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**DISCUSSION
PAPER** 91.4

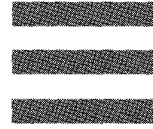


*Agricultural
policy reform
in China*



DISCUSSION
PAPER

P91.4



Agricultural policy reform in China

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Foreword

This report represents the culmination of a collaborative research effort between the Institute of Agricultural Economics of the Chinese Academy of Agricultural Sciences and the Australian Bureau of Agricultural and Resource Economics. The program of joint work between the Institute and the Bureau has already resulted in a number of research reports. These precursors to the present document include a study of the system of decision making for agriculture in China, analyses of agricultural demand and supply in China, and a review of the agricultural policy reforms in China since 1978.

China is a large agricultural producer, and at the end of 1978, after two decades of central planning, embarked on a major program of agricultural policy reforms designed to improve efficiency by giving market forces an increasing role in determining production and consumption

decisions. These policy reforms have already had significant effects, both domestically and on world markets.

The aim in the joint project reported here was to analyse the implications of China adopting policies which would open its agriculture even further to the world market. The analysis also provides insights which should be useful in examining specific policy issues as they arise in the future.

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Agricultural and
Resource Economics

Canberra
March 1991

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Beijing

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Summary

A series of agricultural reforms have been adopted in China since 1978. These reforms have had two major effects. First, by improving the price incentive structure and by reducing the proportions of many agricultural commodities that are directly procured by the government, China has introduced a greater market orientation into the movement of agricultural products from the farm gate to the consumer. Second, by gradually moving away from centralised production planning, China has increased the role played by individual farmers in decision making with respect to the quantities and composition both of production and of inputs used.

Despite these reforms, there is still a high degree of state intervention in agriculture. The attainment of the maximum possible degree of food self-sufficiency is still an important goal of the Chinese government. On the other hand, the continued development of 'special economic zones' in China is likely to lead to a rise in foreign exchange earnings and in domestic incomes, and China's capacity to import agricultural commodities such as grains is likely to expand.

The main focus in this study is on the ways in which Chinese policy makers might approach further reforms designed to maintain the process of agricultural policy liberalisation which commenced in 1978. Specifically, the implications of three alternative policies are analysed using a simulation model of world agricultural trade. The alternatives modelled are the achievement of self-sufficiency in basic food commodities, an increase in wheat imports (which would require an easing of import controls), and the removal of domestic intervention in Chinese agriculture.

*Agricultural reforms adopted
in China since 1978*

*Considerable state
intervention remains*

*Chinese approaches to
further reform*

Self-sufficiency in basic foods

Pursuit of food self-sufficiency would reduce incomes in China . . .

If China seeks the maximum possible degree of food self-sufficiency, this is likely to have adverse implications not only for China but also for many trading countries. Because of the actual and potential importance of China in international agricultural markets, even small changes in China's self-sufficiency in farm products can have a considerable effect on world prices and quantities traded. In China, pursuit of food self-sufficiency would be likely to lead to a net welfare loss because of the substantial transfer of income from both consumers and the government to producers, resulting in a misallocation of resources between the agricultural and non-agricultural sectors.

. . . and reduce world prices

The achievement of self-sufficiency in basic foods would have an adverse effect on food exporters such as the Cairns Group of countries, including Australia, because it would cause international food prices to fall. Net welfare losses would also be expected in the European Community. On the other hand, there would be net welfare gains for both the United States and Japan. In the case of the United States these gains would take the form of considerable benefits to consumers of livestock products, especially pork. Because the United States is a net importer of pork, the fall in the international price of pork following the achievement of self-sufficiency in basic food commodities in China would result in gains to US consumers which would outweigh the associated losses to pork producers. In Japan the effect would be more general: since Japan is a major net importer of most agricultural products, the reductions in world prices would in many areas lead to consumer gains that would offset producer losses.

Increased wheat imports

Benefits of increased wheat imports

In contrast to the policy of pursuing food self-sufficiency, the relaxation of wheat import controls and removal of consumer subsidies on wheat in China could increase overall welfare in both China

and its major trading partners. In particular, producers in major wheat exporting countries, such as the United States and Australia, would benefit considerably as a consequence of a rise in the world price for wheat, and these benefits would more than offset the losses incurred by consumers in these countries.

The extent to which China might ease wheat import controls would largely depend on its capacity to pay for additional wheat imports. China is likely to be able to continue to increase its earnings of foreign exchange by exporting labour-intensive manufactured goods, if it is willing to allow the necessary structural changes to occur within its economy. If foreign exchange earnings were sufficient to permit substantially increased wheat imports, it is likely also that income levels would be sufficient to allow the Chinese government to cease selling wheat at subsidised prices. In this study, therefore, an increase in wheat imports has been simulated in conjunction with the ending of wheat consumption subsidies.

