	5.15
Sugar	1965-73	5.3	4.32	5.89	8.26	-13.17
	1974-81	5.87	18.22	5.12	-36.28	18.81
	1982-83	15.32	-43.09	14.61	29.39	14.41
	1984-89	0.51	8.62	7.12	8.51	-23.74
	1990-00	-1.73	-4.08	-2.12	-3.65	5.32
Beef	1965-73	3.78	5.32	5.89	8.26	-15.7
	1974-81	10.99	0.73	5.12	-36.28	41.42
	1982-83	-10.02	-20.5	14.61	29.39	-33.52
	1984-89	4.73	2.23	7.12	-3.04	-1.58
	1990-00	-2.97	1.57	-2.12	-4.64	2.21
Milk	1965-73	8.89	6.62	5.89	12.26	-15.88
	1974-81	11.33	9.79	5.12	-20.3	16.72
	1982-83	2.91	-3.62	14.61	27.9	-35.98
	1984-89	4.23	-0.27	7.12	-15.36	12.74
	1990-00	-0.01	3.2	-2.12	-5.6	4.51

Note: Comparative results from price decomposition analyses across the case study countries are provided in Annex B of the Synthesis chapter. The results in Annex B present the change in the domestic price as a percentage change with respect to previous period. The case study analyses vary in that some present results as a percentage change with respect to a base period. Whilst the interpretation of results in the case study narrative holds irrespective of the end points compared, the results presented in Annex B should be used for comparative purposes.
Source: Based on data from National Institute of Statistics and Central Bank of Chile.

Finally, the decomposition of the domestic real price of milk shows that the increase in prices observed before 1990 was higher than that of the border price. This was due to favourable changes in the exchange rate and other policies, and occurred despite decreased tariff protection.

The results of a regression analysis covering the period 1965-2000 (presented in the Annex) indicate that real domestic agricultural prices relative to non-agricultural prices have moved in direct response to real international agricultural prices, and have risen with increases in the real exchange rate (currency devaluation) and fallen when the exchange rate has decreased (currency appreciation). Contrary to expectations, the average uniform tariff rate applied during the period analysed shows an inverse relationship with the average price level. However, since the tariff rate is the same for both agricultural and non-agricultural prices, it is possible that the reduction in average protection over time has raised agricultural prices relative to non-agricultural prices.

Effects on agricultural output and value added

Eight products have been selected for a deeper analysis of how trade reforms have impacted on income and food security (Table 7). Selection was based on their importance in the production and consumption baskets of small farmers and together they constituted close to 50 percent of the gross value of agricultural production in 1997. Five of them are import competing products (wheat, maize, sugar, milk, beef), one could be labelled as non-tradable (potatoes), and two are exportables (beans, apples).

In assessing the ability of producers to respond to price changes it is important to recognize the agroclimatic context within which they operate (Box 1).

Wheat

This is the main agricultural commodity in terms of area planted, the number of farms involved in its production, and its geographical spread. The total area sown to wheat has diminished drastically (especially in Central Chile) from about 1 200 000 hectares in 1965 to approximately 776 000 by the end of the 1990s. At the same time, imports have increased, particularly from the Mercosur region.

Wheat production grew rapidly during the second reform period in response to the newly implemented price band scheme and a very favourable trend in the exchange

TABLE 7

Production and trade in main agricultural products (period averages in thousand tonnes)

	1965-1973	1974-1981	1982-1983	1984-1989	1990-2001
Production:					
Wheat	1 190.7	912.4	618.2	1 525.4	1 481.0
Maize	272.9	371.0	497.8	738.5	838.5
Sugar	143.8	192.7	190.7	419.5	455.9
Milk	479.0	579.5	534.5	661.6	1 296.7
Beef	162.2	180.2	201.3	190.3	236.8
Potatoes	714.1	859.8	762.6	878.8	959.0
Beans	68.3	97.8	123.4	89.7	62.6
Apples	121.0	184.3	355.0	536.7	891.3
Trade:					
Wheat exports	0.0	0.1	0.0	4.0	0.2
Wheat imports	503.4	828.1	1 076.0	286.9	362.5
Maize exports	0.0	0.2	0.0	4.9	0.2
Maize imports	149.1	168.0	270.4	87.9	666.1
Sugar exports	0.0	24.7	0.8	0.0	0.0
Sugar imports	184.6	168.4	191.8	45.1	153.6
Milk exports	0.0	2.9	0.2	3.9	48.0
Milk imports	132.8	147.7	143.6	55.2	166.8
Beef exports	0.0	0.1	0.1	0.0	0.1
Beef imports	18.4	197.6	208.1	197.2	338.9
Potatoes exports	0.0	0.2	0.3	0.6	8.1
Potatoes imports	8.9	4.1	0.0	0.0	21.1
Beans exports	10.5	38.6	45.1	52.9	31.8
Beans imports	0.2	0.1	0.0	0.1	0.2
Apples exports	21.3	99.2	206.6	367.0	721.3
Apples imports	0.0	0.0	0.0	0.0	0.0

Source: National Institute of Statistics and Central Bank of Chile.

BOX 1
Agroclimatic conditions

Chile's long and narrow shape (4 270 km from north to south with an average width of 175 km from east to west) provide it with a number of different agroclimatic zones. Only one third of its surface area of 756 623 km² can be used for agriculture or forestry. Of this total, 8.5 million ha is suitable for cattle (34 percent), 11.6 million ha for forestry (46 percent) and 4.5 million ha for crops (20 percent). Only 1.2 million ha have permanent irrigation. Natural boundaries provide phytosanitary protection, giving the country a competitive advantage for the production of exportable fresh produce. Agroclimatic diversity permits different types of agricultural production and allows Chile to exploit seasonal markets in the northern hemisphere. The country is subdivided for administrative purposes into 12 Regions plus the Metropolitan Area. They run from Region I to XII from north to south, with the Metropolitan Area located next to Regions V and VI.

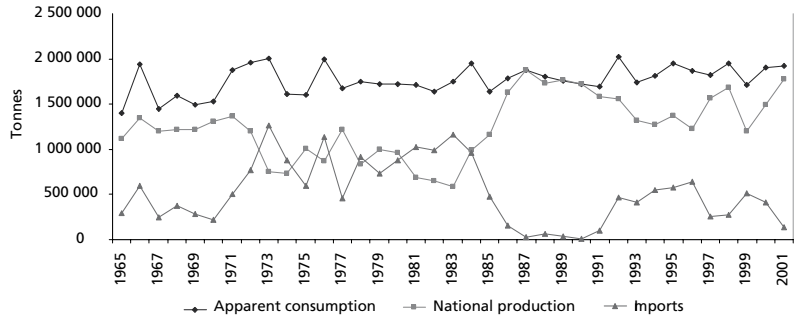
rate. However, in the 1990s the declining world price depressed the domestic price, so that in spite of the price band system being in operation, wheat production fell. Production decreased less than the area sown because of increases in yields. Imports have supplied about 20 percent of domestic wheat consumption in the last 15 years, but this proportion could increase if the elimination of the price band system comes into effect.

During the pre-reform period, government intervention kept domestic prices of wheat below border prices, thus negatively affecting farm incomes. The strategic importance of bread in the food basket of the poor and the high rates of inflation during the pre-reform period (1965-1973) were the justification for keeping the price of wheat, flour and bread below international prices. Controlled food prices also served to keep industrial wages low. Prices were fixed on the basis of estimates of domestic production costs, pre-established marketing margins and political pressures from the different groups affected. Imports were the monopoly of the ECA, the state marketing board, as this was necessary to keep prices regulated and to handle the very frequent balance of payment crises (Espejo and Fontaine, 1991).

During the first period of reforms (1974-81), border and domestic prices increased with declining policy intervention. In 1975/76 the government started to reduce public sector regulation. Rather than the ECA buying wheat from farmers, mills were encouraged to do so. From 1977 to 1979 a price band system was implemented to protect wheat growers from the fluctuations in the international price of wheat. But when world prices started to recover in 1979 the band was eliminated at the request of farmers and ECA was dissolved.

During and following the economic crisis, domestic prices rose as a result of increased protection and the re-establishment of a price band mechanism. COTRISA, a parastatal marketing company, was formed to support the price of wheat within

FIGURE 1
Wheat apparent consumption, national production and imports



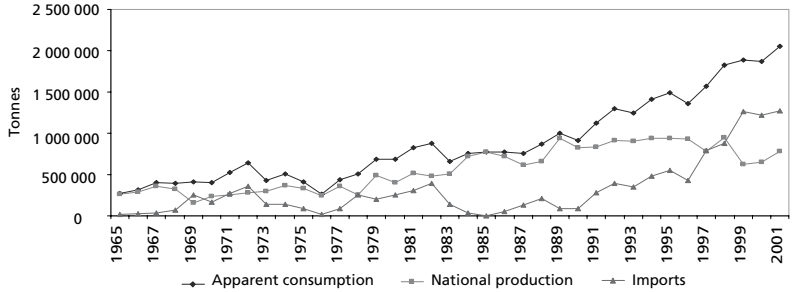
this band by purchasing wheat in competition with the private sector when the floor price was threatened. However, the system did not eliminate the transmission of declining world prices during the recent years, and as a consequence the area sown to wheat has decreased substantially.

Maize

Maize policy in the pre-reform period was different from the policy for other annual crops, although price and trade control was also in the hands of the ECA. The purpose of maize pricing policy was to stimulate production through higher prices. But, due to the closed market situation, higher output was not matched by higher demand, so the outcome was lower market prices. With the introduction of economic reforms after 1973 the market was completely deregulated. Tariffs were reduced in the second half of the 1970s, increased temporarily after the economic crisis of 1982-83, and then reduced again, falling to 11 percent in the mid-1980s, and to 6 percent by the end of the 1990s (and 0 percent under regional free trade agreements).

The border price of maize increased significantly after 1974, as did the domestic real price of maize during the first phase of reforms. This led to an increase in total and per capita production. Due to the increased demand for this important input from the poultry and pork sectors, and due to the reduction in import tariffs, imports increased in spite of higher commodity prices. In the second stage of reform, the world price increased slightly, as did domestic prices. This period experienced a rapid expansion of poultry and pork production, which also helped stimulate maize production. Maize yields increased continuously and production was increasingly concentrated on better soils, and among larger farmers. There was also some vertical integration with the poultry industry. This fast growth in production made it possible to reduce maize imports, which faced higher import tariffs for a number of years after the economic recession of 1982–83. Finally, during the post-reform period both international and domestic prices have fallen as have import tariffs, but production continued to grow until 1998 due to increased

FIGURE 2
Maize apparent consumption, national production and imports



yields and improved technology. Demand from the poultry and pork industry has increased faster than ever, stimulated by their expansion into export markets. Imports have increased significantly in the face of the very low or zero import tariffs agreed by Chile as part of trade agreements with low-cost maize exporting nations, particularly Mercosur.

Sugar

Production of sugar beet increased rapidly until 1970, declined during the early 1970s, and took off again after 1974, continuing to increase throughout the reform period. Up to 1983 around 46 to 56 percent of sugar consumption was covered by imports. This figure fell to 10 and 25 percent in the second phase of reforms and post-reform periods respectively.

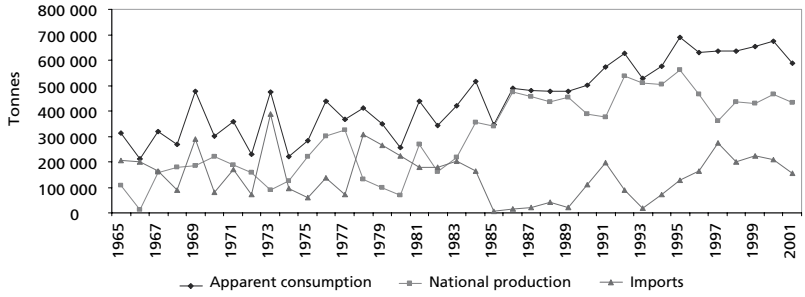
Due to the price band mechanism that decreased the price risk of sugar and increased the nominal rate of protection, production per capita is today more than 108 percent higher than in the pre-reform period. However, the structure of production changed quite drastically in order to compete with imports. Sugar beet production has shifted from a labour-intensive operation on small and medium-sized farms to a capital- and technology-intensive one on medium and larger farms.

The price paid to farmers during the pre-reform period was determined by IANSA, the state-owned sugar manufacturing monopoly[4]. Prices were determined on the basis of several criteria, including consumer purchasing power and production costs. The net effect of these interventions was a negative nominal rate of protection and a negative effect on farm incomes.

During the first stage of reforms, these price distortions were eliminated and both border and domestic prices rose. As a result, production also increased, whilst imports and per capita consumption declined. In the second stage of reforms, with the introduction of the price band mechanism (that continues to the present day), the rate of protection increased, so that, despite a decline in international prices,

[4] IANSA was privatized as part of the reforms and is now owned by a foreign firm plus Chilean shareholders.

FIGURE 3
Sugar apparent consumption, national production and imports



the average real domestic price of sugar beet continued to rise. Production rose and imports fell.

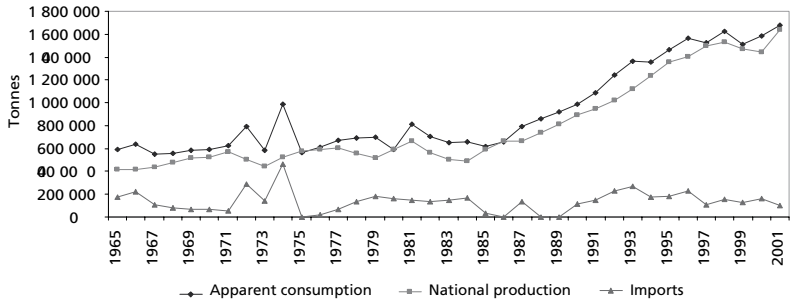
During the post-reform period, the international price of sugar increased and the average real domestic price fell back to a level somewhat higher than in the late 1970s. Despite lower average real prices, production continued to grow in response to the rising yields brought about by modernization of the production system and the concentration of production into larger, more capital-intensive, production units.

Milk

Domestic milk prices have increased continuously throughout the reform process. In the first stage of reforms real milk prices tripled relative to the pre-reform period, while the border price doubled. The higher prices, together with a cow-retention trend at the farm level because of the rapid increase in beef prices, resulted in a tripling of milk production in 1974–81 compared to the 1965–73 level. The average real domestic price of milk in the second phase of reforms was even higher, although the border price was back to a level very similar to that of the first stage of reforms after having risen considerably at the time of the crisis. The increase in the domestic price of milk was a result of increased protectionism after the economic crisis. In late 1983, specific tariffs on dairy products were increased to protect the domestic market from declining world prices. A policy of determining a Minimum Customs Value (VAM), expressed in US dollars, was implemented, to be used as a reference price for the determination of import tariffs and the value added tax. In April 1989, specific tariffs and the VAM instrument were abolished in the light of increasing international dairy prices following European policy reforms in 1987. The Chilean authorities now considered international prices to be an adequate reflection of real production costs (Vargas, 1991). During the post-reform period of the 1990s, domestic prices increased in line with a strong recovery in the world price of milk.

During the first phase of reform, production increased significantly in response to increases in both milk and beef prices. Total imports increased moderately, but remained constant in per capita terms. The country has traditionally been a milk-

FIGURE 4
Milk apparent consumption, national production and imports



deficit market, importing powdered milk, butter and cheese, and the proportion of imports in domestic consumption of milk has remained at about 21–22 percent. After the economic crisis of 1982–83, with higher prices and lower incomes, total production increased, while imports diminished substantially.

Recent years have seen a changing trend. Border prices started to decline a few years ago, and with the slowdown of the economy, this also led to a rapid decline in the domestic producer price of milk. Milk producers have responded by reducing production costs. This has made Chile more competitive and allowed it to export dairy products to other countries in Latin America. In the decade 1990–2001, Chile exported more milk and other dairy products than ever before, and in 2002 the value of dairy exports exceeded that of imports for the very first time.

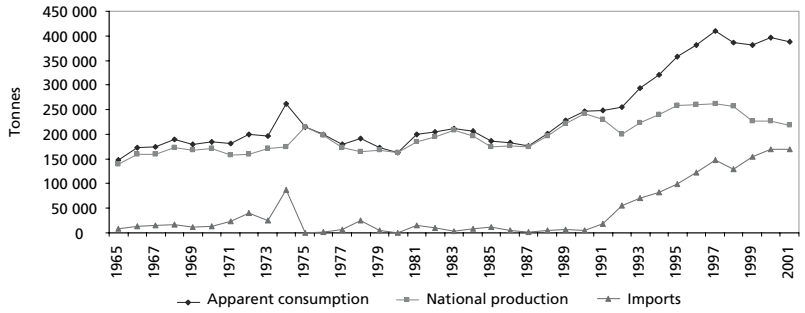
Beef

During the pre-reform period, the price of beef was held below the border price, imports were controlled and monopolized by ECA, and prohibitions on the slaughter cows were common (their alleged purpose being to increase cattle stocks and thus stimulate domestic production). By the end of this period, there were also prohibitions against transporting cattle from one region to another, which indirectly helped to eradicate foot and mouth disease (FMD) in 1974. The country was a traditional beef-deficit market, and imported the product mainly from neighbouring Argentina, a large and very competitive beef exporting nation.

During the first phase of reform, the beef market was deregulated, but because of the sanitary restrictions imposed on beef imports (live cattle or beef with bones) from neighbouring countries where FMD was endemic, the beef market remained closed to external trade for many years and prices and output were determined by local supply and demand. They rose during the 1970s reaching a peak in 1980, before declining sharply during the recession of the early 1980s and then recovering somewhat in the years that followed. The price recovery was moderated by competitive and declining prices for poultry, which was becoming the preferred meat for local consumers.

During the second stage of reform, there was an important change in the structure

FIGURE 5
Beef apparent consumption, national production and imports



of the market as frozen boneless beef imports, particularly from Argentina, began to reach supermarkets and be accepted by consumers, who previously purchased fresh or chilled beef. Beef imports prior to this consisted mainly of meat that was imported for the production of sausages and for institutional use such as in the army and hospitals. The opening up of the beef market was pronounced in the post-reform period as imports stepped up, especially from low-cost beef exporting countries in the region (Argentina, Paraguay and Brazil), putting downward pressure on domestic prices. Sanitary restrictions were reduced during this period, allowing imports of beef with bones from areas that were now free of FMD. In more recent years, import restrictions have been turned on and off in response to periodic outbreaks of FMD in neighbouring countries.

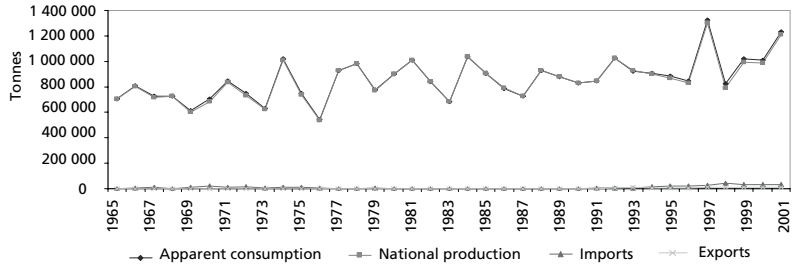
Access was gained in 2003 to new export markets in Israel as well as the EU, with which it has signed a new trade agreement. Although beef is expected to continue to be an import-competing commodity, Chile's FMD-free status and phytosanitary attributes make market access to high-priced foreign markets feasible, whilst the country continues to import low-priced beef.

The domestic price of beef in the second stage of reforms was much higher than in the pre-reform period or during the first stage of reforms. Production was also higher than in those respective periods. The domestic price has clearly diminished in the post-reform period, with lower tariffs and less sanitary restrictions on imports. The role of imports in the domestic market has increase to 30 percent from the average of 3-4 percent at the beginning of reforms.

Potatoes

Potatoes continue to be a small farmer crop, except where grown for industrial purposes. Over 90 thousand farmers grow potatoes, of which about 26 thousand are subsistence farmers, 59 thousand are small commercial farmers, and only about 5 thousand are medium to larger farmers. Production is concentrated in the southern regions of the country (Regions IX and X) and the yield differences between small and larger farms is very large: 12 tonnes/ha at the subsistence level increasing to

FIGURE 6
Potatoes apparent consumption, national production and imports



22 tonnes/ha on large farms. About 20 percent of domestic production is produced on medium or large farms for industrial processing.

With deregulation, the area sown to potatoes decreased by 50 percent between 1975 and 1987, but yield increases allowed average production per person to increase moderately to 80 kg. The production levels of the pre-reform period have never recovered, even though domestic prices are considerably higher than they were. During the reform period, average yields increased from 71 kg per hectare in 1976 to 104 in 1991/94, but have remained stagnant since then.

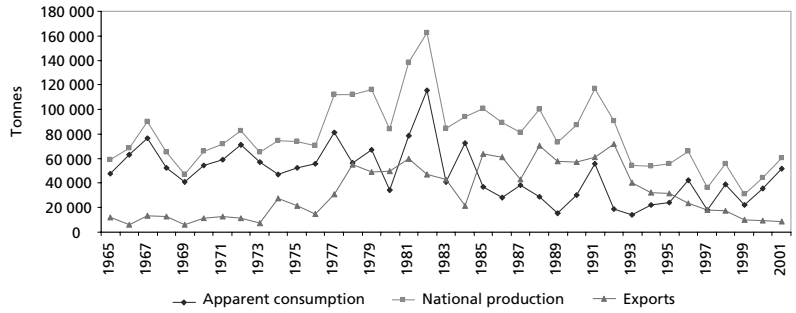
During the pre-reform period domestic prices were kept below border prices by government intervention aimed at controlling inflation and food costs. With deregulation, prices increased substantially. Potatoes are largely non-tradable (although tradable as semi-processed or processed products such as frozen pre-cut potatoes, and as potato seed). The potato market has therefore behaved like a closed market with annual fluctuations in prices and production.

Imports of potatoes have increased recently with changes in diets and the rapid increase in processed potatoes, such as French fries, and with the diffusion of fast food restaurants. Imports of frozen pre-cut potatoes and potato snacks increased during the 1990s. Chile has been able to export fresh potatoes, potato seed, and dehydrated potatoes to neighbouring countries. But the value of exports is no more than about 30 percent of potato imports and these trade flows have depended on the production and trade policies of the large multinational firms, such as Nestlé and McCain. High transport cost of refrigerated products by road to Brazil has also made it difficult to compete in that market with imports from Holland, the world leader in processed potatoes.

Beans

Beans have traditionally been one of the most popular items in the food basket of the population. Due to good climate and soil conditions, beans have also traditionally been exported to other Latin American nations. Over the last 20 years, however, per capita consumption, particularly in the urban areas, has declined, due to the time

FIGURE 7
Bean apparent consumption, national production and imports



and fuel required for cooking beans and changes in consumer preferences. Thus, negative income elasticity has been estimated for this food. There have been no special policies with respect to beans, so that trade barriers have evolved in line with broader trade and economic reforms.

Due to a favourable production environment, the country has traditionally been a net exporter of beans. The varieties preferred for domestic consumption have generally been different from exported varieties. The higher quality produce is usually exported.

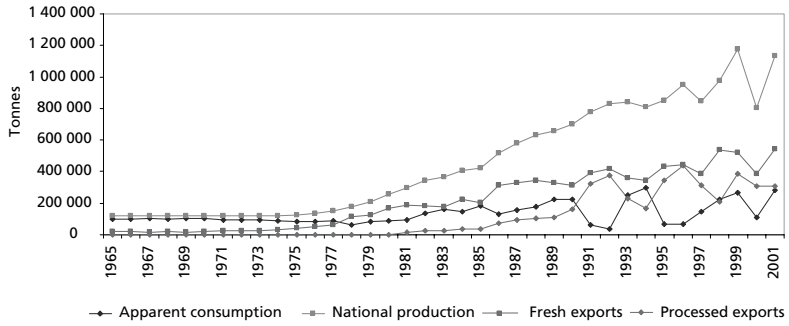
Both the border and domestic prices of beans increased during the first phase of reform, leading to a higher level of production and exports. After the crisis of 1982-83, both export and domestic prices returned to pre-crisis levels, and exports continued to grow and domestic consumption to diminish. Thus, the proportion of bean production exported increased from 39 percent in 1974-81 to 59 percent in 1984-89. Finally, in the post-reform period, exports have decreased substantially, as has domestic consumption, so that production has decreased even though the real domestic price has remained stable and even experienced a moderate rise. The share of exports in production in the post-reform period was 52 percent, compared with 15 percent in the pre-reform period.

Apples

The performance of apple production (and fruits in general) illustrates the significant impact that the reforms have had in terms of Chile's export-led agricultural growth, and in terms of the resulting off-farm employment opportunities created for poor rural and even urban households.

Chile has a comparative advantage in the production of Mediterranean fruits such as grapes, apples and stone fruits, because of its climate, soils, phytosanitary conditions, and, until a few years ago, abundance of low-cost labour, particularly in the central areas of the country. An important factor is that Chile's growing season peaks at the time when fruit grown in the rich nations of the northern hemisphere, Chile's main export markets, are out of season. The fruit-growing sector evolved

FIGURE 8
Apple apparent consumption, national production and imports



in response to external demand and the elimination of the anti-export bias of the previous import-substitution policies. Chilean producers were able to adapt new apple varieties developed abroad to local conditions and worked to improve fruit quality and the marketing skills and infrastructure needed to successfully compete on the global market. At present, about 65 percent of the apple production in the country is exported as fresh fruit, mainly to the European market. Exports of apple juice and dehydrated apples became increasingly important during the second phase of reform.

In the pre-reform period, apple exports were on average only 17 percent of total apple production, while apple processing was very limited, because of the implicit taxation resulting from import substitution policies. The production and export of apples grew very fast during and after the reforms, while domestic per capita consumption has grown only in the last two decades. With an increasing supply in the domestic market of the lower quality fruit discarded by the export process, domestic apple prices fell rapidly in real terms until 1983. Processed apples began to be exported from the early 1980s.

Table 8 indicates the dynamism of fruit exports such as apples, both fresh and processed.

In the central regions of the country (Regions V, VI and Metropolitan Area), the fruit-growing sector has created high demand for hired labour, particularly women and young people, as harvest and packing coincide with the school vacation period. Most of the hired labour is rural, although some urban dwellers in smaller towns and cities also work in this sector.

Changes in the structure of agricultural production

The main sources of information for analysing the changing structure of agricultural production during the reform and post-reform period are the 1976 and 1997 Agricultural Censuses. Information was disaggregated according to changes at the national level and in four selected regions. These regions are located in the central

TABLE 8
Apple production and exports 1985 and 1999 (thousand tonnes)

	1985	1999
Fresh apple exports	203	522
Exports of processed apple products	38	386
Total apple production	425	1 175

Source: Central Bank of Chile and estimates by the authors based on data on fruit plantations and exports.

area of the country (Regions V and VI), representing the most competitive and modern parts of the agricultural sector, and in the south (Regions VIII and IX), where agriculture remains more traditional, involved in farming of traditional import-competing crops and cattle raising.

Land distribution by farm size
The share of total farming land in the hands of smallholders did not change significantly after the reforms (Table 9).

Farmers with less than one hectare in 1976 owned 0.1 percent of total land, with no change in 1997. In absolute numbers, the smallest farmers in 1976 owned around 19 500 ha, and around 11 300 ha in 1997. By contrast, larger farmers (with more than 50 ha) have always owned more than 90 percent of the land.

Farm product composition by farm size
The growth of agricultural exports has changed patterns of land use (Table 10). In 1976, traditional crops (cereals and industrial crops) represented 56 percent of agricultural land use, falling to 44.9 percent by 1997. The main cause of this decline was the increase in fruit plantations, from 4.4 percent of total agricultural area in 1976 to 12.4 percent in 1997. Vineyards were converted into new high-priced varieties, except in the case of smallholders who generally produce wine grapes in areas unsuited to the fine varieties.

The smallest farmers (less than one ha) have also responded to the changes in relative prices, reducing the area devoted to traditional annual crops from 58.1

TABLE 9
Land distribution by farm size 1976 and 1997, including cropland, forests and natural pastures

Farm size	Percent of land area	
	1976	1997
Less than 1 ha	0.1	0.1
1-4 ha	0.7	0.8
5-9 ha	1.0	1.3
10-19 ha	1.8	2.5
20-49 ha	3.9	5.1
50 ha or more	92.5	90.1
Total	100.0	100.0
Total hectares	28 759 162	26 502 364

Source: National Statistics Institute, 1976 and 1997.

TABLE 10
Farm cropland allocation 1976 and 1997

	Total cultivated cropland	Percent of surface devoted to selected crops					
		Total surface	Annual crops	Vegetables and flowers	Fruits	Vineyards	Improved pastures and forages
1976	2 106 264	100	56.0	4.6	4.4	5.0	29.9
1997	1 884 059	100	44.9	6.0	12.4	4.3	32.3

Source: National Statistics Institute, 1976 and 1997.

TABLE 11
Land allocation by type of product and region 1976 and 1997

		Total area	Percent of surface devoted to selected crops					
			Total	Annual crops	Vegetables and flowers	Pastures and forages	Fruits	Vineyards
Region V	1976	100.731	100.0	50.0	14.4	18.5	13.2	3.9
	1997	88 375	100.0	18.4	15.2	24.4	39.7	2.3
Region VI	1976	223 735	100.0	59.7	5.1	19.1	10.1	6.0
	1997	220 664	100.0	49.6	8.4	10.2	26.1	5.7
Region VIII	1976	402 856	100.0	65.1	2.6	22.7	1.4	8.3
	1997	327 466	100.0	60.7	3.0	27.6	2.8	6.0
Region IX	1976	425 715	100.0	63.6	1.8	32.9	1.6	0.0
	1997	375 494	100.0	63.8	1.2	31.7	3.2	0.0

Source: Agricultural Census 1976 and 1997, National Institute of Statistics.

percent to 32.3 percent of the total, and increasing the area devoted to fruits, vegetables, flowers, and forage.

Regional farm land allocation by farm size
Regional product composition has also changed (Table 11). Land used for growing traditional crops has been reduced much more drastically in some regions than in others, especially Regions V and VI, which are particularly well-suited to fruit production. In the southern part of the country (such as Regions VIII and IX), the changes were much less pronounced, due to agroclimatic constraints.

CONSEQUENCES OF REFORMS: TARGET VARIABLES

National food security

Food security indicators estimated show a high per capita dietary energy supply and a low proportion of people undernourished (Table 12). In 1990, about 1.1 million persons were estimated to be undernourished, representing 8 percent of the total population. This figure decreased to 0.6 million persons and 4 percent of the total population in 1997-99.

Other indicators related to food security and food availability also show a positive evolution between 1980 and 2000. Although per capita dietary energy and protein

supply fell slightly between 1979 and 1996 (probably as a consequence of the 1982–1984 economic crisis), it continued increasing thereafter. The food production index has also increased over time and the agriculture trade balance, negative in the early 1980s was, reached a surplus of close to US$1 800 million.

Malnutrition, measured by anthropometric indicators, has dropped over the time and severe malnutrition has been eliminated. There is no significant food security problem among children. Sustained public feeding programmes have contributed to this outcome. Seventy percent of children below 6 years old are assisted and monitored by the public health care system. Monitoring of weight/age ratios began in 1975.

Table 14 includes indicators which also point to a general improvement over time in the socio-economic, health and nutritional status of the population.

Household level food security

The proportion of the population with insufficient income to meet minimum nutritional needs was reduced from 13 percent of population in 1990 to 5.7 percent in 2000. In rural areas, it was reduced from 15.2 percent to 8.3 percent of rural population.

However, household food security is not just a function of income. It also needs to be understood in the context of poverty and the many other variables that affect poverty, such as employment, health and education. This section examines some of these variables.

TABLE 12
Key food security indicators 1990-1999

Indicator	1990-92	1997-99
Per capita dietary energy supply (kcal./day)	2 610	2 860
Number of people undernourished (millions)	1.1	0.6
Proportion of undernourished (percent)	8	4
Average annual growth rate 90-92 to 97-99 in:	**1990-92/1997-99 (percent)**	
a) Per capita dietary energy supply	1.3	
b) Per capita food expenditure	20	
c) Per capita agriculture	1.9	

Source: FAO, 2001.

TABLE 13
Food production and consumption indicators

	1979-81	1996	1997	1998	1999
Food production index *	71	129	133	135	132
Per capita food production index *	84	117	119	119	115
Agriculture trade balance (million US$)	-369	1 353	1 251	1 455	1 793
	1979-81	**1989-91**	**1997-99**		
Per capita dietary energy supply **	2 670	2 540	2 860		
Per capita dietary protein supply ***	71	70	78		

1989-90 = 100; ** kcal/day; *** g/day.
Source: FAO, 2000.

TABLE 14
Main social indicators 1970-2000

	1970	1975	1980	1985	1990	1995	2000
Infant mortality rate (0-1 year)	79.3	55.4	31.8	19.5	16.0	11.1	10.0
Infant mortality rate (below 5 years)	-	57.6	36.8	20.4	19.0	13.8	12.0
Life expectancy (years)	62	64	67	70	73	74	75
Malnutrition below 6 years (%)	-	15.6	11.5	8.7	7.4	5.3	0.7*
Malnutrition in students (%)[1]	-	-	-	-	-	4.8	4.1
Illiteracy (%)	11.8	11.1	9.0	6.6	6.3	4.9	4.5
Primary school coverage (%)	-		92.0	-	94.0	95.0	97.0
High school coverage (%)	-	-	79.0	-	80.0	86.0	90.0
Permanent housing (%)	79.0	-	-	-	91.0	-	96.1
Urban drinkable water (%)	67.0	-	-	-	97.0	-	99.1
Urban sewage (%)	31.0	-	-	-	84.0	-	88.7
Human development index (%)		0.7	-	0.75	-	0.81	0.83

Infant mortality rate (per 1 000 live births).
[1] Malnutrition in 6 to 8 year-old students in public schools.
* based on different methodology after 1995.
Sources: Ministry of Health; Ministry of Education, CASEN Survey; National Census; UNDP, Human Development Report 2001.

The number of people in extreme poverty (reflecting deficiencies in basic needs, such as housing and clean water, as well as food) fell from 21 percent of the total population in 1970 to 14 percent in 1982 (Table 15). However, no significant income distribution improvements have occurred. A recent study of urban incomes in the capital shows a fairly stable Gini coefficient over time and a fairly constant ratio between the incomes of the highest and lowest 20 percent of households.

Rural extreme poverty also declined significantly, from 27 percent of the rural population in 1970 to 19 percent in 1982. The incidence of rural poverty varies from region to region (Table 16). A large proportion of the extremely poor work in agriculture, although this proportion has been declining.

Table 17 shows that in the post reform period, poverty continued declining, from 38.6 percent of population in 1990 to 20.6 percent in 2000. This is mainly explained by the high rate of economic growth. Between 1987 and 1997 GDP per capita grew at an average rate of 6 percent annually. The slower rate of poverty reduction since 1998 seems to be connected with the economic slowdown.

In all four regions selected in this study, poverty fell between 1990 and 1998, both in the urban and rural sectors.

In rural areas, where the incidence of poverty is higher, it also fell (from 40 percent in 1990 to 24 percent in 2000); the reduction was greatest in regions associated with agricultural modernization.

In Regions V and VI in the Central part of Chile, rural poverty was 50 percent lower in 1998 than in 1990. Economic growth and fruit exports have helped, partly by raising the farming incomes of poor households, but mainly by increasing off-farm employment opportunities. However, in regions VIII and IX, where the incidence of rural poverty has traditionally been higher, a lower reduction of poverty was registered. In 1998, the greatest incidence is located in the southern regions: 40 percent in Region VIII and 37 percent in Region IX (Table 18). The poor in these areas are the most affected by food security problems, especially the extreme poor who do not have sufficient incomes to buy a basic food basket.

TABLE 15
National poverty situation 1970-1982

	1970	1982
Extreme poverty (percent of country population)	21.0	14.2
Urban extreme poverty (percent of urban population)	19.5	12.4
Rural extreme poverty (percent of rural population)	27.0	19.2
Rural extreme poverty/country population (percent)	7.0	3.5

Source: National Planning Office, 1970-1982.

TABLE 16
Rural poverty situation by selected regions 1970-1982

Region **	Rural extreme poor rural regional population 1970 (%)	Extreme poor in agricultural activities 1970 (%) *	Extreme poor in agricultural activities 1982 (%) *
Region V	25.8	32.0	20.1
Region VI	23.6	57.0	55.3
Region VIII	28.6	46.0	33.7
Region IX	32.6	65.0	51.3

* Labour force over 15 years.
** Regions V and VI correspond to geographical areas with non-traditional crops related to exportation agriculture, Regions VIII an IX correspond to traditional crops.
National Planning Office, 1970-1982. The 1982 data do not include information about number of rural extremely poor by region but do estimate the number of extremely poor engaged in agriculture.

TABLE 17
National poverty and extreme poverty 1990-2000[1] (percentage of population in each category)

	Extreme poverty	Poverty
1990	12.9	38.6
1998	5.6	21.7
2000	5.7	20.6

[1] These measurements are based on UN-ECLAC methodology and include all those with incomes below the poverty line. This line is based on the minimum household income to satisfy basic needs, including food.

Source: Case surveys of 1990, 1998 and 2000.

Chile's indigenous peoples (*Mapuches)* are concentrated in the rural southern areas About 220 000 *Mapuches* live in the rural areas of Regions VIII and IX, where counties with the highest concentration of *Mapuches* are also those with the highest incidences of poverty. *Mapuches* are grouped in communities with collective property rights, although some of them are small landholders. They are mainly dependent on traditional crops and employment by large forestry enterprises. Neither of these activities generate as much employment as the export-orientated fruit sector. This group also lacks the skills and institutions needed for integration with the market, and has problems accessing modern agricultural technology.

Agricultural income
The analyses of this section focus on subsistence farmers (with landholdings below one hectare) and small commercial farmers (5-10 hectares) in two different regions. Production baskets for these households have been calculated according to the

TABLE 18
Regional poverty and extreme poverty 1990-2000 (percentage of population in each category)

	Extreme poverty		Poverty	
	Urban	Rural	Urban	Rural
Country				
1990	12	15	38	40
1998	5	9	21	28
2000	5	8	20	24
Region V				
1990	15	16	43	40
1998	4	4	18	19
Region VI				
1990	16	15	42	39
1998	6	3	25	19
Region VIII				
1990	17	18	49	46
1998	8	17	30	40
Region IX				
1990	18	20	45	45
1998	11	13	33	37

Source: Case Surveys.

TABLE 19
Gross farm income of small farmers in selected regions 1976 and 1997*

	Subsistence farmers (0-1 ha)				Small Commercial farmers (5-10 ha)			
	Region V		Region IX		Region V		Region IX	
	1976	1997	1976	1997	1976	1997	1976	1997
Farm units	8 352	5 630	2 035	2 458	2 086	2 385	9 714	11 900
Farm land (has)	3 960	2 665	1 049	1 423	9 219	16 279	65 167	84 578
Gross income per ha.* (2002 Chilean pesos)	3 842 858	4 416 938	1 235 682	649 010	1 023 938	3 771 168	368 108	555 232

* Annual average income per harvested hectare calculated according to the product basket of the respective years.
Source: National Institute of Statistics, 1976 and 1997.

average product composition registered in the 1976 and 1997 Agricultural Census. Table 19 includes the number of farm units in each category and region and the total area of those farm units. It also includes the estimated average gross farm income per harvested hectare in each category and region.

In most cases, the results show an increase in the average gross income per hectare, except in the case of subsistence farmers in Region IX. Farmers in this region have maintained an almost identical production pattern, even though relative prices moved against them. However, in the case of the southern small commercial farmers yields of traditional crops (wheat, maize) have increased significantly during between 1976 and 1997. This fact helps to explain the increase in their gross income. Changes in gross incomes are much more pronounced for farmers in Region V, which is located in the central part of the country (Table 20). They have had the advantage of being close to communications and service networks. In this region, farmers have shifted their production patterns towards fruit production (avocados, grapes, and peaches) and away from traditional crops (wheat, maize and beans).

TABLE 20
Real price indices for small farm production baskets in selected regions (1976 and 1997 production weights)

	Subsistence farmers (0-1 ha)				Commercial farmers (5-10 ha)			
	Region V		Region IX		Region V		Region IX	
	1976 Prod. weights	1997 Prod. weights	1976 Prod. weights	1997 Prod. weights	1976 Prod. weights	1997 Prod. weights	1976 Prod. weights	1997 Prod. weights
1975	90.6	111.4	88.2	91.6	116.0	97.7	97.7	96.8
1976	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1980	145.4	140.0	115.7	100.4	138.4	125.1	106.1	100.0
1981	123.0	110.3	98.5	86.6	109.5	101.6	94.0	88.3
1982	106.5	95.4	93.0	85.1	89.4	80.0	87.6	86.5
1984	114.2	111.6	95.4	89.1	106.6	89.4	94.9	87.7
1986	125.9	101.2	114.9	110.0	104.5	98.4	113.7	109.3
1987	140.3	113.2	124.8	114.5	133.3	110.9	115.7	111.8
1989	132.5	132.0	110.5	99.4	118.3	117.6	102.2	97.1
1991	136.1	142.1	111.2	101.0	127.6	124.3	103.3	98.1
1992	144.7	148.4	106.5	94.1	129.1	125.8	98.1	94.1
1994	123.6	139.1	97.5	83.7	110.2	116.7	88.1	84.4
1996	115.7	143.1	97.3	89.4	112.0	119.0	90.9	88.5
1998	113.6	122.7	92.0	80.0	111.5	109.7	80.7	79.5
1999	104.4	120.1	83.0	71.1	91.9	110.1	76.6	71.8
2000	110.0	148.7	84.0	72.8	114.5	118.0	85.9	79.0
2002	108.4	118.9	93.5	84.9	97.1	106.2	84.3	84.4

Source: Calculation based on product baskets taken from Agricultural Census, 1974 and 1997, and agricultural prices from the Ministry of Agriculture.

Evolution of labour force in agriculture

With the growth in agricultural exports, the number of people employed in agriculture increased significantly between 1976 and 1998, although there has been a decline in agriculture's share of total employment (Table 21).

The structure of employment also changed significantly over the period, with a large shift from self-employment to wage labour, particularly permanent employment, and especially in the small farm sector (Table 22). The participation of women in the agricultural labour force is low and has not risen very much between 1976 and 1997, except in permanent employment.

Self-employment is still important in Region IX and to a lesser extent in region VIII (Table 23). Temporary employment is especially important in central Chile,

TABLE 21
Labour force in agriculture 1976-1998*

Year	Agricultural employment (million)	Percent of total employment
1976	481	17.3
1980	530	16.3
1985	523	15.8
1990	873	19.5
1998	713	13.4

* For harvest period, November-January.
Source: Portilla, 2000.

TABLE 22
Changes in the structure of employment (percentage of total employment)

	1976	1997	1976	1997
	All farm households		Farms less than 1 ha	
Permanent wage earners (total)	23	55	3	73
Men	22	48	3	56
Women	1	7	0	17
Self-employed in farming (total)	58	15	95	20
Men	46	8	82	10
Women	12	7	13	10
Temporary wage earners (total)	19	30	2	7
Men	17	22	2	6
Women	2	8	0	1
Total employment (number.)	718 000	939 000	191 000	334 000

* Employed for at least six months in a year.
Source: National Statistics Institute, 1976 and1997.

TABLE 23
Structure of farmers' employment by region 1976-1997 (percentage of farmers)

	Region V		Region VI		Region VIII		Region IX	
	1976	1997	1976	1997	1976	1997	1976	1997
Permanent wage earners *	28	69	23	47	20	57	13	60
Men	27	60	23	42	20	48	13	51
Women	1	10	0	5	1	9	1	9
Self-employed in farm	42	8	35	4	56	19	78	28
Men	37	5	32	3	45	10	58	13
Women	5	3	3	2	11	8	20	14
Temporary wage earners	30	23	41	49	24	24	9	12
Men	24	13	37	34	23	21	9	10
Women	6	9	4	15	1	4	0	2

* Employed for at least six months in a year.
Source: National Statistics Institute 1976 and 1997.

particularly in Region VI, with the incorporation of women into the labour force at harvest time.