Removal of domestic intervention

If China were to abandon its policies of holding prices received by producers at levels which are below equivalent world market prices and subsidising consumers, domestic economic welfare would be likely to increase considerably due to increased returns to producers and reduced government spending. However, unilateral agricultural policy reform of this kind in China would not be beneficial to all other countries. Some trading countries would benefit while others would lose. Net economic welfare would increase in countries such as the United States, the European Community and Japan, due to consumer benefits from lower world prices — particularly for livestock products such as pork — outweighing the associated producer losses. The Cairns Group of countries, including

Increased foreign exchange earnings necessary

China would benefit from removal of domestic interventions

*Wide gains from
multilateral reform*

*China would benefit from
relaxing wheat import
controls . . .*

*. . . but more from
complete removal of
interventions*

Australia, would incur net welfare losses. In these countries, the losses to producers resulting from lower world prices for farm products would outweigh the rise in welfare to consumers.

In contrast, removal of protection of a wide range of agricultural commodities in the United States, the European Community and Japan, together with the above agricultural policy reform in China, would be likely to result in large net economic welfare gains for agricultural trading countries in general.

Conclusion

In summary, the analysis undertaken in this study supports the view that, given its relatively small per-person endowment of arable land, food self-sufficiency for China is a costly option on economic welfare grounds, not only to China itself but also to other trading countries. On the other hand, relaxation of controls on major agricultural imports such as wheat and removal of consumer subsidies on wheat — as could occur in response to an expansion in domestic demand associated with increases in income — would be likely to increase net welfare in both China and its major trading partners. Still greater welfare gains could be expected from the complete removal of various interventionist policies affecting the key sectors of Chinese agriculture.

Introduction

Since 1978 a series of economic reforms, designed to reduce central planning and increase individual incentives and economic efficiency, have been adopted in China. Agriculture, which accounted for 36 per cent of China's national income in 1980, was one of the first sectors to which the new policy reforms were applied. These reforms resulted in rapid growth in agricultural output during the period 1978–84. In addition, production in rural non-agricultural industries rose sharply during this period.

However, while the output of rural non-agricultural industries and some other sectors of the national economy has continued to grow rapidly, the expansion in agriculture has slowed since 1984. Grain output failed to maintain its 1984 level during 1985–88, despite successive increases in administered prices received by farmers in 1986, 1987 and 1988. In contrast, demand for farm produce has increased steadily. As a result, China increased its grain imports in the period 1986–88. Domestic grain production in China recovered strongly in 1989, but overall agricultural production in China remains static.

The stagnation of China's agriculture since 1984 has received wide attention both within and outside China. There is some debate as to whether it is a short term effect of exogenous influences such as adverse weather, or a longer term phenomenon, perhaps resulting from the benefits of earlier reforms having been

fully exploited and/or from the continued operation of agricultural policies which encourage inefficient resource use, despite the earlier reforms. Since 1986, higher administered prices have been provided to farmers to raise production. More generally, however, major programs of economic reform in agriculture and in other sectors of the economy have been postponed since late 1988 because they have been perceived by Chinese policy makers to be inconsistent with the objective of containing inflation, which averaged over 17 per cent a year in 1988 and 1989.

Since late 1988 the Chinese government has introduced a number of measures which it hoped would contain inflation. These measures have included contractionary macroeconomic policies, postponement of price reforms, reintroduction of price controls, and use of administrative measures to restrain demand and stem the diversion of resources from the planned to the non-planned sector where prices have been higher. There are indications that inflation moderated to around 7 per cent a year during the early part of 1990.

China's future economic policy decisions will have important effects both within China and on world markets, just as policies adopted in other countries could influence the world trading environment within which trading countries, including China, operate. China is pursuing membership of the

GATT. As a consequence, its domestic economic structure could change substantially if a more open international trading system is adopted. These changes could have important domestic and international implications.

In light of the potential importance of agricultural policy reforms within China, the objective in this study is to examine the implications of possible agricultural policy changes both for Chinese agriculture in particular and for world agricultural commodity prices and trade in general. China's agricultural policies affect the volumes of agricultural commodities that Australia can export to China, and have some influence on world prices for these commodities. They

thus help to determine both Australia's export performance and its economic welfare. The analysis reported includes the effects on Australian trade and economic welfare.

The plan of the paper is as follows. First, a review of agricultural policy reforms in China is presented, together with estimates of support for key sectors of Chinese agriculture. In chapter 3 some of the possible economic effects of alternative agricultural policy regimes on China and other trading countries are analysed, using a world agricultural trade model. In the final chapter the results are discussed and some qualifications arising from the modelling techniques are mentioned.

Assistance to major sectors of Chinese agriculture

Overview of past policy changes and their effects

In the past, Chinese agriculture has been characterised by extensive state controls (via the commune system), state marketing of most outputs, and state monopoly over foreign trade. Over the two decades to 1978, China's government used its control over returns in agriculture (through the pricing of products and inputs) as an instrument in a development strategy designed to transfer resources to secondary industries. The size of these transfers was reduced during the years 1978–84, when state prices for major agricultural products were increased.

Policy reforms in agriculture and rural industry since 1978 have been far reaching. They have had significant effects on the levels and composition of output by increasing the scope for specialisation, linking productivity and personal rewards more closely, and changing price relativities. The main initiatives — apart from price changes — have been the easing of provincial self-sufficiency requirements for grain and of restrictions on specialised production, and the introduction of the 'household responsibility' system in place of the commune system. Under the new system the individual farmer, rather than the production team, became the basic decision making unit. This system has operated sufficiently

effectively that elements of it have been introduced into other sectors.

The combined effects of these changes were dramatic. Agricultural production grew at an average rate of 7 per cent a year during 1978–84. This was well above the 3.2 per cent a year growth rate of the pre-reform years 1952–78. Growth was so strong that by 1984–85 rationing systems were relaxed.

The apparent success of these reforms between 1978 and 1984 led to a change in policy emphasis in the mid-1980s. Under the 'second stage' rural reforms of 1985–87, priority was given to improving product marketing and to expanding the role of markets in agriculture and its service sectors. State controls over prices for many agricultural products were eased further. At the same time, state outlays on agriculture under general investment and other programs continued to decline as a share of the national total.

The 'second-stage' reforms have coincided with a period of slower growth in crop production. Between 1985 and 1989 output of the cropping industries grew at an annual rate of only around 2 per cent. Overall, since 1984 annual growth in total agricultural output has slowed to an average of around 3 per cent.

This slowdown has been attributed to several factors: first, the fact that the more immediate productivity-increasing effects of the household responsibility system and other reforms are likely to

have been fully exploited; second, a slowing of improvements (and, for some commodities, reductions) in farmers' terms of trade; third, the withdrawal of resources from agriculture due to the higher returns available in the partly deregulated rural industrial and services sector; fourth, a run of unfavourable seasons; and fifth, a deterioration of infrastructural facilities such as irrigation and drainage systems due to a fall in state investments in agriculture (Zhu and Chapman 1988).

With the relaxation of state controls on livestock, horticultural and aquatic production, returns from these industries have risen rapidly. In the meantime, fiscal responsibility has been divided between governments at different levels, creating incentives for the local governments to allocate their funds to the more profitable enterprises such as food processing factories. The rapid expansion of livestock, horticultural and aquatic industries, and of rural non-agricultural industries such as textiles, tobacco processing and beverage production, has led to a shift of some resources from crop production to these industries.

Since 1987, state outlays on agricultural development have increased, and official statements suggest a possibility of further increases through to the early 1990s. However, this new trend has been accompanied by increased intervention in product markets and central control over the levels of direct producer payments. State oversight or 'guidance' of markets has been stepped up, and since late 1988 some direct controls over prices have been reestablished and some previously free markets have been closed as part of the

response to inflation. State contract prices for major crops have been raised, and several new programs supported by state grants and credit facilities have been established to promote the production of livestock products and products such as vegetables. Consumption patterns continue to be state-influenced, especially in urban areas. For example, grain is still rationed, and the prices of some major staple foods at state outlets remain below market levels. (An increasing proportion of China's internal agricultural trade is at freely negotiated prices.) In large cities, in response to shortages of supplies and high rates of inflation, rationing of some non-staple foods such as pork and eggs, which was lifted in 1984-85, has been reintroduced.

Since late 1988, Chinese policy makers have again placed a high priority on increasing agricultural production. At the National Rural Work Conference in October 1988, several policy measures were proposed as a ways of increasing agricultural production. Of these, increases in the levels of material inputs and investment in basic production facilities were emphasised. A considerable further rise was also announced, of some 18 per cent, in prices paid for grain purchased by the state, to take effect in 1989.

1989 was a favourable year for China's agricultural sector. Increased government expenditure on the supply of fertiliser, pesticide and other agricultural inputs, higher state-determined grain prices and favourable weather conditions in most parts of China contributed to a rise of more than 3 per cent in agricultural output in 1989 compared with the previous year. In 1989, total grain production increased

by 3.4 per cent relative to the previous year, reaching 407 Mt — equal to the record grain output of 1984. Nevertheless, China continued to import grains to meet rapidly growing demand. The increase in grain output was accompanied by a decline in the production of cotton and oilseeds.