In very small farms (less than 1 ha), there has been a very large increase in the proportion of permanent wage earners and a more modest increase in the proportion of temporary wage earners, except in the region V where this proportion has been reduced (Table 24).

The only available indicator that can reflect wage income evolution for rural households in the pre-reform, reform, and post-reform period is the minimum rural daily wage fixed by the Government and representatives of unskilled agricultural workers. Following a sharp fall during the reform period, it has grown steadily since 1987. However, the minimum wage does not reflect the wages of the poorest rural households who are usually not formally employed.

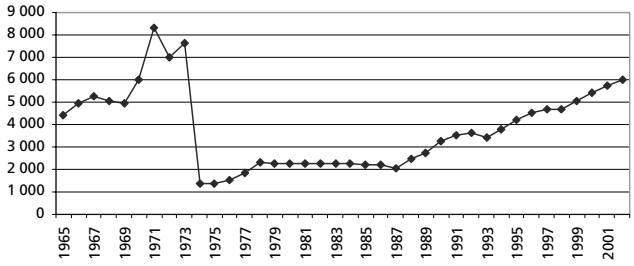
Among rural households, wages from non-agricultural activities have grown as much, if not more, than wages from agriculture. About 60 percent of the income of small farm households is from off-farm activities (Lopez, 1996). Those poor rural households that have been able to obtain off-farm employment have seen their incomes rise over time.

TABLE 24
Structure of employment by region on farms of less than one hectare, 1976-1997

0 - 1 ha farmers	Region V		Region VI		Region VIII		Region IX	
	1976	1997	1976	1997	1976	1997	1976	1997
Permanent wage earners (total)	6	78	4	74	3	62	3	69
Men	6	63	4	59	3	49	3	50
Women	0	15	0	16	0	13	1	19
Self-employed in farm (total)	86	17	87	16	93	22	92	29
Men	70	10	74	9	65	12	57	11
Women	16	7	13	6	28	11	35	18
Temporary wage earners (total)	8	6	9	10	4	16	5	2
Men	8	4	9	9	4	14	3	2
Women	1	1	0	1	0	2	2	1

Source: National Statistics Institute 1976 and 1997.

FIGURE 9
Minimum rural salary evolution: 1965-2002 (CH $ Oct. 2002)



Source: ODEPA data, Ministry of Agriculture.

The impact of reforms on the main socioeconomic characteristics of small farmers

The socioeconomic impact of the reforms in terms of food security and other variables has varied geographically, depending upon the level of agricultural restructuring and the degree of engagement with the export sector. In order to assess this variation, comparisons between the central and southern regions of the country were made using 1998 data for rural inhabitants in the lowest 40 percent income bracket (Table 25).[5]

The following points are worth highlighting:

- In both zones the average number of years in schooling is low relative to the national average and the 8 years associated with completed primary education.
- In the central zone, a high proportion of poor rural inhabitants are wage earners (92 percent) and in temporary employment, associated with seasonal

[5] The characteristics of the sample do not allow more disaggregation of information for rural sectors of regions selected.

TABLE 25
Socio-economic indicators for rural inhabitants in the lowest 40 percent income bracket, 1998

	Central rural zone*	South rural zone*
Education		
Average schooling (years)	6.7	5.8
Schooling household head (years)	6.0	5.4
Occupational category (percent of employees)		
Self-employed	7	35
Wage-earners	92	58
Dependents	1º	7
Type of employment (percent of total employment)		
Permanent	41	60
Temporary	56	36
Other	3	4
Nutritional status of children (according to NCHS-WHO parameters)		
Normal	80	83
Low weight	5	4
Malnourished	1	1
Over weight	11	10
Without information	3	2

* Central Rural Zone includes Region V and VI, South Rural Zone includes Region VIII and IX.
Source. Data from Casen Survey 1998.

TABLE 26
Small farmers by income quintiles: Main socio-economic characteristics, 1994

Quintiles	1*	2	3	4	5	Sample average
Annual household income (US$)	861	2 103	3 388	4 924	16 474	5 018
Annual per capita income (US$)	166	466	804	1 312	4 480	1 300
Off-farm income (percent of household income)	67	68	66	59	30	59
Family size (average number of members)	5.2	4.6	4.3	3.8	3.7	4.4
Farm size (hectares)	9.8	8.6	15	13	26	13.7
Share of traditional crops in total value of agricultural output (%)	79	63	60	56	52	63
Average output price (US$/kg)						
Wheat	0.21	0.23	0.25	0.24	0.37	0.24
Corn	0.20	0.24	0.25	0.35	0.54	0.32

* 20 percent lowest quintile.
Source: Lopez, 1996.

fruit harvesting and packing. In the south, by contrast, a higher proportion is permanent (60 percent), corresponding to farmers that work all year-round on their own land or as employees on commercial farms.

- In both areas the level of malnutrition among poor households is low affecting only 1 percent of children below 6 years of age. This is due to the safety net programmes that reach a high percentage of target groups in rural areas. Ten percent of the rural infant population are overweight.

It can be concluded that there are no serious food security problems in the rural areas of central and southern Chile.

Income differences, off-farm employment and alternative livelihood strategies

Small farmers (farming less than 12 hectares) are highly dependent upon traditional crops. For the poorest quintile of smallholders the share of traditional crops in the production basket reached nearly 80 percent. In the highest quintile it decreased to 52 percent, and on average it was 63 percent (Table 26). This is an important feature because producers of traditional crops are dependent on a limited domestic market.[6]

The average annual per capita income for the total sample was about US$1 300, but incomes differ widely across quintiles, with the lowest registering an average income of US$166 whilst the highest quintile registered US$4 480, nearly 27 times larger that of the lowest quintile.

The data shows a large dependence on off-farm income sources. In fact, the poorest group derives more than 66 percent of their income from off-farm sources, the sample average being almost 60 percent. Average family size is small (4.4) but in the lowest quintile is 5.2.

Another important feature is the disparity between the prices received by different groups for their output. The average prices of wheat and corn are illustrative given the homogeneous nature of these products. The average price received by the poorest farmers tends to be much lower than that of the others. Part of this disparity is associated with unit transaction costs, which are higher for small farmers, given their smaller volume of output and the fact that they are often located further away from markets.

Another study (Berdegué *et al*., 2001), focusing on the coastal highlands in the central and southern zones of the country, also concluded that the coping ability of the rural poor depended on their ability to complement income from self-employment in agriculture with other income sources. Moreover, this study concludes that between 1990 and 1996 income improvements have been greatest for households without access to land but with a greater participation in wage-jobs.

In conclusion, the evidence concerning the impact of policy reforms on the rural poor indicates that although rural poverty still exists, the dynamic sectors of the economy, especially the export-oriented ones, have created many new jobs and improved the incomes of poor households. However, in the regions that remain dependent upon traditional agriculture, such as the southern regions, the incidence of poverty is higher than elsewhere.

Household food consumption

The main sources of information on food consumption are the Household Expenditures Surveys of the National Statistics Institute conducted every ten years. This survey, however, is based on a sample of urban Santiago, the capital city, and does not provide rural information. The data for Santiago points to increased expenditure on food consumption for all income groups, including the poorest, between 1978

[6] Traditional crops include mostly commodities produced for the domestic market including wheat, corn, potatoes, legumes and sugar beets.

TABLE 27
Per capita monthly expenditure on food by quintile in Santiago, 1978-1997

Per capita expenditure* (US$)	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Average
1978	23	31	40	52	88	48
1988	22	28	31	50	84	46
1997	31	49	62	83	154	72

* includes number of people per household for every year of the survey. In 1987 this was: Quintile 1: 4.7, Quintile 2: 4.3, Quintile 3: 4.1, Quintile 4: 3.8, Quintile 5: 3.1, average household: 3.9 members.
Source: National Institute of Statistics, 1978, 1988, 1997.

TABLE 28
Percentage of monthly expenditure in food by income quintile 1978-1997

Expenditure in food (% of total expenditure)	All households	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
1978	41.9	59.4	56.1	53.2	47.7	32.1
1988	32.9	53.0	49.4	45.9	39.7	23.2
1997	26.8	43.6	39.5	35.6	29.6	18.3

Source: National Institute of Statistics, Households Expenditures Surveys.

and 1997, although food expenditure fell between 1978 and 1988, probably due in part to the economic crisis of the early 1980s. High rates of economic growth account for the rapid rise in food expenditure since then (Table 27).

The data also indicate a falling share of food expenditure in total expenditure (Table 28).

POLICY LESSONS

The Chilean reform process has had a positive impact on the agricultural sector and on the economy at large. Openness to trade and the elimination of policy distortions in the terms of trade have stimulated agricultural and economic sector growth, and there has been a major reallocation of land from traditional crops to more competitive and higher added value products, particularly for the export market. This has been beneficial for poverty reduction and food security, both in the urban and rural sectors. Economic and social reforms have also made it possible to better target the poor with social safety nets, thus increasing food security and reducing malnutrition among the poor.

However, reform has not improved income distribution. Vulnerable groups remain in some areas of the country, particularly where the benefits of economic growth have been lower. While rural inhabitants have benefited from reform, the reduction in poverty was proportionally less than in the urban areas, mainly because the low levels of education and the lack of assets make it more difficult for subsistence farmers to escape the poverty trap.

For small and poor rural households, the income derived from farming is often insufficient to provide food security and meet other basic needs, especially as

landholdings continue to be fragmented as a result of laws and practices concerning inheritance. The impact of the economic reforms on the food insecure, mediated by the price and output changes for the main commodities produced or consumed by the poor, is of much less significance than off-farm employment opportunities created in the commercial sectors of agriculture (many of which are export-oriented) as well as in other activities such as services and trade in small towns and villages. The labour intensity of export-oriented commercial activities is substantially greater than that of traditional agriculture, creating new opportunities for poor women and other marginalized groups, especially at harvest time.

The differences between regions in the degree of poverty reduction are largely explained by the degree to which different regions have been able to shift agriculture away from traditional production patterns towards more commercially and export orientated ones. During the 1990s, the poverty rates were lower and reduced by a larger proportion in the central zone where modern, export-oriented, agriculture thrives. This contrasts with higher poverty and food insecurity in the southern zone where farmers mainly engage in traditional agriculture.

The vulnerable are typically those with least schooling, which limits their own farm productivity as well as opportunities for off-farm employment. Rural-urban migration in response to wage differentials continues to provide opportunities for the younger and better-educated population. Those that remain in the rural areas are typically older and less educated. The southern regions are also home to the largest concentration of indigenous peoples, who find it especially difficult to access markets and integrate with the modern economy.

Chile has explicitly recognized the need for special programmes to ensure adequate health and nutrition for vulnerable groups. The main social programmes have focused on human capital investment, nutrition and education. These remain key policies for addressing the problems of poverty and food insecurity faced by those who have not benefited from market reforms.

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ANNEX

Decomposition of price changes: regression analysis

The dependent variable (LOG(RAIPI2) is the logarithm of the aggregate real domestic price of agricultural products relative to non-agricultural products. This relative price was estimated on the basis of the implicit deflators of agricultural GDP and total GDP excluding agriculture.

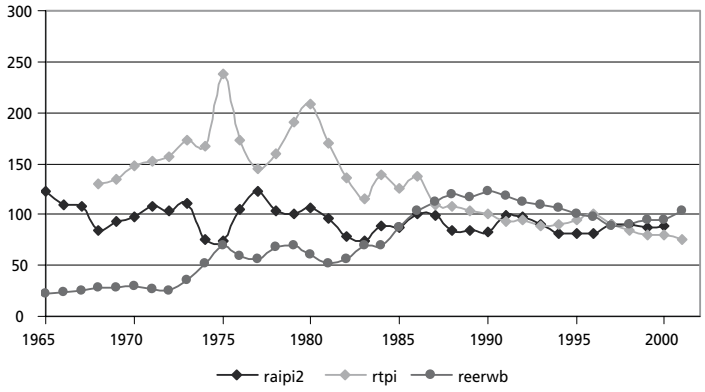
The explanatory variables are:

LOG(RTPI) = logarithm of a price index of real international agricultural prices, constructed as an index of the border prices of agricultural exportables and importables.

LOG(REERWB) = logarithm of the real effective exchange rate - taken from World Economic Indicators (IMF). The exchange rate indicates Chilean pesos per US dollar.

LOG(1+GT), where GT is the average nominal tariff rate on agricultural products.

Trends in the regression variables 1965-2000



Regression results
The results of the regression analysis are as follows:

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3 810	1.180	3 228	0.005
LOG(RTPI)	0 402	0.123	3 256	0.005
LOG(REERWB)	0.233	0.105	2 224	0.041
LOG(1+GT)	-1 258	0.581	-2 166	0.046
LOG(RAIPI2(-2))	-0 466	0.229	-2 035	0.059
R-squared	0.41	Mean dependent var.		4.48
Adjusted R-squared	0.26	S.D. dependent var.		0.09
S.E. of regression	0.08	Akaike info criterion		-2.00
Sum squared resid.	0.10	Schwarz criterion		-1.75
Log likelihood	26.00	F-statistic		2.77
Durbin-Watson stat.	1.58	Prob.-(F-statistic)		0.06

Sample (adjusted): 1980–2000.
Included observations: 21 after adjusting endpoints.

China

Jikun Huang, Scott Rozelle, Hongxing Ni and Ninghui Li[1]

EXECUTIVE SUMMARY

The reforms

The liberalization of agricultural trade in China has occurred simultaneously with a number of domestic economic reforms and these have been implemented gradually but continuously since the late 1970s.

At the macro level, fiscal expenditures on agriculture have been consistently higher than the fiscal revenues from agricultural taxes and fees. However, a significant outflow of capital from agriculture to industry has occurred over the last two decades, particularly through Rural Credit Cooperatives. Exchange rate policy changes have significantly affected the production and trade incentives for producers and traders of imported and exported agricultural commodities. The exchange rate policy during the reform period has clearly been successful in effecting substantial depreciation (increase) in the real exchange rate.

In the initial years, the reduction in protection resulted from a reduction in the number of commodities that were controlled by single desk state traders. Although many commodities were not included in the move to decentralize trade, the moves spurred the export of many agricultural goods. In addition, policy shifts in the 1980s and 1990s changed the trading behaviour of state traders who were allowed to increase imports in the 1980s and 1990s.

At the sectoral level, China's rural economic reform, first initiated in 1979, was founded on the household responsibility system (HRS). Price and market reforms initiated in the late 1970s were aimed at raising farm level procurement prices and also included reductions in procurement quota levels. A second stage of price and market reforms announced in 1985 aimed at radically limiting the scope of government price and market interventions. In the late 1990s market intervention policy shifted from taxing grain producers (by maintaining the government quota procurement price below the market price) to supporting the grain price via a grain protection price set above the market price level.

In terms of input policy, machinery, fertilizer and the seed systems were virtually unchanged to begin with, and remained heavily planned. Since the mid-1980s, market

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liberalization has been implemented gradually, and meaningful liberalization only occurred in the early 1990s for fertilizer and the late 1990s for the seed industry.

Impact on intermediate variables

Before the mid-1980s, the domestic wholesale price of all four major commodities far exceeded the world price, but over the next two decades, the protection rates decreased. Although maize prices fluctuated, they declined between 1995 and 2000. The annual price variation has fallen, as have the price gaps between producing and consuming regions not only for maize, but for all other grains.

Domestic policy reforms account for 95 percent of price changes and trade reforms for at most 5 percent.

Because the one-off efficiency gains from the shift to the household responsibility system were essentially reaped by the mid 1980s, the growth rate of the food and agriculture sectors has decelerated since then. However, rapid economic growth, urbanization and food market development have boosted the demand for meat, fruits and other non-staple foods, changes that have stimulated sharp shifts in the structure of agriculture.

Agricultural trade nearly tripled from 1980 to 1995, with exports rising faster than imports. Since the early 1980s, China has been a net food exporter.

Impact on target variables

National food security status has improved and the level of protein and fat consumption exceeds average nutrient availability in countries with a comparable per capita GNP, mainly because of rapid growth in the supply and consumption of non-staple foods since the early 1980s. By the late 1990s, China had strengthened its ability to import food.

The income of poor farmers depends more on agriculture than does that of richer farmers. The share of agricultural income in total income ranged from 69-76 percent in the poorest groups in all regions to only 26 to 55 percent in the richest groups. Farm households in the poorest group consume less than half the quantity of rice consumed by the average household but more maize and other coarse grains. In the western region the production of wheat, maize and cotton, three traditionally protected commodities, exceeds that of rice in terms of the output values for farmers in lower income categories. Since these commodities are mostly marketed, they represent a major source of agricultural cash income for poor farmers. The reliance on these crops suggests that future trade liberalization of these commodities will affect poor farmers negatively since it will invariably lead to lower prices. On the other hand, recent protection of domestic maize and cotton has benefited the poor in the west.

Income and expenditure trends for the average household and for the poor show rapid improvements. What the average household lost from the liberalization of the importable sector in 1995-2000, it gained back from the protection of maize, wheat and cotton and from the liberalization of the exportable sector. Only 1.9 percent of the change in overall output is due to trade policy.

While both eastern and western regions have benefited from trade policy, liberalization has hurt producers in central China primarily because the region is the largest producer of soybean and edible oil, two of the commodities most hurt by liberalization.

Policy lessons

The rise in yields is explained by domestic policy reforms, decollectivization, new agricultural technologies, irrigation investments and rising access to inputs which have all helped provide the incentives and materials for raising production per fixed unit of land.

Through nearly 20 years of reform, the trade regime has gradually changed from a highly centralized, planned, import substitution regime to a more decentralized, market-oriented and export orientated regime. In the initial stage, reformers only implemented measures that provided incentives to particular sets of corporations and institutions. As experience was gained from the reform, trade liberalization has progressed steadily since the late 1980s.

Domestic reforms have boosted growth in all sectors. They have also increased food security, primarily by increasing food availability. Because of rising output, there has also been a large, negative price effect that has benefited consumers, both rural and urban. By contrast, trade liberalization has had both positive and negative impacts. Although there has been less of an impact on aggregate production and consumption, trade policy reforms have had powerful impacts on structural change, and in improving allocation efficiency. Because they are more commodity specific than domestic reforms, they have a sharper regional and crop-specific impact.

Trade liberalization and domestic reforms have also affected the access of households to non-farm employment and associated wages. Raising the demand for off farm labour is probably the most important thing that can happen in the economy.

INTRODUCTION: CONTEXT AND NATURE OF THE REFORMS

The role and level of development of the agriculture sector

Successive transformations of China's economy have been based on agricultural growth (Nyberg and Rozelle, 1999). Agriculture has made important, but declining contributions to national economic development in terms of gross value added, employment, capital accumulation, urban welfare, foreign exchange earnings and poverty alleviation.

Before 1980, agriculture contributed more than 30 percent of GDP and half of export earnings. By 2000, these shares had fallen to 16 and 10 percent (Table 1).

The shifts in the economy can also be seen in employment (NSBC, 2001). While the share of employment accounted for by the industrial sector has doubled over the past three decades, in the service sector it has tripled. During the same period, employment in the agricultural sector (including part-time agricultural labour) fell from 81 percent in 1970 to 69 percent in 1980, and continued to fall throughout the reform era, reaching about 50 percent in 2000. In the late 1990s, more than 40 percent of the rural labour force was employed in the non-agricultural sector (deBrauw et al., 2002). Expanding non-agricultural employment has contributed substantially to the growth of farmer incomes. Non-agricultural income exceeded agricultural income in 2000 for the first time, accounting for just over 50 percent of the total income of farmers. In 2001, the share rose to 51 percent (NSBC, 2002).

TABLE 1
Changes in structure (percent) of China's economy, 1970-2000

	1970	1980	1985	1990	1995	2000
Share in GDP						
Agriculture	40	30	28	27	20	16
Industry	46	49	43	42	49	51
Services	13	21	29	31	31	33
Share in employment						
Agriculture	81	69	62	60	52	50
Industry	10	18	21	21	23	22.5
Services	9	13	17	19	25	27.5
Share in exports						
Primary products	Na	50	51	26	14	10
Foods	Na	17	14	11	7	5
Share in imports						
Primary products	Na	35	13	19	18	21
Foods	Na	15	4	6	5	2
Share of rural population	**83**	**81**	**76**	**74**	**71**	**64**

Source: NSBC, Statistical Yearbook and Rural Statistical Yearbook, various issues.

TABLE 2
Annual growth rates (percent), 1970-2000

	Pre-reform	Reform period		
	1970-78	1979-84	1985-95	1996-00
Gross domestic product	4.9	8.8	9.7	8.2
Agriculture	2.7	7.1	4.0	3.4
Industry	6.8	8.2	12.8	9.6
Service	na	11.6	9.7	8.2
Foreign trade	20.5	14.3	15.2	9.8
Import	21.7	12.7	13.4	9.5
Export	19.4	15.9	17.2	10.0
Rural enterprises output	n.a.	12.3	24.1	14.0
Population	1.8	1.4	1.4	0.9
Per capita GDP	3.1	7.1	8.3	7.1

Note: Figure for GDP in 1970-78 is the growth rate of national income in real terms. Growth rates are computed using the regression method.
Source: NSBC.

Macro and sectoral components and the policy instruments used

Trade liberalization has occurred simultaneously with a number of domestic economic reforms. Both external and domestic policy reforms have been implemented gradually, but continuously over the past two decades.

In the early reform period, annual GDP growth rates increased dramatically from 4.9 percent in 1970-78 to 8.8 percent in 1979-84. During this period, as economic growth and family planning lowered the nation's population growth rates, the annual growth rate of GDP per capita more than doubled, from 3.1 percent to 7.1 percent.

In the late 1980s, in response to an overheated economy and unprecedented inflation rates, a set of stringent macroeconomic policies was adopted (Naughton,

1995). After two years of high inflation, economic growth slowed sharply in 1989-1990. After the brief slowdown, the Government implemented a series of policy measures to re-stimulate the economy through the use of fiscal and financial expansion, the devaluation of the exchange rate, the expansion of special economic zones, and higher agricultural prices. The economy quickly rebounded and the annual growth rate of GDP accelerated to 14 percent in 1992, maintaining rates of 10 to 13 percent during the mid-1990s.

Although the economy was growing rapidly, inflation was high in the mid 1990s. In order to avoid a repeat of the previous slowdown, a range of measures aimed at achieving a soft landing was implemented (Zhu and Brandt, 2001). As before, financial and credit policies were tightened. Administrative controls over new investments were also implemented. Growth decelerated gradually, falling only marginally, in contrast to the late 1980s. During the late 1990s, economic growth remained high at about 8 percent annually.

Foreign trade has played an increasing role since the beginning of the reforms. The trade to GDP ratio increased from less than 13 percent in 1980 to 45 percent in 2001 (NSBC, 2002). During the same period, the total value of China's primary goods trade (mainly agriculture) increased from US$16.1 billion to US$72.1 billion, an annual growth rate of 7.4 percent (NSBC, 2002). With China's entry into the WTO in late 2001, the growth of foreign trade is likely to remain high and even accelerate in the coming years.

Macroeconomic policy

Fiscal and financial investment policy

Fiscal expenditure on agriculture has been consistently higher than the revenue from agricultural taxes and fees. However, this type of revenue is only a small portion of agriculture's contribution: rural enterprise development has contributed significant fiscal income and has led to a net capital outflow from rural to urban areas since the early 1980s, particularly through Rural Credit Cooperatives.

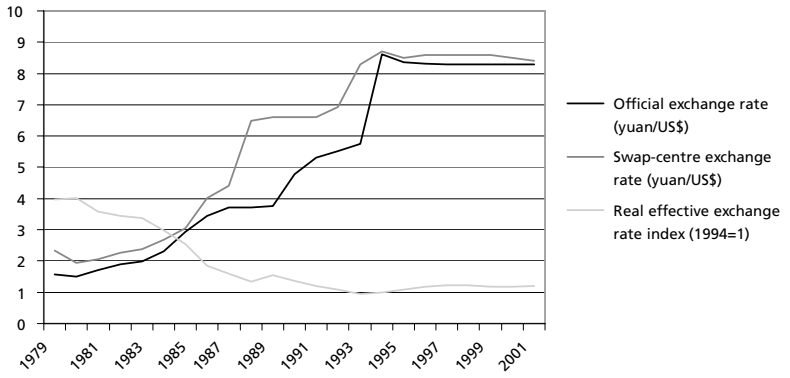
Exchange rate policy

Before economic reform, the Government strictly controlled the earnings and allocation of all foreign exchange to support the nation's import-substitution industrialization strategy (Lardy, 1995). In 1979, China introduced a foreign exchange retention system, aimed at providing incentives to various enterprises and local governments to increase foreign exchange earnings through the expansion of exports.

From 1988, local governments and enterprises were allowed to control and use all of the foreign exchange that they earned as long as they did so in accordance with state regulations. This provided strong incentives to exports from Northeast China. For example, when maize exports led to increased foreign exchange earnings, officials were able to relax the severe constraints that existed on the import of technology, capital and other commodities. Annual maize exports reached an average of about 4 million tonnes in the late 1980s. After the incentives were strengthened, exports nearly doubled to 7.7 million tonnes in the early 1990s.

Exchange rate management was controlled by a two-tiered foreign exchange rate system. One rate, the official foreign exchange rate, was set by policy. The other rate

FIGURE 1
Evolution of exchange rates 1979-2001



was set by a swap centre, based mainly on supply and demand forces. The swap rate was about 20 percent higher than the official rate in the mid-1980s and was as high as 75 percent higher in the late 1980s. A devaluation of the official rate by more than 40 percent in the early 1990s caused the gap between the swap and official rates to fall to 25 percent.

The official exchange rate and the swap market exchange rate were unified in 1994 to a single currency, managed exchange rate system, at a rate that was supposed to be consistent with supply and demand in that year. As a result, the renminbi (RMB, Chinese Yuan or CNY) exchange rate was effectively devalued from the official exchange rate of CNY5.76 per US dollar in 1993 to the managed floating market exchange rate of CNY8.61 per US dollar in 1994. This shift was a one step devaluation of more than 50 percent. In December 1996, after the currency stabilized at that rate, the RMB became convertible on China's current account. Black-market or unofficial secondary markets for foreign exchange have moved closely with the official exchange rates since 1996 and stayed remarkably constant.

The exchange rate policy changes have significantly affected the production and trade incentives for producers and traders of imported and exported agricultural commodities. While a nominal exchange rate devaluation is only effective in raising the price of tradables relative to non-tradable goods, if inflation does not erode the increase in the exchange rate, a real depreciation of the domestic currency raises the local currency prices of tradable relative to non-tradable and contributes to the price competitiveness of domestic exports. Since agricultural products are generally tradable, agricultural incentives may be expected to increase with real depreciation of the domestic currency.

The exchange rate policy during the reform period has clearly been successful in effecting substantial depreciation (increase) in the real exchange rate. Whereas nominal exchange rates remained constant, and even appreciated over three decades prior to the reform period, real exchange rates rapidly depreciated during the entire

reform period except for a couple of years after 1985. From 1979 to 1993, the real exchange rate depreciated by 422 percent.

The success of the exchange rate adjustments stemmed mainly from the productivity effects of economic reforms and technological innovations in agriculture, foreign trade and industry that contributed to relatively low inflation. The favourable trends in the real exchange rate sharply increased export competitiveness.

However, after adopting the managed floating exchange rate system in 1994, the value of RMB has appreciated slightly. The official exchange rate declined from CNY8.61 per US dollar in 1994 to about CNY8.28 in 1998-2001. It is widely believed that the domestic currency has gradually become overvalued since 1994, providing a disincentive to the tradable agricultural sector.

Trade policy

Lower tariffs and rising imports and exports of agricultural products began to affect domestic terms of trade in the 1980s. In the initial years, most of the fall in protection came from a reduction in the commodities that were controlled by single desk state traders (Huang and Chen, 1999). Although many agricultural commodities were excluded from the move to decentralize trade, the initiative did stimulate the export of others (e.g. moving oil and oil seed imports away from state trading firms). Policy shifts also changed the trading behaviour of state traders who were allowed to increase imports in the 1980s and 1990s.

Moves to deregulate access to import and export markets were matched by reductions in border taxes. From 1992 to 1998, the simple average agricultural import tariff fell from 42.2 percent in 1992 to 23.6 percent in 1998 to 21 percent in 2001 (MOFTEC, 2002). However, much of the reduced protection in agriculture has come from decentralizing authority for imports and exports, relaxing the licensing procedures for some crops, and exchange rate reforms.

Overall, trade distortions in the agricultural sector have declined over the past 20 years (Huang and Rozelle, 2003). Non-tariff barriers (NTBs) have been reduced along with tariffs, and quotas have been reformed (Huang and Chen, 1999). Despite this real, and in some areas, rapid set of reforms, the Government retains control over commodities of national strategic importance, such as rice, wheat and maize (Nyberg and Rozelle, 1999).

In the case of grain, although the import tariff rate has been low, importation has been restricted to those agencies and enterprises that hold licences and import quotas. When traders bring in grain within the quota, the tariff was only about 3 percent, whereas above the quota it was as high as 114 percent. No above-quota grain has entered China because grain imports have to be arranged by state traders. The China National Cereals, Oils and Foodstuffs Import & Export Corporation (COFCO) has been the nation's single-desk state trading company for grain. It also manages the import of edible oils. Since the late 1990s, officials have tried to streamline importing procedures by commercializing COFCO and demonopolizing the trade of a number of commodities.

Despite the above efforts in commercializing grain trade, trade liberalization in maize and to some extent cotton, is still minimal (Huang, Rozelle and Chang, 2004). For example, China used export subsidies to increase exports of maize and cotton. This has helped to support domestic prices, thereby protecting producers. Maize

exporters, especially those in Northeast China, received subsidies that averaged 34 percent of the export price.

Institutional reform

Rural economic reform, first initiated in 1979, was founded on the household responsibility system (HRS), which dismantled the communes, and contracted agricultural land to households, mostly on the basis of family size and number of people in the household's labour force. Although individuals controlled the land under HRS and enjoyed the associated income rights, land ownership remained collective. The HRS reforms were completed in 1984, with average farm size about 0.6 hectare. The size of farms varies between regions, ranging from more than one hectare in the Northeast and nearly one hectare in the North, to about 0.5 hectare in the Southwest and 0.2 to 0.3 hectare in the South. Because the multiple cropping index (the number of crops planted per year on a single plot of land) varies from one crop in the Northeast to two to three in South China, variations of sown area among China's regions are less than those of farm size.

Commodity price and marketing policies

The price and market reforms initiated in the late 1970s included gradual increases in agricultural procurement prices toward market prices; reductions in compulsory procurement quota levels; the introduction of above-quota bonuses for cotton, tobacco, and other cash crops; negotiated procurement of surplus production of rice, wheat, maize, soybean, edible oils, livestock, and most other commodities at price levels higher than those for quota procurement; and greater freedom for private traders.

After a record growth in grain production in 1984 and 1985, a second stage of price and market reforms was announced in 1985 aimed at radically limiting the scope of government price and market interventions and further enlarging the role of the market. Other than for rice, wheat, maize and cotton, the intention was to gradually eliminate planned procurement of agricultural products. For grain, production incentives were raised by reducing the volume of compulsory procurement quotas and increasing procurement prices. As result, the share of compulsory grain procurement in total grain production fell from 29 percent in 1984 to 13 percent in 1990, whilst the share of negotiated procurement at market prices increased from only 3 percent in 1985 to 12 percent in 1990.

Because of the sharp drop in the growth rate of grain output and the rise in food prices in the late 1980s, the pace of marketing reform stalled. Mandatory procurement of grain, oil crops and cotton continued. To provide incentives for farmers to raise productivity and to encourage sales to the Government, quota procurement prices were raised over time. The increase in the nominal agricultural procurement price, however, was lower than the inflation rate, which led to a decline in the real grain price (Huang and Rozelle, 2002).

As grain production and prices stabilized in the early 1990s, however, another attempt was made to abolish the rationing of grain. Urban officials discontinued sales at ration prices to consumers in early 1993. For a year and a half the liberalization process succeeded. Then, when it appeared that both the state grain distribution and procurement systems had been successfully liberalized, food prices rose sharply. As a result, the state compulsory quota system was re-imposed in most areas in 1995,

but at a lower procurement level. The share of compulsory grain quota procurement in total production remained at 11 percent in 1995-97.

Since the mid 1990s, several new policies have been implemented. Immediately after the price rises in the mid-1990s, China started the "Rice Bag" responsibility system.[2] The policy was designed to strengthen food security and grain markets by making provincial governments responsible for balancing supply and demand of cereals and for stabilizing local food markets and prices. Policies under the system included re-introducing grain rations for poor consumers, investing in production bases inside the province and attempting to keep grain from being shipped outside the province.

In the late 1990s, market intervention policy shifted from taxing grain producers through low procurement prices to preventing grain prices from falling too low by implementing a grain protection price (higher than the market price). To reduce the financial burden of this policy, the central government in 1998 initiated a controversial policy prohibiting individuals and private companies from procuring grain from farmers.[3] In contrast to past policies, grain quota procurement prices were for the first time set at a higher level than market prices, favouring those farmers able to sell at that price.

If the State could have exercised a monopoly over grain markets, it is possible that it could have implemented the price supports without suffering a major fiscal drain. The loser under this policy would have been the consumer paying a higher price for grain. However, the fiscal burden rose to historic highs as stocks accumulated. In 1998, the Government's grain marketing subsidies in the form of payments to farmers reached nearly CNY100 billion CNY. Yielding once again to market forces, the Government launched another round of liberalization in 2000, eliminating the grain procurement quotas in grain deficit regions (such as, in the coastal provinces of Zhejiang, Jiangsu and Shandong). By 2001, the liberalization efforts spread to inland, surplus regions.

In addition to the development of China's grain markets, the gradual – albeit stop and go – marketing reforms have also slowly reduced the heavy tax burden on grain farmers due to the grain procurement policy.

Livestock was one of a few major agricultural commodities that was mainly liberalized by the mid-1980s. Currently, market prices are based entirely on domestic demand and supply and a limited amount of trade.

Input price and marketing policies

In the first stage of reforms, policy concerning machinery, fertilizer and seeds remained heavily planned, with little change. Since the mid-1980s, market liberalization has been implemented gradually, with meaningful liberalization only occurring in the early 1990s for fertilizer and the late 1990s for the seed industry.

In the 1980s, the Agricultural Inputs Corporations (AICs), a state-owned enterprise with local trade and retail monopolies, rationed subsidized fertilizer and controlled the flow of fertilizer into and out of each jurisdiction in almost the same way they had done in the 1970s (Stone, 1988). In the early years of reform, poorly

[2] "Rice" in China, sometimes means staple food. "Rice Bag" here includes rice, wheat, maize and soybean.

[3] Farmers were supposed to deal solely with the commercial arm of grain bureaus and the grain reserve system, although traders were allowed to operate in wholesale and retail markets.

developed markets often made government sales agencies the only viable marketing channel for agricultural inputs, and it is doubtful that the input markets would have emerged quickly or effectively even if the sector had been liberalized. The nominal price of subsidized fertilizer was constant for the entire 1970s and 1980s, and the state-run system dominated fertilizer markets, even when trade was allowed. In real terms, urea prices declined by 50 percent between 1970 and 1990.

Fiscal deterioration and commercialization of the state-owned fertilizer industry started in the late 1980s. When farmers lost access to inexpensive fertilizer from the State, new opportunities opened up for private traders and markets began to develop. One of the most important policy reforms was the fundamental shift in incentives provided to state-owned fertilizer trading and retailing enterprises in the late 1980s and the early 1990s (Xiao and Fulton, 1997). Government officials offered AIC managers and employees use of the system's trucks and warehouses and a share of trading profits in exchange for keeping workers on the payroll, supporting retirees and keeping their local retail outlets open. Following a similar pattern to that of grain marketing reform, a two-tiered price system was implemented. Fertilizer became available at in-quota and above-quota prices. Above-quota prices of fertilizer were about twice as much as in-quota ones. The amount of fertilizers that farmers could purchase at in-quota prices depended on the amount of grain they sold to the government grain procurement agency.

Although at first, there were few traders in the late 1980s, gradual liberalization of fertilizer markets seemed to work well. Private traders multiplied quickly. Fertilizer became available to farmers, even those in poorer areas, to a greater extent than ever before (Stone, 1993) Soon, AIC-based companies were not only competing with private individuals, but also with each other.

In the early 1990s, private trading was authorized and other state agencies were allowed to join the commercial fertilizer trade. Fertilizer markets supplanted planned distribution networks (Xiao and Fulton, 1997). Rising competition raised the efficiency of markets, made traders more responsive to consumer demands and reduced transaction costs. The only perceived disruption caused by the reforms occurred in the mid-1990s, when the country experienced an imbalance in the supply and demand for food and fertilizer. Fertilizer prices doubled between 1993 and 1996. In part, this was a result of the phasing out of the in-quota fertilizer programme.

Meaningful reform of the seed industry began later than in almost any other sub-sector. However, the seed industry is now being commercialized by encouraging the entry of new domestic firms. The lack of separation between policy goals and commercial activities is one of the main problems facing seed industry managers who, under complete liberalization, might be better positioned to make their firms more efficient and service-oriented (Pray *et al.*, 1998). Although prices have risen recently in international terms, they are still low and many observers believe this is a major constraint to expansion of the seed industry (Pray *et al.*, 1998). Prices of hybrid rice and maize seed in China rank among the lowest in the world.

Rural credit

Financial markets have been liberalized slowly (Nyberg and Rozelle, 1999). Regulated interest rates imply credit rationing, often making it difficult for private entrepreneurs and farmers, especially the poor, to access credit. In many poor

TABLE 3
Amount of loan by activity 1988 and 1995

Year	Fertilizer	Livestock	Small business	Illness	Construction	Other
Percent of households engaged in activity:						
1988	30	25	32	38	56	25
1995	22	18	34	37	56	24
Average loan amount of household receiving loan (CNY, in 1988 prices):						
1988	125	238	1 205	494	1 667	499
1995	90	143	3 767	849	2 161	550

Note: There are 32 observations for Zhejiang, Sichuan, Hubei, Shaanxi, and Shandong; and 24 observations for Yunnan.
Source: Nyberg and Rozelle, 1999.

villages, local credit cooperatives have stopped lending to farmers; although recently, the Government has made an effort to expand lending.

Between 1988 and 1995, farmers reduced credit financing for key activities, such as fertilizer and livestock purchases. In China, most informal credit takes the form of loans to farmers from relatives and friends. Most loans involve no interest, but there is often an implicit obligation for reciprocal lending at zero interest should a future need arise. Although credit does constrain household investment in businesses and large consumption goods (such as housing), there is little evidence that farmers, even those in poor areas, are constrained in their day to day agricultural production activities (Park and Wang, 2001).

Technology development

A nationwide reform of research was launched in the mid-1980s. The reforms attempted to increase research productivity by shifting funding from institutional support to competitive grants, supporting research deemed useful for economic development, and encouraging applied research institutes to support themselves by selling the technology they produce. The record on the reform of the agricultural technology system is mixed, and its impact on new technological developments and crop productivity is unclear. Empirical evidence suggests a decline in the effectiveness of China's agricultural research capabilities (Jin *et al.*, 2002).

CONSEQUENCES OF REFORMS: INTERMEDIATE VARIABLES

This analysis of the impact of trade and related reforms is based on a model, details of which are set out the Annex. The model, known as CAPSiM (China's Agricultural Policy Simulation and Projection Model), attempts to separate out the impacts of trade liberalization and domestic policy reform on domestic production, consumption, and prices of agricultural commodities - at both national and household levels (Huang and Li, 2003). The study is limited to the 1985-2001 period.

Trends in international and domestic prices

Maize provides an example of how prices have changed: Figure 2 shows the trends in selected local markets in major producing provinces (Liaoning and Shandong) and

FIGURE 2
The trend of maize retail price, 1995-2000 (CNY/kg)

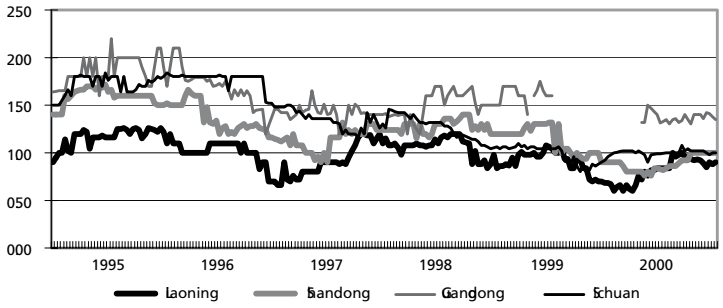


TABLE 4
Nominal protection rates (NPR) for grain 1978/79-2000/01

	Nominal protection rate, under:											
	Quota procurement				Negotiated procurement				Wholesale market			
	Rice	Wheat	Maize	Soybean	Rice	Wheat	Maize	Soybean	Rice	Wheat	Maize	Soybean
1978-79	-42	15	12	2	-6	72	65	22	10	89	92	40
1980-84	-43	-3	-15	13	2	50	28	25	9	58	46	44
1985-89	-30	4	-13	-13	-5	34	17	15	-4	52	37	39
1990-94	-37	-14	-35	-32	-16	14	-7	7	-7	30	12	26
1995-99	-13	1	2	-7	-6	7	10	17	-7	22	26	26
2000-01	2	5	6	10	0	2	5	9	-2	18	26	19

Note: Border prices are averages prices of exports (rice and sometimes maize) or imports (wheat, soybean and sometimes maize) for the varieties that are comparable with domestic grains. Official exchange rates are used to convert border prices.
Source: Estimated by the authors.

consuming provinces (Guangdong and Sichuan). Although prices fluctuate across seasons, they follow a general declining trend between 1995 and 2000. Moreover, the annual price variation has decreased, and the price gaps between producing and consuming regions have also declined over time, not only for maize, but for all other grains, including rice, wheat, and soybeans. Similar trends were also founded for beef and pork.

A nominal protection rate (NPR) was generated by comparing China's domestic prices with international ones. Since the start of reforms there have been several prices – a quota price; a negotiated price; and a market price. Table 4 shows protection rates of cereals and soybeans under these different prices.

Table 5 uses only market prices (or the state administered price in the case of cotton) to show the protection of cotton and livestock products in more recent years.

For most of the early reform period the requirement that farmers submit a quota of grain and soybean at below market prices has represented a lump-sum tax on farmers and lump sum subsidy to the urban consumers. Before the mid-1990s, the average

TABLE 5
Nominal protection rates (NPR) for cotton and livestock products, 1995 to 2001

	Cotton	Pork	Beef	Chicken
1995	17	-14	-14	-22
1996	23	-16	-8	-15
1997	28	-18	-3	-16
1998	18	-25	-15	-16
1999	-3	-13	0	-15
2000	14	-16	-2	-15
2001	14	-21	-11	-17

Note: Export prices of pork, beef and chicken, and import prices of cotton are used as border prices. Domestic prices are prices at urban wholesale markets. The cotton wholesale price is estimated as the state procurement price times 1.25. Official exchange rates are used to convert border prices.
Source: Estimated by the authors.

price farmers received for compulsorily delivered grains and soybean was far below the border price. Although all of the major crops were affected by the state grain quota procurement policy, wheat, the main imported farm commodity, received favourable treatment relative to rice. Between 1995-99 and 2000-01 domestic prices began to rise above the border price, except in the case of rice.

Before the mid-1980s, the domestic wholesale price of all four major commodities far exceeded the world price. The rice market price was 10 percent above the world market price. Wheat and maize prices exceeded the world price around 90 percent. However, over the next two decades, the protection rate on rice became negative and that for wheat and maize fell to around 30 percent.

The case of livestock is different. In all periods, for all major commodities, pork, beef and chicken, the NPRs are negative and producers have received less than they would have if they could have sold their output on the domestic and world markets at international prices.

Decomposition of price changes

CAPSiM was used to simulate how trade and domestic policies have affected domestic agricultural prices (Tables 6 and 7).

For most commodities, prices increased steadily between the mid-1980s and mid 1990s. After 1995, however, the price for all commodities (except coarse grains) declined. The fraction of the overall effect that is due to domestic economic reform far exceeds that of trade reforms. On average, while the direct impacts of domestic policies account for 95 percent of the change in price, trade reform only accounts for at most 5 percent, since the changes in trade are also partially due to domestic policy reforms.