It is evident from the above discussion that, despite the rural and economic reforms, particularly between 1978 and 1987, there is still a high degree of state intervention in agriculture. Cropping patterns are still partly determined by non-market influences such as state purchase contracts, the associated input distribution systems, and the state-controlled production centres for priority commodities such as grains. Many input and product processing industries are operated by the state at national or local government level. The state maintains a major role in rural finance and a monopoly over foreign trade in many of the principal food and fibre products. As a result of border controls and various other national interventions which constrain trade, as well as of transport and other local constraints to trade, the changes in world market prices for many agricultural commodities are not transmitted fully to domestic markets. Differences between domestic and external prices, and between state and market prices domestically, have given rise to income transfers to or from producers which have fluctuated substantially since the reform process commenced.

Current policy setting

The policy instruments employed in the main forms of government intervention

in Chinese agriculture can be grouped into six broad categories: trade controls, procurement, consumer subsidies, direct farm income support, indirect farm support, and other support.

Price support measures involve various border controls on trade, and state controls over domestic producer prices through procurement policies and over consumer prices via rationing and subsidies for urban consumption. The Central Government controls international trade in almost all major agricultural products. A central aim of import controls is to allocate limited supplies of foreign exchange in accordance with perceived needs and priorities. Decisions on the products and quantities to be imported and exported — constituting the 'plan on foreign trade' — are made by the State Council (the national cabinet), and the Ministry of Foreign Trade is responsible for their implementation. The plan breaks the link between world prices and the prices paid by consumers and received by producers for most agricultural commodities.

Procurement policies are implemented in one of two ways: either through contract procurement, under which farmers are required to sell a certain proportion of their output to the state at contract prices determined prior to planting, or through negotiated procurement, under which commodities are obtained from farmers at prices negotiated after harvest. The negotiated price is in general higher than the contract price, and the use of negotiated procurement has consequently grown relative to contract procurement. However, for many commodities both the negotiated prices and the contract prices are well below world prices.

Subsidies are provided on agricultural products for urban consumption by sale of government-procured agricultural products to consumers at prices well below market levels, for many agricultural commodities. These subsidies have become an increasingly heavy financial burden to the Central Government, because prices charged to urban consumers have changed little over the years despite significant increases in the procurement prices.

Farm income support given directly to agricultural producers, at the household, local collective and state farm levels, mainly comprises disaster relief payments, to compensate for income losses arising from natural disasters.

Indirect support to agriculture — via the prices paid for key inputs, particularly for capital, fertiliser and fuel — is partly positive and partly negative. Interest rates on loans to agricultural producers are essentially the same as those to state and collective industrial enterprises and commercial businesses, although slightly lower than those paid by non-agricultural rural enterprises. However, the Central Government, through the People's Bank of China, provides concessional loans for infrastructural development affecting agriculture in general, and particularly for projects in poorer regions. On the other hand, domestic prices for chemical fertilisers and fuel (diesel oil) used in agriculture exceed their border prices, and thus impose an implicit tax on fertiliser and fuel use in agricultural production.

Other support measures in Chinese agriculture range from government funded research and development to state outlays on infrastructure development in agriculture. These measures generally

have a longer term influence on agricultural productivity. Also included in this category is the difference between the rate of taxation paid by peasant households and the lower rate paid by private, non-agricultural businesses.

Estimates of subsidy equivalents

There are several ways of measuring the effects of government intervention on producers and consumers: see Haszler and Parsons (1987) for a brief description of these different methods. In this study measures known as the producer subsidy equivalent (PSE) and consumer subsidy equivalent (CSE) are used. These measure the overall level of support to producers or consumers of a given commodity.

The PSE is the payment that would be required to compensate producers for the loss of income resulting from the removal of a given policy measure. The PSE for a particular commodity is positive when the net effect of all intervention policies affecting that commodity is to increase the incomes of its producers over what they would have been in the absence of these policies, and negative when their net effect is to reduce them.

The CSE is the payment that would be necessary to compensate consumers for their change in expenditure if a given policy measure were removed. The CSE for a particular commodity is negative when the net effect of all intervention policies affecting that commodity is to increase the price consumers pay for it, and positive when consumers pay less for it than they would in the absence of the policies. A detailed discussion of the

calculation of PSEs and CSEs is given in OECD (1987).

The particular advantage of these measures is that they can capture the effects of a comprehensive set of policy measures. However, they present certain difficulties. One is that PSE and CSE calculations require a world reference price (or border price) to be chosen, to represent the price which would rule in the domestic market in the absence of intervention. The level of support as measured by the PSE and CSE will be affected by the choice of the external reference price. It will also change over time as the world price changes, whether or not the support measures themselves are altered. Another important point is that any 'large country effects' — which arise where the effect of a country's support on imports or exports is sufficiently large to affect world prices — are ignored in PSE and CSE calculations (Peters 1988).

Exchange rates are also of importance in PSE and CSE calculations. They are needed in order to express the world reference prices in domestic currencies, for comparison with domestic prices. It follows that exchange rate fluctuations can alter both the absolute PSEs and CSEs and their relative values between countries. The effects of exchange rate changes on PSEs and CSEs can be particularly noticeable in the short run, because exchange rates are often subject to marked short term instability and can deviate substantially from their medium to long term equilibrium level; this is true regardless of whether the nominal exchange rate is fixed or floating (O'Mara 1988). In calculating PSEs and CSEs, the exchange rates generally adopted are those ruling in the year(s)

for which the calculations are being made.

It must be stressed, however, that — historically — PSEs and CSEs are predominantly determined not by fluctuations in exchange rates, but by the policies used by many countries, including China, which prevent world price changes (and exchange rate changes) from being transmitted to their domestic markets — for example, import quotas and administered domestic prices.

In assembling the information required to estimate the PSEs and CSEs for agricultural industries in China, numerous difficulties were encountered. These included missing data, contradictory data and poor documentation of data collection procedures. In addition, there were difficulties in identifying the policy measures that should be incorporated in the calculations. For this reason, PSEs and CSEs were estimated only for the major agricultural industries, for which adequate data are available.

Estimation of PSEs and CSEs generally includes calculation of income transfers arising from the difference between the domestic price of a product and the border price of a similar product. The question arises as to which domestic prices should be used for this purpose — the market or administered prices. The planning system which operates in China has required agricultural producers to deliver specified quantities of output to the state at official prices. The proportion of output marketed outside these quotas at market prices appears to have increased for most commodities. In 1986, around 44 per cent of all farm produce sold in China was sold at market prices, compared with 18 per cent in

1984 (Almanac of China's Prices 1989; Sicular 1988). Output levels have been affected not only by institutional factors such as the change from a commune to a household responsibility system, but by increases in product prices, and particularly in the market prices (Martin 1989; Halbrendt and Gempesaw 1990). In this study, the domestic prices used in calculating PSEs and CSEs are the market prices, on the ground that production and consumption decisions in China are guided by price changes at the margin and marginal sales are at market rather than administered prices.

In expressing the border prices of agricultural commodities in Chinese currency, for comparison with domestic prices, the official exchange rate has been adjusted to take account of the apparent overvaluation of the Chinese currency. In the absence of empirical information on an unconstrained, legal equilibrium exchange rate, the procedure followed by Cowitt (1989), Webb (1989) and Yang and Tyers (1989) was used. The official exchange rate was adjusted by one-third of the difference between it and the prevailing 'open' (unofficial) market rate.

In PSE and CSE calculations, the comparison of domestic and world reference prices implies an assumption that the domestic and external products are homogenous. However, agricultural commodities produced in China may be of different quality from those traded on world markets; for example, rice produced in China is classed as inferior to that traded on world markets (Dixit and Webb 1989). If the world reference price is an overestimate of the value of the Chinese product, the calculations will result in overestimates both of the effective taxation

of producers and of the subsidies to consumption.

Recently Webb (1989) has estimated PSEs and CSEs for major agricultural commodities in China, but taking account only of procurement pricing and border measures. In the present study, an attempt has been made to estimate the PSEs and CSEs for Chinese agricultural commodities due not only to these interventions but also to various other key government measures such as: direct income support (disaster relief); indirect support, including advance payments to farmers, interest subsidies and administered input pricing; and other support measures including research and development expenditure, transfers through the tax system, expenditure on infrastructure development and transfers from profits of other rural enterprises. As a consequence, the PSEs and CSEs estimated in this study capture most of the key policy transfers relevant for major agricultural industries in China.

Estimates of PSEs and CSEs for major agricultural industries in China for 1986 are presented in tables 1 and 2. This was the latest year for which detailed information on the above transfers was readily available for the major agricultural industries. Detailed information on the estimation of the various transfers is given in appendix A.