While the patterns over time for all commodities are remarkably similar, the extent of price changes due to domestic reforms and trade vary significantly between commodities. The prices of lightly traded commodities, such as rice, sweet potato, minor coarse grains, vegetables and all livestock products, have been little affected by trade liberalization. For other commodities, trade liberalization has had more effect on domestic prices. For example, after significant tariff reductions and elimination of non-tariff barriers for soybean from the late 1990s, imports of soybeans surged

TABLE 6
Impact of agricultural trade and related reforms on crop prices, 1985-2000

Commodity	Period	Actual price per tonne in 2001 CNY	Percentage change over previous period	Percentage changes due to	
				Trade	Other reforms
Rice	1985	1 741			
	1990	2 102	20.74	-2.14	22.88
	1995	2 534	20.54	0.40	20.14
	2000	1 567	-38.15	3.93	-42.08
Wheat	1985	1 462			
	1990	1 770	21.09	-9.78	30.87
	1995	1 949	10.11	8.91	1.20
	2000	1 287	-33.98	9.79	-43.77
Maize	1985	1 181			
	1990	1 369	15.89	1.83	14.06
	1995	1 598	16.78	-4.73	21.51
	2000	1 091	-31.76	14.45	-46.21
Other grains	1985	905			
	1990	1 026	13.41	-1.10	14.51
	1995	1 426	38.97	-7.77	46.74
	2000	1 575	10.40	-2.90	13.30
Soybean	1985	2 776			
	1990	3 142	13.18	5.07	8.12
	1995	3 163	0.68	-14.59	15.27
	2000	2 115	-33.13	-40.63	7.50
Oil crops	1985	6 112			
	1990	9 800	60.35	-9.50	69.85
	1995	9 114	-7.00	3.19	-10.19
	2000	8 754	-3.95	-25.14	21.19
Sugar crops	1985	4 827			
	1990	5 471	13.33	47.57	-34.23
	1995	6 233	13.94	-23.54	37.49
	2000	5 025	-19.39	16.81	-36.19
Vegetables	1985	3 877			
	1990	2 860	-26.24	0.17	-26.41
	1995	2 608	-8.80	-0.03	-8.77
	2000	2 253	-13.60	-0.17	-13.43

Note: Prices are rural wholesale prices deflated by the rural consumer price index and are 3-year averages centred on the years indicated.
Source: Estimated by the authors.

from less than half a million metric tonnes (million tonnes) in the mid-1990s to more than 10 million tonnes annually in 1999/2001, and began to approach the level of domestic production. Domestic soybean supply declined sharply as domestic prices fell. Indeed, soybean price would have fallen even more if domestic production had not slowed.

China exported maize during most of the 1980s and 1990s using export subsidies. Exports reached nearly 7 million tonnes in 1999/2001. Domestic maize prices would have declined by 46 percent from 1995 to 1999/2001 if China had not provided export subsidies. Instead they only fell by 32 percent. China increased its exports of rice in the late 1990s. However, the positive effect of this on prices was small relative to the negative effect arising from domestic policies.

Domestic grain prices rose in both periods of 1985-1990 and 1990-1995 as domestic marketing reforms reduced the tax burden on grain farmers and the size of urban food subsidies. However, in the following period (1995-2000), market prices

TABLE 7
Impact of agricultural trade and related reforms on livestock prices, 1985-2000

Commodity	Period	Actual real price per tonne (CNY)	Percentage change over previous period	Percentage changes due to	
				Trade	Other reforms
Pork	1985	8 701			
	1990	10 759	23.66	1.13	22.52
	1995	14 468	34.47	-1.17	35.64
	2000	12 010	-16.99	0.59	-17.58
Beef	1985	10 115			
	1990	12 848	27.02	9.36	17.67
	1995	16 825	30.95	-13.76	44.71
	2000	14 381	-14.52	-1.63	-12.89
Mutton	1985	9 055			
	1990	12 809	41.46	0.74	40.72
	1995	19 566	52.75	-2.49	55.24
	2000	17 465	-10.74	-0.83	-9.90
Poultry	1985	10 894			
	1990	11 888	9.13	-0.16	9.28
	1995	12 931	8.77	0.12	8.65
	2000	10 363	-19.86	-2.27	-17.59
Fish	1985	8 308			
	1990	11 534	38.83	1.15	37.68
	1995	10 562	-8.42	1.45	-9.88
	2000	8 865	-16.07	-0.26	-15.81

Note: Prices are rural wholesale prices deflated by the rural consumer price index (normalized in 2001) and are three-year averages centred on the years indicated.
Source: Estimated by the authors.

fell in response to the large grain stocks accumulated as a result of the re-imposition of compulsory procurement (Huang and Rozelle, 2002).

Trade reforms have affected livestock prices much less than the cropping sector. The main impact has come from domestic market reforms. Before the mid-1990s, demand for livestock products grew faster than livestock production. As a result, market prices rose by about 30 percent every five years for pork and 40-50 percent for mutton. Poultry prices increased much less than other livestock prices because of faster production growth.

Market integration and price transmission

In the late 1990s, the co-movement of prices between pairs of markets reflected an increase in the number of integrated markets. For maize, prices in one market move at the same time as in another in 89 percent of the cases, compared to only 28 percent in the early 1990s. The results for soybeans, japonica and indica rice show similar improvements. The results are impressive because in many cases the market pairs are separated by more than a 1 000 kilometres (Table 8).

Despite significant progress, the results also show that there are pairs of markets that are less integrated, especially in the case of rice. One explanation relates to constraints based on institutions, policy and poor infrastructure/communication (Park, Jin, Rozelle and Huang, 2002). However, since rice is produced and consumed throughout China, it is also plausible that moderate price movements will not transmit between regions when there is a balance between supply and demand within individual regions.

TABLE 8
Indicators of market integration for selected products in rural China, 1988-2000

Commodity	1989-1995	1996-2000
	(Percent of market pairs*)	
Maize	28	89
Soybeans	28	68
Japonica rice (Yellow River Valley)	25	60
Indica rice (Yangtze Valley and South China)	25	47

* Percentage of market pairs that test positive for being integrated based on Dickey Fuller Test. The results for the two periods are from the same data set. For 1989-1995 maize and rice results, see Rozelle *et al.* (2000). Rice results are for the whole country in 1989-1995. Results from soybeans for 1989 to 1995 and all results from 1996 to 2000 are by the authors.

Despite the continued presence of non-integrated markets, it is still fair to conclude that, in the late 1990s, the impact of price reforms has been transmitted widely, from coastal to inland regions.

Effects on agricultural output and value added

In assessing the ability of producers to respond it is important to recognize the agroclimatic context within which they operate (Box 1).

Between 1978 and 1984, grain production increased by 4.7 percent per year; the output of fruit rose by 7.2 percent. The highest annual growth rates of production came in the cotton, oilseed, livestock and aquatic product sectors, sectors that expanded in real value terms by 19.3, 14.9 percent, 9.1 percent and 7.9 percent, respectively (Table 9).

However, as the one-off efficiency gains from the shift to the household responsibility system were essentially reaped by the mid-1980s, growth rates subsequently decelerated, especially in the case of grain crops. In the meantime, rapid economic growth and urbanization and food market development have boosted the demand for meat, fruits and other non-staple foods, changes that have stimulated sharp shifts in the structure of agriculture (Huang and Bouis, 1996; Huang and Rozelle, 1998). For example, the share of livestock output value more than doubled from 14 percent of total agricultural output to 30 percent between 1970 and 2000. One of the most significant signs of structural changes in agriculture is that the share of cropping fell from 82 to 56 percent (Table 10).

Within the cropping sector, the share of the major cereals increased from 50 percent in 1970 to a peak level of 57 percent in 1990 and then gradually declined to less that 50 percent in 2001. Most of the fall has been due to a decrease in the wheat-sown area. The area share of rice declined marginally. By contrast, the share the maize-sown are grew by about 50 percent between 1970 and 2001. The rise in maize area, China's main feed grain, is correlated in no small way with the rapid expansion of livestock production (Table 11).

In addition to the maize area expansion, that of other cash crops such as vegetables, edible oils, sugar crops and tobacco has also expanded. In the 1970s, vegetables accounted for only about 2 percent of total crop area; by 2001, the share had increased by five times. The area share of edible oil also grew by two to three times. Field interviews reveal that the livelihoods of the poor rely more on cropping than

BOX 1
Agroclimatic conditions

China has complex and diversified weather conditions. The temperature gradient rises gradually from north to south. The annual accumulated temperature ranges from 2 500 °C-3 000 °C in the northeast and northwest of the country, where one crop a year is normally planted, to 5 000 °C-7 000 °C in southern plain areas along the middle and lower reaches of the Yangtze River, where there are up to three crops a year. In areas to the south of the Nanling Mountains Range, the accumulated temperature varies from 7 000 °C to 8 000 °C and farmers can cultivate crops all year. Precipitation varies greatly from year to year, from season to season and from region to region. In line with local weather and resource conditions, farmers use various cropping systems. For instance, double- and triple-cropping rice systems (rice-rice, rice-wheat, and rice-rice-rice) are common in tropical and subtropical areas. Farmers in the north and in some upland areas have developed multiple cropping rotations that are widely used in the temperate zone (e.g. maize-wheat and cotton wheat).

The cultivated land resource is relatively limited. According to the official statistics, there were 128 million hectares of cultivated land in 2000 (NSBC, 2001), a decrease of 4.5 million hectares compared to 1978. In general, paddy field (irrigated lowland areas) account for about 25 percent of China's total cultivated area and non-paddy fields account for the rest.

Measured in per capita water availability, China is one of the most water-scarce countries in the world, especially in the north. Over the past five decades, the irrigated areas rose from 20 million hectares in 1952 to 54 million hectares in 2000 (NSBC, 2001). In the 1980s and 1990s, groundwater investments have boosted the water utilization rates and expanded irrigated areas (Wang, 2000), which has been the major factor contributing to the expansion of agricultural production capacity (Stone, 1993).

Water shortages, particularly in the North China Plain and the northwest part of the country, have become more acute over the last two decades. With intensified farm and non-farm uses of water, the water table has declined rapidly in north China and many rivers stop flowing during the dry season (Wang, 2000). In central and south China, both surface and underground water have been polluted. These problems have reduced water availability to both farm and non-farm users.

on livestock and fish. Within the cropping sector, poorer farmers produce more grains (particularly maize) than cash crops. These figures suggest that the poor may have gained less than better off farmers from the diversification of agricultural production during the course of reform.

During each sub-period of the reform era, the output structure of agriculture has varied between regions. Southern China produces more than 70 percent of the nation's rice; most of the wheat is produced in the north. Southern China has a more

TABLE 9
Annual growth rates of selected agricultural commodities, 1970-2000 (percent)

	Commodity	Pre-reform	Reform period		
		1970-78	1978-84	1985-95	1996-2000
Grain total	Production	2.8	4.7	1.7	0.03
	Sown area	0.0	-1.1	-0.1	-0.14
	Yield	2.8	5.8	1.8	0.17
Rice	Production	2.5	4.5	0.6	0.3
	Sown area	0.7	-0.6	-0.6	-0.5
	Yield	1.8	5.1	1.2	0.8
Wheat	Production	7.0	8.3	1.9	-0.4
	Sown area	1.7	-0.0	0.1	-1.4
	Yield	5.2	8.3	1.8	1.0
Maize	Production	7.4	3.7	4.7	-0.1
	Sown area	3.1	-1.6	1.7	0.8
	Yield	4.2	5.4	2.9	-0.9
Cotton	Production	-0.4	19.3	-0.3	-1.9
	Sown area	-0.2	6.7	-0.3	-6.1
	Yield	-0.2	11.6	-0.0	4.3
Soybean	Production	-2.3	5.2	2.8	2.6
	Sown area	-2.2	1.1	0.8	2.5
	Yield	-0.1	4.1	2.0	0.1
	Edible oil crops	2.1	14.9	4.4	5.6
Rapeseed	Production	4.3	17.3	5.4	2.6
	Sown area	6.4	7.2	4.3	1.4
	Yield	-2.0	10.1	1.1	1.2
	Vegetable area	2.4	5.4	6.8	9.5
Fruits	Production	6.6	7.2	12.7	8.6
	Orchard area	8.1	4.5	10.4	1.5
	Total cash crop area	2.4	5.1	2.1	3.5
	Meat (pork/beef/poultry)	4.4	9.1	8.8	6.5
	Fish	5.0	7.9	13.7	10.2

Note: Growth rates are computed using the regression method. Growth rates of individual and groups of commodities are based on production data; sectoral growth rates refer to value added in real terms.
Sources: NSBCb, 1980-2001 and MAO, 1980-2002.

TABLE 10
Share of selected commodities in agricultural output, 1970-2000 (percent)

	1970	1980	1985	1990	1995	2000
Share in agricultural output						
Crop	82	76	69	65	58	56
Livestock	14	18	22	26	30	30
Fishery	2	2	3	5	8	11
Forestry	2	4	5	4	3	4

Source: NSBC.

diversified agricultural production system than north. Variations in agricultural output structure are less noticeable between regions based on income level (income increases from western to central to eastern China), than based on a north–south comparison. Rice, cotton, horticulture, livestock and oilseeds also vary somewhat between richer and poorer areas.

TABLE 11
Share of crop sown areas, 1970-2001 (percent)

	1970	1980	1985	1990	1995	2000	2001
Rice	22.1	23.1	21.9	22.3	20.5	19.2	18.5
Wheat	17.4	19.7	20.0	20.7	19.3	17.1	15.8
Maize	10.8	13.7	12.1	14.4	15.2	14.8	15.6
Soybean	5.5	4.9	5.3	5.1	5.4	6.0	6.1
Sweet potato	5.9	5.1	4.2	4.2	4.1	3.7	3.3
Cotton	3.4	3.4	3.5	3.8	3.6	2.6	3.1
Rapeseed	1.0	1.9	3.1	3.7	4.6	4.8	4.6
Peanut	1.2	1.6	2.3	2.0	2.5	3.1	3.2
Sugar crops	0.4	0.6	1.0	1.2	1.3	1.0	1.1
Tobacco	0.2	0.3	0.9	0.9	0.9	0.8	0.8
Vegetable	2.0	2.2	3.2	4.3	6.3	9.7	10.5
Others	30.1	23.5	22.5	17.4	16.3	17.2	17.4
Total	100	100	100	100	100	100	100

Source: NSBC.

More recent studies show that since the HRS was completed in 1984, technological change has been the primary engine of agricultural growth (Huang and Rozelle, 1996; Fan, 1997; Fan and Pardey, 1997; Huang *et al*. 1999). Improvements in technology have contributed by far the largest share of crop production growth even during the early reform period. The results of these studies show that further reforms beyond decollectivization also have high potential for affecting agricultural growth. Price policy has been shown to have a sharp influence on the growth (and deceleration) of both grain and cash crops during the post-reform period. Favourable output to input price ratios contributed to the rapid growth in the early 1980s. However, a deteriorating price ratio caused by slowly increasing output prices in the face of sharply rising input prices was an important factor behind the slowdown in agricultural production in the late 1980s and early 1990s. Rising wages and the higher opportunity cost of land have also held back the growth of grain output throughout the period, and that of cash crops since 1985.

Decomposing the impact of domestic policy reforms and trade reforms on production
Previous studies demonstrate a significant output response to price changes (e.g. deBrauw *et al.*, 2004), and provide data which (based on the CAPSiM model) can be used to model the relative effects of trade and domestic policy reforms on production. Tables 12 and 13 show that trade reforms have affected domestic production, but usually to a much lesser degree than domestic policy reforms. However, the relative effect of non-trade versus trade policies differs between commodities: for example, the 1.39 percent rise in rice production between 1995 and 2000 resulted from a 2.17 percent contribution by trade policy reform as compared to –0.79 percent from domestic policy reforms.

Trade liberalization has benefited domestic production of rice and vegetables, but hurt the domestic production of soybean, oil crops and coarse grains. Increases in protection, such as export subsidies and export tax rebates, have benefited the production of maize, cotton and sugar crops.

The production of meat and fish grew substantially over the entire reform period, mainly due to domestic factors, whereas the impact of international trade on

TABLE 12
Impact of agricultural trade and related reforms on crop production, 1985-2000

Commodity	Period	Production (thousand tonnes)	Percentage output change over previous period	Percentage change due to	
				Trade	Other policies
Rice	1985	121 111			
	1990	129 097	6.59	-0.72	7.32
	1995	129 794	0.54	0.21	0.33
	2000	131 595	1.39	2.17	-0.79
Wheat	1985	87 888			
	1990	94 996	8.09	-4.86	12.95
	1995	104 024	9.50	4.19	5.32
	2000	102 463	-1.50	5.96	-7.46
Maize	1985	69 364			
	1990	89 234	28.65	1.41	27.23
	1995	106 758	19.64	-2.78	22.42
	2000	116 063	8.72	9.90	-1.19
Other grains	1985	25 149			
	1990	22 777	-9.43	-1.27	-8.16
	1995	22 740	-0.16	-4.08	3.92
	2000	19 746	-13.16	-1.07	-12.09
Sweet potato	1985	21 171			
	1990	20 864	-1.45	0.34	-1.79
	1995	23 246	11.41	-0.01	11.42
	2000	23 804	2.40	1.08	1.33
Soybean	1985	10 605			
	1990	10 313	-2.75	4.49	-7.23
	1995	14 242	38.09	-9.28	47.37
	2000	15 022	5.48	-22.78	28.26
Cotton	1985	4 648			
	1990	4 657	0.19	0.88	-0.70
	1995	4 437	-4.72	1.16	-5.87
	2000	4 522	1.91	2.10	-0.19
Oil crops	1985	3 596			
	1990	5 081	41.28	-5.03	46.32
	1995	8 052	58.47	2.67	55.79
	2000	7 611	-5.48	-10.51	5.04
Sugar crops	1985	4 546			
	1990	5 743	26.35	18.77	7.57
	1995	5 969	3.93	-9.62	13.56
	2000	7 433	24.53	13.83	10.70
Vegetables	1985	173 162			
	1990	184 351	6.46	1.25	5.21
	1995	202 871	10.05	0.23	9.81
	2000	281 346	38.68	0.20	38.48

Note: Figures are three-year averages centred on the years indicated.
Source: Estimated by the authors.

livestock and fish production has been much smaller and seems to have shifted from positive to negative. Such a result is consistent with the increase in maize and other feed prices due to rising trade protection in these commodities, leading to a negative production response.

TABLE 13
Impacts of agricultural trade and related reforms on livestock and fish production, 1985-2000

Commodity	Period	Production (thousand tonnes)	Percentage change in production over previous period	Percentage change due to	
				Trade reform	Other policies
Pork	1985	16 318			
	1990	21 548	32.05	1.18	30.87
	1995	27 053	25.55	0.83	24.71
	2000	31 320	15.78	-3.06	18.83
Beef	1985	618			
	1990	1 350	118.50	12.78	105.72
	1995	1 929	42.85	-11.34	54.19
	2000	3 014	56.25	-5.16	61.40
Mutton	1985	613			
	1990	931	51.88	1.09	50.79
	1995	1 294	39.03	-1.47	40.49
	2000	1 805	39.43	-3.23	42.66
Poultry	1985	1 644			
	1990	3 107	89.01	-0.20	89.21
	1995	5 389	73.48	2.79	70.68
	2000	9 076	68.41	-8.03	76.44
Fish	1985	4 150			
	1990	6 285	51.44	1.34	50.10
	1995	11 863	88.76	2.05	86.70
	2000	17 904	50.93	-1.69	52.62

Note: Figures are three-year average centred on the years indicated.
Source: Estimated by the authors.

Agricultural trade performance

While agricultural production has been growing fast, agricultural trade has grown faster, nearly tripling from 1980 to 1995. During this time, exports have risen faster than imports. Since the early 1980s, China has been a net food exporter.

Patterns of trade have changed during the reform period. Whereas the share of primary (mainly agricultural) products in total exports was over 50 percent in 1980, it fell to only 10 percent in 2000. Over the same period, the share of food exports in total exports fell from 17 to 5 percent and the share of food imports fell from 15 to 2 percent. Exports and imports are increasingly moving in a direction that is consistent with China's comparative advantage. In general, the net exports of land-intensive bulk commodities, such as grains, oilseeds and sugar crops, have fallen (or imports have risen). At the same time, exports of higher-value, more labour-intensive products, such as horticultural and animal (including aquaculture) products, have risen. Grain exports, nearly one third of food exports in the mid1980s, declined to less than 10 percent by the late 1990s, while horticultural, animal and aquatic products increased to about 70 to 80 percent of food exports (Huang and Chen, 1999).

However, Table 14 shows that there have been wide variations between periods. The rapid growth of exports halted after 1995 due to increasing protection against China's exports. Grain (mainly maize) is a major exception, its export rose significantly in the late 1990s and is now the third largest in terms of export values. The import trend after 1995 diverged from the previous 15 years. Oil seeds (mainly soybean) imports

TABLE 14
Structure of food and feed trade, 1980 to 1999 (US$ million)

	1980	1985	1990	1995	1999
Exports:					
Live animals	384	304	430	473	374
Meat	361	448	791	1 349	1 054
Dairy products	71	57	55	61	71
Fish	380	283	1 370	2 875	2 969
Grains	423	1 065	614	281	1 273
Fruit and vegetables	746	825	1 759	3 399	3 150
Sugar	221	79	317	321	214
Coffee and tea	328	435	534	523	561
Animal feeds	58	241	623	351	239
Other foods	49	66	107	290	541
Oilseeds	na	na	na	522	373
Vegetable oils	na	na	na	454	132
Total food	**3 021**	**3 803**	**6 600**	**10 899**	**10 951**
Imports:					
Live animals	5	18	14	18	22
Meat	1	6	54	97	503
Dairy products	5	31	81	60	160
Fish	13	44	102	609	890
Grains	2 458	982	2 353	3 631	574
Fruit and vegetables	48	52	83	185	384
Sugar	316	274	390	935	183
Coffee and tea	56	40	30	74	72
Animal feeds	14	83	182	423	620
Other foods	2	23	46	92	182
Oilseeds	na	na	na	110	1 531
Vegetable oils	na	na	na	2 596	1 352
Total food	**2 918**	**1 553**	**3 335**	**8 828**	**6 474**
Net exports:					
Live animals	379	286	416	455	352
Meat	360	442	737	1 252	551
Dairy products	66	26	-26	1	-89
Fish	367	239	1 268	2 266	2 079
Grains	-2 035	83	-1 939	-3 350	663
Fruit and vegetables	698	773	1 676	3 214	2 766
Sugar	-95	-195	-73	-614	31
Coffee and tea	272	395	504	449	489
Animal feeds	44	158	441	-72	-381
Other foods	47	43	61	198	359
Oilseeds	na	na	na	412	-1 158
Vegetable oils	na	Na	na	-2 142	-1 220
Total food	**103**	**2 250**	**3 065**	**2 071**	**4 477**

Source: Estimated by the authors.

surged, while grain import (mainly wheat) declined rapidly. Rice exports show a general rising trend over time, except during the late 1980s, and reached a historical high (3.74 million tonnes) in 1998. Imports of high quality rice also take place, but have averaged less than 0.3 million tonnes during the 1980s and 1990s.

Vegetable, fish and most livestock commodities have also become important exports. Since the early 1980s, exports of these commodities have nearly doubled

every five years. Pork, traditionally one of the largest exportable livestock commodities, expanded steadily from the early 1980s until the mid-1990s. In recent years, however, growing international concern on meat quality and other phytosanitary concerns reduced pork exports. Poultry exports, by contrast, grew steadily through the late 1990s. The rising trends made poultry the top livestock export product at 0.3-0.4 million tonnes. Among three main livestock commodities, beef is the least traded, at least in recent years, reflecting its low share of total livestock production (5 percent in value terms).

In summary, overall trade liberalization has continued steadily over the past 20 years despite the persistence of policy distortions for some commodities (notably maize). In aggregate terms, both imports and exports have been rising during the past two decades. Total trade in the food sector tripled between 1985 and 2000. However, because agricultural trade is small in relation to total production, it is not surprising that trade has not had a large impact on domestic prices.

CONSEQUENCES OF REFORMS: TARGET VARIABLES

National food security

By any measure, China's national level food security status has improved. In 2000, the level of protein and fat consumption far exceeded the average nutrient availability in countries with a comparable per capita GNP. For example, per capita dietary energy supply reached 3 040 kcal per day in the late 1990s, about 25 percent higher than the levels in India and Thailand, and its rate of increase was much higher than in these countries (Table 15).

Comparison between per capita food supply and per capita cereal (staple food) consumption shows that the improved national food security has mainly come from rapid growth in the supply and consumption of non-stable foods, such as meat, vegetables, edible oils, and other foods, since the early 1980s (Tables 16 and 17).

In the past two decades about one-fifth of the increase in grain production was to meet increased demand for food (mainly due to population growth), whilst most of the remainder was for use as feed grain, which increased its share of total grain consumption from 14 percent in the early 1980s to 27 percent in the late 1990s.

In the 1980s, 15 percent of imports were food commodities. To pay for these imports, China had to export other agricultural products (16 percent of total

TABLE 15
Key indicators on food security in China, India and Thailand, 1990-99

	Per capita dietary energy supply		Number of people undernourished		Proportion of undernourished population		1990-92 to 1997-99: Annual average per capita growth rate (percent)		
	1990-92	1997-99 (kcal/day)	1990-92	1997-99 (millions)	1990-92	1997-99 (percentage)	Dietary energy supply	Food production	Agricultural production
China	2 710	3 040	192.6	116.3	16	9	1.7	5.3	4.9
India	2 370	2 430	214.6	225.3	25	23	0.4	1.1	1.0
Thailand	2 200	2 410	16.9	12.9	30	21	1.3	0.7	0.9

Source: FAO, 2002.

TABLE 16
Per capita supply and sources of calories, protein and fat per day in China, 1961-2000

		1961-1963	1969-1971	1979-1981	1989-1991	1998-2000
Supply	Calories	1 716.7	1 993.3	2 328.0	2 683.3	3 033.0
	Protein (g)	44.8	47.5	54.5	65.0	84.3
	Fat (g)	16.8	23.5	32.5	53.0	81.9
Sources (%)						
Calories	Vegetable products	95.9	94.1	92.6	88.4	81.3
	Animal products	4.1	5.9	7.4	11.6	18.7
Protein	Vegetable products	90.5	87.9	86.4	77.7	65.6
	Animal products	9.5	12.1	13.6	22.3	34.4
Fat	Vegetable products	66.1	56.8	53.4	49.0	41.4
	Animal products	33.9	43.2	46.6	51.0	58.6

Sources: FAO database.

TABLE 17
Per capita food consumption in rural China, 1981-2000 (kg per annum)

	1981	1985	1990	1995	2000
Milled rice	88.2	105.0	103.4	103.7	103.8
Wheat	55.8	75.3	82.8	86.2	85.3
Maize	30.5	18.2	18.7	14.3	11.2
Other cereal grains	26.7	19.8	16.5	14.5	13.0
Sweet potato	9.0	7.1	4.3	3.3	2.4
Potato	2.2	2.3	2.8	3.7	4.5
Vegetable	132.8	131.5	134.0	124.4	169.7
Fruit	2.0	3.4	5.9	13.0	18.3
Edible oil	3.1	4.0	5.2	5.8	7.1
Pork	9.9	12.0	14.4	16.5	20.7
Beef	0.2	0.3	0.4	0.6	1.0
Mutton	0.4	0.4	0.4	0.5	1.1
Poultry	0.7	0.9	1.8	3.0	4.4
Egg	1.7	2.8	4.0	5.4	7.2
Aquatic products	1.4	1.9	2.7	4.6	5.8
Share of food in total expenditure (%)	60	58	59	59	49

Source: Fruits and edible oil consumptions and food expenditure data are from NSBC, the rest are from CAPSiM database.

TABLE 18
Income disparity between rural farmers and between rural and urban population, 1980-2001

	Real per capita income index in rural population:		Income ratio of average/poorest 20	Income disparity:	
Year	Average rural	Poorest 20 percent	percent farmers	Gini coefficient	Urban/rural income ratio
1980	100	100	1.97	0.24	3.4
1985	175	157	2.20	0.23	2.2
1990	183	154	2.34	0.31	2.3
1995	239	179	2.62	0.34	2.8
2000	317	219	2.85	0.35	2.8
2001	330	224	2.89	0.32	2.9

Source: NSBC.

exports). Even when in 1985 the share of food in total imports had fallen, China still needed 59 percent of its foreign exchange reserves to pay for food imports, limiting its ability to import other goods.

By the late 1990s, total exports far exceeded imports and China had accumulated the second largest foreign exchange reserves in the world (after Japan). It had, therefore, greatly strengthened its ability to import food, and these rose from US$3 billion in the 1980s to US$6-8 billion a decade later. Only about 5 percent of its foreign exchange earnings were needed to pay for them, so that although imports were playing a greater role in supplementing the national food supply, their relative cost to the economy was substantially lower than in the past.

Household level food security

More than two-thirds of the population (1.3 billion in 2001) resides in rural areas. The annual growth rate of the population was as high as 1.8 percent in the 1970s, slowing to 0.9 percent in the late 1990s.

Poverty in China has always been essentially a rural phenomenon. In 1978, about 260 million people, all of whom lived in rural areas, were below the absolute poverty line. In the two decades since then, more than 220 million people have escaped poverty. The number of people in absolute poverty fell to less than a 100 million by the mid-1980s, to about 50 million by the mid-1990s and to 29 million in 2001. The incidence of rural poverty has fallen equally fast, plunging from 32.9 percent in 1978 to about 3.2 percent in 2001. Although the greatest reductions in poverty came in the early years of reform, the rate has continued to fall steadily since then.

At the same time, income disparities within rural areas have risen (World Bank, 1997). Per capita rural income increased by 330 percent between 1980 and 2001. While the increase in the income levels of poorer farmers (the bottom 20 percent of the population) increased by 224 percent, this growth was more than 30 percent lower than the national average. The rising income disparity among rural residents can be shown by rising Gini coefficients, which increased from 0.24 in 1980 to 0.35 in 2000 and 0.32 in 2001.

In the 1980s, most of China's poor were among the more than 200 million living in officially designated poor counties in 23 of China's 27 provinces. About 78 percent of the counties were concentrated to the west of a north-south line that runs through the central mountainous parts of the country from Heilongjiang, Gansu, and Inner Mongolia in the north to Guangxi and Yunnan in the south (World Bank, 1992). The remaining poor counties, generally better off, were located in less contiguous pockets of poverty in the hills of eastern and southeastern China. Poor counties in the first wave of officially designated counties were normally characterized as being poorly endowed by geographic location (remote and mountainous) and at a disadvantage in terms of agricultural resources (such as soil, rainfall, and climate). Many of these areas suffer from severe ecological damage such as deforestation and erosion (Li, 1994). Poor counties also tend to have more variable yields (Weersink and Rozelle, 1997). Partly as a result of these poor natural conditions, and partly as a result of poverty itself, farmers in poor areas suffer from below average irrigation facilities, fertilizer use, and infrastructure (Tong *et al.*, 1994). Poor counties in the 1980s were still highly subsistent in grain, and in net terms, often needed to procure grain to meet household demand (Piazza and Liang, 1997).

After more than two decades of reform and ten years of intense implementation of the nation's poverty alleviation effort, absolute poverty is more than ever concentrated in resource-constrained remote uplands (Piazza and Liang, 1997). Although the poor have land-use rights, in some cases the land itself is of such low quality that it is not possible to achieve subsistence levels of crop production. Minorities constitute a disproportionate share of the poor.

Urban poverty began to rise in the mid-1990s when state-owned enterprise (SOE) reforms deepened and SOEs began to lay off large numbers of workers (Fan and Zhang, 2002). The official estimate of urban unemployment rose to 5.7 million in 1998 (about 3.1 percent of the urban labour force) and increased to nearly 7 million in 2001 (about 3.6 percent of the urban labour force - NSBCb, 2002).

China can be divided into three regions: west, central and east. The western region is the least developed area and is characterized by poor infrastructure. The eastern region is the most developed. The majority of the provinces are located on the coast, and have a better infrastructure and a higher population density. The central region, in terms of geography, population and economic development is in between the western and eastern regions. Table 19 summarizes the characteristics of the regions.

Because all rural households have access to land, farm size is small by international standards. Since the eastern region has the highest population density, its average farm size is the smallest. Farmers in the central region have more land than those in the rest of China, but the average size is still less than 0.8 hectare. With such small farms, households have to use their land resources intensively, to produce both their own food and cash crops.

Western farmers spend nearly 60 percent of their total budget on food, compared to less than 50 percent in the east. Among the 34 million people below the poverty line, about half are located in the west. The poverty incidence rate (7.3 percent) is about twice as high as the national average. In the eastern region the poverty incidence is only 1.3 percent in 1999.

TABLE 19
Household characteristics in rural China by region, 1999

	China	Western	Central	Eastern
Population share (percent)	100	24.3	25.0	40.7
Family size (persons)	4.25	4.53	4.15	4.15
Labour	2.77	2.84	2.71	2.77
Dependency ratio	1.53	1.60	1.53	1.50
Off-farm time percent	16.1	11.1	12.3	22.5
Labour education (percent)				
Full/semi-illiteracy	9	18	6	6
Primary school	34	38	33	31
Middle school	46	37	50	49
High school/above	11	7	11	14
Average farm size (hectares)	0.59	0.61	0.77	0.39

Note: Dependency ratio is number of family members (family size) divided by family labour. Off-farm employment share is the percentage of full-time equivalent working time in off-farm employment (30 days per month and 12 months per year) as percentage of total available family labour time (30 days per month and 12 months per years). One hectare = 15 mu.
Source: NSBCa.

Table 20 shows that disparities among income groups within a region are even greater. The income of the richest farmers in the east (group 11) is about 8 times higher than the bottom 10 percent in the western region (groups 1 and 2).

Sources of income

Wage income contributes more to the disparities than other sources of income. For example, poor farmers earn a much smaller fraction of their income from wages and other off-farm activities, and also depend more on agriculture than is the case for richer farmers. In 1999, the share of agricultural income in total income ranged from 69-76 percent in group 1 in all regions; by contrast, the share was only 26-50 percent in group 11.

Farmers spent more than their earnings in 1999, signifying that they were either receiving transfers from the Government, their relatives or friends, or were dissaving. Farmers with average income levels less than CNY600 spent about 60 to 70 percent of their total expenditure on food, whereas for income groups above CNY2500 this proportion was less than half, and these richer farmers also had positive savings. Clearly, higher incomes for the poor could dramatically improve their food security.

Household agricultural production

For China as a whole, rice is the dominant crop. Maize surpassed wheat as the second most important crops in the late 1990s. Vegetables have also become increasingly important, having the highest output simply because it is measured in fresh weight. Among livestock commodities, pork dominates all others. The average household produces about one hog per year (Table 21).

National production figures hide many regional and income-based variations. The richest group (group 11) produces about five times more rice than the poorest group (group 1). The poor produce much more maize than other crops and cotton is also important for this group. . Despite the fact that farm sizes are similar, per capita agricultural output for group 1 is only about half of the national average and less than 30 percent of the rich. It is clear that increasing agricultural productivity of the poor is an essential way to increase their income.

In the poor western region the output value of wheat, maize and cotton (three of the commodities that China has protected despite its low comparative advantage) surpasses that of rice and other commodities for the farmers in lower income categories. These commodities represent a major source of cash income for poor farmers. Recent protection of domestic maize and cotton should have benefited the poor in the west, but future liberalization in the trade of these commodities may negatively affect them by lowering prices. Liberalization of soybean and edible oil crops will have less negative impact, but this group has probably not benefited much from past trade liberalization, since the production of more competitive commodities (e.g. rice, horticulture, livestock and fish) is much lower in the west than in the rest of China.

In central China, maize has become the single most important crop in terms of production, followed by sweet potatoes and other coarse grains. Soybeans and edible oil are also more important in this region than in the other two regions. Since the poor depend relatively more on these commodities for their earnings than the rich,

TABLE 20

Rural household income and expenditure by income groups and region 1999 (CNY)

	Income groups from lowest (1) to highest (11)											
	Average (100%)	1 (3.5%)	2 (6.5%)	3 (10%)	4 (10%)	5 (10%)	6 (10%)	7 (10%)	8 (10%)	9 (10%)	10 (10%)	11 (10%)
Western China												
Per capita net income (CNY)	1 502	356	592	783	960	1 130	1302	1 497	1 723	2 026	2 494	3 961
Wage income(CNY)	332	55	98	146	177	213	250	302	364	487	630	941
Wage income (percent per capita net income)	22	15	17	19	18	19	19	20	21	24	25	24
Income from agriculture (percent total income)	62	76	68	66	67	66	66	65	63	60	57	50
Per capita living expenditure	1 197	685	706	774	887	967	1 067	1 182	1 329	1 488	1 734	2 383
Food expenditure	706	455	488	519	582	621	666	717	785	851	930	1 125
Food expenditure (percent)	59	66	69	67	66	64	62	61	59	57	54	47
Central China												
Per capita net income (CNY)	2 003	459	840	1 118	1 366	1 574	1 785	2 007	2 260	2 584	3 098	4 726
Wage income(CNY)	488	127	184	237	288	363	419	493	572	649	794	1090
Wage income (percent per capita net income)	24	28	22	21	21	23	23	25	25	25	26	23
Income from agriculture (percent total income)	65	69	76	74	72	70	67	65	63	62	60	55
Per capita living expenditure	1 437	920	957	1 050	1 146	1 249	1 286	1 406	1 497	1 658	1 947	2 506
Food expenditure	788	552	574	631	672	717	747	797	830	895	982	1 143
Food expenditure (percent)	55	60	60	60	59	57	58	57	55	54	50	46
Eastern China												
Per capita net income (CNY)	2 929	598	1 074	1 437	1 780	2 100	2 425	2 800	3 236	3 826	4 780	8 040
Wage income(CNY)	1 106	154	253	383	513	640	788	964	1 206	1 535	2 028	3 476
Wage income (percent per capita net income)	38	26	24	27	29	30	32	34	37	40	42	43
Income from agriculture (percent total income)	42	72	65	60	55	53	49	47	43	38	35	26
Per capita living expenditure	1 991	1 024	1 041	1 194	1 365	1 487	1 680	1 865	2 129	2 465	3 059	4 367
Food expenditure	963	588	618	689	757	807	877	936	1 026	1 148	1 322	1 668
Food expenditure (percent)	48	57	59	58	55	54	52	50	48	47	43	38

Note: The difference between per capita income and living expenditure is mainly due to farmers' saving and the payments for tax, fee, income transfer and others not included in living expenditure.
Source: CAPSiM database.

TABLE 21

Agricultural production, output values and farmland by income category in rural China, 1999

	Income groups from lowest (1) to highest (11)											
	Average	1	2	3	4	5	6	7	8	9	10	11
	Per capita production (kg)											
Paddy	243	75	127	164	198	224	244	262	282	304	330	374
Wheat	145	84	118	132	143	151	150	153	152	146	151	166
Maize	184	209	166	160	167	169	177	185	179	191	212	238
Other crops	118	66	82	92	104	110	117	123	129	138	156	153
Soybeans	20	13	14	15	17	16	18	20	21	22	24	38
Cotton	5.4	5.2	4.5	4.5	4.6	5.0	4.6	4.5	5.4	5.0	5.9	11.3
Oil crops	34	19	24	27	28	32	34	36	37	41	43	45
Sugar crops	94	26	49	75	80	101	90	125	94	112	124	113
Vegetables	276	109	135	180	205	232	247	283	317	359	402	504
Pork	37	18	22	26	31	34	36	41	43	46	48	56
Beef & mutton	4.4	3.3	3.1	3.2	3.3	3.8	4.0	3.8	4.6	4.9	4.9	9.6
Poultry	5.3	1.6	2.1	2.9	2.8	3.9	4.5	4.7	4.2	6.2	5.9	18.8
Egg	7.3	5.0	2.9	3.2	4.2	5.0	4.6	5.3	7.5	7.8	11.7	24.8
Milk	4.2	1.5	1.1	2.7	1.4	1.5	1.9	3.0	3.2	3.5	6.4	22.1
Fish	7.3	0.9	1.2	1.4	2.0	2.2	3.8	5.5	4.5	5.9	17.1	37.0
AOV-I (CNY)	1 596	831	970	1 130	1 289	1 403	1 501	1 610	1 709	1 854	2 071	2 848
AOV (CNY)	1 833	917	1 054	1 236	1 400	1 548	1 665	1 809	1 921	2 093	2 373	3 279
Arable land (hectares)	0.58	0.86	0.65	0.59	0.58	0.55	0.55	0.55	0.53	0.54	0.56	0.59

Note: Other crops include sweet potato, potato, millet, barley, sorghum, other coarse grains, and beans except for soybeans. AOV-I is output values for all commodities covered in this study. AOV is total agricultural output values including outputs of crops, livestock, fish and forest.

Source: CAPSiM database.

TABLE 22

Per capita consumption of major foods by income category in rural China, 1999

	Income groups from lowest (1) to highest (11)										
	Average	1	2	3	4	5	6	7	8	9	10	11
	Per capita production (kg)											
Paddy	122	63	85	99	111	118	127	130	137	143	146	148
Wheat	79	75	82	83	83	83	80	81	77	74	73	73
Maize	19	28	24	22	19	18	18	18	17	17	16	20
Other crops	28	46	32	27	26	24	24	25	26	29	30	31
Edible oils	6.2	4.2	4.6	5.0	5.4	5.7	6.1	6.3	6.8	7.1	7.7	8.2
Sugar crops	1.8	1.2	1.2	1.4	1.5	1.6	1.8	1.9	2.1	2.1	2.3	2.8
Vegetables	109	71	80	90	97	105	110	115	118	126	130	141
Pork	13	7	8	9	11	11	12	13	14	15	17	18
Beef and mutton	1.1	1.1	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.2	1.6	2.5
Poultry	2.9	1.1	1.5	1.8	2.0	2.5	2.6	2.8	3.2	3.6	4.5	6.0
Egg	4.3	2.7	2.9	3.1	3.5	3.9	4.2	4.7	4.7	5.0	5.6	6.7
Milk	0.9	0.7	0.6	0.6	0.6	0.6	0.9	0.8	1.0	1.0	1.3	2.3
Fish	3.9	1.7	1.7	2.1	2.5	2.8	3.3	3.8	4.5	5.2	6.2	8.3
Food expenditure (CNY)	847	529	573	643	703	748	818	848	923	987	1096	1235

Note: Other crops includes sweet potatoes, potatoes, millet, barley, sorghum, other coarse grains, soybeans and other beans. Food expenditure is on all food commodities covered in this study.
Source: CAPSiM database.

liberalization that affects these crops will have a significant effect on farm households in this region.

Eastern China, by contrast, has a more diversified agriculture than the other regions, and produces more competitive crops. Even in the east, however, income of the poor depends largely on maize, sugar and pork.

Household consumption

Consumption patterns also vary across income categories (Table 22). The poorest arm households consume less than half the quantity of rice of the average household. Poorer farmers consume much more maize and other coarse grains than the richer ones. Wheat consumption varies little among income groups, but the poorest consume almost all their production. In most food categories, apart from maize, coarse grains, wheat, beef and mutton, the consumption of the poorest consumers is only about half to two thirds that of average farmers. Consumption of the poor in most food categories is around one third that of the richest farmers.

Changes in incomes and expenditure

Per capita incomes rose by more than CNY1 000, or 81 percent, between 1985 and 2000 (Table 23). The incomes of the poor have also risen, except between 1985 and 1990, but less than those of wealthier groups. Faster growth in recent years shows the combined effect of poverty policy, protectionism and the rise in off-farm income.

Although average households lost CNY68 per capita from the liberalization of the importable sector in 1995-2000, they gained it back from the protection of maize, wheat and cotton (CNY84), and from export liberalization (CNY15), giving a net per capita gain of CNY31.7. The impact of trade policy is very small on aggregate – the net per capita gain is only 1.9 percent of total per capita agricultural output. However, trade policy clearly had a bigger impact on some subsectors than others – in the liberalizing importable subsector the net trade-related loss was 47.3 percent of per capita output (soybeans, oil crops, sugar, milk).