It is evident from table 1 that in 1986, as a result of government policies, returns to Chinese farmers were lower than they would otherwise be — that government policies imposed an implicit tax on the production of most of the commodities examined. Commodities with large negative PSEs include many of the livestock products, and rice and sugar. Wheat and soybeans have low

1 PSEs for major Chinese agricultural industries, 1986

Commodity	Policy-induced transfers						Value of production ^d	PSE ^e
	Price support		Direct			Total		
	Procurement pricing	Border measures	income support ^a	Indirect support ^b	Other support ^c			
yuan m	yuan m	yuan m	yuan m	yuan m	yuan m	yuan m	%	
Beef	-331	-1 472	9	6	115	-1 673	3 278	-51.0
Pork	-993	-46 450	153	108	2 053	-45 129	58 478	-77.2
Mutton	-20	-740	6	5	86	-663	2 456	-27.0
Poultry	-6	199	19	13	255	480	7 257	6.6
Wheat	-1 242	-3 109	122	-1 403	1 634	-3 998	46 551	-8.6
Corn	-958	589	78	-901	1 050	-142	29 901	-0.5
Other coarse grains	-12	250	16	-190	221	285	6 300	4.5
Rice	-3 093	-37 312	226	-2 601	3 029	-39 752	86 284	-46.1
Soybeans	-300	-434	28	-326	379	-652	10 801	-6.0
Cotton	0	1 468	30	-343	400	1 554	11 385	13.7
Sugar	0	-915	8	-97	112	-891	3 203	-27.8
Total ^f	-6 955	-87 926	695	-5 729	9 334	-90 581	265 893	-34.1

^a Disaster relief. ^b Includes advance payments, interest subsidies and input pricing. ^c Includes R&D expenditure, transfers through the tax system, infrastructure development in agriculture, transfers from rural enterprise profits and other state outlays. ^d At domestic market prices. ^e Total policy transfer divided by gross value of production. ^f Excludes eggs, milk, soybean meal, soybean oil, other oilseeds, other meals and other oils.

Sources: See appendix A, tables 12, 13 and 15.

2 CSEs for major Chinese agricultural products, 1986

Commodity	Policy-induced transfers				Gross value of consumption ^a	CSE ^b
	State consumer subsidy	Transfers due to border measures	Total			
	yuan m	yuan m	yuan m			
Beef	289	1 407	1 696	3 133	54.1	
Pork	3 507	46 178	49 685	58 136	85.5	
Mutton	244	738	982	2 448	40.1	
Poultry	70	-196	-126	7 149	-1.8	
Wheat	6 417	3 320	9 737	49 706	19.6	
Corn	1 343	-546	797	27 706	2.9	
Other coarse grains	619	-245	374	6 191	6.0	
Rice	8 902	37 174	46 076	85 965	53.6	
Soybeans	619	393	1 012	9 798	10.3	
Cotton	1 614	-1 249	365	9 690	3.8	
Sugar	16	1 074	1 090	3 760	29.0	
Total ^c	23 640	88 048	111 688	263 682	42.4	

^a At domestic market prices. ^b Total policy transfer divided by gross value of consumption. ^c Excludes eggs, milk, soybean meal, soybean oil, other oilseeds, other meals and other oils.

Sources: See appendix A, tables 12, 14 and 16.

negative PSEs, while PSEs for poultry meat, cotton and coarse grains other than corn are positive, indicating that the production of these commodities is subsidised.

For products with a negative PSE, a substantial proportion of the negative transfers arises from the price effects of government measures which restrain international trade. In the case of grains and oilseeds, state procurement at prices below the prevailing market prices also accounts for a considerable share of the negative transfers.

Consumption of most of the agricultural commodities is effectively subsidised (table 2) — particularly pork, beef, mutton, rice and sugar. Effective consumer subsidies on coarse grains, soybeans and cotton are much lower. For the products with high CSEs (and overall), most of this 'subsidy' is indirect: it is the consumer price effect of government intervention in international trade. The other category of consumer transfer, actual consumption subsidies

— particularly those to urban consumers — have become an increasingly heavy financial burden on the Central Government. In 1986, the state spent nearly 24 billion yuan (US\$6.9b) to make up the difference between procurement prices and urban retail prices (Webb 1989) — about 2.5 per cent of gross domestic product, and around 13 per cent of total government expenditure.

From an international perspective, the pattern of government intervention in Chinese agriculture is consistent with that which is prevalent in many low-income developing countries. Producers of many agricultural commodities are taxed (explicitly or implicitly), and livestock producers are taxed heavily relative to grains producers (see table 3), while consumption of farm products is heavily subsidised. This contrasts with the situation in major developed countries where consumption of agricultural products is heavily taxed (see table 4).