The aggregate impacts are similar for poor and richer households (on average, a net gain of about CNY30), although, again, the impact on individual households depends upon the commodities they produce. While both eastern and western regions have benefited from trade policy, liberalization has hurt producers in central China, primarily because the region is the largest producer of soybeans and edible oil, the two commodities most hurt by liberalization.

TABLE 23

Income, expenditure and food budget shares in rural China, 1980-2000

Year	Per capita net income (in 2000 CNY)	Real per capita income index (in 1985 prices)		Per capita living expenditure (in 2000 CNY)		
		Average	Poorest 20 percent	Total	Food	Food percent
1980	712	57	64	603	373	62
1985	1 248	100	100	997	576	58
1990	1 305	105	98	1 112	654	59
1995	1 702	136	114	1 414	829	59
2000	2 253	181	140	1 670	821	49

Source: NSBCa, 1989-2001, and rural household income and expenditure surveys.

Aggregate rises in income have led to growth in expenditure. Although per capita expenditure has followed a similar pattern to income, its slightly lower growth rate means that savings have increased. Part of the rise in expenditure shifted from food to non-food.

There are many reasons for income and expenditure growth, and access to markets is one of them. Although the production-to-consumption ratios for almost all major commodities (except fish) and all income categories exceed 1, households have begun to buy more food from markets (Huang and Rozelle, 1998). Farmers use traditional marketing venues, such as periodic markets and government-sponsored outlets, and the number of private traders and stores buying and selling food commodities in rural areas - even the most poor and remote areas - is also increasing. On average, the proportion of production marketed ranged from 54 percent for grain to more than 90 percent for fish, and even the poor market a significant share of their production.

During the early 1980s, villagers spent about 60 percent of their total outlays on food. This share has fallen over time, but was still about 50 percent in 2000. Although rural consumers in poorer provinces in the western regions spend nearly 60 percent of their income on food, those in the eastern provinces spend less then 50 percent. For the average rural household, per capita food expenditure increased by 11.2 percent in 1985-1990 and 14.4 percent in 1990-1995, but declined by 17.9 percent in 1995-2000. Most of the change has been come from domestic policy reforms rather than trade reforms. Nevertheless, the trade impact on food expenditure was negative in 1985-1990 (mainly due to a significant increase in wheat imports in the late 1980s) but positive since the early 1990s. Table 24 shows the striking similarity of impacts of trade policy on food consumption for farmers in different income categories.

The effect of trade-induced price changes on rural residents as producers is typically larger than the effect on them as consumers. Income shifts (both positive and negative) are larger than shifts in expenditure because while rural residents as producers enjoy (suffer) all of the gain (loss) from the price rise (fall), as consumers they are only affected by a fraction of it due to a large proportion of output being sold to consumers in the city.

In summary, farmers that grew crops that belonged to the protected imported sector (e.g. maize) or the exportable sector (e.g. horticulture crops) gained on average. Those who cultivated crops in the liberalized importable sector (e.g. soybeans) lost. On aggregate, however, trade policies have helped food security. Richer farmers have benefited the most in net terms. They are the ones who produce the crops in which China has a comparative advantage, and these are the crops that have seen their price rise as a result of more relaxed trade rules. The poor have also benefited.

The poorest of the poor are estimated to have gained around 2 to 3 percent of average household income as a result of trade-induced changes in net income. Whether a conscious decision or not, interventions to protect maize and cotton markets have aided the poor. Reliability of food supplies and access to food by the poor is another important dimension of food security. In this regard, the Government has developed its own disaster relief programme. It also runs a national food-for-work scheme, although this is less for disaster relief and more for long-run investments. The nation's capacity to deal with emergencies has been demonstrated repeatedly during the reform period. For example, the Government responded massively and in a timely fashion during the floods in 1990s.

TABLE 24
Impacts of trade on household food consumption for the selected income groups in rural China, 1985-2000

	Group 1	Group 2	Group 6	Group 9
Impacts on per capita food consumption (CNY)				
Total				
1990 over 1985	-8.9	-9.6	-9.3	-7.9
1995 over 1990	4.8	6.6	7.0	5.6
2000 over 1995	18.2	19.2	19.3	17.1
Liberalizing importable sector				
1990 over 1985	1.5	1.5	2.1	2.6
1995 over 1990	-1.1	-1.2	-1.4	-1.6
2000 over 1995	-5.8	-6.2	-7.8	-9.0
Protecting importable sector				
1990 over 1985	-7.7	-8.4	-8.5	-7.8
1995 over 1990	7.1	8.0	8.3	7.6
2000 over 1995	18.9	18.7	17.6	16.2
International protecting exportable sector				
1990 over 1985	-0.9	-1.5	-2.1	-1.8
1995 over 1990	0.1	0.4	0.6	0.3
2000 over 1995	4.2	6.1	9.2	9.7
Other sector				
1990 over 1985	-1.8	-1.3	-0.8	-0.9
1995 over 1990	-1.2	-0.6	-0.4	-0.8
2000 over 1995	0.8	0.6	0.3	0.2
Impacts as percentage of food expenditure (percent)				
Total				
1990	-1.5	-1.5	-1.1	-0.8
1995	0.7	0.9	0.8	0.5
2000	3.5	3.4	2.6	1.9
Liberalizing importable sector				
1990	4.2	4.0	4.2	4.3
1995	-2.6	-2.5	-2.3	-2.2
2000	-12.8	-12.8	-12.2	-11.9
Protecting importable sector				
1990	-3.9	-4.2	-4.5	-4.5
1995	3.3	3.7	4.0	4.0
2000	14.3	13.8	13.4	13.4
International protecting exportable sector				
1990	-0.4	-0.5	-0.4	-0.3
1995	0.0	0.1	0.1	0.0
2000	1.6	1.9	1.8	1.5
Other sector				
1990	-1.5	-1.3	-1.1	-1.0
1995	-1.3	-0.9	-0.7	-1.0
2000	1.0	1.1	0.6	0.3

Source: Estimated by the authors.

While China's farmers face production risks, these may be less significant than in other nations. A high share of China's land (nearly 50 percent) is irrigated (NSBC, 2001) and a large share of households (around 80 percent) have at least one family member earning off-farm income (Rozelle *et al*., 2002). With an increasing number of households relying on markets to procure their food, households also face rising

market price risk. When farmers are hit by adverse shocks, they cope mainly by borrowing from informal sources (Park, Brandt and Giles, 2002). Most of these loans are among family members. Few loans, especially for emergency consumption needs, are available from formal sources but farmers are still able to go to the local government for help. Although this safety net is low in rural areas, it does at least exist in most areas. However, the local government is more likely to try and coerce family, relatives and friends to help a farmer under food stress, than to provide direct cash or food subsidies.

Rural labour and off-farm employment

Farm households need to find off-farm employment, and this expanded steadily between 1981 and 1995. About 32 percent of the rural labour force found some off-farm work in 1995 compared to 15 percent in 1981 surveys (e.g. State Statistical Bureau, 1996; and our own 1995 survey). By 1999, the average farmer allocated 16.1 percent of his time to off-farm activities and earned 45 percent of household income from the non-agricultural sector. Most off-farm earnings were in the form of wages. More than 40 percent of rural labourers were employed in some kind of off-farm job, typically part-time, although full-time off-farm employment through regional migration has been increasing (deBrauw *et al*., 2002; Zhao, 1999). Off-farm employment in richer provinces is both historically higher and has grown faster than in poorer provinces, such as Sichuan and Hubei, where migration has emerged as the dominant form of off-farm labour.

The rise in labour markets has already begun to have a positive impact on the off-farm employment rates of women, which have been much lower than those of men over the last 20 years, but which have risen since the early 1990s. The rising participation of women in the labour market has involved all job categories, although the most striking absolute gains have come in migration. Throughout the entire 1980s, less than 1 percent of women left their homes to work for a wage or become engaged in self-employed activities. By 2000, nearly 6 percent of the female labour force was working as a wage earning migrant and nearly 3 percent was working as a self employed migrant. One interpretation of this rise in the participation of women is that as labour markets have become more competitive, the scope for managers to exercise their discriminatory preferences has declined.

While China's success at generating off-farm work opportunities for its rural workers is well known, what is less well known is that many of the new jobs are in rural areas. Whereas in 1988, only about 1 percent of the rural labour force found employment in another rural village, by 1995, this had risen to 5 percent.

The increase in the size of the rural labour force and the increasing share of rural workers heading to other rural villages has contributed to the expansion in rural-to-rural labour movement, which has grown at 27 percent annually compared to 13 percent growth in local employment and 9 percent growth in rural-to-urban migration. There were 12.9 million rural-to-rural migrants in 1995, up from 2 million in 1988. An additional 9.8 million rural workers in 1995 commuted to other villages, up from 3 million in 1988. The 22.7 million workers who found non-agricultural employment through rural-to-rural labour movement make China's development path quite unprecedented.

POLICY LESSONS

During the period under review, China's economic reforms have generated outstanding results for economic growth, poverty reduction and food security at both the national and the household level. Sharp falls in poverty rates have dramatically improved household food security, and the incidence of malnutrition has dropped. For China, both trade reforms and domestic reforms have been important and reforms have followed a gradual approach that appears to have worked well. In the initial stages, measures that provided incentives to rural institutions were implemented. As reform experience was gained, broader reform policies followed.

Many different factors, including domestic policies, have helped China improve its food security over the past 20 years. The rise in yields has undoubtedly contributed and China's domestic policy has played a major role. Decollectivization, new agricultural technologies, irrigation investments, and rising access to inputs have all helped provide the incentives and materials for raising production per hectare (Lin, 1992; Fan, 1991; Huang and Rozelle, 1996). Given the equal distribution of land, the higher yields have meant that the incomes of farmers have risen from increased quantities of output.

Foreign trade has also been a vital part of China's growth story, with trade expanding even more rapidly than GDP. External reforms have paralleled those in domestic reform. Through nearly 20 years of reform, China's foreign trade regime has gradually changed from a highly centralized, planned, import substitution regime to a more decentralized, market-oriented, export promotion regime. In the initial stage, reformers only implemented measures that provided incentives to particular sets of corporations and institutions. As experience was gained from the reform and the objectives of trade could be achieved through alternative institutions and policies, trade liberalization has progressed smoothly since the late 1980s. However, in the late 1990s, China used various means to protect some of its crops such as maize and cotton.

Overall, the impact of changes in trade policy on domestic agricultural production and food security appears to have been smaller than that of domestic policy reform. However, the nature of impacts of trade and non-trade domestic policies differs. Domestic policy reforms have tended to stimulate growth across all sectors. They have increased food security primarily by increasing food availability (at both the national and household levels). Because of rising output, there has also been a large, negative price effect that has benefited both rural and urban consumers (and, particularly the urban poor). In contrast, trade liberalization has had more sector-specific effects. Although there has been less of an impact on aggregate production and consumption, trade policy reforms have had powerful structural change impacts, moving the country towards sectors in which it has a comparative advantage. As such, trade policies have been useful in improving allocative efficiency and making the sector more competitive.

Although the overall gains from trade reform in China are positive, there have been large differences in the effects on particular groups of farmers. Because trade impacts are more commodity specific, they have more sharp regional and crop-specific impacts. This also means that they affect equality. China's agricultural markets have been highly integrated since the mid-1990s and any impacts (either

positive or negative) could be largely transmitted to the farmers in different regions. Specialization in the production of different commodities accounts for much variation: while both eastern and western regions have benefited from trade, liberalization appears to have hurt producers in central China, primarily because this region is the largest producer of soybean and edible oil, the two commodities most hurt by liberalization of imports. The poor suffered, since they were large producers of these products. In recent years, however, the poor have probably gained from protection of the maize, cotton and wheat that they produce.

Production trends are increasingly moving in a direction consistent with China's comparative advantage. The richer farmers producing crops in which the country is inherently competitive have gained from trade reform. However, the poor tend to allocate a large share of their land to crops with less of a comparative advantage. Poorer farmers producing crops such as maize and cotton may need assistance to shift production towards products in which the country has a clearer comparative advantage. For example, the Government could assist by providing better training and extension services, marketing information, and by promoting credit availability and facilitating productivity-enhancing investments.

The impact on agriculture, however, is only part of the reform story. Trade liberalization and domestic reforms have also affected the access of households to non-farm employment and the wages they earn for being in the off farm market. Raising the demand for off-farm labour is probably the most important thing that can happen in the economy.

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ANNEX

A framework for analysis of impacts of reforms

Analysis based on the original CAPSiM framework can only be done at the national level. It was designed to simulate the future effects of policy shifts. A number of modifications were made to the original model (Huang and Li 2003; Huang, Li and Rozelle, 2003) in order to allow disaggregation of the national impacts into household production, consumption and food security at the regional level and to assess the impact that trade liberalization has had on households in different income groups.

1. Creating a database on production, consumption, price and trade for the study period (1984-2001) at the national level;
2. generating a database for household food consumption, production, farmgate prices of agricultural products and procurement prices of foods by income group and by region.
3. estimating a set of demand and supply elasticities for the entire period of reform(income elasticities of demand for various foods decline over time).
4. separating the impacts of trade from other impacts;
5. ensuring the results of CAPSiM's "backward projection or simulation" be largely consistent with the actual realizations of agricultural production, consumption, price and trade patterns during the reform period;
6. testing market integration and price transmissions from national to regional and to households, and using the findings of these analyses to adjust the results of impact studies based on CAPSiM simulations.

Any change in the economy (i.e., in production, consumption or price) between time period *t-1* and time period *t*, dY_t, can be decomposed into the impacts of trade and other factors as:

$$Y\,t = Yt\text{-}1 + \Delta YAt + \Delta YBt, \qquad (1)$$

or

$$dY\,t = dYAt + dYBt$$

where *d* denotes the difference that occurred during the time period; subscript *A* refers to trade shocks, which could be both trade policy and domestic policy; subscript *B* refers to all other shocks, which are mainly domestic policies.

The effect of trade on the economy is simulated by examining the effects of changes in imports or exports. Let X_t be the volume of trade in time *t*. A change in trade will be reflected in external trade changes, that is, X will change. Changes in domestic policy *(B)* could also lead to changes in *X*. For this reason, the results of the study may overstate the pure impacts from trade reform.

Given these assumptions, the impacts of trade changes and trade liberalizing reforms on the economy are fairly easy to analyse with the revised CAPSiM framework. To

do so, we assume that there are two alternative, mutually exclusive scenarios that could have occurred in the case of trade in China's external economy:

$$dX_t^I = X_t - X_{t-1} \neq 0 \quad \text{which we call } \textit{Scenario I}, \text{ and} \quad (2)$$
$$dX_t^{II} = 0 \text{ and } X_t \neq 0 \quad \text{which we call } \textit{Scenario II}. \quad (3)$$

Scenario I is used to simulate the economy in which trade changed over time to examine what actually happened. If we set X equal to the actual trade that occurred in the country during each time period, then the outcomes that occur during the simulations periods embody the impacts of trade and trade related policies. In contrast, scenario II seeks to replicate an economy in which there was no change in trade. If the period between *t-1* and *t* covers each of the three five-year periods between 1985 and 2000, scenario II attempts to project what would have happened to production, consumption and prices had there been no trade changes.

To quantify the impact of trade, we can use CAPSiM to simulate separately the economy when the conditions are imposed in either condition (2) or (3). We can then examine the difference in the differences of the outcome variables during the study sub-periods (from t-1 to t), and summarize the results with the following equation:

$$dY_{At} = dY_t^I - dY_t^{II} = dY_{At}\,|_{dXt = Xt - Xt\text{-}1 \neq 0} - dY_{At}\,|_{Xt = Xt\text{-}1 \neq 0} \quad (4)$$

In other words, equation (3.4) calculates the impacts of trade on Y_t in *t* over *t-1*. If we know the actual changes, we can then use equation (1) to generate the residual of the change between the actual performance of the economy (dY_t) and the changes due to trade (dY_{At}). This residual can be interpreted as the impact of all other factors besides trade (trade and trade-related policies). In other words:

$$dY_{Bt} = dY_t - dY_{At}$$

In summary, to simulate the impacts of trade changes on production, consumption, and price, two scenarios are formulated based on conditions (2) and (3).

Ghana

Abena D. Oduro and George T-M Kwadzo[1]

EXECUTIVE SUMMARY

Pre-reform

Economic policy during most of the 1970s was highly interventionist. Price and non-price control measures pervaded the economy. Parastatal organizations were involved in the distribution and marketing of inputs and some agricultural products. Most of these operated in competition with the private sector, the major exception being the Cocoa Marketing Board. The Ghana Food Distribution Corporation was responsible for buying agricultural products from the farm gate for distribution, importing and exporting agricultural products, and stabilizing food prices but did not purchase more than 10 percent of the marketed food surplus. The import tariff regime was subject to frequent changes and the cocoa tax varied between 27 percent and 60 percent. An export retention programme was imposed and a fixed exchange rate regime was maintained.

Economic growth decelerated in the late 1970s and turned negative in the early 1980s. By 1983 real GNP per capita had contracted considerably.

The reforms

The economic reform programme began in 1983. In the first three years price controls were lifted, the currency was devalued and fiscal measures were introduced to reduce the deficit. Improvements were recorded in most important macroeconomic indicators. The second phase of the reforms began in 1987 with the emphasis of the agriculture strategy being on liberalization and privatization. 1992 marked the beginning of a democratic political regime but also the start of a new period of macroeconomic instability.

Impact on intermediate variables

The withdrawal of the minimum guaranteed producer price policy for maize and rice did not have an appreciable impact on the wholesale prices of these commodities as the minimum price policy had had little impact on prices to begin with. The real prices of food declined after 1984 and it was not until 1984/85 that an increase in the real producer price of cocoa was observed.

Price indices show smaller variation during the reform and post-reform period than has been observed for the pre-reform period. The continued existence of seasonal variations in prices for most food crops, however, indicates that households

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that do not have stores of food during the lean periods or access to non-farm sources of income experience a decline in food consumption during the lean season when food prices are rising.

Tariff reforms reduced the nominal protection of the agriculture sector. The depreciation of the real exchange rate that occurred during most of the 1980s and the first half of the 1990s counterbalanced to some extent the decline in protection.

The cocoa sector was taxed for the entire period but the proportion of the export price received by farmers was higher in the 1990s compared to the 1980s. Declining world prices between 1987 and 1991 are largely responsible for the decline in real prices, and counteracted the positive impact of the depreciation of the real exchange rate and the decline in the cocoa tax rate, as measured by the increase in the share of the world price going to farmers. The real exchange rate appreciated in the period 1995-1997 but the positive impact of other policies and the decline in the export tax contributed to the positive change in real prices in 1992-1998.

There was an upsurge in food production per capita in the period 1984-1986, but the increase in the rate of growth was not maintained. Per capita food production levels did not attain their mid-1970s levels until the mid-1990s.

The volume of rice imports increased with growth in demand from the rising population and real incomes. Growth rates in agriculture export volumes have tended to be positive during the entire reform period. Some diversification of agriculture exports has occurred although cocoa exports still predominate.

Impact on target variables

National level indicators suggest that food security improved. Food imports constituted a declining share of total exports between 1992 and 1996. The downward trend was reversed after 1996, although the ratio remained below the 1992 level. There has been a decline in the proportion of underweight children. However, five regions experienced an increase in the proportion of underweight children.

The incidence of poverty declined from 51.9 percent in 1991/92 to 39.5 percent in 1998/99, but not all regions benefited. When households are classified by ecological zone, the distinct urban-rural divide in terms of household income breaks down. Rural forest households (export crop farmers) had higher mean real incomes than urban coastal and savannah households. Households headed by men consistently had higher mean real incomes than those headed by women, although the latter's grew faster. The mean real incomes of rural households also grew faster compared to those of urban households. The proportion of households not able to meet minimum nutritional requirements increased in three regions.

There was a decline in the proportion of rural household members employed in agriculture in the 1990s. This, and the decline in real prices of the major agricultural products, coincided with a decline in the share of household income originating from agriculture for households headed by food crop farmers. Agricultural income's share of total household income of households headed by export crop farmers on the other hand increased.

Policy lessons

Early assessments lauded the trade, exchange rate and monetary reforms in the context of improving macro aggregates.

The increase in agricultural production occurred despite the decline in real prices. The expansion in food production occurred largely through an expansion of the area cultivated with marginal changes in yield for most crops. Trade liberalization did not improve price incentives for food crop farmers and neither did the agriculture specific reforms. The expected private sector response did not materialize.

Opportunities for non-farm employment have increased as real incomes have increased. This is because an increase in real incomes brings with it an increase in the demand for non-food items. An increase in real incomes provides a pool of resources for investment in non-farm activities. Expansion in the rural road network, rural electrification and potable water supply are important for the development of non-farm activities and agro-processing. The expansion in non-farm businesses has been more rapid in the rural forest zones compared to the rural savannah.

Measures need to be implemented to maintain the incentives for food crop production. The increase in the real cost of production highlights how critical it is that agricultural productivity also increases if real prices facing farmers are declining.

INTRODUCTION: CONTEXT AND NATURE OF REFORMS

Role and level of development of the agriculture sector

Agriculture's share of GDP has varied substantially over the period since 1980. In 1980, at the time when the economy was experiencing negative growth rates, agriculture's share of GDP was 36 percent. It rose to 54 percent in 1984 before declining to 43.5 percent in 1990 and now contributes approximately 36 percent to GDP. About 51 percent of the population aged 15 years and older is employed in the sector, but with wide regional variation: 10 percent in the Greater Accra region compared to 43.8 percent in Ashanti region and 67.1 percent in the Upper East region. A slightly lower proportion of women than men are employed in agriculture.

TABLE 1
Indicators of the extent of subsistence agriculture in Ghana, 1991/92-1998/99

	Harvest sold 1991/92 (%)	Production 000 tonnes	Harvest sold 1998/99 (%)	Production 000 tonnes
Cocoa	91.2	243.0	89.2	397.7
Maize	44.5	730.6	42.2	1 015.0
Rice	55.6	131.5	42.3	281.0
Beans	34.2	14.3	42.9	70.4
Groundnuts	49.0	113.0	41.2	212.0
Cassava	20.0	5 662.0	21.4	7 845.4
Yam	18.4	2 331.4	22.3	3 249.0
Plantain	27.8	1 082.0	43.0	2 046.0
Oil palm	41.2		42.2	1 022.0
Proportion of rural household selling[1] :				
Less than 20% of output	46.72		35.50	
Between 20% and 50% of output	23.68		24.57	
More than 50% of output	29.59		39.91	

[1] Sample does not include households that recorded a negative value of agriculture output.
Source: Ghana Statistical Service, 1991/92 and 1998/99.

The sector's contribution to tax revenue as measured by trade taxes has declined, from 25 percent in 1985 to 19 percent in 1988 and 4.1 percent in 2000, and is now mainly limited to taxes on cocoa. The decline is explained by the trade liberalization programme that has reduced export taxes and limited the emergence of alternative sources of taxation.

Smallholder farmers on family-operated farms produce about 80 percent of total agricultural output. A limited number of crops, such as oil palm, rubber, banana and pineapple, are produced on large corporate-managed estates, although smallholders also produce significant shares of these crops, especially oil palm. Production for own consumption is still important in the food crop sector. The low proportion of the harvest that is sold is indicative of low production levels by a large proportion of farmers and a weak marketing system. Nevertheless, an increasing number of households are selling more than half of their output.

Degree of openness of the economy prior to reform

Economic policy during most of the 1970s was highly interventionist. Price controls and non-price control measures which pervaded the economy were largely responses by policy makers to inflation and balance of payments difficulties. Parastatal organizations were involved in the distribution and marketing of inputs and some agricultural products. Most of these organizations operated in competition with the private sector. The major exception was the Cocoa Marketing Board established in 1947 with exclusive rights to the export of cocoa beans. In the immediate pre-reform period it was the only domestic purchaser of cocoa beans. Apart from the domestic purchase and export of cocoa, the Cocoa Board provided research and extension services to farmers. The domestic price of cocoa was an administered price. The Producer Price Review Committee determined in which proportions the world price would be divided between farmers, government and the Cocoa Board.

The Ghana Food Distribution Corporation was established in 1971 to buy agricultural products from the farm gate for distribution, to import agricultural products to supplement local production if there was a shortfall, and to export agricultural products and stabilize food prices. It traded mainly in rice, maize, beans, groundnuts and meat products but did not purchase more than 10 percent of the marketed food surplus. The corporation was handicapped in its ability to perform its functions. Although it was the institution through which the minimum guaranteed price policy was implemented, these prices were lower than those offered by private traders, and the farmers' preference was to sell to the traders. In addition, the corporation did not have an adequate fleet of vehicles to collect the food crops from farmers or adequate storage facilities.

The Ghana National Procurement Agency (GNPA) was set up in 1976 and was responsible for the import and export of agricultural products. Its customers are government, public organizations, and private wholesalers and retailers. The GNPA did not have exclusive rights or privileges in the purchase or sale of any of the commodities it traded in.

Cotton production was promoted as an import substitution measure to supply newly established textile mills in the south with raw materials. From 1968 onwards, smallholder cotton production was encouraged by the Ghana Cotton

Development Board (GCDB), which aimed to spread the benefits from production of the crop as widely as possible. The GCDB offered farmers a complete package of services, from ploughing, supply of seed and fertilizer, through extension advice, chemical supply and application, to marketing. Farmers made no explicit payment for pre-harvest services, with the exception of ploughing. Rather, GCDB adjusted the per kilo price of seed cotton to take account of the cost of services provided, the calculation assuming an average yield of seed cotton. However, cotton production experienced steady decline as a result of a vicious circle of low producer prices, unreliable services and late payment, and the poor financial state of GCDB (Seini, 1985). By the early 1980s Ghanaian cotton production had almost collapsed.

State farms were established to produce a wide range of agricultural commodities including cocoa. Departments in the Ministry of Agriculture provided some services to farmers, such as extension services.

External trade regime

The import tariff regime was subject to frequent changes. Ghana had an escalated tariff regime with tariff rates lower for raw materials and higher for processed goods. Capital equipment entered under the lowest tariff schedules. By 1981 the tariff rates were 35 percent, 60 percent and 100 percent. Import controls were pervasive, with all goods except for trade samples, gifts and personal effects requiring approval before they could enter the country.

The cocoa tax rates vary with the world price and the marketing costs of the Cocoa Board. In the 1970s the cocoa tax varied between 27 percent and 60 percent.

An export retention programme became operational in 1982 whereby exporters of non-traditional exports could hold 20 percent of their foreign exchange earnings in an account with the Ghana Commercial Branch in the United Kingdom. The use to which the retained earnings could be put was limited to the purchase of equipment, spare parts and raw materials. The foreign exchange retention scheme was aimed at reducing the impact that the foreign exchange constraint had on production.

A fixed exchange rate regime was maintained. The nominal exchange rate remained constant between 1978 and 1982. The real exchange rate appreciated during the period and there was considerable real exchange rate misalignment (Harrigan and Oduro, 2000). Excess demand pressures for foreign exchange built up with the appreciation of the real exchange rate. Foreign exchange had to be rationed. A parallel market in foreign exchange had emerged in the early 1970s. The period 1978-1982 recorded rapid increases in the size of the premium on foreign exchange in the parallel market.

Motivations for the reforms

Economic growth had decelerated in the late 1970s and turned negative in the early 1980s. By 1983 real GNP per capita had contracted by 37 percent since 1970, investment rates were a fraction of the 1960 rates, import and export volumes had declined precipitously and inflation was accelerating to three digits. External financial flows had diminished and there was an urgent need for foreign exchange for budgetary and balance of payments support as well as to purchase essential imports for the productive sectors, in particular agriculture, manufacturing and mining.

The controls that had been introduced to address macroeconomic problems had encouraged the development of a parallel economy[2], which eroded the government tax base. Tax revenue and government expenditure declined as a ratio of GDP and in real terms. It was against this backdrop that the Economic Recovery Programme (ERP) was negotiated between the Government of Ghana and the International Monetary Fund. The economic strategy pursued since 1983 is an outward oriented one with a focus on private sector development.

Macro and sectoral components of reform

The reforms begun in 1983 had as their main objectives to increase production, particularly of food, industrial raw materials and exports, through an improvement in the structure of incentives; to increase the availability of consumer goods; to rehabilitate physical infrastructure; to increase the overall availability of foreign exchange and improve its allocation; and to lower the rate of inflation.

In the first three years of the programme price controls were lifted, the currency was devalued and fiscal measures were introduced to reduce the deficit. Improvements were recorded in most important macroeconomic indicators. From a growth rate of negative 4.3 percent in 1983 the economy grew by 8 percent in 1984. The growth rate fell to 5.2 percent in 1986. The inflation rate declined from 123 percent in 1983 to 10 percent in 1985 rising to 24 percent in 1986. Central government expenditures and revenues increased in real terms and as a share of GDP.

The second phase of the reforms began in 1987 and covered agriculture, education, the financial sector, state enterprises and the civil service. Macroeconomic aggregates remained fairly favourable. Despite this, concerns were expressed about the limited impact of the reforms on employment creation and export diversification. Non-traditional exports had been growing quite rapidly but from a very small base. The economy was still dependent on external inflows, raising doubts about the sustainability of the reforms (Jebuni, Oduro and Tutu, 1992). External financial flows as a ratio of GDP grew from 2.8 percent in 1983[3] to 11.8 percent in 1988 and to 16 percent in 1993.

In the 1990s, growth rates never exceeded 5 percent. Inflation rates began to rise after 1992, reaching an average of 59 percent in 1995. Stabilization concerns predominated. Average inflation rates for 1997 declined to 27 percent. Macro-instability re-emerged in the third quarter of 1999. The economy was hit by a combination of shocks: the decline in cocoa and gold prices, rising oil prices and a shortfall in expected external inflows. The nominal exchange rate doubled between 1999 and 2000 as did the rate of inflation. Government ran large budgetary deficits beginning from the second half of 1998. The central bank had instituted a policy whereby it did not automatically honour government cheques. This led to the build up of arrears estimated at approximately 5 percent of GDP at the end of 1999.[4] The 1999 fiscal crisis revealed major shortcomings of the reforms, i.e. the inability to diversify the structure of the economy and the continuing dependence of the economy on external inflows.

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[2] See Bulir (2000) for estimates of the effect of the pricing policy on cocoa production and the volumes smuggled.

[3] The estimates of external financial flows used for this analysis includes long and medium term loans to central government and official transfers.

[4] CEPA, 2000.

The period 1980-2000 thus sub-divides into four. The first sub-period, 1980-83 covers the years prior to the start of the reforms. The second period 1983-1986 coincides with the first three years of the reform when the emphasis was largely on economic stabilization. Thirdly, 1987 marks the start of the second phase of the reforms until 1991 when most of the agriculture sector reforms were completed. The fourth phase is the period 1992-2000. The year 1992 marks the beginning of the democratic political regime and is also the start of a new period of macroeconomic instability.

Exchange rate policy

One of the first policy measures undertaken in 1983 was the adjustment of the nominal exchange rate. In the next three years, systematic nominal devaluation of the exchange rate led to a depreciation of the real exchange rate (Table 2). The transition from a fixed to a market determined exchange rate regime began in 1986 with the establishment of the foreign exchange auction for selected transactions.

Between 1987 and 1991, the liberalization of the exchange rate regime deepened further when the foreign exchange bureaux system was introduced in 1988. A wholesale auction was introduced in 1990. The move to a liberalized exchange rate system was accompanied by a decline in the parallel market premium and the eventual disappearance of the parallel market for foreign exchange (Harrigan and Oduro, 2000). The liberalization of the exchange rate regime and the accompanying depreciation of the real exchange rate was a crucial component of the reforms, being an important explanatory of trends in export volumes (Jebuni *et al.*, 1992).

TABLE 2
Trends in the nominal and real exchange rate 1980-2000

	Nominal exchange rate (period average) GHC per US$	Real exchange rate GHC per US$
1980	2.75	220.00
1981	2.75	113.76
1982	2.75	95.77
1983	8.83	140.41
1984	35.99	421.24
1985	54.37	569.16
1986	89.2	730.89
1987	153.73	924.62
1988	202.35	963.41
1989	270.0	1 080.00
1990	326.33	984.27
1991	367.83	941.24
1992	437.09	1 020.96
1993	649.06	1 232.18
1994	956.71	1 472.45
1995	1 200.43	1 200.43
1996	1 637.23	1 142.49
1997	2 050.17	1 119.17
1998	2 314.15	1 074.12
1999	2 647.32	1 102.78
2000	5 321.68	1 873.06

Source: Nominal exchange rates are obtained from IMF, 2001; real exchange rates are calculated by the authors.

In addition, the devaluation was important in contributing to an increase in central government revenues (Oduro and Tutu, 1999).

In 1992, an interbank market in foreign exchange replaced the wholesale auction market. The real exchange rate appreciated between 1995 and 1998, partly through the use of the nominal exchange rate as an instrument to achieve inflation rate targets, and also because of improved terms of trade as world cocoa prices increased in 1998. With the terms of trade shock and slow down in donor disbursements in 1999, the nominal exchange rate nearly doubled causing an almost 70 percent depreciation in the real exchange rate in 2000.

Import restrictions

The economic reforms begun in 1983 brought about a decline in nominal tariff rates. The tariff schedules were adjusted downwards to 10 percent, 20 percent and 30 percent in 1983 (Jebuni, Oduro and Tutu, 1994). A special tax of 20 percent had been introduced in 1981. It was revised upwards to 50 percent in 1985. In addition to the import tariff and special tax, there was an import sales tax.

During the reform period 1987-1991, the major change was the decline in the tariff on luxury goods in 1988. To constrain the importation of luxury goods, a super sales tax was introduced in 1990 and ranged from 50 percent-500 percent. Imported fruits such as bananas, plantain, pineapples and guavas were subject to a tax of 500 percent. Vegetables such as onions, potatoes and beans were subject to a tax of 100 percent. The range was reduced to between 10-100 percent in 1991. The import licensing regime was abolished in 1989 and with it special tariffs on import licensing. The import duties and taxes on lint cotton was 40 percent till 1987 and reduced to 15 percent after 1987.

During 1992-2000, the major changes in the import tariff regime were the increase in the tariff on raw materials to 20 percent and its reduction to 10 percent in 1992. The super sales tax was replaced with a special tax of 20 percent, which was later reduced to 17.5 percent in 1998. The sales tax was replaced with a value-added tax of 10 percent in 1998.

Export promotion

The export bonus scheme was withdrawn in 1983. The other elements of the export promotion package remained. The proportion of foreign exchange earnings that could be retained was increased to 35 percent in 1987. Restrictions on how the funds could be utilized were removed during the 1987-1991 period. Exporters of non-traditional exports could retain 100 percent of their foreign exchange earnings.

The Government gave approval for the introduction of partial liberalization of the external marketing of cocoa, with effect from the 2000/01 cocoa season. This policy has allowed the licensed buying companies to export up to 30 percent of their purchases.

The cocoa tax rate stood at 31 percent in 1984. It rose to 44 percent in 1985. Between 1987 and 1991, restrictions on the export of cotton and palm oil were removed.

Agriculture policy

The emphasis of the agriculture strategy during the period of reforms was on liberalization and privatization. The privatization of the supply of inputs was

expected to increase their availability. The expected increase in competition would reduce input prices to farmers. The liberalization of the food marketing system was expected to result in higher prices being offered farmers compared to what the Government could offer. Another reason for the privatization of the sector was to redirect the business of the Ministry of Food and Agriculture towards policy issues and monitoring. Finally, several parastatals were making losses. There has been a definite movement in agricultural strategy away from the supply driven agriculture of the state's direct involvement in the production, distribution and marketing of output and inputs. There is also a clear movement away from actions that directly intervene in the market through administered prices and the provision of production and/or input subsidies.

Output price measures

The reforms in 1983 involved the upward adjustment of cocoa producer prices. This was made possible largely because of the devaluation of the exchange rate, without which the Government would not have generated any revenues from the cocoa sector. The producer prices of commodities such as coffee, cotton and tobacco also increased during this period. In 1990 the guaranteed minimum price scheme for maize and rice was ended.

Since 1985, the prices of seed cotton and the majority of other components of the cotton package have been set collectively by the companies. When there were few companies, the companies themselves decided the price they would pay for seed cotton the following season, based on projections for the international lint price. As the number of companies increased, this system of pricing gave way to price leadership by the Ghana Cotton Company (GCC), with the other companies following suit. One disadvantage of the system was that farmers did not know the price they would receive for seed cotton at harvest time until after critical resource allocation decisions had been made. This collective price setting, it was argued, reduced the incentives for farmers to divert their seed cotton from the company that had provided them with pre-harvest services to a competitor, thus avoiding repayment of the farmer's debt. This, however, did not prevent a price war between the GCC and the other companies in 1996/97 when GCC offered to pay a bonus to farmers selling their seed cotton before Christmas, an attempt to encourage picking before the Hamattan winds set in. This resulted in crop diversion. To prevent a repeat of the 1996/97 crop diversion experience, the other companies pressurised GCC to return to the system of price setting by joint discussion.

The medium term agricultural development programme (MTADP) for the period 1991-2000 indicated the re-thinking of the direction and bias in agricultural strategy and policy-making: the objectives were food security, rural employment, increased agricultural exports and increased production of raw materials.

The general design of the MTADP for the period 1991-2000 was to establish market-led growth in agriculture. Support was to take the form of providing an enabling environment in the way of feeder roads, marketing infrastructure, irrigation, research and development. Actions were required in five main areas: improving the incentive framework, improving agriculture support services, increasing private sector participation, strengthening agriculture sector management, and establishing a framework for a more rational allocation of public sector resources.

Cotton sector policy

In the 1997/98 cropping season, a change was introduced whereby the seed cotton price was announced to farmers before planting began. A combination of factors – falling world lint cotton prices in the second half of the 1990s; the fierce competition provided by the cheap import of textile from China and other Asian countries; and the increasing import of second hand cloths due to the liberalized trade regime – led to falling demand for lint cotton by local textile companies.

The GCC sought ways of exporting the excess cotton lint and in 1999, a new system of pricing seed cotton was introduced. This involves annual price negotiations before the cropping season begins between cotton farmers and cotton companies, with the Ministry of Food and Agriculture (MOFA) mediating. The negotiations establish cotton prices as well as the prices for inputs and ploughing. Since both the crop budget and the world market prices are factored in the determination of the seed cotton price, both companies and farmers are satisfied with the new arrangement. This is a more transparent system than all the previous pricing arrangements.

Cocoa sector policy

The producer price of cocoa is also fixed through negotiations. The negotiating committee involves representatives of COCBOD, the Ghana Cocoa and Coffee Farmers Association, the Ministry of Finance and Economic Planning and the cocoa processing companies. The floor price is fixed and bonuses paid to farmers based on the actual fob prices received for the crop relative to the announced producer price.

The Government has continued the policy of raising the producer price of cocoa. It was increased by 65 percent in 1985/86 and in 1988 farmers were paid bonuses on production in the previous two years. By 1988/89, farmers' share of the world price had increased but had not reached the target set by the World Bank. Subsidies on cocoa inputs were removed in 1990.

A means of achieving an increase in farmers' share of the world price without jeopardizing revenues was to reduce the cost of the COCOBOD. The World Bank suggested that this could be done by liberalizing the cocoa sector through the reduction in the activities of the COCOBOD, greater participation of the private sector and reduction in the work force of the COCOBOD, but the Government was concerned that private traders and haulers would probably be unwilling to evacuate cocoa from areas where road infrastructure was poor and that the banking system in Ghana would find it difficult to provide financing to private traders for the purchase of cocoa. A compromise was reached: the COCOBOD was to restrict itself to activities that could not be performed by other public institutions or the private sector, including purchasing, marketing, extension and research functions. Twelve thousand workers were retrenched in 1987, and the COCOBOD divested the majority of its shares in the insecticide plant and its plantations.

Input policy measures

The fertilizer subsidy rate declined to 42 percent in 1987 and to zero in 1990. The subsidy removal was a precondition for the privatization of the fertilizer trade, which took place in 1991. Government turned over the import/wholesale functions to four companies one of which controlled over 50 percent of all imports. A special unit of MOFA, created in 1988 to manage the removal of the fertilizer subsidy

and privatization, encouraged private retailers to fill the vacuum created in rural towns and villages. Initially, the unit received large numbers of applications from prospective wholesalers and retailers wishing to enter the trade. Within two years, practically all the retailers had withdrawn their applications. The combined result of the sharp and continuous reduction in the value of the cedi, of subsidy removal, and of the privatization programme initially had traumatic effects on fertilizer usage, cropping patterns, areas sown and yields, raising questions about the appropriateness of the mechanism and the scheduling of subsidy and privatization actions. However, this downward trend was reversed in the mid-1990s.

In 1987, state provision of wheeled tractor services was ended. The then existing fleet of equipment was auctioned or retired. A year later the combined-harvest service came to an end and in 1991 state provision of land clearing services was terminated.

Agricultural credit

The removal of the requirement in 1990 that at least 25 percent of bank loans be made to the agriculture sector has been accompanied by a decline in the share of agriculture in total bank lending, which in 1992 fell to 9.7 percent but rose to 12.2 percent in 1998. Rural banking was introduced in the 1970s to address the credit needs of small-scale entrepreneurs and farmers who have traditionally been unable to access credit from the formal banking sector. Subsidized credit to agriculture ended in 1987. The effect of this was for rates to increase from 18.5 percent in 1985 to range between 22.75-30 percent in 1988. Comparable rates for manufacturing were 20.5 percent in 1985 and between 25-30 percent in 1988). The economic reform programme has not made it any easier for farmers to access formal credit.

Marketing and distribution

In 1985, the GCDB was privatized and other companies were allowed to enter the market, but the GCDB (which became the Ghana Cotton Company) remained the dominant player. The Ghana Seed Company, responsible for the production and distribution of seeds to farmers was abolished in 1986. The monopoly of the Produce Buying Company of the Cocoa Board in cocoa haulage was removed during the period 1987 to 1991. The Livestock Marketing Board was closed down and the Ghana Food Distribution Corporation ceased to expand its storage facilities for price stabilization purposes and food distribution.

Despite the new competitive environment, the companies all adopted the same basic contractual package that the GCDB had supplied to farmers. In part this may have been because the new companies relied heavily on the experience of ex-GCDB staff to establish themselves in business. The "take-it-or leave-it" package offered to cotton farmers allowed the companies to specify and also enforce desired input levels for cotton production at a time when smallholders in general were reducing the quantity of purchased inputs because of devaluation and the removal of subsidies on agricultural inputs. This system of payment for inputs guaranteed cotton farmers some return even in bad years.

Subsequently, the method of payment for inputs has evolved, such that farmers now make explicit payment for fertilizer, thereby bearing more of the risk associated with fertilizer use. However, pre-harvest services are still provided on a credit basis

within a "take-it-or leave-it" package. Whilst the lack of competition in price setting contributed to the control of output diversion, it also removed any dynamics to raise real prices for farmers. It has been shown that there has been a steady decline in the seed cotton price relative to prices of major competing crops in the north since the liberalization of the cotton sector in 1985 (Blench, 1999).

Agricultural research

Research facilities had deteriorated and funding of research and extension were so low that after paying staff salaries nothing was left for operations, maintenance and replacement of equipment. Improvements introduced into the national agricultural research system have created an enabling environment for scientists to conduct sustainable research that is addressing the constraints in agricultural development. The national agricultural research programme (NARP) has lifted the moral of agricultural scientists and has made them more effective partners with scientists of regional and international agricultural research centres.

Central government spending on agriculture

The devaluation and fiscal measures introduced as part of the reform programme made it possible to increase central government spending in real terms and as a share of GDP. Spending on agriculture as a share of central government spending however has registered a steady decline since the start of the reforms (Table 3).

Real spending on agriculture has fallen considerably during the period. Donor lending has become important for the sector, contributing at least half of the public sector resources allocated to the sector in most years, and over 60 percent in 2002 and 2003.

TABLE 3

Central government spending on agriculture*, 1983-2000

	Percent share of total spending	Real spending GHC million
1983	10.4	586.5
1984	4.9	361.8
1985	4.2	419.0
1986	4.5	636.1
1989	0.5	790.8
1990	4.1	658.1
1991	3.6	661.2
1992	3.1	760.2
1993	2.8	769.4
1994	1.7	513.7
1995	1.7	455.1
1996	1.5	425.2
1997	1.9	785.1
1998	1.5	661.2
1999	1.3	536.7
2000	0.9	374.2

* Based on information on budgetary allocations to the Ministry of Food and Agriculture. This does not capture total central government support to the sector, since spending on feeder roads for example, that comes under a separate ministry, has a direct impact on agriculture activities.

Source: Calculated from data of the Statistical Service Quarterly Digest of Statistics, various issues.

Land administration and utilization
Land administration and utilization has been guided by both customary practices and enacted legislation. Traditional institutions own most of the land. Customary practices have played a dominant role in providing access to land, giving rise to different types of land tenure governing the holding, acquisition, use and disposal of land which vary from region to region and among ethnic groups. While these varied customs have traditionally served a vital role, they have tended to hamper sustainable agricultural development. The lack of formal documented land demarcation and titles contributes to protracted litigation which hinders the acquisition of large areas of contiguous land for commercial agriculture.

Food security strategy
Until 1991, Government food security strategy was to use the Ghana Food Distribution Corporation as a means of holding strategic food reserves, in addition to administering the guaranteed minimum price scheme. For most of the time the Corporation could not stock enough cereal due to financial constraints. Since 2000, private grain merchants have been holding reserve stocks, with some leasing the Corporation's storage facilities. Cereals have been released onto the market during the usual periods of price increases and this action has moderated the levels of price increases.

CONSEQUENCES OF THE REFORMS: INTERMEDIATE VARIABLES[5]

Trends in prices[6]

The nominal wholesale prices of major food crops quadrupled in 1983,[7] because of the return of about a million emigrants from Nigeria, the drought and bush fires in that year which destroyed harvests, and the effect of the nominal devaluations of the exchange rate. Prices declined in the two subsequent years and then began a steady increase thereafter.

The withdrawal of the minimum guaranteed producer price policy for maize and rice did not have an appreciable impact on the wholesale prices of these commodities as the minimum price policy had had little impact on prices to begin with. This is because the Ghana Food Distribution Corporation was constrained in its capacity to do this. The nominal wholesale price of local rice declined in 1990, and even though

[5] Three villages were selected in three important farming system zones for a rapid rural appraisal: are Adankranja (near Bekwai in the forest zone), Ampenkro (in the transitional zone) and Wungu (near Walewale in the savannah zone). Focus group discussions were held with community members to discuss changes that had taken place since the reform measures were implemented and the real and perceived impacts of the measures on their agricultural activities, income and food consumption.

[6] The analysis will focus on developments in selected food crops, i.e. rice, maize, plantain and cassava and export crops (i.e. cocoa, yam and pineapples). Rice is an important import substitute. It accounted for about 15 percent of agriculture imports in the late 1990s. Maize can be described as a non-tradable commodity. Approximately 17 percent of the cultivated area is under maize. Most of domestic supply is obtained from local production. Cocoa is the traditional agricultural export. Yam and pineapple have emerged as important non-traditional exports in the 1990s.

[7] The national average wholesale price of a commodity is the strict average of the prices of that commodity existing in designated markets in the country. Unfortunately Ghana does not have a series on farm gate commodity prices.

TABLE 4
National average wholesale prices for selected food commodities, 1980–2002

Year	Nominal (GHC)				Real prices, i.e. nominal deflated by consumer price index (Sept 1997=100)			
	Maize	Yam	Cassava	Local Rice	Maize	Yam	Cassava	Local rice
1980	414	957	138	5.76	940.91	2 175.00	313.64	13.09
1981	774	1 545	339	11.35	806.25	1 609.38	353.13	11.82
1982	797	2 156	383	18.6	675.42	1 827.12	324.58	15.76
1983	3 858	7 020	1 497	60.2	1 472.52	2 679.39	571.37	22.94
1984	2 338	6 960	846	68.28	640.55	1 906.85	231.78	18.70
1985	2 038	6 813	795	52.18	440.17	1 471.49	171.71	11.27
1986	3 311	9 012	1 409	61.22	658.25	1 791.65	280.12	12.17
1987	5 387	10 769	3 184	105.11	766.29	1 531.86	452.92	14.95
1988	6 859	19 387	1 605	192.21	743.12	2 100.43	173.89	21.58
1989	5 421	23 600	2 481	310.25	468.94	2 041.52	214.62	26.83
1990	8 633	30 102	4 433	187.49	544.33	1 897.98	279.51	11.82
1991	9 435	29 469	4 000	191.79	504.01	1 574.20	213.68	10.24
1992	10 048	29 070	4 048	210.54	487.53	1 410.48	196.41	10.21
1993	11 072	40 098	5 421	271.51	402.76	1 458.64	197.20	9.87
1994	13 863	53 310	5 733	345.74	375.79	1 445.11	155.41	9.37
1995	24 708	82 219	9 550	545.68	392.13	1 304.86	151.56	8.66
1996	32 814	97 487	10 289	795.50	392.56	1 166.25	123.09	9.51
1997	64 326	142 086	15 878	1 038.98	636.89	1 406.79	157.21	10.28
1998	59 309	239 536	28 160	1 085.77	507.30	2 048.89	240.87	9.28
1999	45 153	166 434	19 235	1 151.15	339.42	1 251.10	144.59	8.65
2000	93 663	215 284	33 797	1 672.76	500.98	1 151.50	180.77	8.94
2001	150 163	357 500	80 807	2 548.39	662.18	1 576.49	356.34	11.23

Units: Maize 100 kg; Yam 250 kg; Cassava 99 kg; Local rice 1 kg.
Source: Calculated from Ministry of Food and Agriculture information.

it rose in 1991, it was still below its 1989 levels. Maize prices increased in 1990 and 1991 but this cannot be attributed to policy changes.

The nominal prices of food crops relative to the national consumer price index on the other hand declined after 1984 for some of the major crops (Table 4). In the case of maize, rice and yam, the real prices of these commodities have not attained their pre-reform levels. In 2001 it is estimated that the real prices of the important food crops were lower than their 1980 levels.

Continuous increases in the nominal producer price of cocoa have not always been matched by increases in the real price, which rose initially in 1981/82, before declining again as result of high inflation. It was not until the 1984/85 crop year that the real price of cocoa rose again, before once again going into decline. However, the longer term trend has been upwards.

Since 1993 the Government has articulated its commitment to increasing the producer's price to more than 50 percent of fob with a renewed stated commitment to increase farmer's share of fob price further to 60 percent by 2000 (Ministry of Finance, 1999). It was not until 1998/99 that this objective was achieved.

Seasonal trends in price indexes

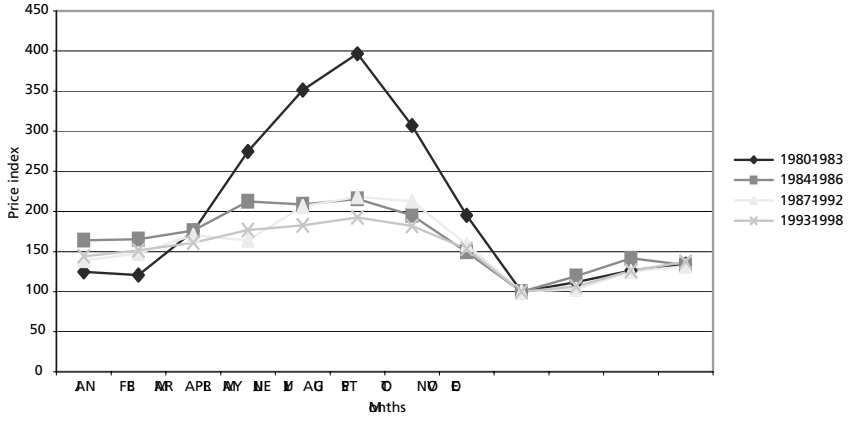
The continued existence of seasonal variations in prices for most food crops suggests that households that do not have stores of food during the lean periods or access to

TABLE 5
Trends in nominal and real cocoa producer prices, 1980/81-1999/2000

Year	Nominal prod. price GHC/tonne	Real price	Percent of FOB paid to farmers
1980/81	4 000	4 000	66.94
1981/82	12 000	5 530	242.59
1982/83	12 000	4 528	289.19
1983/84	20 000	3 390	33.82
1984/85	30 000	3 641	27.59
1985/86	56 000	6 161	26.89
1986/87	85 000	7 502	27.09
1987/88	150 000	9 470	34.76
1988/89	165 000	7 933	40.1
1989/90	174 400	6 692	41.55
1990/91	224 000	6 262	45.95
1991/92	251 000	5 948	48.76
1992/93	258 000	5 553	46.06
1993/94	308 000	5 306	30.42
1994/95	700 000	9 657	41.78
1995/96	840 000	7 266	38.94
1996/97	1 222 000	7 083	42.97
1997/98	1 800 000	8 308	47.42
1998/99	2 250 000	8 733	56.0
1999/00	2 250 000	7 766	60.0

Source: Cocoa Board.

FIGURE 1
Trends in monthly wholesale price index of maize, 1980-1998



non-farm sources of income will experience a decline in food consumption during the lean season when food prices are rising. For maize, price indices show smaller seasonal price variation during the SAP and post-reform period than has been observed for the pre-reform and the ERP period. For other crops the evidence is less clear.

TABLE 6
Trends in input prices 1980-1998

Year	Fertilizer (NPK) price GHC per 50kg bag	Ratio of wholesale price to fertilizer price 1980=100	
		Maize	Rice
1980	15	100.00	100.00
1981	30	93.48	98.52
1982	30	96.26	161.46
1983	58	241.00	269.94
1984	440	19.25	40.41
1985	440	16.78	30.88
1986	700	17.14	22.78
1987	1 380	14.14	19.84
1988	2 300	10.80	22.56
1989	3 350	5.86	24.12
1990	4 200	7.45	11.63
1991	4 500	7.60	11.10
1992	7 800	4.67	7.03
1993	11 800	3.40	5.99
1994	17 200	2.92	5.23
1995	22 500	3.98	6.32
1996	31 000	3.84	6.68
1997	34 000	6.85	7.96
1998	39 000	5.51	7.25

Source: Ratios calculated from Ministry of Food and Agriculture data.

Trends in input prices

The average price of fertilizer increased 223-fold between 1980 and 1989 and only 9 times between 1990 and 1998 (Table 6). Fertilizer prices increased faster than did the national average wholesale prices of maize and rice. Much of the erosion in the ratio of product prices to fertilizer prices occurred prior to 1990.

Bumb *et al.* (1994) argued that the decline in fertilizer consumption can be explained largely by the removal of the subsidy and the impact of exchange rate changes. Donovan (1996) on the other hand argues that the removal of the subsidy did not create conditions unfavourable for the use of fertilizers. However, the steady decline in the ratio of wholesale commodity prices to input prices would suggest that unless farmers were able to reduce other costs of production, the demand for fertilizers is unlikely to have been maintained. Farmers interviewed during the focus group discussions indicated that the removal of the fertilizer subsidy has caused them to reduce and in some cases stop the use of fertilizer on their crops.

Decomposition of price changes

An assessment of the impact of sector and macroeconomic policies on agricultural price incentives can be made by decomposing changes in real agricultural prices.[8] Developments in price incentives were estimated for cocoa beans, maize and rice for the period 1984-1998.[9] The decomposition analysis was conducted by dividing the period 1984-1998 into three.

[8] This section depends heavily on discussion provided in Helfand and de Rezende (2001).

[9] The domestic price of cocoa used for the analysis is the producer price announced by the Government. The domestic price of maize and rice are the national average wholesale prices for these crops. The border prices of maize and rice are proxied by international prices. The international inflation index is proxied by the USA consumer price index.

TABLE 7
Decomposition of changes in real cocoa producer prices, 1983-1998 (period averages)

Period	Changes in real price	Change in world price	Change in real exchange rate	Trade policy	Residual
1983-1986	26.46	8.619	50.807	29.685	-76.405
1987-1991	-4.64	-15.358	5.058	-9.749	15.406
1992-1998	6.01	-0.1633	1.886	-4.002	8.291

Source: Calculated by the authors.

TABLE 8
Decomposition of changes in real rice and maize wholesale prices, 1983-1998 (period averages)

	Changes in real price	Change in world price	Change in real exchange rate	Trade policy and residual
Rice				
1983-1986	-6.45	-11.67	50.807	45.58
1987-1991	-3.46	2.83	5.058	-11.348
1992-1998	-0.55	-4.68	1.886	2.240
Maize				
1983-1986	-0.63	-53.67	50.807	2.23
1987-1991	-5.36	-6.39	5.058	-4.02
1992-1998	-0.94	-0.89	1.886	-0.05

Note: Comparative results from price decomposition analyses across the case study countries are provided in Annex B of the Synthesis chapter. The results in Annex B present the change in the domestic price as a percentage change with respect to previous period. The case study analyses vary in that some present results as a percentage change with respect to a base period. Whilst the interpretation of results in the case study narrative holds irrespective of the end points compared, the results presented in Annex B should be used for comparative purposes.

Large reductions in nominal tariff rates facing agricultural imports occurred in the 1980s. The frequency and the size of subsequent tariff changes were limited. The major changes that occurred were in the level of special and sales taxes. Thus the tariff policy has reduced nominal protection of the agriculture sector. On the other hand, the depreciation of the real exchange rate that occurred during most of the 1980s and the first half of the 1990s may be seen as counterbalancing somewhat the decline in protection conferred on the agriculture sector through tariff policy.

The cocoa sector was taxed for the entire period. The proportion of the export price received by farmers was higher in the 1990s than in the 1980s. The real producer price of cocoa increased in the first three years of the reforms (Table 7). Favourable world prices and the depreciation of the real exchange rate contributed positively to this. Declining world prices in the period 1987-1991 are largely responsible for the decline in real prices during that period. The influence of the decline in world prices counteracted the positive impact of the depreciation of the real exchange rate and the decline in the cocoa tax rate, as measured by the increase in the share of the world price going to farmers. The real exchange rate appreciated in the period 1995-1997; however the positive impact of other policies and the decline in the export tax contributed to the positive change in real prices in 1992-1998.

The real price of rice followed a downward trend during the period 1983-1998 (Table 8). Domestic policies (for example the decline in sales tax rates and the removal

of quantitative restrictions) and the decline in tariff rates contributed the most to this decline in real price. The decline in the real wholesale price of rice occurred despite the depreciation of the real exchange rate. Import tariff rates hardly changed at all in the years 1992 to 1998. During this period the effect of domestic policy was less than that of international prices.

The trend of real maize prices was downwards in each of the three periods (Table 8). The declining world price and the trade and other policies account for this. Unlike the case of rice, declining world prices, and not domestic policy, was largely responsible for the fall that occurred.

A further analysis of the effect of macroeconomic and sector policies on price incentives was conducted by estimating an econometric relationship between these variables and the ratio of the price of cocoa to the price of manufactured products (see Annex). The results suggest that a 1 percent change in the real exchange rate would generate a similar proportional change in the ratio of cocoa producer price to manufactured goods price. A negative relationship between the export tax on cocoa and the cocoa producer price to manufactured goods price ratio is found. The terms of trade between cocoa and manufactured goods tend to favour cocoa producers after the reform programme. However, with the passage of time the terms of trade between cocoa and manufactured goods tends to favour producers of the latter. Lastly, the findings show that the past relative price ratio between cocoa and manufactured goods does exert some influence on the current relative price ratio.

Price margins and market integration

The price spread between wholesale and retail prices appears to be constant in absolute and percentage terms (Austin Associates Inc, 1990, Aniwa, 1996). Marketing margins expressed as a percentage of the retail price range between 8 percent and 87 percent for the various commodities. Generally, market margins are higher for starchy staples and rice compared to other commodities. The main reason for this is the bulky nature and low value of the starchy commodities and the greater processing requirement in the case of rice.

There is also evidence of market integration, with little segmentation in the maize market Prices were transmitted from the net importing areas to the net producing centres. The improving transportation network has been important in explaining the relatively high degree of price transmission: market connectedness was greater for those centres that had better transportation links compared to those that did not (Badiane and Shively, 1998).

Effect on agricultural output and value added

In this section, the findings from the price analysis are related to evidence of changes in output levels. These are presented on an annual basis by changes in area and in yield the aim being to attempt to establish a link between prices (and non-price factors) and output by examining the nature of the output response (or lack of).

In assessing the ability of producers to respond it is important to recognize the agroclimatic context within which they operate, as illustrated in Box 1.

BOX 1
Agroclimatic conditions

About 57 percent of the land area of Ghana, estimated at 23 853 900 hectares, is available for agriculture, of which 42 percent was under cultivation in 2001 (including 0.08 percent land under irrigation). Although this may suggest an excess supply of agricultural land, there are many indications of land scarcity, including: the virtual elimination of shifting cultivation and the dominance of fallow rotation; increased land-use intensity as reflected in a shortening of the fallow period, and in some areas (e.g. Upper East Region) a total elimination of fallow; the changing mix of crops in favour of low input crops (e.g. the replacement of yam by cassava); increasing migration of farmers from areas of low productivity to areas such as Brong Ahafo and the Western Regions where there is more fertile land; and changes in the method of land acquisition. The lack of management of land as a common property resource is a major constraint to agricultural land use. This is most critical in the livestock producing areas where animals are reared using free-range systems. The destruction of crops by grazing livestock is also a major source of conflict between herdsmen and crop farmers.

There are four major ecological zones in Ghana. The coastal zone has mean rainfall of between 800-1 200 mm. Cereals, in particular maize, are important in this zone. The forest zone comprises about a third of the country. Mean rainfall ranges between 1 500 and 2 000 mm and there is a bi-modal rainfall pattern. The major crops to be found here are tree crops (for example cocoa), plantains, cocoyam and cassava. The transition zone, lying between the forest and savannah zone, is important for the production of grain for commerce, and also produces root crops such as yam and cassava. This zone has two rainy seasons with a mean rainfall of 1 300 mm per annum. The savannah zone, in the northern part of the country, comprises almost two thirds of the land area. There is one rainy season and mean rainfall averages 800-1 100 mm. The major crops here are cereals, pulses, cotton and yam.

Soil fertility between zones, but is generally low as a result of extensive soil degradation caused by various degrees of erosion and nutrient mining from continuous cropping. Most soils are old and have been leached over an extended period of time, resulting in low organic matter contents, and require careful management to support good crop yields. To crop yields, the soils require inputs, such as mineral and organic fertilizers, and on-farm organic recycling practices.

Rainfall levels make it possible to have at least one successful cropping every year throughout Ghana. However, poor distribution and the erratic nature of rainfall make the achievement of successful cropping difficult. For instance, the interior savannah zone has between 90 and 120 days when soil moisture is favourable for crop growth. Within this growing period dry spells often occur at critical stages of plant growth, thus increasing the probability of crop failure. Supplementary irrigation would therefore reduce this risk. Furthermore, irrigation would allow more than one crop to be produced within the year and also increase productivity by making it possible for greater use of purchased inputs such as fertilizer.

FIGURE 2
Food production indices, 1974-2001 (1989-91=100)

Agriculture and food production and production per capita had been declining since 1974 and attained their lowest levels in 1983.[10] The bush fires and drought (rainfall figures were below the 30 year average) in 1983 exacerbated a declining trend.

Improved weather conditions contributed to an upsurge in per capita food production in the period 1984-1986, but in addition, the near famine situation of 1983 which compelled many households to go into farming in 1984 also explains the dramatic increase in area cultivated and total production in 1984. The reforms were accompanied by a relaxation of the foreign exchange constraint. The increase in the availability of consumer goods, such as textiles and soap, probably created an incentive for increased production by farmers to purchase these items, despite falling real prices. The increase in the rate of growth of food production was not maintained, with a sharp drop in food and agriculture production in 1990 due to a drought in that year. Production maintained its upward trend after that. The recovery in agriculture and food production after 1983 exceeded levels attained in the mid-1970s. However, per capita food production did not attain its mid-1970 level until the mid-1990s. The removal of the fertilizer subsidy and input subsidies in 1990 does not appear to have made an appreciable impact on the growth of food production.

The production of maize and rice declined between 1980 and 1983. The increase in maize production during the two decades under review has been driven largely by a more than doubling of the area planted. In all the ecological zones in 1997, about 54 percent of farmers planted the new varieties of maize on at least one of their fields, but less than a quarter used fertilizer. Compared to local varieties, the new varieties increased yields by 88 percent without fertilizer use and by 102 percent with fertilizer (Morris *et al.*, 1999). Maize yields per hectare increased by an average

[10] As agriculture trends are similar to those for food production, the graph only shows the latter.

TABLE 9
Decomposition of sources of growth of selected food crops, 1980-2002

Crop	Period	Output growth	Hectarage	Productivity
Maize	1980-1983	-0.196	-0.029	-0.167
	1984-1986	0.460	0.174	0.285
	1987-1991	0.102	0.051	0.051
	1992-1998	0.011	0.017	-0.006
	1999-2002	0.108	0.100	0.008
	1980-2002	0.066	0.048	0.018
Rice	1980-1983	-0.213	-0.113	-0.100
	1984-1986	0.319	0.226	0.093
	1987-1991	0.154	0.034	0.120
	1992-1998	0.089	0.053	0.036
	1999-2002	-0.001	-0.015	0.014
	1980-2002	0.065	0.031	0.034
Cassava	1980-1983	-0.131	-0.036	-0.094
	1984-1986	0.246	0.157	0.089
	1987-1991	0.137	0.065	0.072
	1992-1998	0.033	0.023	0.010
	1999-2002	0.076	0.058	0.018
	1980-2002	0.062	0.045	0.017
Plantain	1980-1983	-0.010	0.014	-0.024
	1984-1986	0.122	0.101	0.021
	1987-1991	0.016	-0.018	0.034
	1992-1998	0.069	0.049	0.020
	1999-2002	0.044	0.030	0.014
	1980-2002	0.046	0.032	0.015
Yam	1980-1983	-0.110	-0.082	-0.028
	1984-1986	0.362	0.288	0.074
	1987-1991	0.184	0.048	0.136
	1992-1998	0.004	-0.011	0.014
	1999-2002	0.092	0.088	0.004
	1980-2002	0.085	0.046	0.039

Source: Calculated from Ministry of Food and Agriculture data.

of just under 2 percent per annum between 1980 and 2002. The major improvements in output per hectare occurred in the 1980s. Little if any change in productivity took place in the 1990s. The trend in real maize prices was downwards between 1980 and 1998. Input prices and the minimum daily wage have risen faster than have maize wholesale prices over the same period. The low contribution of intensification to the increase in production can be explained by the high cost of inputs needed for intensification faced by the average maize farmer.

Productivity in the food crop sector is quite low. Estimates of achievable yields show that there is a wide gap between actual yields and the potential (Table 10).

The expansion in rice production has been due to a combination of increasing area under cultivation and a growth in productivity. Indeed, in the period since 1999, there has been limited expansion in the area planted to rice. Any increase in rice production that has been recorded is due largely to improvements in yields. Approximately 400 000 hectares is suitable for the development of lowland rice but only a fraction of this potential is currently being cultivated. A number of projects have been implemented to increase rice yields through improved farming practices

TABLE 10
Average and achievable yields of selected food crops,1987-2000 (tonnes per hectare)

	Average yield 1987-1990	Average yield 2000	Achievable yield	Percent achieved in 2000
Roots, tubers, and plantain				
Cassava	7.8	12.3	28.0	43.9
Yam	6.1	12.9	20.0	64.5
Cocoyam	5.7	6.6	8.0	82.5
Plantain	7.1	7.9	10.0	79.0
Cereals				
Maize	1.2	1.46	5.0	29.0
Rice	1.2	2.17	3.0	72.3
Millet	0.7	0.8	2.0	40.5

Source: SRID, Ministry of Food and Agriculture, Accra.

and the use of high yielding varieties. In contrast to maize, the ratio of the nominal wholesale price of rice to the consumer price index remained fairly stable in the 1990s, fluctuating within a narrow band.

Non-tradable crops

Plantain[11] production declined in the period 1980-1983. The slowdown in plantain production between 1987 and 1991 is due largely to a decline in the area planted to the crop, despite the increase in yields. The steady increase in plantain production in the 1990s has again been determined largely by expansion in area since yields remained fairly constant. The increase in production has occurred despite the decline in real prices.

Expansion in the area under yam production and improvements in yields are both responsible for the increase in output. In most years, yam production has responded to the opportunities for exporting provided by the depreciated real exchange rate and the policies to encourage non-traditional exports. Of the three major starchy crops, yams recorded the greatest improvement in production levels in the period 1999-2001.

Cassava production has increased largely because of an increase in the area planted to the crop. Improvements in yield per hectare have been low compared to that of yam production.

Effects on imports and exports

The volume of rice imports has risen steadily since the start of the reforms, due to rising population and real incomes (Table 11).

Agriculture export volumes declined by 5 percent in the period 1981-1983 and then increased by 8.2 percent in the period 1984-1986 and have tended to be positive during the entire reform period. Except for the surge in export volumes in 1996, growth rates declined in two out of the four years between 1995 and 1998 when the real exchange rate was appreciating.

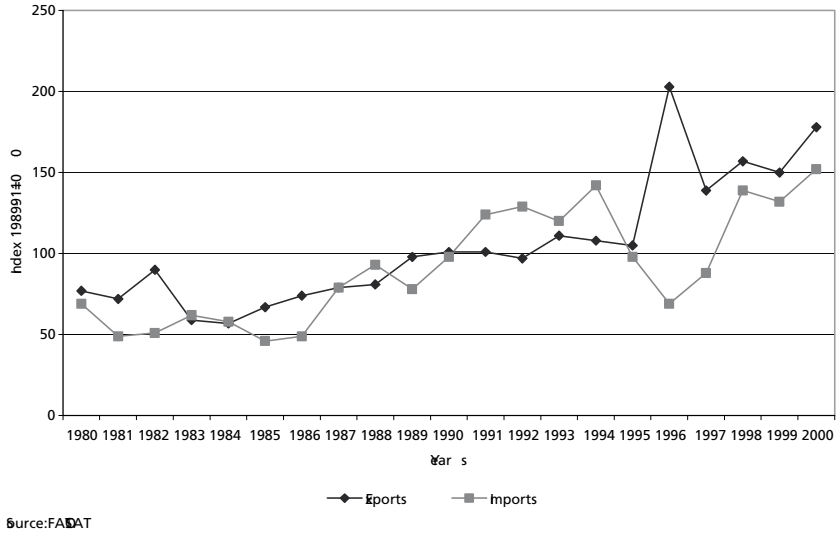
[11] Plantain is classified as non-tradable because the volumes traded have been minimal.

TABLE 11
Trends in rice import volumes, 1980-2001 (period averages)

Year	Rice imports (volumes)	Imports as percent of production	Growth in rice imports
1980-1983	32.33	92.87	7.06
1984-1986	55.20	82.89	36.35
1987-1991	106.08	98.24	108.61
1992-1998	148.13	100.77	11.00
1999-2001	265.80	106.27	19.53

Source: Ministry of Food and Agriculture.

FIGURE 3
Volume of agricultural exports and imports, 1980-2000 (1989-91 = 100)



Some diversification of agricultural exports has occurred since the start of the economic reforms. Although cocoa exports still dominate, the share of cocoa beans and products has declined from 96 percent in 1986 to 76 percent in 2001. Pineapples, fish and fish products have emerged as important non-traditional agriculture exports (Table 12). The depreciation of the real exchange rate has been a significant explanation of the expansion of non-traditional exports (Jebuni *et al*., 1992).

There has been a significant drop in the share of agriculture exports in total exports since the start of the reforms. From a share of almost 70 percent in 1986, agriculture exports averaged approximately 31 percent for the period 1999-2000. The trend in export volumes has been positive for most of the period since the start of the reforms. Thus the decline in the share of export value can be attributed to falling world prices for major agriculture exports and faster growth in non-agriculture

TABLE 12
Structure of agriculture exports 1986-2001 (percent)

Year	Share of the value of agriculture exports to the value of total exports	Cocoa share of agriculture exports	Share of value of pineapple in agriculture exports	Share of value of fish & fish products in agriculture exports
1986	69.816	96.209	0.083	2.791
1987	62.390	96.061	0.136	2.831
1988	55.575	94.360	0.286	4.289
1989	53.150	95.052	0.489	3.077
1990	42.776	94.021	0.991	5.228
1991	36.906	94.785	0.815	3.232
1992	33.062	92.754	1.346	4.523
1993	29.492	91.126	1.651	3.631
1994	30.388	85.228	1.411	1.954
1995	32.029	84.965	1.222	2.705
1996	41.409	84.820	1.691	2.874
1997	38.878	81.145	1.657	3.625
1998	37.235	79.692	1.130	2.685
1999	35.158	78.329	2.198	2.964
2000	30.123	74.934	2.040	3.189
2001	26.789	75.807	2.615	4.319

Source: ISSER State of the Ghanaian Economy, various issues.

TABLE 13
Trends in pineapple export volumes, 1980-2001

Year	Export volumes (tonnes)	Average annual growth rate in export volumes
1980-1983	0.148	4 705
1984-1986	1.705	79.74
1987-1991	7.421	33.57
1992-1998	18.328	14.11
1999-2001	28.961	16.99

Source: Ghana Exports Promotion Council.

exports. The declining trend in the world price for cocoa partly explains this. From approximately 224 cents per kg 1985, cocoa prices on the world market declined to about 110 cents in 1994. They rose to 167 cents in 1999, and declined to 108 cents in 2001 (IMF, 2001).

Pineapple export volumes have increased markedly since the start of the reforms. Export volumes increased more than four-fold in 1983, thus explaining the extremely large average growth rate for the period 1980-1983. The area under the production of pineapples is estimated to have more than quadrupled between 1985 and 2000. Yields per hectare have increased by about one and half times over the same period due to increased plant population per hectare and the increased use of yield enhancing inputs. The growth in the volume and value of pineapple exports has far exceeded the growth rates of cereals and starchy staples (Table 13).

The decline in cocoa production was reversed after the implementation of the economic reforms (Table 14). The sector benefited from a rehabilitation project. The increase in real prices as nominal producer prices were increased created an incentive

TABLE 14
Trends in cocoa production and exports, 1980/81-2000/01

Crop year	Production (tonnes)	Exports (tonnes)	Cocoa export values [1] (million US$)
1980/81	257 974	240 974	
1981/82	224 882	230 780	
1982/83	178 626	162 479	
1983/84	158 956	148 973	268.61
1984/85	174 813	162 122	381.69
1985/86	219 044	193 170	411.99
1986/87	227 764	205 397	503.30
1987/88	188 176	154 585	495.40
1988/89	300 101	281 200	462.00
1989/90	295 051	226 580	407.80
1990/91	293 352	245 210	360.60
1991/92	242 817	254 444	349.00
1992/93	312 123	273 250	302.46
1993/94	254 655	261 074	285.87
1994/95	309 456	256 088	320.22
1995/96	403 824	330 646	389.48
1996/97	322 500	373 808	551.82
1997/98	409 400	229 100	470.03
1998/99	397 700	269 608	620.41
1999/00	436 800	317 134	552.30
2000/01	389 800	296 493	437.05

[1] For the calendar year.
Source : Cocoa Board.

to expand production and reduce smuggling, and real cocoa prices and production figures have tended to move in tandem. Production levels in 2000 have more than doubled over the 1983 level. Cocoa export values declined between 1987 until 1993 and again between 1998 and 2000, largely because of the fall in world prices.

CONSEQUENCES OF REFORM: TARGET VARIABLES

National food security

National level indicators suggest that food security improved with the reforms. However, the upturn of the ratio of food imports to total exports (Table 15) and the slow down in the growth of food production per capita, and of cereal production in particular, beginning in the mid-1990s is suggestive of a deterioration of national level indicators.[12] The value of cereal imports began rising in 1997 and in 2001 accounted for almost half the value of food imports. For the first time in more than 20 years, Ghana, a traditional net food exporter became a net food importer.

Domestic production dominates the supply of maize on the local market. Maize imports are quite small and did not exceed 1 percent of total domestic supply over the period 1995-1999 (Table 16). The price of maize on the world market has declined since 1995. Despite this it does not appear that imports have substituted domestic production.

[12] The average growth in food production per capita fell from 4.4 percent during the period 1992-1998 to 2.6 percent in the period 1999-2001.

TABLE 15
Macro level indicators of food security, 1980-2001

Year	Food and live animals imports (thousand US$)	Food and animals exports (thousand US$)	Food trade balance (thousand US$)	Food imports as percentage of total imports	Food imports as percentage of total exports	Cereal imports (million US$)	Cereal exports (million US$)
1980	100 660	743 040	642 380	11	9	56.982	
1981	82 989	435 411	352 422	9	12	50.620	
1982	91 692	421 388	329 696	16	15	42.940	
1983	74 369	268 527	194 158	15	16	46.340	
1984	73 621	382 344	308 723	14	13	40.600	
1985	57 469	395 427	337 958	9	9	29.050	
1986	53 509	499 769	446 260	7	7	27.343	
1987	85 623	533 782	448 159	9	10	38.600	
1988	103 702	476 294	372 592	10	12	51.500	
1989	108 697	420 834	312 137	11	13	53.230	
1990	153 332	405 598	252 266	13	17	68.200	
1991	201 669	361 043	159 374	15	20	85.430	
1992	229 417	309 423	80 006	16	23	90.080	
1993	162 992	290 967	127 975	9	15	67.19	
1994	188 969	332 804	143 835	12	15	92.765	
1995	179 814	373 570	193 756	11	13	56.280	
1996	165 387	755 811	590 424	9	11	67.577	5.974
1997	178 144	498 135	319 991	81	12	54.587	1.167
1998	252 688	556 191	303 503	9	12	81.650	2.695
1999	274 061	505 784	231 723	8	14	76.676	2.366
2000	254 878	515 970	261 092	9	13	98.654	0.443
2001	330 857	278 654	-52 203		18	162.303	0.448

Source : FAOSTAT.

The picture is quite different for rice. Domestic rice production did not keep up with demand over the period 1995-1999. Rice imports constitute a significant share of the supply of rice on the local market. In 1995 commercial rice imports made up approximately 42 percent of domestic supply. In 1998 this proportion had risen to 67 percent. Food aid import volumes dropped quite sharply after 1995, with volumes staying fairly stable thereafter. In the case of rice, therefore, developments in the world market will have implications for domestic food security. The price of rice on the world market has fallen since 1995. This means that if there is to be lower dependence on foreign production for the domestic supply of rice, measures have to be implemented at home to improve upon the rice farmer's ability to compete with imports.[13]

The capacity to import food to meet domestic food requirements can be measured by the share of food imports in the total value of merchandise exports and by the share of food imports in total imports. The period after the removal of quantitative controls in 1989 saw an increase in the share of food imports in total imports. After reaching a peak in 1992, the ratio has since declined. Food imports constituted a

[13] The current domestic policy objective is self-sufficiency in rice production. In the 2003 budget statement an increase in the import duty on rice was proposed as a means to achieving this objective and saving foreign exchange. However by November 2003 it had still not been implemented.

TABLE 16
Production and domestic supply of selected cereals, 1995-1999

	Maize		Rice	
Thousand tonnes:	**1995**	**1999**	**1995**	**1999**
Net production	723.94	710.15	104.45	109.12
Commercial imports	0.89	0.20	104.26	227.78
Food aid imports	3.21	1.12	37.98	3.56
Exports	0.00	5.57	0.00	0.70
Total domestic supply	728.04	705.89	246.69	339.76
Ratio of total domestic supply	**1995**	**1999**	**1995**	**1999**
Net production	0.99	1.01	0.42	0.32
Commercial imports	0.00	0.00	0.42	0.67
Food aid imports	0.00	0.00	0.15	0.01
Exports	0.00	0.01	0.00	0.00
World price ($/ tonne)	104	87	270	240

Source: Production and trade data obtained from the Ministry of Food and Agriculture and the Ghana Statistical Service; price data obtained from IMF, 2001.

declining share of total exports between 1992 and 1996. The downward trend was reversed after 1996, although the ratio remained below the 1992 level. In 1998, total import values increased by 42 percent. This was largely due to the 49 percent increase in cereal imports. The real exchange rate had appreciated by 4 percent in that year and the price of rice on the world market had declined by 40 percent. Thus the expansion in food imports and therefore total imports in that year can be explained by these two factors. World prices of rice and cereals in general remained below their 1997 values until 2000. In 1996 cereals accounted for 40 percent of total food imports, the proportion fell to 32 percent in 1998 and then rose to 49 percent in 2001.

Trends in malnutrition

At the national level there has been a decline in the 1990s in the number of both urban and rural children who are underweight. However, at the administrative level, five regions experienced an increase in the proportion of underweight children. In the Central Region the number of households below the lower poverty line increased in the 1990s and this may explain why the proportion of underweight children increased.

Household level food security

Household level food security needs to be assessed against an understanding of the demographic and poverty context. The population was 18.9 million in 2000 with an average annual inter-census growth rate of 2.8 percent from 1984 to 2000, slightly higher than rates in the two previous decades (Table 18). The Upper West Region is the fastest growing, followed by Greater Accra Region. Annual average population growth was negative for the Upper East Region, possibly because of ethnic conflicts leading to migration to adjacent regions, especially the Upper West Region. The Central, Volta and Eastern regions have also experienced a persistent decline in the proportion of the population over the last 40 years.

The overall incidence of poverty declined in the 1990s from 51.9 percent in 1991/92 to 39.5 percent in 1998/99 (Table 19), but in the Central, Northern and Upper East

TABLE 17
Underweight children, 1993-1998

Region	1993	1998	Percent change 1993-1998
Western	33.1	25.6	-22.7
Central	21.5	26.3	22.3
Greater Accra	16.9	12.2	-27.8
Volta	24.0	24.7	2.9
Eastern	20.6	22.3	8.3
Ashanti	22.6	24.7	9.3
Brong-Ahafo	33.2	24.1	-27.4
Northern	41.3	38.1	-7.7
Upper West	47.6	28.4	-40.3
Upper East	32.8	34.0	3.7
Rural	31.4	27.9	-11.1
Boys	28.8	25.4	-11.8
Girls	25.9	24.3	-6.2
National	27.4	24.9	-9.1

Source: Ghana Statistical Service, 1993 and 1998.

TABLE 18
Population distribution by region, 1960-2000

Region	Population				Percentage distribution			
	1960	1970	1984	2000	1960	1970	1984	2000
All regions	6 726 800	8 559 313	12 205 574	18 912 079	100.0	100.0	100.0	100.0
Western	626 200	770 087	1 116 930	1 924 577	9.3	9.0	9.2	10.2
Central	751400	890 135	1 145 520	1 593 823	11.2	10.4	9.4	8.4
Greater Accra	541900	903 447	1 420 066	2 905 726	8.1	10.6	11.6	15.4
Volta	777300	947 268	1 201 095	1 635 421	11.6	11.1	9.8	8.6
Eastern	1 044 100	1 209 828	1 679 483	2 106 696	15.5	14.1	13.8	11.1
Ashanti	1 109 100	1 481 698	2 089 683	3 612 950	16.5	17.3	17.1	19.1
Brong Ahafo	587 900	766 509	1 179 407	1 815 408	8.7	9.0	9.7	9.6
Northern	531 600	727 618	1 162 645	1 820 806	7.9	8.5	9.5	9.6
Upper East	468 600	542 858	771 584	576 583	7.0	6.3	6.3	3.0
Upper West	288 700	319 865	439 161	920 089	4.3	3.7	3.6	4.9

Source: Ghana Statistical Service, 2002.

regions it increased. The incidence of poverty declined in all ecological zones with the exception of the urban savannah.

Households which cannot meet their minimum nutritional requirements even if their entire consumption expenditure is spent on food are defined as falling below the lower poverty line. With an extreme poverty rate of approximately 27 percent this implies that over one-quarter of the poor is food insecure. The proportion of households in extreme poverty remained the same in the two periods for households in the urban coastal and urban savannah regions and increased in rural savannah. It also increased in the Central, Northern and Upper East regions.

Household income: distribution and changes over time

Household surveys conducted in 1991/92 and 1998/99 show that urban households tend to have higher mean real income levels than rural households (Table 20). However, when households are classified by ecological zone, the distinct urban-

TABLE 19
Incidence of poverty by region and location, 1991/92 and 1998/99

Administrative region	Proportion below the lower poverty line (extreme poverty)		Proportion below the upper poverty line	
	1991/92	1998/99	1991/92	1998/99
Western	0.42	0.14	0.60	0.27
Central	0.24	0.31	0.44	0.48
Greater Accra	0.13	0.02	0.26	0.05
Eastern	0.35	0.30	0.48	0.44
Volta	0.42	0.20	0.57	0.38
Ashanti	0.25	0.16	0.41	0.28
Brong-Ahafo	0.46	0.19	0.65	0.36
Northern	0.54	0.57	0.63	0.70
Upper West	0.74	0.68	0.88	0.84
Upper East	0.53	0.80	0.67	0.88
Ecological Zones				
Urban	0.15	11.6	0.27	0.19
Accra	0.11	0.02	0.23	0.04
Urban Coastal	0.14	0.14	0.28	0.24
Urban Forest	0.12	0.10	0.25	0.18
Urban Savannah	0.27	0.27	0.37	0.43
Rural	0.47	0.34	0.63	0.49
Rural Coastal	0.32	0.28	0.52	0.45
Rural Forest	0.45	0.21	0.61	0.38
Rural Savannah	0.57	0.59	0.73	0.70
National	36.5	26.8	51.7	39.5

Source: Ghana Statistical Service. 2000.

rural divide breaks down. In 1998/99, rural forest households had higher mean real incomes than urban coastal and urban savannah households. Households headed by men had higher mean real incomes than those headed by women. Households headed by non-working adults have the lowest average real income, followed by households headed by food crop farmers.

It would be expected that the incidence of food insecurity amongst male-headed households would be lower than in households headed by women due to differences in the real incomes of the two groups. It would also be expected that households located in Accra would be less food insecure than households located in the rural Savannah.

Households with comparatively high levels of real income did not necessarily grow the fastest over the period. The mean real incomes of rural households grew faster than that of urban households, and mean real incomes of households headed by women grew faster than those headed by men. Classification of households on the basis of the socio-economic status of the household head reveals that those headed by non-working persons grew the fastest, followed by households headed by export farmers and households headed by public sector employees.

The improvement in the mean real incomes of households headed by export crop farmers is to be expected. Although the real exchange rate appreciated between 1995 and 1998, there was a net real exchange rate depreciation during the period 1991/92-1998/99. Real cocoa prices for example increased by 10 percent during the period 1991/92-1998/99. The comparatively low increase in mean real incomes for

TABLE 20
Trends in household real income, 1991/92 and 1998/99[1]

		Mean real income		
		1991/92	1998/99	Percent change
Gender of household head	Male	3 071 948	3 259 713	6.1
	Female	2 170 161	2 354 208	8.5
Sector of employment of household head	Public sector employee	3 908 895	4 602 600	17.7
	Private formal sector employee	4 159 039	4 403 754	5.9
	Private informal sector employee	3 308 995	2 779 164	-16.0
	Export farmer	2 699 629	3 791 284	40.4
	Food crop farmer	2 075 806	2 169 628	4.5
	Non-farm self employment	3 402 077	3 209 280	-5.7
	Non-working	1 028 217	1 708 039	66.1
Location of household	Urban	3 698 861	3 446 233	-6.8
	Rural	2 397 632	2 796 115	16.6
Location by ecological zone[2]	Accra	3 935 522	4 243 397	7.8
	Urban Coastal	3 416 579	3 067 274	-10.2
	Urban Forest	3 967 812	3 504 320	-11.7
	Urban Savannah	3 239 770	2 456 267	-24.2
	Rural Coastal	1 924 253	2 210 871	14.9
	Rural Forest	2 779 092	3 171 764	14.1
	Rural Savannah	2 198 324	2 634 477	19.8
	Mean income for entire sample	2 829 020	3 012 326	6.5

[1] Household income comprises income from employment (cash or kind), agricultural income that includes value of home consumption, non-farm self employment income, income from rent, remittances and other incomes. Other incomes include pensions, social security, interest on savings and dividends on investment.
[2] The definition of ecological zone developed by the Ghana Statistical Services does not identify the transition zone.
Source: Estimated from Ghana Statistical Service, 1995 and 2000.

households headed by food crop farmers could be explained by the fact that for most of the food crops, real average wholesale prices tended to decline during the period. Real prices for maize, rice and cassava declined during most of the period 1991/92 and 1998/99. Thus it is to be expected that over the period households headed by export crop farmers would be more likely to experience an improvement in food security than would those headed by food crop farmers.