3 Comparison of PSE estimates for major agricultural industries in selected countries, 1986

Commodity	United States	European Community	Japan	India	Mexico	China
	%	%	%	%	%	%
Beef	11.7	36.5	70.9	-52.0	-67.0	-51.0
Pork	7.9	27.1	51.3	na	na	-77.2
Mutton	na	59.5	na	-35.0	na	-27.0
Poultry	17.1	33.6	20.3	na	na	6.6
Wheat	63.0	54.2	103.1	-29.0	18.0	-8.6
Coarse grains	54.4	39.2	103.7	na	51.0	0.4 ^a
Rice	71.7	73.3	94.3	-5.0	-47.0	-46.1
Soybeans	13.3	43.4	65.9	-12.8	40.0	-6.0
Cotton	na	na	na	-9.9	-89.0	13.7
Sugar	82.7	49.2	75.4	40.0	-7.0	-27.8

^a Weighted average of corn and other coarse grain PSEs from table 1. na Not available.

Sources: Table 1; US Department of Agriculture (1988); Sullivan, Wainio and Roningen (1989).

4 Comparison of CSE estimates for major agricultural products in selected countries, 1986

Commodity	United States	European Community	Japan	India	Mexico	China
	%	%	%	%	%	%
Beef	-1.0	-19.0	-34.0	32.0	39.0	54.1
Pork	na	-13.0	-21.0	na	na	85.5
Mutton	na	-25.0	-19.0	15.0	na	40.1
Poultry	-5.0	-18.0	-8.0	na	na	-1.8
Wheat	-14.0	-41.0	-48.0	15.0	8.0	19.6
Coarse grains	-47.6	-7.2	-17.9	na	33.0	3.5 ^a
Rice	-4.0	-36.0	-72.0	1.4	24.0	53.6
Soybeans	na	na	na	-13.0	31.0	10.3
Cotton	na	na	na	9.0	67.0	3.8
Sugar	-47.0	-28.0	-29.0	-23.0	3.0	29.0

^a Weighted average of corn and other coarse grain CSEs from table 2. na Not available.

Sources: Table 2; US Department of Agriculture (1988); Sullivan et al. (1989).

Economic implications of possible policy changes

An extensive body of literature now supports the view that individual countries and the world as a whole can achieve economic benefits if all countries follow policies of free trade. However, the available theory provides little guidance on how countries might best move from a position of intervention in markets toward a policy of free trade. A significant obstacle to such reform is the adjustment costs involved. Such adjustment costs are likely to be quite appreciable in the case of China.

In this situation, there are many ways in which Chinese policy makers might approach further policy reforms towards agricultural trade liberalisation. Since it is not possible to anticipate all the combinations of policy changes that might be adopted, emphasis in this study is on a limited range of alternative policy regimes, chosen to help illustrate some of the key choices available to Chinese policy makers. Particular attention is given to grain, because it is a crucial area of agricultural policy in China. The analysis specifically focuses on three policy options: attaining self-sufficiency in basic food commodities; an increase in wheat imports; and a unilateral complete removal of domestic intervention in Chinese agriculture.

Self-sufficiency

The attainment of the maximum possible degree of food self-sufficiency is still an important goal of the Chinese

government, despite the fact that China has only a relatively small per-person endowment of arable land compared with agricultural exporting countries in the Asia-Pacific region and North America. This shortage of arable land is exacerbated by limited availability of irrigation water, particularly in the northern and north-western regions. There are considerable differences in agricultural production between and within regions in China due to variations in natural resource endowments.

At present, potential to expand agricultural production still remains. According to Yang and Tyers (1989), this would require removal of state controls, the correction of deficiencies in transportation and increased investment in agricultural education, research and extension. Nevertheless, in view of China's relatively small per-person endowments of arable land and water, its comparative advantage in food production can be expected to decline as the overall economy expands. Therefore, retention of food self-sufficiency as a policy goal would be likely in the long run to involve increasingly large costs to China in terms of production alternatives forgone elsewhere in the economy.

Increased wheat imports

China has continued to develop special economic zones adjacent to important international trade routes, as part of the

opening up of its coastal regions to world markets. It is intended that coastal development will be focussed on manufacturing, including agricultural processing industries using both domestically produced and imported raw materials. These initiatives have been accompanied by steps to reduce state regulation of trade and to provide greater autonomy to exporting industries (Zhu and Chapman 1988). China's coastal development strategy is likely to have important implications for world trade in both primary and processed agricultural products, particularly over the longer term. As economic activity in the coastal regions expands, China's exports, foreign exchange earnings and domestic incomes are likely to rise. The expansion of its ability to export will increase China's capacity to import producer and consumer goods, including grains such as wheat. Under such circumstances, the present wheat import controls — at present constrained by foreign exchange availability — might well be relaxed progressively.