Farmers interviewed in the forest zone during the rapid rural appraisal indicated that they had experienced increasing incomes from cocoa and oil palm. In the transitional zone most of the increased income was from tomato production. Farmers in the savannah zone did not indicate that their incomes had increased substantially since the start of the reforms. In all instances they indicated that there was improved access to the market. Traders came to these communities to purchase their items for resale in the larger markets. A major complaint of most of the farmers was that prices offered were low.

Thus the relatively faster growth in real incomes of export crop farmers compared to food crop farmers can be explained partly by macroeconomic and sector policies that resulted in a faster increase in the real prices of export products compared to food crops. An objective of the reforms was to shift to an outward oriented economy with export-led growth. It seems that the incentive structure was sending out the intended signals.

Sources of farm household income and structure of employment

Agriculture is the sector that employs the largest proportion of economically active rural household members (Table 21). There was a decline in the proportion employed in agriculture in the 1990s, in favour of manufacturing and trading. The decline in the proportion of household members employed in agriculture was pronounced amongst rural coastal and forest households (Table 21). In these households there was an increase in the proportion involved in fishing activities. Households headed by export crop farmers registered a larger decline in the proportion of household members employed in agriculture compared to food crop farmers. This may be because this category of households was able to accumulate resources to invest in non-farm businesses. Most of the export crop farmers are to be found in the rural forest zone. Compared to other rural locations, households in the rural forest zone had the largest percentage point increase in non-farm businesses.

Over 80 percent of household members in rural savannah were employed in agriculture in both years, and the decline was smallest here among the tree ecological zones. The proportion of households operating a non-farm business amongst rural savannah households is estimated at 31.6 percent in 1998/99, a decline from 50 percent of households in 1991/92 (Ghana Statistical Service, 1995 and 2000). In that year it is estimated that a greater proportion of rural savannah households had non-farm enterprises compared to rural forest households. In 1998/99 however, rural savannah households had the lowest proportion of non-farm business enterprises. The distribution of employment within rural savannah households suggests that opportunities for employment outside of agriculture are limited compared to other locations.

The decline in the share of household labour employed in agriculture and the decline in real prices of the major agricultural products coincided with a decline in the share of household income originating from agriculture for households headed by food crop farmers. Agriculture income's share of total household income of households headed by export crop farmers on the other hand increased.

The share of income from agriculture decreased for all categories of rural households with the exception of households headed by export crop farmers (Table 22). The mean real value of agricultural income increased by 21 percent for rural households. This contrasts with an increase of 47 percent for households headed by export farmers. Thus the increasing importance of agricultural income among households headed by export crop farmers was because of an increase in the absolute values of real agricultural income. The mean real value of agricultural income amongst households headed by food crop farmers increased by less than 2 percent. The limited growth in real agriculture income of food crop farmers is not unsurprising given the decline in real food crop prices that was registered in the 1990s. Thus, even though production of food crops increased, at the household level, this did not translate into significant increases in real agricultural income because of the decline in real prices.

The trend of the real daily minimum wage has been positive (Table 23). There was a sharp drop in the real value of the minimum wage in 1983 when inflation reached 3 digit numbers. In that year the daily minimum wage of twelve cedis was equivalent to 0.3 kilograms of maize. The increase in the nominal daily minimum wages in subsequent years translated into an increase in real wages so that by 1986 the daily

TABLE 21
Distribution of rural household members by main sector of employment,[1] 1991/92 and 1998/99

	Rural households			Male headed household			Female headed household		
	1991/92	1998/99	% change	1991/92	1998/99	% change	1991/92	1998/99	% change
Agriculture	0.776	0.674	-13.144	0.801	0.695	-13.233	0.694	0.612	-11.816
Fishing	0.007	0.014	100.000	0.009	0.018	100.000	0.000	0.002	0.000
Manufacturing	0.069	0.096	39.130	0.060	0.096	60.000	0.098	0.097	-1.020
Trading	0.087	0.132	51.724	0.067	0.101	50.746	0.156	0.228	46.154
Restaurant/food sellers	0.002	0.003	50.000	0.002	0.002	0.000	0.003	0.007	133.333
Others	0.054	0.081	50.000	0.061	0.088	44.262	0.049	0.054	10.204
	Rural coastal			**Rural forest**			**Rural savannah**		
	1991/92	1998/99	% change	1991/92	1998/99	% change	1991/92	1998/99	% change
Agriculture	0.642	0.524	-18.380	0.787	0.655	-16.773	0.843	0.81	-3.915
Fishing	0.015	0.017	11.842	0.002	0.001	-50.000	0.009	0.031	244.444
Manufacturing	0.105	0.162	54.286	0.067	0.093	38.806	0.05	0.056	12.000
Trading	0.157	0.207	31.847	0.076	0.139	82.895	0.059	0.07	18.644
Restaurant/food sellers	0.001	0.005	400.000	0.003	0.004	33.333	0.001	0.001	0.000
Others	0.080	0.085	6.516	0.065	0.108	66.154	0.038	0.032	-15.789
	Export farmer			**Food crop farmer**					
	1991/92	1998/99	% change	1991/92	1998/99	% change			
Agriculture	0.978	0.911	-6.851	0.973	0.945	-2.878			
Fishing	0.000	0.000	0.000	0.000	0.000	0.000			
Manufacturing	0.007	0.017	142.857	0.015	0.017	12.583			
Trading	0.009	0.040	344.444	0.007	0.028	300.000			
Restaurant/food sellers	0.001	0.001	0.000	0.000	0.001	0.000			
Others	0.005	0.031	520.000	0.005	0.009	83.673			

[1] The employment classifications are based on the international standard classification of occupations.
Source: Calculated from Ghana Statistical Service, 1995 and 2000.

minimum wage could purchase 1.9 kilograms of maize. The next substantial increase in the real value of the daily minimum wage occurred in 1992, when prior to the first democratically held national elections in almost two decades, nominal wage increases were offered to labour. By 2000, the quantity of maize that the daily minimum wage could buy was about 17 times the 1983 quantities.

Almost all farm households utilize family labour. Many use hired labour during the peak farming season (land preparation, weeding and harvesting). During the rapid rural appraisal, many of the farmers complained about the lack of labour during the peak season. This can be explained by migration into the urban areas. Thus, coupled with the real increase in input prices the real cost of production would appear to have increased since the start of the reform.

Household expenditures: distribution and changes over time

The patterns of real household expenditure tend to follow closely the pattern of real household income (Table 24). Mean real household expenditure is higher for households headed by men and for urban households. However, real household expenditure per capita is higher for households headed by women than for those headed by men. Also, in 1998/99, expenditure in rural forest locations was higher on average compared to urban savannah for the whole household and per capita. Central, Upper East and Northern administrative regions registered declines in both

TABLE 22
Distribution of real income of rural households, 1991/92 and 1998/99 (percent)

	Male headed households			Female headed households		
	1991/92	1998/99	% change	1991/92	1998/99	% change
Wage employment income	8.5	8.6	1.2	3.4	3.2	-4.1
Imputed rental income	5.8	5.4	-5.5	2.5	4.5	83.8
Remittance income	2.9	8.6	200.2	13.2	16.2	22.5
Other income	1.1	1.8	61.8	0.7	0.8	7.7
Agriculture	65.3	55.9	-14.5	56.1	54.4	-3.1
Non-farm self employment	16.5	19.7	19.9	23.8	20.9	-12.3
Total	100.0	100.0		99.7	100.0	
	Export farmer			Food crop farmer		
	1991/92	1998/99	% change	1991/92	1998/99	% change
Wage employment income	1.1	1.5	44.8	1.3	0.9	-28.5
Imputed rental income	3.6	2.7	-25.3	6.7	7.3	8.7
Remittance income	5.4	4.0	-25.4	5.5	13.6	148.0
Other income	1.6	1.6	-1.6	0.6	1.7	182.9
Agriculture	76.2	81.1	6.3	73.4	63.5	-13.5
Non-farm self employment	12.1	9.1	-24.7	12.6	13.1	4.0
Total	100.0	100.0		100.0	100.0	

	Coastal			Forest			Savannah		
	1991/92	1998/99	% change	1991/92	1998/99	% change	1991/92	1998/99	% change
Wage employment income	9.9	9.8	-1.2	8.3	9.6	15.5	5.1	2.9	-43.5
Imputed rental income	3.4	7.7	130.4	2.1	3.2	55.6	9.9	6.7	-31.7
Remittance income	6.8	10.9	60.9	6.3	10.6	67.6	2.5	9.4	281.1
Other income	1.7	1.3	-22.1	1.2	1.3	6.3	0.4	2.0	397.6
Agriculture	50.0	40.3	-19.4	65.2	55.3	-15.1	67.9	64.5	-5.0
Non-farm self employment	28.3	29.9	5.9	16.9	20.0	18.3	14.2	14.4	1.2
Total	100.0	100.0		100.0	100.0		100.0	100.0	

Source: Estimated by the authors using the third and fourth household surveys.

TABLE 23
Trends in the nominal and real daily minimum wage, 1979-2000

Year	Daily minimum wage	Retail price of maize per kg	No. of kg maize daily wage can buy
1979	4.00	1.67	2.00
1980	4.00	4.14	0.90
1981	5.33	7.74	0.70
1982	12.00	7.97	1.50
1983	12.00	38.58	0.30
1984	21.75	23.38	0.90
1985	33.96	20.38	1.60
1986	65.36	33.11	1.90
1987	90.00	53.87	1.70
1988	112.50	68.59	1.60
1989	146.00	54.21	2.70
1990	170.00	86.33	1.90
1991	218.00	100.48	2.10
1992	460.00	110.72	4.10
1993	460.00	138.63	3.30
1994	790.00	247.08	3.20
1995	1 200.00	328.14	3.60
1996	1 700.00	643.26	2.60
1997	2 200.00	593.09	3.70
1998	2 200.00	451.53	4.90
1999	2 700.00	451.53	5.90
2000	4 200.00	936.63	5.20

Source: Data obtained from Ministry of Employment and Social Welfare.

mean household expenditure and mean household expenditure per person between the two periods.

Mean real household expenditure and household expenditure per person increased for all categories of households with the exception of urban savannah households that registered an absolute decline.[14] This contrasts with trends in real urban household incomes which with the exception of Accra declined between the two periods.

Households headed by export crop farmers recorded a larger increase in mean real household expenditure per person compared to households headed by food crop farmers. Rural forest households recorded the highest percentage change in mean real household expenditure per person.

It is expected therefore that the incidence of and improvement in food security will be higher amongst households headed by export crop farmers, households located in the rural forest zone, households headed by persons employed in the private formal sector, and the more commercialized households (as measured by the share of output that is sold).

Using food consumption per adult-equivalent[15] as the measure, access to food improved on average for all categories of household (Table 25). The average urban household experienced a larger increase than did the average rural household. Rural forest households tended to do better than the national average, in contrast to rural savannah and coastal households. In three administrative regions, mean real food expenditure per adult equivalent was lower in 1998/99 compared to 1991/92. In the Upper East Region, there was an almost 50 percent fall. Rural households headed by women had a higher mean real expenditure on food per adult equivalent than did male households in the two periods. Women generally give priority to provision of household food before any other expenditure items. The percentage increases for households headed by export farmers were about double those of food crop farmers.

Cereals make up on average about 15 percent of the household food budget. However in some parts of the country the dependence on cereals is much higher than the national average. In the rural savannah zone, cereals comprise 20 percent of the food budget share.

Proportion of households with insufficient food consumption

Households falling below the lower poverty line cannot meet their minimum nutritional needs, even if their entire consumption expenditure is used to purchase food. If the lower poverty line of GHC700 000 is kept fixed in constant prices across the two periods, it is not surprising that the proportion of households with total consumption expenditure below nutritional food requirements declines, given the increase in real spending on food for the average household (Table 26). However this decline did not occur evenly across the different groups that are the focus of this study.

Most of the improvement in food sufficiency amongst urban households must

[14] Expenditure per person increased faster than did household expenditure, because the average household size declined between the two periods.

[15] Food expenditure is measured as the sum of spending on food and the imputed value of consumption of home production. The adult equivalent measure takes into account the gender and age composition of the household.

TABLE 24
Household real expenditure and real expenditure per person in cedis, 1991/92 and 1998/99

	Mean household real expenditure	Mean household real expenditure	Percent change in real house-hold expenditure	Mean real household expenditure per capita	Mean household real expenditure per capita	Percent change in real household expenditure per capita
	1991/92	1998/99		1991/92	1998/99	
Entire sample	4 553 171	5 484 535	20.5	847 007.4	1 099 914.0	29.9
Gender household head						
Male	4 762 835	5 713 660	20.0	824 587.7	1 079 151.0	30.9
Female	3 984 527	4 875 002	22.3	907 813.3	1 155 149.0	27.2
Gender of rural household head						
Male	3 855 237	4 855 913	26.0	655 855.9	866 795.1	32.2
Female	3 181 080	4 000 100	25.7	724 317.8	925 732.7	27.8
Socio-economic groupings						
Public sector employee	6 173 000	7 665 045	24.2	1 130 561.0	1 404 807.0	24.3
Private formal sector employee	5 609 461	7 924 751	41.3	1 179 680.0	1 842 174.0	56.2
Private informal sector employee	4 963 285	4 969 011	0.1	1 067 011.0	1 307 843.0	22.6
Export farmer	3 868 577	5 504 244	42.3	659 239.7	975 132.7	47.9
Food crop farmer	3 556 311	3 884 681	9.2	621 318.5	737 829.3	18.8
Non-farm self employment	5 329 434	6 295 080	18.1	998 451.1	1 267 147.0	26.9
Non-working.	4 010 482	5 682 035	41.7	1 355 291.0	1 901 524.0	40.3
Location						
Urban	6 280 635	7 170 758	14.2	1 199 927.0	1 538 509.0	28.2
Rural	3 696 454	4 644 312	25.6	671 980.6	881 367.5	31.2
Location by ecological zone						
Accra	6 301 991	8 781 325	39.3	1 416 360.0	1 944 957.0	37.3
Urban coastal	5 201 363	6 757 150	29.9	1 088 985.0	1 389 358.0	27.6
Urban forest	6 913 771	7 122 082	3.0	1 220 381.0	1 579 021.0	29.4
Urban savannah	6 698 241	5 002 264	-25.3	1 005 445.0	935 258.4	-7.0
Rural coastal	3 793 901	4 479 840	18.1	800 147.7	950 219.9	18.8
Rural forest	3 610 299	5 205 255	44.2	697 539.7	1 012 773.0	45.2
Rural savannah	3 747 275	3 902 142	4.1	560 595.9	631 707.3	12.7
Percent of output sold						
Sells > 20% of output	4 014 180	4 686 845	16.8	666 505.7	843 113.1	26.5
Sells 20-50% of output	3 490 138	4 505 275	29.1	621 263.8	768 091.2	23.6
Sells < 50% output	3 298 432	4 370 501	32.5	611 861.2	808 594.1	32.2

Source: Calculated from Ghana Statistical Service, 1995 and 2000.

have occurred in Accra, the capital city, where the proportion of households unable to meet minimum nutritional requirements fell by more than 80 percent. A lower proportion of rural households headed by women are unable to meet minimum nutritional requirements than is the case for male-headed households. The proportion of households that had consumption expenditure levels below GHC700 000 increased for the group that sold more than half of its output. Food expenditure levels among this category of households are lower than the rural average.

The proportion of households not able to meet minimum nutritional requirements increased in the Central, Northern and Upper East regions. The last two regions are located in the savannah zone whilst the Central region is located in the coastal zone.

TABLE 25
Food expenditure amongst rural households, 1991/92 and 1998/99

Food expenditure	1991/92		1998/99		
	Share of food in total household expenditure	Mean real food expenditure per adult equivalent	Share of food in total household expenditure	Mean real food expenditure per adult equivalent	Percent change in real food expenditure
Entire sample	**59.8**	**659 764.3**	**59.0**	**824 312.0**	**24.9**
Location					
Urban	51.9	716 108.6	53.0	965 586.4	34.8
Rural	63.7	631 875.0	61.9	753 916.7	19.3
Rural Coastal	62.2	697 920.5	60.4	761 501.8	9.1
Rural Forest	60.3	610 365.8	60.1	820 004.9	34.3
Rural savannah	68.9	618 984.5	65.6	647 444.0	4.6
Administrative region					
Western	60.6	597 113.2	57.8	870 320.0	45.8
Central	62.6	762 049.1	60.3	713 314.8	-6.4
Greater Accra	48.5	746 405.3	49.9	1148 840.0	53.9
Volta	61.3	687 239.1	59.0	739 509.5	7.6
Eastern	61.2	657 149.8	60.4	783 403.2	19.2
Ashanti	54.4	687 634.2	56.1	975 993.6	41.9
Brong-Ahafo	58.2	535 057.7	62.2	889 471.3	66.2
Northern	58.2	591 698.3	64.6	648 436.9	9.6
Upper West	67.7	475 828.5	68.8	433 601.1	-8.9
Upper East	77.1	740 743.6	63.4	392 347.9	-47.0
Gender household head					
Male head of rural household	63.8	606 258.0	61.9	733 009.4	20.9
Female head of rural household	63.3	715 037.8	62.1	817 568.7	14.3
Socio-economic group					
Export Farmer	62.1	613 835.4	62.3	823 890.7	34.2
Food crop farmer	66.8	582 676.4	65.3	686 979.5	17.9
Rate of commercialization in farming rural household					
Less than 20 percent sold	67.1	666 744.8	64.3	772 698.3	15.9
Between 20-50 percent sold	64.9	607 004.6	64.8	716 176.5	18.0
More than 50 percent sold	60.8	541 688.5	60.4	676 046.7	24.8

Source: Calculated from Ghana Statistical Service, 1995 and 2000.

Real household expenditure is very low in the Upper East region (ranking ninth in descending order) and this may explain the increase in the proportion of underweight in the region (Table 17). The increase in the proportion of underweight children in Ashanti, Volta and Eastern regions cannot be explained by low or declining real incomes or expenditures. Ashanti region, for example, recorded the fourth highest increase in household expenditure per capita of about 40 percent and ranked third in terms of real household expenditure per capita. The increase in the proportion of underweight children in these regions may be explained by household decisions concerning the type of food that is eaten and intra-household food allocations.

The households headed by export farmers recorded a significantly larger drop in the proportion with consumption expenditures below the lower poverty line than those of food crop farmers. There was an increase in the proportion of rural savannah households that could not meet minimum nutritional requirements.

During the rapid rural appraisal, participants commented that there was more food available now compared to the early 1980s and that their food consumption had

TABLE 26
Proportion of households not able to meet minimum nutritional requirements 1991/92 and 1998/99

	1991/92	1998/99	Percent change
Entire sample	**36.5**	**26.8**	**-26.5**
Location			
Urban	15.1	11.6	-23.1
Accra	11.3	1.7	-85.0
Urban Coastal	14.2	14.3	0.7
Urban Forest	12.9	10.9	-15.5
Urban Savannah	27.0	27.1	0.4
Rural	47.2	34.5	-26.9
Rural Coastal	32.8	28.2	-14.0
Rural Forest	45.9	21.1	-54.1
Rural Savannah	57.5	59.3	3.1
Administrative region			
Western	42.0	13.6	-67.6
Central	24.1	31.5	30.7
Greater Accra	13.4	2.4	-82.1
Eastern	34.8	30.4	-12.6
Volta	42.1	20.4	-51.5
Ashanti	25.5	16.4	-35.7
Brong-Ahafo	45.9	18.8	-59.0
Northern	54.1	57.4	6.1
Upper West	74.3	68.3	-8.1
Upper East	53.5	79.6	48.8
Gender			
Male head of rural household	49.2	35.7	-27.5
Female head of rural household	40.5	30.7	-24.1
Socio-economic group			
Export farmer	49.6	19.4	-60.9
Food crop farmer	51.8	45.0	-13.1
Rate of commercialization in farming rural household			
Less than 20% sold	45.4	37.2	-18.0
Between 20-50% sold	50.6	39.9	-21.2
More than 50% sold	18.3	27.3	49.3

Source: Calculated from Ghana Statistical Service, 1995 and 2000.

increased since the start of the reforms. Food consumption had increased because of improving yields. With increasing income they were able to purchase more food from the market. In the two communities located in the forest and transition zones there had been an increase in agroprocessing in the 1990s and this has contributed to increasing incomes for the farmers.

POLICY LESSONS

The initial emphasis of reform was on stabilization and the reforms have been criticized by some observers for not focusing enough on the agricultural sector, especially in the early years (Donovan, 1996). This review has shown that most, if not all, of the sectoral measures prior to 1990 involved the removal of state support to the sector; for example, the removal of input subsidies and the failure to sustain

real government spending in the sector. Because of the critical role it plays in external trade and government finances, the cocoa sector was an exception to the early lack of focus on the agricultural sector. The World Bank pushed for liberalization of the cocoa sector, but the Government had concerns about the weakness of the financial system and road infrastructure in most of the cocoa growing areas; partial reform of the sector occurred in the early phases of the economy's transformation.

Although the real exchange rate depreciated during the post-reform period, there were periods during which it appreciated. Thus, encouragement of the tradable goods sector through the exchange rate was not consistent. However, the exchange rate measures have been important in explaining cocoa production and the export of non-tradable goods. Without depreciation of the real exchange rate, real wholesale prices of maize and rice would have been lower than they actually were. The contribution of the real exchange rate to real product prices since 1983 has tended to be positive. The cocoa sector, in particular, benefited from the depreciation of the real exchange rate. However, trade liberalization and other policy measures counteracted the positive impact that the depreciating real exchange rate could have had on real wholesale food prices.

Not only did trade liberalization fail to improve price incentives for food crop farmers, but neither did the agriculture-specific reforms. These tended to be accompanied by an increase in the input/output price ratio, reduced access to inputs in some localities because of privatization of input distribution, and reduced central government funding of the sector. Indeed, the cost of labour and inputs (fertilizers) tended to rise faster than food crop prices. Thus, as the ratio of input to output prices increased, it was unlikely that farmers would increase production using methods that were intensive in the use of these inputs.

Food production has increased since 1983, when the economic reform programme began despite the decline in real wholesale prices. This suggests that even though price incentives are important for increasing food production they are not sufficient. The expansion in food production occurred largely through an expansion of the area cultivated, with marginal changes in yields for most crops. The manner in which food production was increased is not unexpected given the nature of the reforms that took place.

Nominal food prices were relatively stable after 1993 compared to the previous years. The advantage of this relative price stability is that it facilitates planning and reduces uncertainty. However, the continued existence of seasonal variation in food prices suggests that households that do not have stores of food or access to non-farm sources of income will experience a decline in food consumption during the lean season when food prices are rising.

The expected private sector response to the measures that were implemented did not materialize. It was expected that about 40 percent of cocoa purchasing would be carried out by the private sector, but it took about a decade to reach this target. Involvement of the private sector required fairly significant up-front investments and the high prevailing bank rates made borrowing to invest in the cocoa trade or input marketing unattractive. Uncertainty about the future actions of donors in the provision of subsidized inputs as part of an international aid project also explains the reluctance to invest in the input distribution trade. Also, some issues have been so complex that, against the backdrop of changing world market conditions, it has not

been easy to arrive at the appropriate policy and revisions have been inescapable, as the example of cotton pricing shows.

The reform period has been associated with an improvement in national level food security indicators. However, the developments in the second half of the 1990s suggest a reversal of this trend. Household level indicators also registered an improvement but did not occur evenly across different groups.

Households headed by export crop farmers registered significant improvements in food security, thanks to the positive impact that the depreciating exchange rate had on the prices of export crops, especially cocoa. In contrast, real prices of most food crops declined during most of the period of reform. For those households that were net sellers of food crops, the relatively slower growth in real incomes and improvement in food security indicators may be attributed to this.

The findings suggest that measures need to be implemented to maintain the incentives for food crop production. The increase in the real cost of production highlights how critical it is that agricultural productivity also increase if real prices facing farmers are on the decline. Productivity in the food crop sector is quite low. Significant constraints to the adoption of improved technologies are the shortage of locally improved seeds, planting materials and other inputs.

Agricultural research spending increased as a share of GDP during the 1980s, that is, relatively early in the reform experience, but research and extension have had limited success. Farmers need to obtain assistance in the form of extension advice, for example, to reduce their costs of production in the context of declining real output prices. A project aimed at improving the research-extension-farmer linkage was funded by external donor support from 1995-99, but the end of this external funding has impeded sustaining the project.

Efforts to improve the competitiveness of markets can cause problems if the process is not well designed. The private sector has not responded to the withdrawal of state distribution and marketing services in the less well-connected areas.

The reforms have been accompanied by some expansion in the feeder road network, although much remains to be done. Ghana has been described as a "footpath economy" where the poor transportation network is a constraint on agriculture production. Some improvements in infrastructure have occurred, but the actual annual achievement of rehabilitating 212 to 1 080 km fall well short of the target of rehabilitating 1 200 to 2 000 km per annum. Market access has improved for those communities where the road network has been upgraded; it was confirmed in the rapid rural appraisal that traders came from distant parts of the country and the West African sub-region to purchase produce. The certainty of buyers for their produce has been an incentive for farmers to increase production.

Opportunities for non-farm employment have increased as real incomes have increased: a rise in real incomes not only brings with it an increase in the demand for non-food items but it also provides a pool of resources for investment in non-farm activities. The expansion in the rural road network, rural electrification and portable water supply are important for the development of non-farm activities and agroprocessing. This study has found that the expansion in non-farm businesses has been more rapid in the rural forest zones compared to the rural savannah.

Opportunities for non-farm employment need to be enhanced for rural households, especially those in the rural savannah. This is important to provide income to

households during the lean season. More investigation needs to be conducted into the reasons for the reported decline in the proportion of non-farm enterprises in these households. The northern sector (savannah zone) of the country where the incidence of food insecurity is highest has only one farming season. Food security would be enhanced with the establishment of irrigation schemes, dug out wells and water management systems that make possible a second farming season in this part of the country.

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ANNEX

The manufacture price index was proxied by the price of clothing and footwear. The econometric relationship that was estimated is based on the derivation in Fosu (1992):

$$Ln(Pc/Pm) = f(lnRER, ln (1- TAX), DUM, e)$$

Where Pc is the producer price of cocoa, Pm is the price of clothing and footwear, RER is the real exchange rate, TAX is the cocoa export tax rate, DUM is a dummy variable introduced to capture the economic reforms. It takes a value of 1 for years after 1983.

The findings of the estimated dynamic equation are summarized below. The coefficients are all statistically significant at the 1 percent level with the expected signs, except the first lag of Δ^2Ln(RER) which is insignificant even though it has the appropriate sign. The adjusted R-squared indicates that about 40 percent of the variations in $Ln(P_c/P_m)$ can be explained by joint variations in the independent variables contained in the model.

Modelling $Ln(P_c/P_m)$ **Sample : 1973 –1997**

Variable	Coefficient	S. E.	H.C.S.E.	t –value	t –prob	Beta– coefficient
Constant	5.8987	0.7618	1.198	7.743	0.0000	N/A
$Ln(1-Tax)_t$	1.0064	0.3354	0.4975	3.000	0.0077	0.5204
$\Delta^2Ln(RER)_t$	1.0650	0.3174	0.39	3.355	0.0035	0.6764
DUM	1.1181	0.3761	0.4819	2.973	0.0082	0.9741
$Ln(P_{cc}/P_n)_{t-1}$	-0.7831	0.2121	0.2707	-3.692	0.0017	0.7793
$\Delta^2Ln(RER)_{t-1}$	0.2270	0.2635	0.2063	0.862	0.4002	N/A
Trend	-0.0888	0.0260	0.0425	-3.412	0.0031	-1.1388

R^2=0.5608 F(6,18)=3.8305[0.0123] σ=0.4392
R^2–adjusted=0.4144 RSS=3.4723 DW=1.9

Guatemala

Pablo Rodas-Martini, Luis Gerardo Cifuentas and Juan Pablo Pira[1]

EXECUTIVE SUMMARY

Pre-reform
The degree of intervention and support in the agriculture sector has always been modest. The institutional structure that was in effect during the 1980s and a good part of the 1990s had been in place since the beginning of the 1970s.

The reforms
With the return to democracy in January 1986, a process of economic reform was started in the country, marked by structural adjustment, liberalization of the economy and, to a lesser extent, institutional reform.

The principal macroeconomic measure adopted was the devaluation of the quetzal. In addition, high tariffs were reduced, as were price controls, particularly ceiling prices on basic commodities. Tariff contingents began to be used following Guatemala's accession to GATT.

Direct support to the agricultural sector, which was already minimal, was reduced under the reforms and marketing boards were abolished.

Impact on intermediate variables
For almost all commodities there was an appreciable domestic price reduction, explained mainly by the fall in international prices. The depreciation in the rate of exchange positively affected domestic prices but this impact was counteracted by the fall in international prices and changes in other policies, which also tended to exert a negative effect on domestic prices. Despite the reforms, domestic markets remain partially isolated from international markets.

Maize production and the area allocated to production have fallen, explaining in part the strong growth in imports. The area allocated to wheat cultivation has also plummeted in recent years. Production and area cultivated of beans are also lower than those existing at the beginning of the 1990s. Imports have generally been higher than exports.

Coffee production has grown continuously during the period. An increase in the production of sugar has been even more marked, in particular throughout the 1990s, reaching its maximum value in 1997. The production of bananas was stagnant up to 1993 and the area under cultivation today is much lower than in the 1980s. However,

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the growth of non-traditional crops – vegetables, fruit and flowers – is helping to reduce the country's excessive dependence on a few products, such as coffee or sugar.

Impact on target variables

The food security situation improved during the 1980s, but worsened in the 1990s. Nevertheless, malnutrition of children declined throughout the period studied.

Agricultural wages dropped sharply in the mid-1980s. By 1995, wages, and possibly income as well, had risen to the levels of the early 1980s**.** Even though the income in rural farm households increased in 1991, the differences between these households and other households have increased greatly. Women are less dependent on wages and sales and more on remittances and other transfers, while men have maintained the same income structure as in previous years.

Some changes in the pattern of food expenditure are observed with an increase in the proportions spent meat and poultry, and on health and education.

Policy lessons

The country no longer depends on the success or failure of one or two products for its foreign exchange earnings. A more diversified commodity base has provided greater stability in the receipt of foreign resources, resulting in less volatile aggregate revenue. Many small farmers in the western highlands and other parts of the country, as well as medium size-farmers, are switching from the traditional cultivation of grains, such as maize, to new export crops. Nevertheless, the rural food security status has worsened, and in some specific cases there have been famines. This is largely due to the fall in coffee prices and the unequal distribution of the benefits from the growth in non-traditional crops and the growth in non-agricultural activities, particularly in the interior of the country.

INTRODUCTION: CONTEXT AND NATURE OF THE REFORMS

The role and level of development of the agriculture sector

In spite of rising production, agriculture's contribution to GDP has declined from almost 26 percent in 1989-91, to 23 percent in 2000 (Table 1). This is explained by growth in the service sector rather than in the industrial sector, which makes a lower contribution than agriculture.

Guatemala continues to have a large rural population. In the past 20 years, its proportion of the population has fallen by only 3 percent: in 2000 it was still 60 percent of the total population. Rural employment was 57 percent of the total in the same year, having fallen slightly from 59 percent at the beginning of the 1980s. Rural employment is mostly male, although female participation has increased from 7 percent in 1980 to 17 percent in 2000.

Agricultural wages have been lower than wages in the rest of the economy. The trends, however, have been similar: a fall from the beginning of the 1980s to 1990 (the year in which inflation reached 60 percent) followed by a recovery to date. In real terms, present wages hardly recovered their lost value, standing in 2000 at a level similar to that that which existed between 1982 and 1983.

TABLE 1
Agricultural indicators, 1980-2001

	1980-82	1983-85	1986-88	1989-91	1992-94	1995-97	1998-00	2001
Structure of GDP								
Agriculture (percent of GDP)	25.0	25.6	25.8	25.8	24.9	24.0	23.1	22.6
Industry (percent of GDP)	21.7	20.0	20.0	19.8	19.9	19.8	20.0	19.7
Services (percent of GDP)	53.4	54.4	54.1	54.4	55.3	56.2	56.9	57.7
Population								
Total population (millions)	7.0	7.5	8.1	8.8	9.5	10.2	11.1	-
Rural population (millions)	4.4	4.7	5.1	5.4	5.8	6.2	6.6	-
Rural (percent total population)	62.5	62.4	62.2	62.0	61.5	60.8	59.9	-
Economically active population (EAP)								
EAP rural/EAP total	59.2	59.0	58.6	58.3	57.9	57.5	57.0	-
EAP rural women/EAP rural total	7.8	9.2	11.0	12.6	14.1	15.6	17.0	-

Sources: World Bank and Economic Commission for Latin America and the Caribbean (ECLAC).

TABLE 2
Production of principal basic grains by size of farm, 1996

	Farms (percent)	Area harvested (percent)	Production in grain (percent)	Yield (quintals per M)
White maize				
Less than 10 M	90.2	61.1	55.8	23.3
From 10-64 M	5.8	13.9	13.9	25.5
More than 64 M	4.1	25.0	30.4	31.0
Yellow maize				
Less than 10 M	97.5	86.5	84.5	21.1
From 10-64 M	2.0	8.4	8.2	21.1
More than 64 M	0.5	5.1	7.3	30.9
Black beans				
Less than 10 M	86.6	66.3	53.5	6.5
From 10-64 M	9.0	15.6	18.6	9.7
More than 64 M	4.4	18.2	27.8	12.4

Note: M (manzana) = 1.7 acres.
Source: Agricultural Survey 1996, Ministry of Agriculture, Guatemala.

In relation to foreign trade, the country has traditionally produced a surplus in the agricultural sector. In the last six years, this has ranged between US$800 and US$1 000 million, which contrasts with the permanent, and growing, deficit in the total balance of trade.

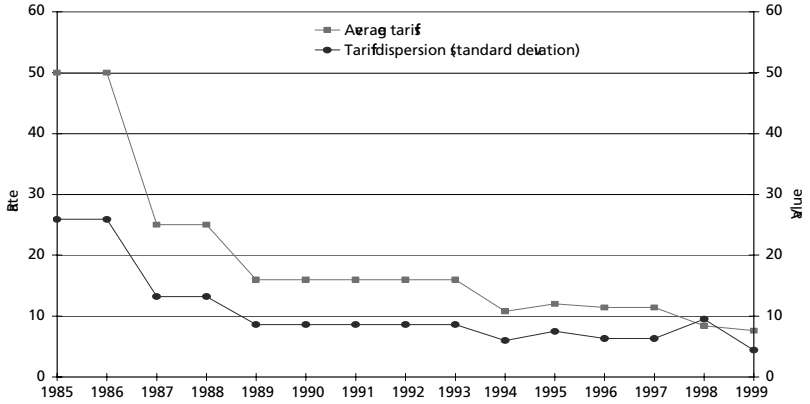
Guatemala is, however, no longer dependent on the export of two or three traditional products or on exports to the Central American market. Three key developments have been the increased export of clothing, which has become the principal export to the United States; family remittances from migrants, which are the principal source of foreign exchange; and tourism, thanks to Guatemala's archaeological sites and geographic closeness to the markets of North America. There has also been a recovery of intraregional trade.

Agriculture is dominated by small scale producers, as depicted in Table 2.

Degree of openness of the economy prior to the reforms

Prior to the reforms, the Government sought to control the price of basic commodities. However interventions were not always successful and led to parallel

FIGURE 1
Average tariffs and tariff dispersion, 1985-1999



Source: Inter-American Development Bank (IADB).

TABLE 3
Main economic indicators, 1980-2001

	1980-82	1983-85	1986-88	1989-91	1992-94	1995-97	1998-00	2001
Exchange rate (GTQ/US$)	1.0	1.0	2.3	4.1	5.5	6.0	7.2	7.9
Max. commercial bank:								
lending rate (percent)	12.5	12.0	14.1	24.5	22.4	20.8	19.0	19.0
Inflation rate (percent)	4.0	8.7	20.1	28.5	10.9	9.6	5.9	7.6
Exports (US$ million FOB)	1 327.2	1 094.5	1 031.7	1 189.2	1 399.0	2 332.4	2 904.2	2 864.6
Imports (US$ million FOB)	-1 432.3	-1 105.0	-1 207.4	-1 528.5	-2 419.5	-3 151.9	-4 407.8	-5 142.1
Trade balance (US$ million)	-105.1	-10.4	-175.7	-339.3	-1 020.5	-819.4	-1 503.6	-2 277.5
Current account (US$ million)	-378.4	-282.5	-291.4	-261.2	-677.6	-552.3	-1 038.2	-1 237.9
Deficit as percent of GDP[a]	-5.3	-2.0	-1.3	-1.3	-0.7	-0.9	-2.3	-1.9
GDP growth (percent)	-1.0	-0.9	2.5	3.6	4.3	4.1	4.1	2.3
Population (millions)	7.1	7.7	8.4	8.9	9.5	10.2	11.1	11.7

[a] Not including 1984.
Source: Average based on International Financial Statistics, 2002, IMF, Washington, DC.

TABLE 4
Growth rates of main economic indicators, 1980-2001 (percent per annum)

	1980-83	1983-86	1986-89	1989-92	1992-95	1995-98	1998-01
Exchange rate	0.0	20.8	13.5	21.4	3.8	2.9	6.9
Consumer prices	4.8	18.8	11.5	27.9	10.4	9.1	6.1
Exports FOB	-10.3	-2.0	3.3	4.2	18.4	10.3	1.2
Imports FOB	-11.1	-6.3	17.8	16.3	9.0	13.0	7.1
GDP at 1958 prices	-2.0	-0.1	3.8	3.8	4.3	4.1	3.3
Population	2.8	2.9	3.0	1.2	2.7	2.7	2.7

Source: Own estimations based on International Financial Statistics, 2002, IMF, Washington, DC.

markets. Policies were generally unsupportive of agricultural producers, and trade and exchange rate policies were biased against the production of exports and other tradable commodities.

The National Agricultural Marketing Institute (INDECA) was responsible for buying, selling, transporting and storing farm products and for importing grain. The Wheat Imports Regulation Office (ORIT) and the National Association of Wheat Growers controlled national production and authorized import quotas and specific support programmes for dairy products was provided through PROLAC. The National Bank for Agricultural Development (BANDESA) lent to small and medium farmers who were not eligible for loans from private banks. The Directorates General of Agricultural Services (DIGESA) and of Livestock Services (DIGESEPE) provided development and extension services for crop and livestock products, and technical support to small producers.

Motivations for the reforms

In 1985, a new national constitution was approved and general elections were called. The elected government took office in January 1986, bringing to an end the military regimes that had been in power since the early 1970s.

With the return to democracy, a process of economic reform was started, marked by structural adjustment, liberalization of the economy and, to a lesser extent, institutional reform. The process has not been without interruptions and setbacks.

Macro and sectoral components and the policy instruments used

Macroeconomic reforms

Trade reform did not occur in clearly distinguishable phases. Figure 1 shows that both the average tariff and tariff dispersion have fallen almost uninterruptedly, without evident breaks from one year to the other, except for the initial fall when the reforms started.

The reform period can however be divided into four stages based on different political regimes. In the first period, 1986-90, trade reforms were started, but the period ended in a deep macroeconomic crisis.

Between 1990 and 1995, macroeconomic stability was recovered and important steps were taken in the area of trade, such as accession to GATT.

From 1996 to 1999, trade reform continued. In particular, bilateral negotiations were started with Mexico, Dominican Republic and Panama; and two key sectors in the economy were privatized and deregulated: electricity and telecommunications.

The last period, 2000-2003, witnessed the start of negotiations with Canada for the signing of a free trade agreement, while negotiations were started and concluded with the United States.

First phase of reform: 1986-90

As can be seen in Table 3, in the first half of the 1980s Guatemala fell into recession. GDP and exports and imports contracted and there were serious fiscal deficits. The rate of exchange with the US dollar was kept at 1 to 1 on the official market, but was at higher levels in the growing black market.

The two principal macroeconomic targets in this phase were to pursue stability and recover economic growth. The principal measure adopted was the devaluation

BOX 1
The elimination of ceiling prices

The policy of ceiling prices had been in effect for several years. Governments had kept it under the belief that agricultural markets were imperfect and that market forces did not allow for an efficient determination of prices. The measure also supported the politically more influential urban consumer, who was better organized than those in rural areas.

Ceiling prices led to frequent hoarding, the creation of artificial shortages and resale on the black market at above-ceiling prices. Price inspections took up most of the time of the Ministry of Economy (MINECO), which did not have the budget or sufficient inspectors to supervise compliance and was susceptible to corruption.

It was assumed that the measure would be progressive in its effect on income distribution. However, as the beneficiaries of these measures included the middle and upper classes in the cities, and as urban populations had greater income than that of peasants, the imposition of ceiling prices was regressive.

Products covered by the measure included maize, rice, beans, meat, eggs, sugar, coffee and oil, among others.

Although there have at times been public demands to reinstate ceiling prices to counteract the effects of inflation, successive governments have resisted this pressure.

List of ceiling prices at 28 September 1987

Product	Unit of measure	Maximum selling price to consumer (GTQ)
Black beans		
Packed	Pound	0.60
Unpacked	Pound	0.50
Maize		
White	Pound	0.23
Yellow	Pound	0.22
Rice		
First quality, packed	Pound	0.75
First quality, unpacked	Pound	0.70
Second quality, unpacked	Pound	0.66
Third quality, unpacked	Pound	0.50
Wheat		
National production	Quintal	24.00

Source: Diario de Centroamérica, 1987, Guatemala.

of the quetzal, which thus lost the parity it had had with the dollar since the 1920s. Tax reforms were also approved and monetary policy was tightened.

High tariffs, inherited from the time of the Central American integration process in the 1960s and 1970s in order to bring about import substitution, were reduced. Guatemala adopted this decision together with other countries in the region. In

1984, the Caribbean Basin Initiative of the United States came into effect, providing a more favourable preferential treatment than that granted under the General System of Preferences and expected, in the medium term, to stimulate the production of a wider range of non-traditional products.

In domestic markets, the decision at the end of the 1990s to eliminate price control on food products (see Box 1) was of great relevance. The policy of ceiling prices, deeply rooted for decades, discouraged production and reinforced the anti-agricultural bias of trade policy.

The economy reacted positively to the reforms. Relative stability was brought about and there was a modest growth in GDP. In 1990, however, stability was lost and Guatemala experienced the highest inflation rate in its history. The growth of exports was slow, while imports grew more rapidly due to the fall in tariffs, thus increasing the trade deficit.

Second phase of reform: 1991-95

The first task of the new administration was to reduce macro instability. This was pursued via tax reform aimed at controlling the fiscal deficit and tight monetary policy which took interest rates to above 20 percent by the end of the period. Despite monetary contraction, the devaluation of the quetzal continued, although at a slower pace than in the previous phase.

At an institutional level, the first steps were taken towards de-monopolizing electricity generation. Given the shortages of energy at the time, private and foreign participation was permitted.

The accession of Guatemala and the other Central American countries to the GATT occurred towards the conclusion of the Uruguay Round.

Third phase of reform: 1996-99

As part of the peace accords signed with the guerrillas in 1996, a wide-ranging social expenditure agenda was agreed. This led once again to an increase in the tax burden, not so much for purposes of economic stabilization, but with the objective of taking basic infrastructure and public services to the interior of the country. In order to increase tax collection, a new inland revenue institution, the SAT, was created, with partial autonomy from the central government.

Parallel to this socio-economic agenda, the Government also implemented two important privatization and deregulation initiatives – in the electricity and telecommunications sectors. Both led to greater foreign investment than the country had ever recorded, primarily from Spain and Mexico.

As the United States continued to refuse to grant the so-called NAFTA-parity requested by Central America, which would have consisted of giving the area the same treatment as given Mexico, Guatemala decided to negotiate free trade treaties with other trading partners. It thus opened negotiations with Mexico, the Dominican Republic, Panama and Chile, in some cases in a common front with other Central American countries.

In 1999, macroeconomic instability returned and the quetzal depreciated significantly as monetary expansion led to currency depreciation. The authorities reacted with monetary restrictions, which in turn kept the interest rate high. GDP and exports continued to grow at moderate rates.

Fourth phase of reform: 2000-03

Macroeconomic stability was restored: the country achieved a moderate inflation rate, a stable rate of exchange and a moderate fall in interest rates. However, GDP per capita fell as economic growth dropped below the population growth, and exports were affected by appreciation in the exchange rate.

After concluding negotiations with Mexico and starting them with Canada, Central America received the proposal launched in 2002 by the United States Government to enter into negotiations for a FTA. Negotiations started in January 2003 and concluded in December 2003. It is believed that the provisions arising out of this, in respect of trade, investment and intellectual property among other things, will have a strong effect on the long-term development model for the region.

With its accession to GATT in the 1990s, Guatemala consolidated a trade regime with a low level of protection for the agricultural sector. None of the following instruments were applied: Safeguards; Price bands; Seasonal tariffs; Minimum, maximum or controlled prices; Export taxes or Subsidies. The only tool used to protect the agricultural sector is the tariff, which in a few cases, is combined with tariff contingents.

Tariff contingents began to be used following accession to GATT. In its accession list, Guatemala included a total of 25 agricultural products. It was not until 1996, however, that the Tariff Contingents Administration Unit (UACA) was created as a department of the Ministry of Economy. That year saw the implementation of the first contingents in rice, apples, poultry, wheat, wheat flour and maize. In 2000, a contingent for sugar was added. Table 5 shows the import volumes authorized by contingents as well as the tariffs applicable for products entering within and outside the contingent.[2] The use of contingents tends to fall, and in 2002 they were applied to only four of the eight products.

Tariffs and contingents, despite their decline, are the main trade policy instrument affecting agricultural production and trade since the mid-1990s.

Sectoral reforms

It was not until 1996 that important changes were made to agriculture sector institutions:

- The role of INDECA as a grain marketing board was abolished and its silos, its principal assets, were sold. At present, agricultural production occurs without public intervention to guarantee farm prices.
- Agricultural credit subsidies were removed. Although the Government has participation in BANRURAL (previously BANDESA), BANRURAL operates like any other private bank.
- XDIGESA and DIGESEPE, and replaced by specific programmes, such as PROFRUTA or PLAMAR (the latter in irrigation and drainage).
- Specific support programmes for certain products, such as PROLAC and ORIT, were abolished.
- The capacity of public institutions for dealing with natural disasters was improved through an early warning programme.

[2] For purposes of simplification, only three years are included, but there has been application of contingents every year since 1996.

TABLE 5
Agricultural tariff contingents, 1996, 1999 and 2002

Product	1996			1999			2002		
	Contingent (tonnes)	Tariff within contingent (%)	Tariff outside contingent (%)	Contingent (tonnes)	Tariff within contingent (%)	Tariff outside contingent (%)	Contingent (tonnes)	Tariff within contingent (%)	Tariff outside contingent (%)
Beef	NA	0	0	1 595	0	30	NA	0	0
Poultry meat	2 050	15	45	7 000	15	45	NA	0	0
Apples	5 000	12	25	7 500	12	25	11 500	12	25
Wheat	308 319	1	6	391 322	1	6	NA	0	0
Wheat flour	12 699	8	15	17 984	8	15	78 000	4	10
Yellow maize	306 200	5	55	401 820	5	95	576 000	5	35
Rice	25 491	20		26 782	0	40	73 409	5	29
		30			20			14.6	
Sugar	NA	0	0	NA	0	0	5 000	0	20

Source: MINECO (2003), Ministry of Economics, 2003, Guatemala.

- Environmental policy was strengthened with the creation of a Ministry of the Environment and a National Environmental Commission.
- In landholding, a Land Fund for the purchase of farms was created.

In brief, the state reduced its direct support to the agricultural sector, which was in fact already minimal under the previous structure due to budgetary constraints. Of particular importance is the reduction in support for the production of basic grains for domestic consumption. After 2000, other elements were introduced, such as the delivery of fertilizers and tools, but no new reforms were introduced.

Agricultural credit

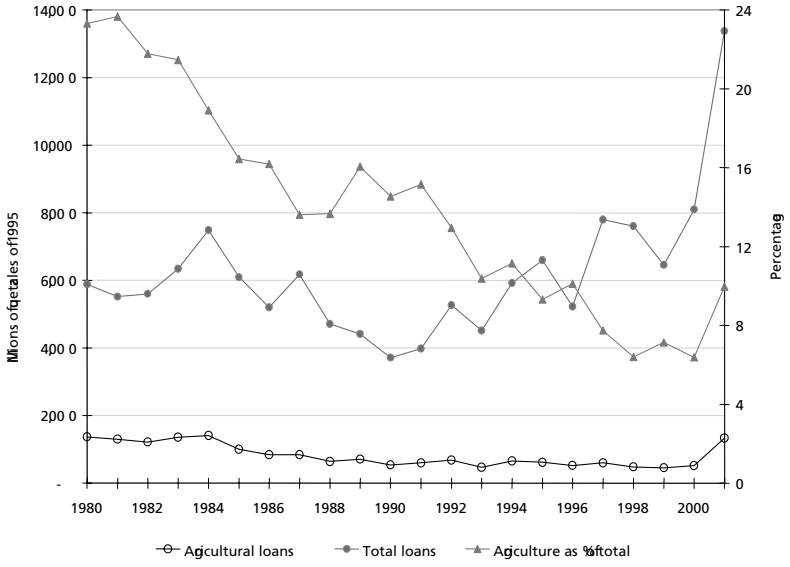
Figures 2 and 3 show the allocation of credit to the agricultural sector and its distribution by groups of products. Agricultural credits have fallen appreciably, from nearly 24 percent of total credit at the beginning of the 1980s to less than 10 percent at the beginning of the 1990s. Throughout the entire period, the allocation of agricultural credit has been lower than the contribution of agriculture to GDP. This tendency is more marked during the 1990s. The allocation has been channelled primarily towards export products, leaving little for basic grains.

Agricultural public expenditure is even lower in relative terms than agricultural credit, despite the fact that Guatemala is a country with an abundant supply of natural resources, which gives it a comparative advantage in agricultural production.

Food security policies

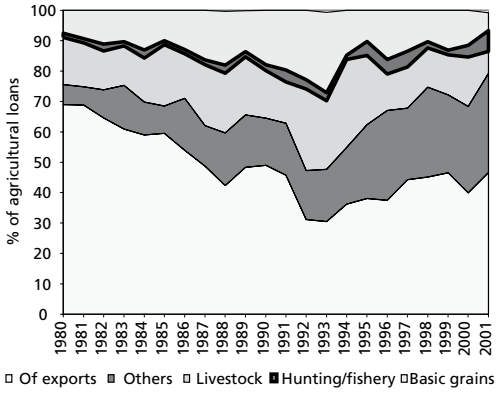
Government provisions made it compulsory to fortify salt with iodine, sugar with vitamin A, and wheat flour with iron and B complex vitamins. In a recent report, the National Commission for Fortification, Enrichment and/or Harmonization of Food indicated that the implementation of these rules in relation to salt and wheat has been weak. It also recommended that, because it is a mass consumer product, maize flour be fortified. Micronutrient fortification programmes have been promoted in health centres and hospitals for undernourished children and pregnant women. However, the application of these programmes has been sporadic and has had little support from the Government.

FIGURE 2
Loans to the agricultural sector, 1980-2000



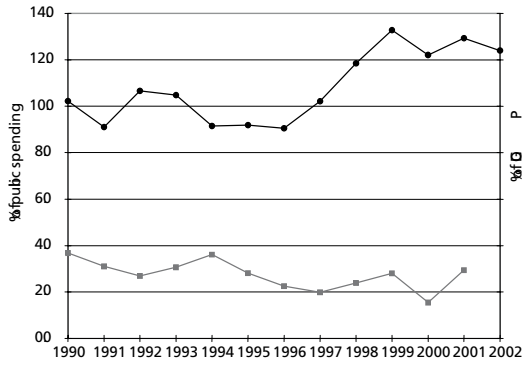
Source: Economic Commission for Latin America and the Caribbean, 200 3

FIGURE 3
Loans to agriculture by categories, 1980-2001



Source: Economic Commission for Latin America and the Caribbean, 2003.

FIGURE 4
Agriculture and public spending, 1990-2002



Source: Economic Commission for Latin America and the Caribbean and Central Bank of Guatemala, 2003.

The Ministry of Education (MINEDUC) had for decades been promoting the serving of biscuit and maize gruel to children in public schools. In the second reform period, the programme received greater support and, after 1997, included a school breakfast for all students in the primary public schools in the rural area.[3] It is estimated that this breakfast provided 65 percent of the daily nutritional needs of children. In the urban areas, where it is believed that children enjoy better nutrition, the programme was more modest, but always included the serving of biscuits and gruel. After 1999, the programme deteriorated. School breakfasts were suspended in rural areas, with a return to sporadic provision of biscuits and gruel.

Finally, in 2002, the National Council for Food and Nutritional Security was created, but it has not developed any significant actions.

CONSEQUENCES OF REFORMS: INTERMEDIATE VARIABLES

In assessing the effects of reform on output incentives, the relationship between changes in the international price and changes in the domestic price of commodities are investigated to in relation to other possible drivers such as the RER and improvements in the efficiency of domestic marketing systems. The price series are derived from INDECA, USPADA (Sectoral Planning Unit for Food and Agriculture), INE (National Institute of Statistics), MAGA (Ministry of Agriculture), BANGUAT (Bank of Guatemala) and ECLAC. The suppression of entities such as INDECA or USPADA contributed to the loss of sequence in the collection of price statistics. It was not until after 1999 that adequate statistics on prices became more fully available.

[3] MINEDUC paid mothers in the community to prepare the breakfast.

Trends in international and domestic prices

Figure 5 shows international and domestic prices for the products under study. The former are in constant 1995 US dollars and the latter are in constant 1995 quetzals. In almost all cases, with the exception of bananas, there has been a significant fall in prices. This has affected Guatemala's terms of trade, given her position as a net exporter of agricultural products. The country was forced to compensate for the fall in prices with increases in the volume of product exported. Visual comparison between international and domestic prices shows a weak relationship.

Volatility of prices

Table 6 shows five indicators for each series of prices: maximum price, average price, minimum price, standard deviation and coefficient of variation. Of these, the coefficient of variation is the most appropriate for purposes of comparison between different series.

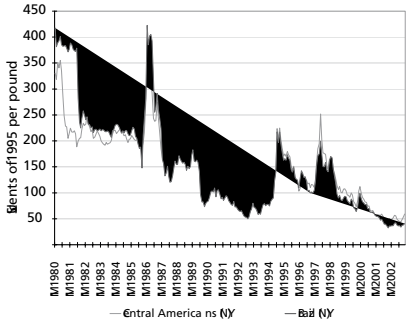
TABLE 6
Price volatility, 1980-2002

		Max.	Mean	Min.	SD	CV
Coffee	Coffee international, Central America (NY)	355.18	147.92	43.91	70.48	0.48
	Coffee international, Brazil (NY)	422.42	154.34	32.34	95.53	0.62
	Coffee producer, cereza	227.18	113.76	53.89	25.70	0.23
	Coffee producer, pergamino	828.36	421.58	221.82	134.39	0.32
	Coffee retail	35.45	16.61	7.51	5.58	0.34
Sugar	Sugar international, European Union	43.78	27.94	19.36	4.61	0.17
	Sugar international, World	73.00	12.82	3.94	10.39	0.81
	Sugar international, United States	75.08	26.49	15.35	8.47	0.32
	Sugar retail	1.51	1.28	0.84	0.16	0.12
Bananas	Bananas international	37.98	20.18	11.25	4.56	0.23
	Bananas producer	17.11	9.80	4.10	2.23	0.23
	Bananas retail	1.60	1.09	0.48	0.28	0.25
Maize	Maize international, Chicago	5.85	2.94	1.31	1.10	0.37
	Maize international, # 2 Yellow Gulf	6.77	3.41	1.69	1.20	0.35
	White maize, producer	103.63	60.03	36.12	12.76	0.21
	White maize, wholesale	105.74	59.56	34.76	13.74	0.23
	White maize, retail	1.22	0.73	0.49	0.13	0.17
	Yellow maize, producer	102.65	63.22	44.62	10.83	0.17
	Yellow maize, retail	1.22	0.76	0.56	0.11	0.14
Wheat	Wheat international, Australia	10.59	4.95	2.45	1.75	0.35
	Wheat international, US Gulf	9.47	4.84	2.52	1.61	0.33
	Wheat international, Argentina	10.89	4.57	2.28	1.90	0.42
	Wheat producer	80.11	59.75	43.72	8.87	0.15
Black beans	Black beans, producer	316.89	181.46	109.84	42.19	0.23
	Black beans, wholesale	429.09	220.98	142.39	49.76	0.23
	Black beans, retail MAGA	3.75	2.18	1.36	0.41	0.19
	Black beans, retail, INE	3.77	2.39	1.67	0.42	0.18
Beef	Beef inter, Australia-New Zealand (US ports)	267.12	125.52	69.08	41.70	0.33
	Beef international, US (NY)	211.89	123.36	84.80	29.71	0.24
	Cattle producer	5.98	3.68	2.43	0.78	0.21
Milk	Milk producer	3.09	2.32	1.64	0.30	0.13
	Milk retail	3.75	3.26	2.14	0.39	0.12
Poultry	Poultry meat	7.28	5.63	4.89	0.45	0.08
Eggs	Eggs producer	7.64	6.16	4.61	0.78	0.13
	Eggs retail	7.63	5.85	0.60	0.78	0.13

Source: Own estimations (several sources).

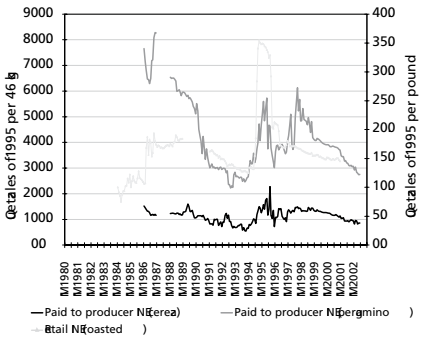
FIGURE 5
International and domestic prices of selected commodities, 1980-2002

Coffee international prices



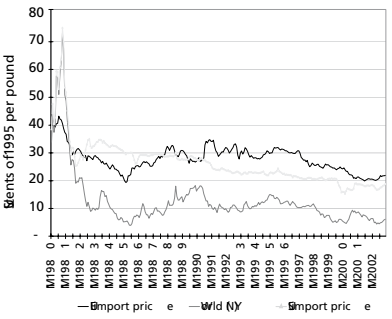
Source: International Financial Statistics, IMF.

Coffee domestic prices



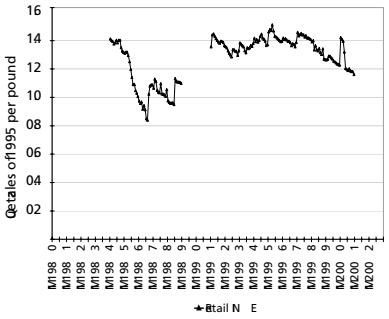
Source: National Institute of Statistics (INE) of Guatemala.

Sugar international prices



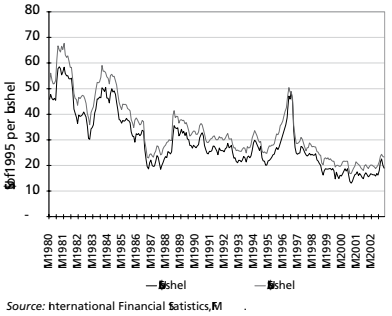
Source: International Financial Statistics.

Sugar domestic prices



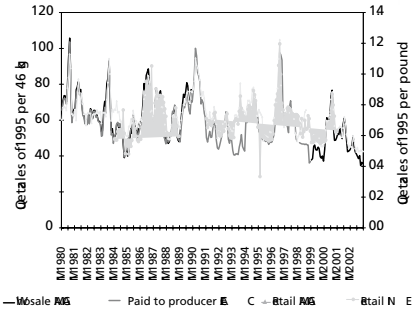
Source: National Institute of Statistics, (INE).

Maize international prices

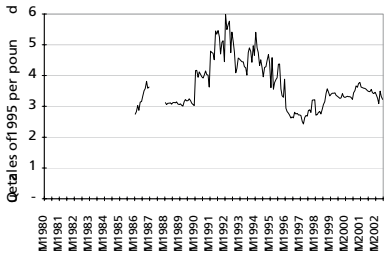


Source: International Financial Statistics, IMF.

White maize domestic prices



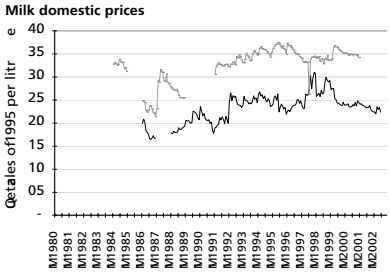
Cattle domestic prices*



* Proxy for live meat

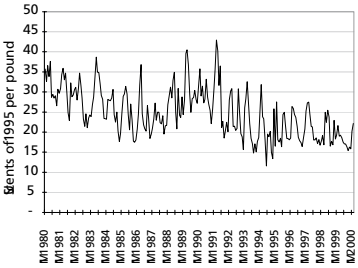
Source: National Institute of Statistics (INE) of Guatemala.

Milk domestic prices



Source: National Institute of Statistics (INE) of Guatemala.

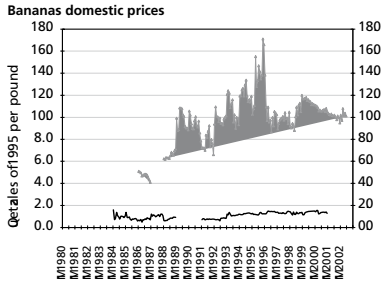
Bananas international prices*



* Market prices: Latin America (FOB exports)

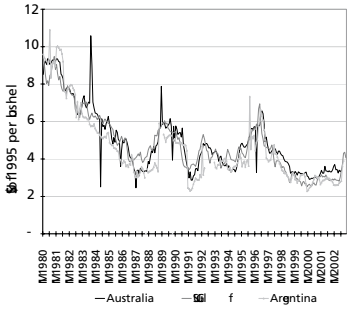
Source: International Financial Statistics, IMF

Bananas domestic prices



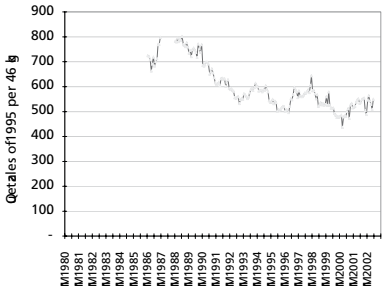
Source: National Institute of Statistics of Guatemala (INE)

Wheat international prices



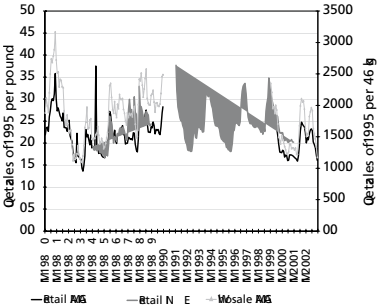
Source: International Financial Statistics, IMF

Wheat domestic prices (paid to producer INE)



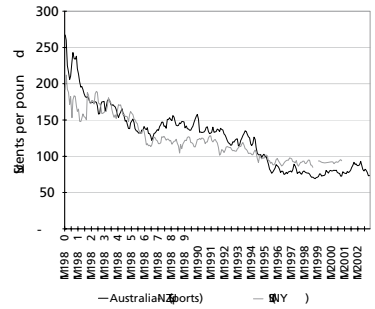
Source: National Institute of Statistics, (INE)

Black beans domestic prices



Source: Ministry of Agriculture (MAGA) and National Institute of Statistics (INE) of Guatemala.

Beef international prices



Source: International Financial Statistics, IMF.

TABLE 7
Price correlations 1980-2002

		2	3	4	5	6	7
1	Coffee international, Central America (NY)	0.94	0.52	0.77	0.09		
2	Coffee international, Brazil (NY)		0.46	0.74	0.04		
3	Coffee producer, cereza			0.63	0.48		
4	Coffee producer, pergamino				0.23		
5	Coffee retail						
1	Sugar international, European Union	0.72	0.60	0.14			
2	Sugar international, World		0.84	0.21			
3	Sugar international, United States			-0.46			
4	Sugar retail						
1	Bananas international	-0.23	-0.19				
2	Bananas producer		0.65				
3	Bananas retail						
1	Maize international, Chicago	0.99	0.35	0.40	0.38	0.35	0.37
2	Maize international, # 2 Yellow Gulf		0.33	0.40	0.35	0.33	0.35
3	White maize, producer			0.98	0.82	0.84	0.83
4	White maize, wholesale				0.92	0.96	0.88
5	White maize, retail					0.90	0.93
6	Yellow maize, producer						0.91
7	Yellow maize, retail						
1	Wheat international, Australia	0.92	0.93	0.41			
2	Wheat international, US Gulf		0.93	0.52			
3	Wheat international, Argentina			0.29			
4	Wheat producer						
1	Black beans, producer	0.22	0.65	0.81			
2	Black beans, wholesale		0.84	0.45			
3	Black beans, retail MAGA			0.63			
4	Black beans, retail, INE						
1	Beef inter, Australia-New Zealand (US ports)	0.89	0.36				
2	Beef international, US (NY)		0.29				
3	Cattle producer						
1	Milk producer	0.71					
2	Milk retail						
1	Eggs producer	0.23					
2	Eggs retail						

Source: Own estimations (several sources).

Two main conclusions are derived. First, the volatility of domestic prices tends to be lower than that of international prices. In the case of maize, coffee, sugar and wheat, the volatility is close to half; the exception is in meat and bananas, in which they are practically equal. Therefore, despite the reforms, the domestic markets remain partially isolated from international markets.

Second, as in almost every market, the volatility of consumer prices tends to be equal to or less than that of the producer or wholesaler prices. It was equal for coffee, meat, bananas and eggs, and less for maize, black beans, sugar and milk.

With the same monthly price information, correlation coefficients[4] between the different series of prices for each product are estimated in Table 7. The principal

[4] Price correlations cannot be made for different regions of the country because regional prices have been generated only since the beginning of the 2000s. See MAGA web page www.maga.gob.gt.

findings provide evidence that integration between international and domestic markets is still weak:

(a) international prices show a strong correlation among themselves, especially as regards maize, coffee, wheat and meat. This was to be expected, these being highly integrated markets;
(b) the correlation between international and domestic prices is much lower; in two cases, bananas and sugar, it is even negative;
(c) the correlation between domestic prices, producer-wholesaler-consumer, tends to be moderate or low; the only case in which there were strong correlations was for domestic prices of maize.

In the case of export products, the results could be due to oligopolistic production or to the fact that in the domestic market there is a tendency to sell products that could not be sold on the international market (for reasons of quality or international surpluses caused by overproduction). The former would apply to sugar where a small number of mills control the domestic market and manage to keep domestic prices much higher than the international price. The latter would apply more to bananas, where there are also a few companies controlling most of the production and exports. With coffee, there is greater integration between domestic and international prices. Consequently, the greater the competition in production, the greater the integration between domestic and international prices.

In the case of importable products such as maize and wheat, the weak integration with international prices could be due to limited trade in these products and the effect of tariff contingents.

Decomposition of price changes

A decomposition of the change in domestic prices into three components – change of international prices, change in the rate of exchange and change in other factors – was carried out for coffee, sugar, maize and wheat.

Domestic prices tended to decrease rather than increase (Table 8). The downward trend of domestic prices is explained to a great extent by the fall in international prices. The decrease of the latter was greater than that for domestic prices. The depreciation in the rate of exchange led to an increase in domestic prices; its impact, however, was annulled by the fall in international prices and other factors. Changes in other policies tended to exert a negative effect on domestic prices.

Effects on agricultural output and value added

Most indices of agricultural production show continuous growth since 1980 (Figures 6 and 7). The exception is in the production of cereals, which shows a fall, particularly since the beginning of the 1990s.

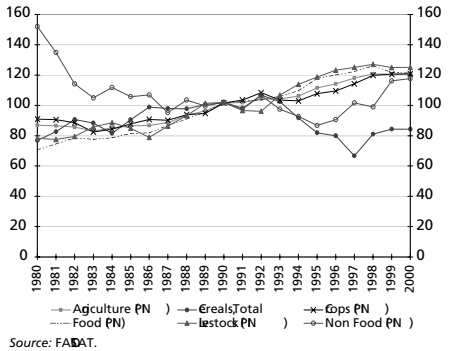
The evolution of production and trade for the principal crops is shown in Tables 9 and 10. Coffee production has grown continuously during the period, particularly during 1998- 2000. It was not until 2001 and 2002, as a consequence of the new fall in international prices, that production began to contract. The area under cultivation showed a fall in the mid 1980s, reaching its lowest value in 1987 but recovering at the beginning of the 1990s. Quantities exported rose in line with production increases. The value of exports, however, has shown greater fluctuations due to world price volatility.

TABLE 8
Decomposition of changes in domestic prices with respect to pre-reform base period, 1980-85 (percent)

	Period	Change in real domestic price	Change in real world price	Real exchange rate	Change in other policies and other effects
Coffee	1986-90	-9.9	-26.1	56.3	-40.1
	1991-95	-58.7	-75.7	58.9	-41.9
	1996-00				
Sugar	1986-90	-25.6	-53.8	56.3	-28.0
	1991-95	-29.2	-61.2	58.9	-26.8
	1996-00				
Maize	1986-90	9.7	-48.4	56.3	1.8
	1991-95	-7.7	-56.0	58.9	-10.6
	1996-00	-13.3	-63.0	44.2	5.6
Wheat	1986-90	-13.5	-41.0	56.3	-28.8
	1991-95	-38.8	-49.6	58.9	-48.1
	1996-00	-45.5	-63.3	44.2	-26.4

Note: Comparative results from price decomposition analyses across the case study countries are provided in Annex B of the Synthesis chapter. The results in Annex B present the change in the domestic price as a percentage change with respect to previous period. The case study analyses vary in that some present results as a percentage change with respect to a base period. Whilst the interpretation of results in the case study narrative holds irrespective of the end points compared, the results presented in Annex B should be used for comparative purposes.
Source: Own estimations (several sources).

FIGURE 6
Net production indices (1988-91 = 100)

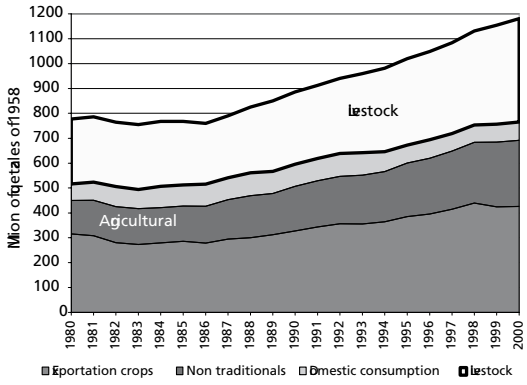


Source: FAOSTAT.

The increase in the production of sugar has been even more marked, particularly in the 1990s, reaching its maximum value in 1997. The increase in area under cultivation has paralleled the increase in output. As in the case of coffee, the value of exports has fluctuated more than the volume of exports because of changes in international prices.

The production of bananas was stagnant up to 1993. In the five following years, it increased rapidly, reaching its maximum value in 1998. Subsequently, as a

FIGURE 7
Agricultural and livestock value added, 1980-2000



Source: BC .

TABLE 9
Harvested area, production and trade of exportable goods, 1980-2001

	1980-82	1983-85	1986-88	1989-91	1992-94	1995-97	1998-00	2001
Coffee								
Harvested area (ha)	259 830	242 620	229 320	248 150	262 342	267 147	268 667	273 000
Production (tonnes)	186 863	187 083	189 720	197 263	209 712	224 189	280 200	275 700
Exports value (US$ million)	373.0	367.8	433.1	327.5	278.0	533.7	574.4	306.5
Exports quantity (tonnes)	126 272	147 538	156 521	191 007	197 986	232 672	257 823	246 829
Sugar								
Harvested area (ha)	73 103	71 890	81 340	107 777	128 193	157 060	180 667	182 000
Production (tonnes)	6 473 333	6 546 667	7 145 938	9 339 067	11 637 040	16 237 907	17 030 593	16 934 900
Exports value (US$ million)	61.4	70.0	58.0	114.9	155.1	231.9	234.2	212.6
Exports quantity (tonnes)	171 162	256 883	327 629	474 232	719 063	898 717	1 249 346	1 130 249
Bananas								
Harvested area (ha)	26 000	21 333	18 167	19 000	20 667	20 667	20 233	18 900
Production (tonnes)	513 667	448 667	436 667	485 398	537 332	705 333	817 848	789 251
Exports value (US$ million)	54.8	64.0	68.5	76.9	102.6	148.3	164.7	185.0
Exports quantity (tonnes)	400 137	333 116	342 070	360 252	461 979	635 359	739 779	873 829
Cantaloupes and other melons								
Harvested area (ha)	947	1 561	2 214	2 895	2 963	3 523	5 000	
Production (tonnes)	13 403	22 858	33 808	43 281	56 485	76 149	96 400	
Exports value (US$ million)					9.3	16.8	37.4	9.0
Exports quantity (tonnes)					34 258	60 644	123 466	41 330

Source: FAOSTAT.

TABLE 10
Harvested area production and trade of importable goods, 1980-2001

	1980-82	1983-85	1986-88	1989-91	1992-94	1995-97	1998-00	2001
Maize								
Harvested area (ha)	669 747	609 300	695 287	634 527	677 398	565 835	603 385	592 900
Production (tonnes)	999 907	1 018 733	1 189 315	1 250 757	1 282 951	989 771	1 049 063	1 091 480
Imports value (US$ million)	8.5	0.3	5.5	14.5	20.6	35.7	37.6	59.0
Imports quantity (tonnes)	46 537	1 056	42 371	94 245	130 700	214 175	307 996	515 912
Wheat								
Harvested area (ha)	33 628	32 293	24 687	16 473	11 963	11 643	5 390	4 620
Production (tonnes)	54 009	71 367	49 352	32 979	24 317	24 231	10 801	9 525
Imports value (US$ million)	24.6	31.8	24.4	29.3	45.7	62.7	58.1	70.8
Imports quantity (tonnes)	125 624	163 900	141 953	195 521	273 464	288 195	347 339	407 470
Dry beans								
Harvested area (ha)	76 147	127 739	161 137	123 737	131 846	121 774	128 746	128 800
Production (tonnes)	74 940	100 767	101 319	107 029	101 884	80 791	87 375	94 656
Imports value (US$ million)	1.4	0.0	1.7	1.9	2.3	1.0	1.8	2.0
Imports quantity (tonnes)	1 934	21	3 834	3 149	3 253	1 914	3 987	5 029
Beef and veal								
Head	313 365	306 783	257 786	342 826	258 333	299 100	336 933	350 000
Production (tonnes)	50 627	50 301	46 710	62 165	46 814	54 114	59 471	62 000
Imports value (US$ million)	1.0	0.6	1.5	0.6	0.6	2.2	9.1	16.4
Imports quantity (tonnes)	307	155	1 233	301	294	1 506	6 261	10 595
Milk animals								
Cow milk (whole fresh)	366 274	384 195	371 667	370 000	376 000	443 333	378 800	379 000
Production (tonnes)	243 803	262 845	246 134	251 426	266 959	315 580	269 322	270 000
Imports value (US$ million)	11.2	7.7	12.1	21.0	30.3	36.9	49.9	65.9
Imports quantity (tonnes)	0	0	0	0	0	0	0	0
Poultry meat								
Animals slaughtered	30 897	36 733	43 900	51 100	54 467	68 604	77 200	80 000
Production (tonnes)	39 606	48 559	57 672	66 897	92 929	115 079	139 001	144 000
Imports value (US$ million)	0.1	0.1	0.0	0.8	5.6	6.5	15.3	13.3
Imports quantity (tonnes)	38	33	14	687	6 036	7 112	15 023	14 915
Hen eggs								
Laying animals	4 122	5 198	6 352	4 893	5 893	7 103	7 200	7 200
Production (tonnes)	44 637	51 817	61 226	68 197	88 423	107 150	109 000	109 000
Imports value (US$ million)	0.1	0.0	0.0	0.2	0.3	0.2	0.7	2.0
Imports quantity (tonnes)	24	20	11	118	215	106	250	873

Source: FAOSTAT.

consequence of hurricane Mitch, it fell. The area under cultivation today is much lower than in the 1980s. Exports follow a pattern similar to that of production, in which the effect of Mitch can also be seen.

Broccoli, snow peas and melons have become three of the most important products in the new wave of non-traditional exports (FAOSTAT does not have detailed information on them). The growth of the non-traditional crops, including a relatively wide range of vegetables, fruit and flowers, is helping to reduce the country's excessive dependence on a few products, such as coffee or sugar.

Maize is the most important cereal produced and consumed. Traditionally, import and export volumes have been small, but a recent increase in imports is explained by output being lower than at the beginning of the 1990s.

Guatemala has a big deficit in wheat production. Since the mid-1980s, production and the area allocated to cultivation have collapsed, leading to growth in imports.

Beans are the traditional product in the diet of Guatemalans. Production and area cultivated are also lower than in the beginning of the 1990s. Imports have generally been higher than exports.

For many years, Guatemala had a surplus in the production of bovine meat, which was exported. However, output over the period under study has fluctuated, and since 1997, imports of meat have been greater than exports – probably a growing tendency in future, as demand increases. Other deficit commodities are dairy products. Production increased in the mid-1990s, but then fell. The long-term tendency is towards stagnation.

Poultry production has grown continuously since the beginning of the 1980s. Despite the continuous increase, production is not sufficient to satisfy the demand, and imports have also grown, particularly since the mid 1990s. The production of eggs follows the pattern for poultry meat with uninterrupted growth since 1980. Trade has shown a less clear tendency, with exports at the beginning and imports in more recent years, particularly during 2001.

Correlation coefficients between price change and changes in output and harvested area are estimated in Table 11. For export crops and for basic grains there is a weak relationship (Table 11). Negative correlations are evident for coffee, wheat and sugar. This apparently paradoxical result could be explained by the increase in coffee production in the 1990s as a consequence of increases in productivity during previous years. For wheat, it could be due to the abandonment of cultivation as a result of massive imports, which could be isolating the remaining small local production from international price effects – in the case of domestic prices for wheat there is a positive correlation both with area cultivated and with output. In the case of sugar, the gradual expansion of sugar cane cultivation in the south of the country, accompanied by increases in productivity, has led to growth, independent of the more volatile behaviour of international prices.[5]

The exception to these trends is in bananas, in which there is a positive relation between prices and production.

Prices are not the only variable that affects the decision to expand area cultivated and increase production. The prices of inputs, changes in productivity, credit obtained, government support, the degree of competition on the market for each

[5] Since the mid-1980s, the sugar mills have also become generators of electricity, by burning waste products.

TABLE 11
Impact of price changes on harvested area and production, 1980-2002

	Harvested area			Production		
	0	+1	+2	0	+1	+2
Coffee						
Coffee international, Central America (NY)	-0.45	-0.52	-0.48	-0.59	-0.53	-0.44
Coffee international, Brazil (NY)	-0.38	-0.39	-0.34	-0.55	-0.50	-0.48
Coffee producer, cereza	-0.12	-0.07	0.27	0.19	0.39	0.59
Coffee producer, pergamino	-0.64	-0.63	-0.27	-0.20	-0.04	0.14
Sugar						
Sugar international, World	-0.40	-0.35	-0.38	-0.42	-0.35	-0.31
Sugar international, United States	-0.77	-0.74	-0.77	-0.77	-0.75	-0.72
Bananas						
Bananas international	-0.12	-0.10	-0.07	0.89	0.84	0.82
Bananas producer	0.21	0.09	0.15	0.51	0.51	0.62
Maize						
Maize international, Chicago	0.02	0.19	0.30	-0.38	-0.32	-0.08
Maize international, # 2 Yellow Gulf	0.03	0.18	0.30	-0.38	-0.31	-0.09
White maize, producer	-0.03	-0.18	0.28	0.09	-0.11	0.32
White maize, wholesale	0.14	0.29	-0.37	0.60	-0.01	-0.06
Yellow maize, producer	0.23	0.29	0.26	0.36	0.11	0.44
Wheat						
Wheat international, US Gulf	-0.97	-0.96	-0.95	-0.89	-0.88	-0.88
Wheat international, Argentina	-0.71	-0.70	-0.68	-0.68	-0.66	-0.63
Wheat, producer	0.83	0.66	0.58	0.81	0.63	0.54
Black beans						
Black beans, producer	0.00	0.51	0.26	0.25	0.37	0.46
Black beans, wholesale	-0.35	-0.43	-0.41	0.06	-0.17	-0.08

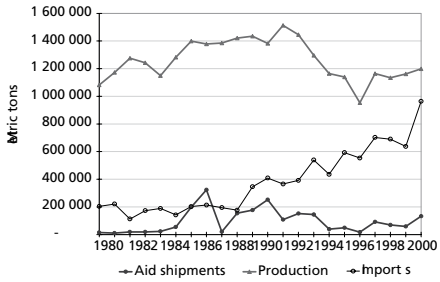
TABLE 12
Losses caused by drought in Central America, 2001

	Million US$
Agriculture	110.4
Industry	15.1
Electricity	46.6
Water	3.5
Emergency	13.4
Total	189.0
Per capita, US$	4.8

Source: CEPAL and CCAD 2002.

product, tariffs and, increasingly, weather changes also need to be taken into account. Natural disasters are particularly important in their effects on agriculture (Table 12). Over half of the cost of the 2001 drought fell on this sector. Guatemala was particularly exposed to droughts and tropical storms in the 1990s: several severe hot spells in 1991 and 1994, prolonged droughts in 1997, hurricane Mitch in 1998, and droughts again in 2001. This greater climatic vulnerability is due in large part to the more frequent recurrence of El Niño. The effects of climatic disasters are not homogenous for all agricultural products. It is estimated that self-consumption is

FIGURE 8
Cereals: production, imports and food aid, 1980-2000



Source: FAOSTAT.

hardest hit, particularly in the case of basic grains, such as maize or beans. Droughts and hurricanes can, therefore, have devastating effects on the food security of vulnerable sectors.

It is now thought that climate changes have become the principal determinant in agricultural production, even above prices. On the basis of this, systems have been created such as the Early Warning Network Against Food Insecurity[6], to forecast changes in agricultural production. The agricultural forecasts made by this body are regarded as correct.

The effect that food aid has on prices and production decisions in general appears to be marginal (Figure 8). During the 1990s the amounts of such aid fell in comparison to the second half of the 1980s.

CONSEQUENCES OF REFORMS: TARGET VARIABLES

National food security

Guatemala's food situation improved during the 1980s, but worsened in the 1990s, having peaked, in terms of per capita calorie and protein consumption, in the years 1988-92. The values for 1988-2000 appear to be lower than those of 20 years previously.

From the breakdown of products, it is evident that the fall in per capita calorie and protein consumption was due to the falling contribution of pulses and, especially, cereals. In 1978-82, cereals provided 1 363 calories and 36.8 g of proteins per capita per day, but by 1998-2000 these values had fallen to 1 135 calories and 30.8 g, respectively. A more detailed breakdown shows that it was primarily due to the fall in consumption of one product, maize, which provided calories and proteins equivalent to 1 092 and 28.4 in 1978-82 and only 857.3 and 22.3 in 1998-2000.

Under-five mortality and infant mortality have been reduced in the period since 1980. Both, however, still show high values when compared to other countries: 71.7 and

[6] Available at www.fews.net/centralamerica.

TABLE 13
Per capita/day calories and proteins, 1978-2000 (percent of total)

	1978-82	1983-87	1988-92	1993-97	1998-2000
			Per capita/day calories		
Total	2 276.8	2 249.9	2 342.9	2 287.0	2 144.8
			Percent of total		
Vegetal products	92.8	93.0	93.0	91.9	90.6
Cereals (exc. beer)	59.9	59.7	58.3	57.4	52.9
Sugar & sweeteners	16.1	16.6	17.4	18.5	19.4
Pulses	4.7	5.4	5.7	4.5	4.3
Vegetables oils	6.1	4.5	5.3	4.9	6.4
Fruits (exc. wine)	2.0	2.3	2.2	2.8	3.1
Others vegetal	4.0	4.4	4.2	3.8	4.5
Animal products	7.2	7.0	7.0	8.1	9.4
Meat	1.7	2.0	2.2	2.9	3.9
Milk (exc. butter)	3.3	2.9	2.7	3.1	3.2
Others animal	2.2	2.1	2.0	2.2	2.4
			Per capita/day proteins (gr)		
Total	57.6	57.9	59.9	58.0	54.7
			Percent of total		
Vegetal products	82.1	82.3	81.4	77.9	74.3
Cereals (exc. beer)	63.8	62.0	60.9	60.9	56.3
Pulses	12.2	13.9	14.5	11.6	11.2
Other vegetal	6.1	6.4	6.0	5.4	6.8
Animal products	17.9	17.7	18.6	22.1	25.7
Meat	6.4	7.3	8.3	10.4	13.9
Milk (exc. butter)	7.3	6.4	6.1	6.7	6.9
Eggs	2.7	3.0	3.2	3.9	3.3
Others animal	1.5	1.0	1.1	1.2	1.6

Source: Authors' computation based on FAOSTAT.

47.0 per 1 000 live births in 2002 for both, respectively. Life expectancy has also increase appreciably, from close to 56 years at the beginning of the period to 66 in 2000.

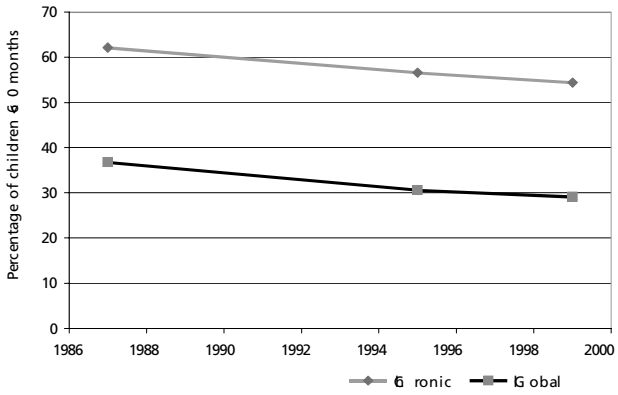
Food security can also be gauged using the ENSMI (National Survey of Health Maternal and Infantile) 1987 to 1998-99 data. Progress has been steady in both chronic malnutrition (height for age) and global malnutrition (weight for age) during the period in question. At a first glance, Figure 9 seems to show a steady decrease and suggests no relationship with income or prices. However, since the data are sparse, little can be assumed regarding the relationship between these variables.

Household level food security

A large portion of the population works in subsistence farming or derives its income from the sale of farm products or agricultural labour. However, it is in agriculture where incomes are lowest, causing a tendency to move to other sectors in the economy. This change is hindered mainly by the lack of appropriate skills to work in industry or services. In this section, the evolution of the rural and agricultural population will be examined as it is the largest group of Guatemalans, as well as the group that is most likely to be affected by trade reforms.

A Rural Farm Household (RFHH) is defined as a rural household where at least one family member has his or her activity listed as a farm activity. A poor

FIGURE 9
Malnutrition in children <60 mos. 1987-1999



Source: n b sed on N E 19871 999.

TABLE 14
Characteristics of rural farm households (RFHH), 1979-2000

Household survey year	Total households	RFHH	RFHH average family size of	Total RFHH population	RFHH population in the lowest 20 percent income bracket
1979-81	1 334 894	603 129	5.2	3 161 000	
1989	1 610 789	677 902	5.9	3 954 000	736 000*
1998-99	1 997 537	799 273	5.2	3 161 000	1 004 000
2000	2 191 451	869 056		5 191 734	1 364 000

Note: Surveys are not standard and practically no variables were comparable over the whole time period. By decree of Congress, communities having in their name "villa", "pueblo" or "ciudad" are urban and all others are rural. This definition has led to the inclusion of communities within the metropolitan area of Guatemala City in the rural category, while some villages of fewer than 3 000 inhabitants fall within the urban category.

* persons of 11 years old and over only.

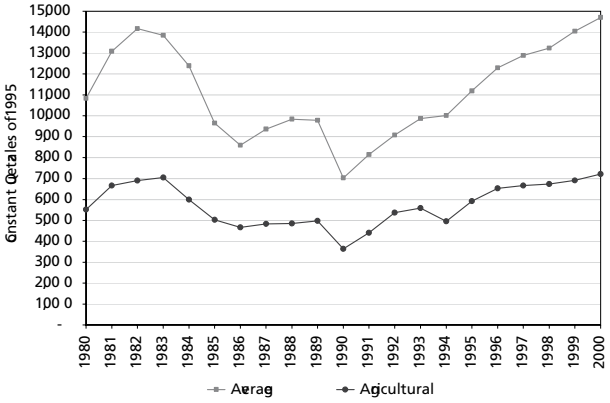
Source: National Institute of Statistics, Household Surveys.

rural household is defined as a rural household with a family income in the lowest 20 percent.

The number of households in the rural farm household category in Guatemala has declined in the last twenty years. However, the percentage of people living in rural farm households has stayed constant at around 45 percent, as shown in Figure 12. The main reasons for this are the tendency to have smaller families in urban areas, so even though fewer households are dedicated to farm activities, the number of individuals in these households still represents a similar percentage of the total population.

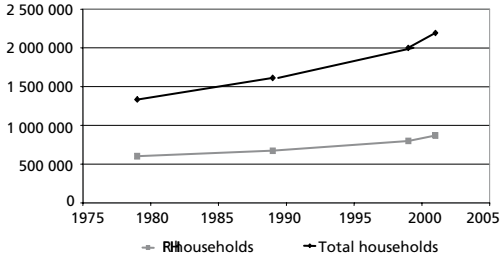
Nevertheless, since the number of members in a RFHH is not likely to increase and as families move from agricultural to other activities, it is expected that the number of RFHH will decline in the near future.

FIGURE 10
Annual wage



Source: ILO and Banco de Guatemala.

FIGURE 11
Total and rural farm households



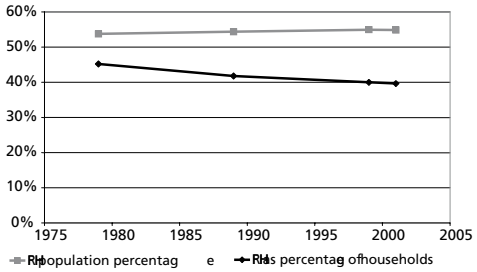
Source: Based on NSI data 1979–2001

Changes in employment and rural wages[7]

Rural wages at the beginning of the 1980s were at a high point. However, over the following years real incomes fell rapidly as the official exchange rate was devalued. Since 1986, average rural wages have risen and levels comparable with those of 1980 were achieved around 1995. As few opportunities other than agriculture are

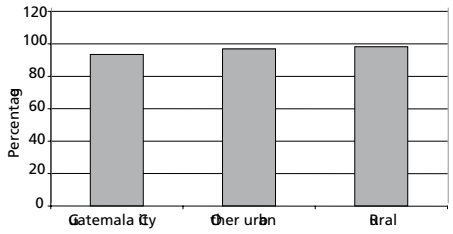
[7] Average yearly rural wages were obtained from Central Bank data. This source was preferred because it has a greater number of data points than household surveys. Comprehensive employment figures are contained only in the 2002 Encuesta Nacional de Empleo e Ingresos (ENEI) series. The relationship between wages and employment could not be evaluated because of the scarcity of the data regarding rural employment.

FIGURE 12
Percentage of population in rural farm households, 1979-2001



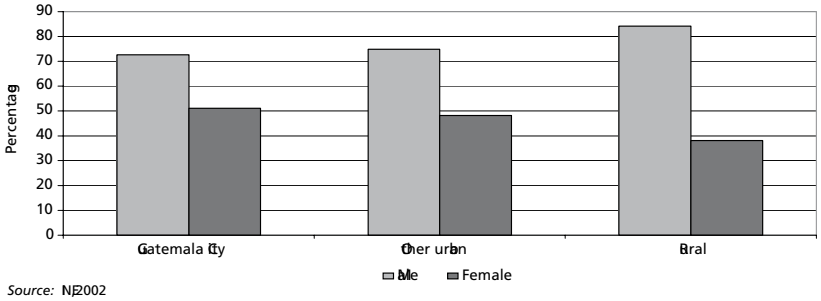
Source: Own based on NEC data 1979-2001

FIGURE 13
Employment rates by area, 2002



Source: INE 2002

FIGURE 14
Participation in workforce by gender, 2002



Source: INE 2002

available to rural inhabitants, these changes are unlikely to have caused changes in rural employment.

Employment rates seem high (Figure 13), particularly in rural areas, but underemployment is common and a large number of workers are employed in informal sector activities where wages are lower.

A higher proportion of the economically active population (EAP) are men than women, particularly in rural areas. Agricultural activities include fewer women than other activities (Figure 14).

Changes in income since 1979[8]

In 1979-81, median monthly income was estimated at GTQ141 (US$141) for rural households compared with GTQ200 (US$200) for urban households. Having larger families and lower incomes, members of rural households receive on average about GTQ27 a month compared with GTQ41 for urban households.

A comparison between the distribution of incomes of the economically active population in rural areas shows a slight difference by gender, with women relying more heavily on sales of products and transfers, probably remittances from abroad, than on wages. Additionally, it should be noted that when women are mentioned, this refers to women in the workforce and not necessarily to female heads of households.

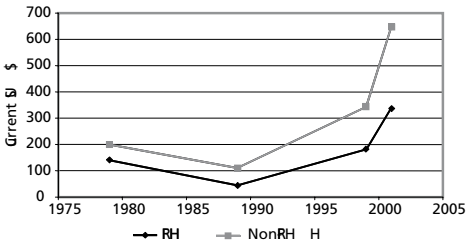
By 1989, the average (median) monthly income was close to GTQ120 (about US$44) for RFHHs compared with GTQ300 (US$111) for urban households. This means that members of RFHH could count on approximately GTQ20 a month compared with GTQ60 for other households. It is during this time that the largest gap in income between RFHH and non-RFHH is evident. Additionally, it should be noted that the sharp decrease in actual income was even more damaging to the RFHH, since they lost over two thirds of their purchasing power. Other types of households lost slightly less than half of their effective purchasing power. Median monthly income for the poorest 20 percent of all rural households reached a low GTQ33 (US$12 per month). This group showed a proportionally large gap between men and women, with a median of GTQ35 for households led by men and GTQ25 for similar households led by women. Heads of RFHH in 1989 were mostly men (95.3 percent).

Rural farm households are still among the poorest. Average (median) monthly income for 1998-99 is estimated at GTQ1 367 (US$182) for rural farm households compared with GTQ2 583 (US$344) for other households. Having larger families and lower incomes, members of RFHH can count on approximately GTQ249 (US$33) per month compared to GTQ579 (US$77) for other types of household. Since food produced for the household is counted as income, the actual availability of cash is even lower than the figures suggest.

As in the previous periods, female headed RFHH can be expected to have lower incomes. Houses with a female head can count on GTQ1 046 per month (US$139)

[8] Comparison of data from different time periods is difficult because of from differences in the methodologies used for measuring income and classifying its source. Two surveys recorded income data under the heading of wages, sales, etc. Two other surveys classify according to primary income, and secondary income, but do not reveal whether this income comes from wages or sales.

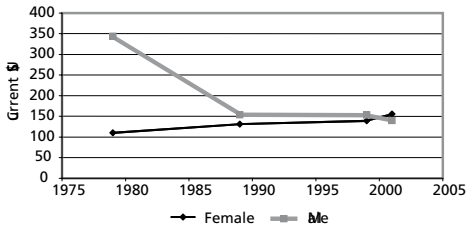
FIGURE 15
Average monthly income by type of household, 1979-2001



Note: Since 2000, averages are calculated as means rather than medians, so the sharp increase represented in the data may not show a real change in incomes.

Source: Own using NES data, 1979-2001.

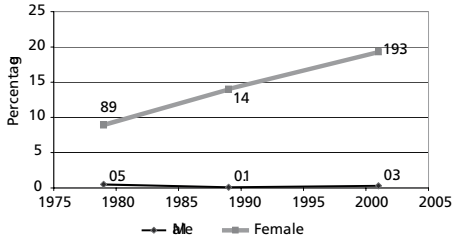
FIGURE 16
Average monthly income in rural farm households by gender of household head, 1979-2001



Note: Since 2000, averages are calculated as means rather than medians, so the sharp increase represented in the data may not show a real change in incomes.

Source: Own using NES data, 1989-99.

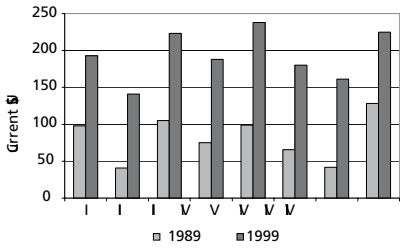
FIGURE 17
Remittances as a percentage of incme in rural farm households by gender of head of household, 1979-2001



Source: Own using NES data, 1979-2001.

FIGURE 18

Mean income in rural farm households by region, 1989-1999



Source: Own calculations using INE data, 1989 and 1999.

compared with an average for males of about GTQ1 154 (US$153). However, the difference is smaller than in previous years. Incomes for rural households led by women seem to be increasing their income when compared to those led by men. For the 20 percent poorest households in the rural area, median income can be estimated at GTQ538 (US$72) with a large, but decreasing, gap between households led by males and females. Households led by women in the poorest 20 percent of all rural households had a median income of GTQ460 (US$61) while those led by men had a median income of GTQ566 (US$75). Thus it seems that the gender of the household head is not as important in determining income as in 1979-81.

The average (median) monthly income for the 2000 survey can be estimated at GTQ2 590 (about US$332) for rural farm households compared with GTQ5 047 (US$647) for other households. Even though the income in these households increased in 1991, the differences between RFHH and non-RFHH have increased markedly.

Analysis by gender of the head of each household shows striking differences with previous surveys, however. When comparing median incomes in RFHH led by women and by men, the average (median) amount observed for households led by women is GTQ1 215 (US$156), higher than that obtained by men GTQ1 092 (US$140). A closer examination of the income categories suggests an explanation. Women are less dependent on wages and sales and more on remittances and other transfers, while men have maintained the same income structure as in previous years. This may be explained by the fact that most Guatemalans abroad are men sending remittances to their mothers or wives.

Throughout the period, rural farm households have had an income lower than other types of households. Indeed, monthly incomes have been less than the poverty line of US$2.00 per day per member. At the beginning of the study period, income for female-headed households was lower than that of male-headed households, as would be expected in a traditional male-dominated society such as rural Guatemala (Figure 17). However, as larger numbers of men have migrated overseas, the incomes of female-led RFHH have increased, mainly due to larger remittances. Therefore, the income for females is more closely related to migration than to economic activity, and cannot be considered a sign of female empowerment.

Regional analysis for the 1998-99 survey suggests that income differences among regions for RFHH are dependent on types of crops. As with the 1989 data, regions where most of the agriculture is subsistence farming show lower incomes than those where export crops are grown. The increases seem similar in all regions.

Food security and food expenditures

In 1979-81, more than half (54.79 percent) of all expenses were on food and beverages (Table 15). However, as incomes increased, the expenses shifted to other categories. Most changes can be considered positive: health expenses have more than doubled in the intervening twenty years and education expenses have quadrupled.

The largest group, food expenditure, is broken down in Table 16 to disclose the proportion of each of the main farm products. One of the largest categories is flour, cereals and their products, because of the extensive use of maize in the Guatemalan diet. Out of the 26.6 percent spent on flour and cereals, slightly less than half is maize and maize products. A slight shift towards more processed foods is also visible. Importantly, at the end of the period, a larger amount of money was spent on meat and poultry. (From the 2000 survey it was impossible to assess the percentage spent on food).

TABLE 15

Monthly expenditure for all households, 1979-81 and 1998-99 (percent of total expenditure)

		1979-81	1998-99
1	Food and beverages	54.79	38.75
2	Household expenditure	12.43	10.00
3	Furniture and equipment	6.53	7.95
4	Clothing	9.96	7.94
5	Health and medicines	2.02	5.48
6	Education	1.20	5.60
7	Transportation	6.30	10.92
8	Reading and recreation	2.20	6.83
9	Other	4.55	6.52

Source: Authors' computations based on ENIGF (National Survey of Income and Expenditure) 1979-1981, Guatemala, and ENIGFAM (National Survey of Household Income and Expenditure) 1998-99, Guatemala.

TABLE 16

Monthly food expenditures for rural households, 1979-81 and 1998-99 (percent)

		1979-81	1998-99
1	Flours, cereals and their products	26.58	19.19
2	Meat, fish, and poultry	18.22	20.29
3	Oils and fats	3.53	1.56
4	Eggs and dairy products	9.68	10.10
5	Fruits	3.10	3.40
6	Vegetables	14.81	9.98
7	Sugar and molasses	6.01	3.60
8	Non alcoholic drinks and prepared food	17.55	30.84
9	Alcoholic drinks	0.53	1.04

Source: Own calculations based of ENIGF 79-81, INE.

POLICY LESSONS

Historically, Guatemala has been a country with a surplus in agricultural production for almost the entire range of products that it produced. The country has the potential to continue as a net exporter of agricultural production. Crucial negotiations, such as the Dominican Republic and Central America Free Trade Agreement (DR-CAFTA) with the United States, the ratification of which was expected in 2004, will accentuate structural change in agriculture. It is expected that the dynamic sectors, such as sugar, will increase their exports to the United States, while others which have been affected by growing imports, including dairy products and poultry products, may be seriously affected by DR-CAFTA.

Guatemala is still in transition from exporting a few to many crops, but it is evident that in one or two decades it will have a different farm export pattern from that which dominated during most of the 20th century. Diversification provides greater revenue stability and cushions the effects of international price volatility.

However, non-traditional exports have grown at the cost of basic grain production, such as maize, wheat, rice and beans, products that are essential for the Guatemalan diet. Many small farmers in the western highlands and other parts of the country, as well as medium-size farmers, are switching production to new export crops, thus abandoning the traditional cultivation of grains such as maize. This may have implications for food security in that households will depend increasingly on income, and hence on market participation, rather than own production in order to satisfy their food consumption requirements.

Despite the fact that the country has successfully substituted its agricultural production with more profitable products and despite the fact that it has other sources of resources apart from those of a few traditional products, the country's food security has worsened, and in some specific cases there have even been famines. The reasons for this are first, the fall in coffee prices affected numerous communities. The number of migrants to the United States increased, but the transition was painful. Thousands of persons lost their main source of income and the non-traditional products were not generating employment fast enough to keep up with the decline in coffee income. To this must be added the negative effects of climatic phenomena, which were marked during the 1990s. Those most affected by the droughts and tropical storms tend to be subsistence farmers, who rely heavily on the production of maize and beans. Some communities have been doubly affected, by the fall in coffee income, and by a decline in their own food production due to the unfavourable weather conditions.

Secondly, whilst the country has certainly generated new sources of income, such as tourism, manufacturing and family remittances, this has not benefited all sectors or all geographic zones. Tourism, for example, is concentrated in certain areas. Manufacturing is concentrated in the capital and surroundings, or near ports in the free zones. Clothing manufacturers are located near airports or seaports in order to ship their products on time. As to the remittances, the dollars that come reach only those who have relatives in the United States, Canada or Mexico. In brief, poor households living in the interior of the country where tourists do not come, and who do not have the option of employment in the clothing industry, and do not receive remittances, can be at serious food insecurity risk.

Guyana

C.Y. Thomas and M. Bynoe[1]

EXECUTIVE SUMMARY

Pre-reform

Since independence in 1966, the Guyanese economy has gone through a number of major policy phases. The first phase (1970-85) was marked by considerable state intervention in the economy. While the country showed some measured success, the state failed to control spending as commodity prices declined and the economy began experiencing major economic problems. This period culminated in a process of increasingly inward-oriented development, and crisis. Existing policy were unable to sustain real increases in living standards, foreign debt mounted, and massive emigration took place.

The reforms

The reform period commenced in the late 1980s. In a relatively short period of time, economic and trade policy reforms shifted the economy away from state-led, inward-looking, commandist policies, to a de-regulated, liberalized, open, private sector-led, market-driven economic system. The main reforms consisted of eliminating price and other controls in the food industry sectors; the private management contract under which the state-owned sugar industry is now operated; the unification of the exchange rate and opening up of private transactions in foreign currency; the liberalization of capital flows; better water resources management; and promotion of land markets.

The reforms (particularly the WTO/AOA and the CET provisions of CARICOM) have substantially transformed agricultural arrangements in Guyana. Food imports have been liberalized as the regime of quotas, licences and other administrative controls has been abolished.

After 1991, the country registered impressive growth rates, improved GDP per capita, received substantial debt write-offs, and improved agricultural output in most major commodities. However, since 1997, the country has entered a phase characterized by a combination of political and social unrest, adverse weather conditions, deterioration in the terms of trade, and slow economic growth. The drive therefore remains one centred on food security and improvement in the social welfare of the populace.

[1] C.Y. Thomas and M. Bynoe, Institute of Development Studies, University of Guyana, Guyana.

Impact on intermediate variables

The initial economic response to reform was not positive. Inflation rates soared as price controls were removed, the fiscal situation of the Government came under immense stress, and the real minimum wage reached its lowest level for the period 1970-2001. The situation was further frustrated by exogenous shocks. However, by 1991 there was improvement as the economy began to grow at 6 percent per annum, inflation was reduced and the government finances improved. The agricultural sector showed substantial increases in both production and exports, particularly in the case of the two main crops, rice and sugar, both of which contributed substantially to the high rate of economic growth. In the period 1991-1995, agricultural GDP grew by nearly 7 percent per annum.

Real producer prices for both sugar and rice increased in response to the reforms whereas the price of many other crops fell. In recent years, the prices of most of commodities have been declining. Changes in the exchange rate devaluation have had a major influence on domestic price movements. For most crops the period after the reform saw an increase in output.

Impact on target variables

The value of agricultural exports nearly doubled between 1986 and 1995 and the value of imports grew even faster. This exceptional import surge after 1991 reflected the liberalization of the economy and an increased dependence on food imports.

Although imported food items (many of which were being subsidized in exporting countries) put some agricultural sub-sectors under pressure, consumers benefited through reduced prices, greater choice and better quality products.

Overall poverty rates improved, but disproportionately for the urban population. In particular, absolute poverty did not change in rural areas in the interior, which is also where most of the indigenous population live.

For the entire 1970-2000 period, the per capita supply of calories averaged 2 487, 4 percent above the recommended intake of 2 400 calories. The number of undernourished people has, however, remained constant and is high compared to the Latin American Caribbean average.

Policy lessons

There were various design flaws in the approach to reform in Guyana. Planners underestimated the social consequences of massive cuts in national expenditure and the rapid increase in the cost-of-living which followed the currency devaluations. This prompted the introduction of social adjustment provisions to counterbalance these effects. The trade reforms had liberalized the economy so rapidly that when the WTO Agreement came into force in 1995 no significant challenges remained for Guyana's implementation of its Agreement on Agriculture (AOA). Guyana came under considerable pressure from the international financial institutions and donor countries to follow what was at the time a standard one-size-fits-all approach to its economic recovery programme. The reforms were in some cases enacted too rapidly, resulting in increased hardship in the short term. This was particularly so in the case of the rice industry due to price adjustments and the elimination of subsidies.

Guyana's food security difficulties arise from failure to ensure adequate access to food for the whole population. Distribution is a key problem, and the country depends significantly on food imports to meet its food requirements. Broad-based

rural reform, sustained economic growth, and better targeting are identified as being essential components for a successful programme. This would need to direct attention to the assets of the rural poor, including land access, land improvement, infrastructure, credit, training, technical support, improved community services, as well as overall institutional support and strengthening.

Finally, two of Guyana's export commodities that are heavily dependent on the European market – sugar and rice - are among the most heavily administered products in the world. The preferential access arrangements for these products are totally bound up with the support arrangements in the EU, and the fortunes of the rice industry in Guyana in recent years have been determined largely by changes in the EU quotas. For this reason, administrative decisions have a greater effect on export earnings than do market forces.

INTRODUCTION: CONTEXT AND NATURE OF THE REFORMS

The role and level of development of the agriculture sector

The agricultural sector (excluding forestry and fishing), accounts for 23 percent of GDP and is the most important export sector, accounting in 2001 for about 30 percent of the value of total exports. The main products are sugar and rice, both of which are produced mainly for export and enjoy special marketing arrangements.

Most agriculture production takes place on the low-lying coastal plain because of a complex drainage/irrigation and sea/river defence system. Not only is the agricultural sector dualistic in its spatial location but its structure of production is also dualistic. Export agriculture is typically organized on a fairly extensive and highly mechanized large estate basis, while the bulk of the farming population is made up of small farmers involved with domestic food and livestock production. The food-processing sector is also dualistic. The emphasis on sugar and, to a lesser extent, rice has left a legacy of skewed distribution of land holdings, with some 75 percent of farm households classified as small (less than 15 acres in size) and accounting for only 23 percent of the agricultural land.

Sugar is the largest net earner of foreign exchange and the biggest source of public revenue. It is produced by a state-owned enterprise, the Guyana Sugar Corporation (Guysuco), which came into existence in 1976 following the nationalization of the then foreign-owned sugar plantations. This company is responsible for over 90 percent of the cultivated cane and all of the cane milling and processing. Small and medium farmers contribute about 9-10 percent of the cane for the mills. Rice is the second most important agricultural crop in terms of foreign exchange earnings, and the largest user of agricultural land. It is also the major source of income and employment in rural areas. Rice is also the main staple of the population, with consumption estimated at around 50 kg per capita. Its by-products, bran and broken rice, are used to produce animal feed, in the brewery industry, as fuel for paddy dryers, and for electricity generation. Both small and large farmers are engaged in rice cultivation and farm sizes vary from less than 10 acres to over 1 000 acres.

While Guyana is a major producer and exporter of food products, it also imports substantial quantities, and food insecurity remains a major public policy issue. Agricultural exports recently averaged US$175 million. Food imports declined substantially in the 1980s, to less than US$20 million, but have now increased to

approximately US$55 million as foreign exchange has become more readily available. The main food imports are wheat obtained under the United States PL480 food aid scheme, which is milled locally; poultry; dairy products; and a wide range of other foods and beverages.

Degree of openness of the economy prior to the reforms

During the period 1970 to 1985, the Government pursued a policy of cooperative socialism, with the three pillars of the economy identified as the state, the private sector and the cooperatives, with the state being the dominant player. This was also a period in which the Government set itself the objective to "feed, clothe and house" the nation, and in pursuit of this objective a number of agricultural programmes were introduced with supporting finance, marketing, livestock and land development schemes.

Growth in both agriculture and manufacturing was substantial during the early years. Self-sufficiency in agricultural and food production was a key policy objective. There was massive investment in large agricultural projects, such as the Tapacuma Irrigation Project and the Mahaica-Mahaicony-Abary Rice Development Scheme, and in rural infrastructure such as farm-to-market roads and marketing centres. The Guyana Marketing Corporation (GMC) and the Guyana Rice Board (GRB) were established to buy and sell agricultural produce at highly subsidized prices, the Livestock Development Company (LIDCO) was established to promote the development and expansion of the dairy industry, and the Guyana Agricultural and Industrial Development Bank (GAIBANK) was established to provide agricultural credit.

However, high dependence on primary commodity exports made the economy particularly vulnerable to cyclical movements in commodity prices, and it was partly the decline of world commodity prices (especially, for sugar and bauxite) that caused economic decline in the latter half of the 1970s. Falling revenues from bauxite and sugar led to growing fiscal and balance of payments problems. This prompted price controls, trade and foreign exchange restrictions, high rates of taxation and a steady appreciation of the real exchange rate.

Prior to the reforms the public sector's role in the economy grew steadily and severely distorted incentives for private sector involvement. State control extended throughout the financial sector and even to consumer marketing. Government controlled the prices of most food items, while the maintenance of overvalued exchange rates and the rationing of foreign exchange further limited private sector activity and discouraged domestic agricultural production. This led to a secular decline in output, large government deficits, accelerating inflation and an increased reliance on external borrowing. Maintenance of vital infrastructure to support the agricultural sector and to fulfil the goal of food self-sufficiency was neglected, thereby further constricting the productive capacity of the country.

It is estimated that the parallel economy grew during this time to be at least as large as the official economy.[2] At the same time, the inability of the public sector to provide adequate economic and social infrastructure, and unemployment in the official

[2] Thomas (1989) and Faal (2003).

economy led to growing emigration of skilled labour and qualified managers.[3] The effect of these developments was to reduce output in most agricultural sub-sectors, particularly sugar.

The pre-reform period saw the emergence of the Caribbean Free Trade Area and in 1973 the Caribbean Common Market (CARICOM), (later changed to Caribbean Community) in 1973. Guyana was a founding member of this trading bloc, although the major export markets were still in Europe and North America. During this period, natural resource products dominated the country's exports (90 percent), led by sugar, with the major markets being in the United States and Europe which accounted for more than 80 percent of total exports.

Licensing requirements for rice exporters were instituted under the 1974 Trade Order to preserve the monopolistic powers of the Guyana Rice Board (GRB). During this period, farmers' representation was mainly through the Guyana Rice Producers Association (GRPA), which also helped the GRB in its research and extension activities.

The pre-reform period was marked by emphasis on land reform under the Government's "land to the tiller" programme, as well as drainage and irrigation schemes. The Black Bush Polder Scheme, a major land development scheme, was expected to become the bread-basket of the Caribbean. The thrust of agricultural policy for the rice sector was to promote rice production through state support. This approach had little success, however, with average rice output remaining largely unchanged as acreage sown declined when the severe foreign exchange squeeze and restrictive trade policies began to adversely affect the sector. Absentee farmers, the conversion of land to cash crops or pasture, and land left idle became increasingly common.

Agricultural producers were paid artificially low prices for their produce as the Government sought to make food available in both rural and urban locations. The Government also demonstrated a reluctance to promote private sector involvement in agricultural service provision and neglected measures to increase cost-recovery in the sector. The most important policy that affected the sector was the Government's reluctance to devalue the currency as domestic and external macroeconomic imbalances grew larger. This led to an appreciation of the real exchange rate that altered the country's relative price structure to the detriment of exportables (e.g. sugar and rice). This was magnified by the existence of dual exchange rate regimes that resulted in an implicit export tax, since most private imports (including inputs) were financed at the parallel exchange rate while export revenues had to be converted into domestic currency at the official exchange rate.

Motivations for the reforms

As the value of exports fell, external debt mounted, foreign exchange, spare parts, equipment and other imports became increasingly scarce, and the nation's social and economic infrastructure began to collapse. The Government's response to the continuous decline in exports was the implementation of increasingly restrictive trade policies. For example, there was a complete prohibition of imports on several food items, including wheat, Irish potatoes, peas, and chicken.

[3] IDB (1990).

The economy was slipping into deep recession and national output fell at an annual average of 7 percent during 1979-85, mainly as a result of sharp contractions in bauxite production. This affected agricultural production and food security which was already adversely affected by an overvalued exchange rate and price controls. Output levels fell in most agricultural sub-sectors, particularly sugar, leading to changing household consumption patterns, and increasing poverty (IDB, 1990).

At the beginning of 1986, the Government began lifting some of its trade embargoes, including those on imports of wheat, peas and Irish potatoes. It also began a gradual devaluation of the Guyana dollar, commencing with a six percent depreciation. Nevertheless, economic policies continued to rely heavily on price and exchange rate controls, despite evidence of their ineffectiveness and the growing size of the parallel economy. Uncontrolled current expenditures continued to produce large public sector deficits ranging from 40 to 60 percent of recorded GDP. Inflation was 8 percent in 1986 and rose to 40 percent by 1988. Despite improved commodity prices in the 1980s, there was only modest growth in real GDP, which averaged less than 1 percent annually from 1986-88.

Guyana's large external debt was a problem, with about 60 percent of revenues going towards debt repayments. The Government sought debt relief but about a quarter of the debt was owed to multilateral agencies and were therefore not subject to such relief.

Macro and sectoral components and the policy instruments used

With the economic crisis entering its second decade, efforts to reduce growing imbalances in the economy and expand output were intensified. In 1989 the Government formally launched a three year Economic Recovery Programme (ERP) aimed initially at financial stabilization, with emphasis on demand management, and followed by a period of structural adjustment. The ERP aimed to:

- create a basis for sustained economic growth;
- restore the balance of payments to a sustainable level;
- reintegrate the parallel economy, in particular the unofficial foreign exchange market;
- normalize relations with external creditors.

It required a reversal of previous policies, and placed emphasis on private sector led development and a reduction of state intervention in the economy.

Macroeconomic policy

Fiscal policy

Fiscal policy focused on expenditure cuts. Between 1989 and 1991 employment in the public sector fell by nearly 18 percent and real public sector wages declined by 18 percent between 1986 and 1991, to between one-third and a quarter of those in the private sector.

Direct allocations of Government resources to agriculture, as a percentage of GDP, declined between 1989 and 1991, as the Government cut capital expenditures and divested itself of some previously subsidized public enterprises. Despite emphasis on private sector activities, transfers to agricultural parastatals in 1989 continued to account for the largest allocation of expenditures in the sector.

Monetary policies

The major goals of monetary policies after 1988 were the reduction of inflation and the stabilization of the Guyana dollar. Facilitating the access of the private sector to bank credit was also an objective. A programme of incrementally devaluing the Guyana dollar was pursued. The parallel market which had developed during the 1980s was legalized, which allowed banks and non-bank dealers to trade foreign currency at freely determined rates.

However, currency depreciation initially contributed to spiralling commodity prices, increased costs for imported products, including agricultural implements, and high rates of inflation. In 1988 the inflation rate was 40 percent, increasing to 70 percent by 1989.

Sectoral reform

The major focus of agricultural policy reform was to promote export-oriented economic growth, employment, and the country's potential in food production. The Government divested itself of many of its traditional functions and transferring them to the private sector. Input and output marketing were liberalized and the private sector was encouraged to provide agricultural support services on a commercial basis.

The policy reforms included better price incentives for rice farmers, and measures to improve the sugar industry's contribution to public sector finances. The initiatives dramatically improved the competitiveness of rice production. Real price increases for rice served as a catalyst for rice leading to a more than 100 percent increase in acreage harvested between 1990 and 1995.

To encourage diversification, measures were initiated to ensure that non-traditional crop farmers and livestock producers, who are generally small farmers, had greater access to credit. The credit problems faced by small farmers were addressed by the formation in 1986 of the Institute of Private Enterprise Development Limited (IPED) as a local NGO to provide loans to small entrepreneurs. It uses a cross guarantee system, whereby each member of a small group is liable for the debts of the others. IPED has been instrumental in facilitating output increases for a number of small producers in the non-traditional sector.

Some key agricultural policy initiatives are summarized below:

1985 Establishment of the Guyana Rice Marketing and Milling Authority (GRMMA): to purchase and mill paddy
1986 Establishment of the Institute of Private Enterprise Development: to provide loans to small and medium-sized businesses
1986 Establishment of the "New" Guyana Marketing Corporation: to provide marketing services
1990 Introduction of private operational management introduced into the sugar corporation
1991 Privatization of all the rice mills but one
1992 Establishment of the Guyana Rice Millers and Exporters Association: a private sector initiative to promote the development and expansion of the rice industry
1994 Re-establishment of the drainage and irrigation board

1995 The Guyana Rice Development Board (GRDB) formed: to promote the industry.

Trade policy

In February 1991, legislation to bring Guyana in line with the common external tariff (CET) of the Caribbean Common Market (CARICOM) was approved and a CET was applied to imports from outside the region. In October 1992, CARICOM member states agreed to a phased reduction in the CET rate.

Guyana's commitment under the WTO Agreement on Agriculture (AOA) involves rules governing market access, domestic support, and export subsidies, along with other methods used to make exports "artificially competitive". However, most of its WTO (AOA) commitments were already being met because the economic reform measures along with their trade reform components, had already liberalized most agricultural production and trade.

By 1995, market access distortions like licensing, quotas and negative lists had largely been removed. Non-tariff barriers (NTBs) had been replaced with tariffs, with limited exceptions, the main ones being sugar and rice. Neither these nor other exports receive export subsidies, and indeed until quite recently, sugar and rice were subject to a substantial export levy. Guyana therefore is comfortably fulfilling its WTO commitment not to subsidize agricultural exports.

Guyana, like other CARICOM countries, has so far made no effort to calculate the level of its non-exempt (amber box) domestic support. The reason given for this is that the existing level of support falls well below the *de minimis* limits, so there is nothing to be gained from pursuing this exercise. Most of the agricultural support is in the "green box" area of rural infrastructure projects (especially access roads and drainage and irrigation) and general support in areas like research, training, and extension activities. This WTO commitment has also had no direct impact on the country's agricultural sector performance since 1995.

However, whilst the WTO agreement has posed no significant challenges in relation to Guyana's own trade liberalization commitments, it does threaten the country's preferential access to the markets for many of Guyana's agricultural exports.

CONSEQUENCES OF REFORMS: INTERMEDIATE VARIABLES

After 1991, the country registered impressive growth rates, improved GDP per capita, received substantial debt write-offs, and improved agricultural output in most major commodities. However, by the late 1990s the momentum gained under the ERP appeared to have been exhausted. During 1998-2001 the average annual growth rate fell to 0.4 percent and the fiscal deficit widened. Since 1998, the country has entered a third phase of its development, characterized by economic stagnation, prompted by a combination of political and social unrest, adverse weather conditions, floods, and deterioration in the terms of trade. The agriculture sector, which spearheaded the recovery of the economy, has had a somewhat sluggish performance since 1997. The bauxite mining operations continued to contract as the Government sought to find a strategic partner, and the major gold mining operation, OMAI Gold Mines, was also in decline.

FIGURE 1A
Nominal EU wholesale, producer and world market prices for sugar 1971-2001

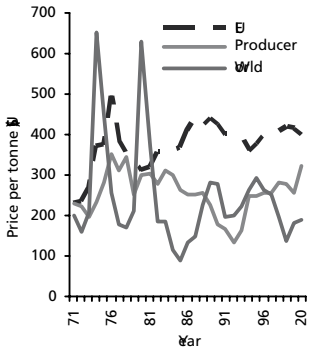
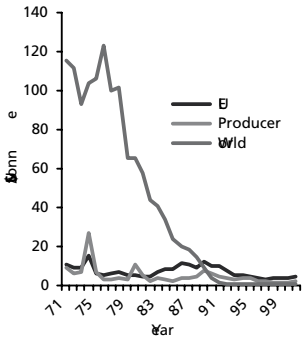


FIGURE 1B
Real EU producer and world market prices 1971-2001 (1990=100)



Source: Guyana Sugar Corporation Report, various years; Caribbean Sugar Association Report, various years; UNCTAD Monthly Commodity Bulletin.

In assessing the effects of reform on output incentives, the relationship between changes in the international price and changes in the domestic price of commodities are investigated in relation to other possible drivers such as the real exchange rate (RER), improvements in the efficiency of domestic marketing systems and other factors.

Trends in international and domestic prices

Sugar

Figure 1A reveals that the nominal EU wholesale export price[4] for sugar increased noticeably in the years 1975-76 and 1985-89. However, since 1977 world market prices have been falling in real terms (Figure 1B). Furthermore, since the reforms, more prudent fiscal and monetary discipline has seen a reduction in the differential witnessed in the pre-reform years between the international price received and the producer price paid, indicative of producers receiving prices closer to that paid to GuySuCo. Additionally, the removal of the sugar levy in 2000 has allowed the industry to use much of its resources to refinance its development.

Rice

Prior to the domestic reforms, the commodity price of rice was relatively stable before increasing substantially in 1983-84 period as a result of better prices in Guyana's preferred markets and the Government's policy of promoting the cultivation of larger tracts of land through offering better prices (Figure 2A).

[4] This is the preferential price that Guyana received for exporting to Europe under the Lomé Convention and Sugar Protocol.

FIGURE 2A
Average nominal EU world and producer prices for cargo rice (US$/tonne)

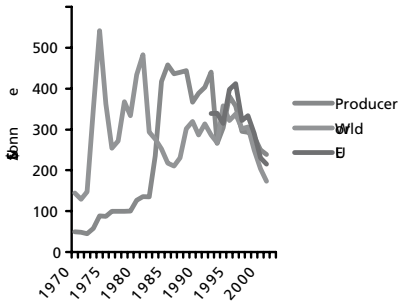
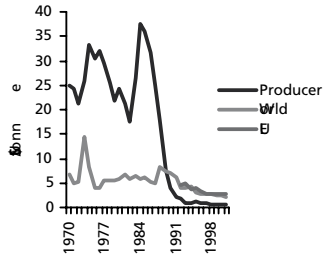


FIGURE 2B
Real domestic, EU and International prices for rice (1990=100)



Source: producer prices from FAOSTAT; world prices from UNCTAD Monthly Commodity Bulletin; EU prices from Eurostat.

Attempts to raise producer prices prior to the reforms led to a short term increase in the number of acres harvested, but were insufficient to stop the withdrawal from rice production as a result of other factors, such as foreign exchange restrictions, and marketing and transportation obstacles. However, after the reform period and significant increases in the EU export prices, up to 80 percent of farmers returned to paddy cultivation.

The price increases came at a time when the sector was being deregulated and more than 80 percent of the export price was being transmitted to local producers as indicated by Figure 2, as milling and marketing entities sought to out-compete each other.

Other crops

The "other crops" sector remains vital to any discussion of food security in Guyana. As the Government focused on inward-oriented policies before the reforms, the impetus was created for the sector to grow as Guyanese began to turn towards locally produced items. This resulted in real producer prices moving upwards. With the deregulation of the economy, lifting of trade barriers, and the emphasis on global trade, these food prices declined before remaining relatively constant (Figure 3). In fact, prices increased only marginally over the base year (1996) or in some instances declined. However, the retail price for meats increased by about 15 percent. This overall modest increase was responsible for inflation remaining largely in single figures for the period 1994-2001.

Reduced real producer prices occurred particularly after the reforms, as the economy was liberalized and the currency devalued. While stable or declining food prices were welcomed by consumers, for some producers it implied a decline in disposable income. This latter effect was particularly severe for small producers.

FIGURE 3A
Real domestic producer prices for selected other crops 1970-2000 (1996=100)

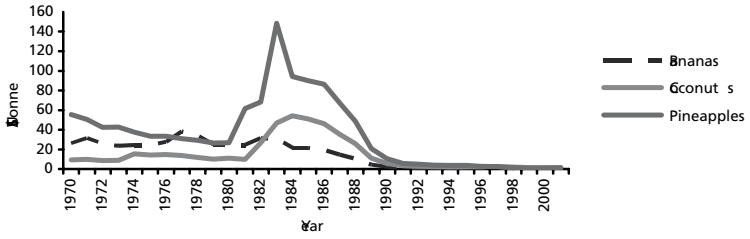
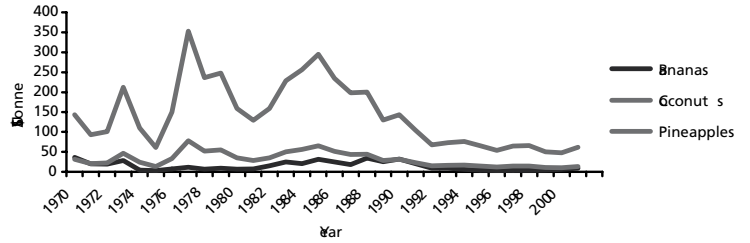


FIGURE 3B
Real international producer prices for selected other crops 1970-2000 (1996=100)



Source: Producer prices from FAOSTAT and the New Guyana Marketing Corporation.

Price decomposition

Domestic prices in Guyana have been influenced by a range of factors including world prices, exchange rate movements, tariffs and transaction costs. The relative contribution of each has been investigated in Thomas and Bynoe (2003) and is shown in Table 1.

Real producer prices rose for both sugar and rice, which service highly protected markets. These increases are largely due to the exchange rate and other factors. For the other crops, sector, prices fell during the post-reform period (1991-2001) for various reasons. The results for cereals differ from those of other crops. In the former case, exchange rate and other factors dominated; while in the latter it was the world price and exchange rate (Table 1). The continual depreciation of the Guyana dollar is reflected in the growing influence of the exchange rate factor in all the commodities' price decompositions.

Integration of the domestic and international markets

Analysis of the relationship between changes in domestic agricultural prices and changes in the real effective exchange rate, international prices and a policy variable was undertaken to examine the sensitivity of domestic prices to changes in these

TABLE 1
Price decomposition of selected crops (base year = 1980)

	Period	Change in domestic price	Change in world price	Change in exchange rate	Other factors
Sugar	1980-85	1.33	3.53	24.33	-26.53
	1986-90	1.63	1.93	-81.80	81.50
	1991-95	1.32	-0.27	-171.33	172.92
	1996-01	0.63	0.34	-156.00	156.29
Rice	1980-85	1.83	3.27	24.33	-25.77
	1986-90	1.87	2.59	-81.80	81.08
	1991-95	1.43	0.29	-171.33	172.47
	1996-01	0.92	-0.35	-156.00	157.27
Pineapples	1980-85	99.00	62.00	24.33	12.67
	1986-90	30.20	10.60	-81.80	101.4
	1991-95	-182.00	-74.00	-171.33	63.33
	1996-01	-291.50	-103.17	-156.00	-32.33
Coconuts	1980-85	87.50	20.5	24.33	42.67
	1986-90	53.80	10.2	-81.80	125.40
	1991-95	-150.80	-74.4	-171.33	94.93
	1996-01	-179.70	-103.70	-156.00	80.00
Cereals	1980-85	-73.83	3.30	24.33	-101.46
	1986-90	-399.00	22.61	-81.80	-339.81
	1991-95	-814.40	-11.40	-171.33	-631.67
	1996-01	-896.00	-38.80	-156.00	-701.20
Bananas	1980-85	1.80	-72.69	24.33	50.16
	1986-90	-115.00	-17.59	-81.80	-15.61
	1991-95	-329.80	-130.40	-171.33	-28.07
	1996-01	-376.10	-193.70	-156.00	-26.40

Note: Comparative results from price decomposition analyses across the case study countries are provided in Annex B of the Synthesis chapter. The results in Annex B present the change in the domestic price as a percentage change with respect to previous period. The case study analyses vary in that some present results as a percentage change with respect to a base period. Whilst the interpretation of results in the case study narrative holds irrespective of the end points compared, the results presented in Annex B should be used for comparative purposes.

Source: Authors' computations from FAOSTAT and the sub-sector for producer prices; from the International Financial Statistics of the IMF for real effective exchange rates; from GRDB and GuySuCo for preferential prices for rice and sugar; from the Monthly Commodity Bulletin of the UNCTAD for world prices.

variables (Thomas and Bynoe, 2003). At the aggregate level, 92 percent of the variation was due to changes in the real effective exchange rate, the world price, and the policy variables. Elasticity estimates suggest that the policy variable (-2.04) and the real effective exchange rate (0.73) strongly influenced the real domestic agricultural price index, whereas the transmission elasticity (0.02) of world prices was weak in comparison, due in large part to the macroeconomic policies in place. The estimated world price transmission elasticity varies between 0.62 (bananas) and 2.50 (cereals). The estimated transmission elasticity for sugar of 0.67 was only higher than that of bananas. State regulation of the sugar industry could have been a causal factor. The exchange rate had a major impact on the prices of most crops. The policy variable appeared to have affected only the rice industry, as the pricing formula for paddy was said to be one of the most important determining factors.