Reduction of domestic intervention

China is seeking to join the General Agreement on Tariffs and Trade (GATT) and, if successful, may be required to make substantial changes to its agricultural and trade policies in order to comply with GATT rules (including any agreements which may be reached in the Uruguay Round of multilateral trade negotiations). The purpose of including the third policy option is to obtain an indication of the maximum potential impact of agricultural policy reform. In reality, a more likely outcome would be a gradual reduction in domestic intervention in agriculture.

If a need to reduce domestic intervention in agriculture were accepted, an important option open to China would be to reform domestic policy so that production and consumption decisions would be made at world prices. Such reforms could be partial or complete in terms of the degree of movement toward world prices. Also, they could be applied to all industries or only to some. The extent and the industry coverage of these reforms would depend on the priorities of the Chinese government and the prevailing domestic economic environment. Where support policies insulate farmers from world market signals, the unilateral removal of domestic interventions (that is, their removal even if other countries maintain distortionary policies) can benefit domestic consumers, taxpayers and those sectors of the Chinese economy that are already unassisted or lightly assisted, through more efficient allocation and utilisation of available resources.

The modelling framework

There is a variety of possible approaches to examining the effects of policy changes on commodity production, consumption, trade and prices. They include the use of single-commodity partial equilibrium models and of multi-commodity global models. Here, where the focus is on the domestic and international effects of a range of alternative policy regimes for several agricultural commodities, it is appropriate to use a multi-commodity, multi-country model which can capture the interactions in production and consumption between products, both within and between countries.

SWOPSIM models

The model chosen is based on the Static World Policy Simulation (SWOPSIM) modelling framework developed in the Economic Research Service of the US Department of Agriculture. A detailed description of the SWOPSIM framework is presented by Roningen (1986) and Roningen and Dixit (1989). The SWOPSIM framework facilitates the construction of static, partial equilibrium models of world trade in agricultural commodities. The models are based on supply and demand equations with constant elasticities¹ reflecting responses over about five years. Demand for each product is modelled as a function of its own price and the prices of substitutes and complements. For some commodities there are, in addition, derived demands: livestock feed demands are in part a function of livestock production (Roningen 1986). Supply of a product is modelled as a function of its own price, the prices of competing products, and in the case of livestock products, the prices of feeds (Roningen 1986). Rationing, changes in tastes and preferences, and government procurement are not explicitly represented.

SWOPSIM models are based on the assumption that world prices are determined so as to balance supply and demand in international and in all domestic markets, taking into account

¹ An elasticity is the percentage change induced in one variable by a 1 per cent change in another. For example, the own-price supply elasticity for wheat is the percentage change in supply in response to a 1 per cent price change. A cross-price elasticity is the percentage change in supply or demand for one product in response to a 1 per cent change in the price of another. An assumption of 'constant elasticity', as in the SWOPSIM model, is an assumption that the elasticities do not vary with price or quantity.

protective arrangements and other policies which distort prices facing producers and consumers in each country or region included in the model. Models created from the SWOPSIM framework are designed to simulate the medium run effects of changes in agricultural policies on production, consumption, trade and prices. In the process of deriving a solution, world and domestic prices are adjusted in the model until world total exports equal total imports for each commodity.

The SWOPSIM model structure does not allow for stocks of commodities; thus, stocks are in effect assumed to remain constant. It is also assumed in the model that any country could export a commodity to, or import it from, any other country. Transport costs are not explicitly taken into account, and trade flows between specific pairs of countries are not represented. Therefore, no definite conclusions can be drawn from the model results about the specific destinations for, or sources of, a country's traded commodities.

In the SWOPSIM model, all types of policy which affect production, consumption, exports and imports are introduced as 'wedges', derived from estimates of PSEs and CSEs, between producer, consumer and trade prices. These price wedges are intended to capture the effects of market intervention by governments on producers, consumers and taxpayers, as well as on exports and imports. Policy changes can be introduced into the SWOPSIM model as changes to these price wedges.

There are a number of characteristics of developing countries which are not taken into account in SWOPSIM models. These include the large proportion of

the population which is rural; the extent of subsistence production as a component of the rural economy; the large proportion of the income of rural households derived from agricultural production; and the large proportion of consumer income spent on food. In the model, changes in farm income do not explicitly contribute to changes in consumer income. Nevertheless, there have been a number of recent applications of SWOPSIM to developing country issues. These include Gunasekera, Bowen and Andrews (1990); Krissoff and Ballenger (1989); Liefert, Koopman and Cook (1989) and Ames and Mukendi (1990).

The 10-region, 22-commodity model used in this study is an aggregated

version of the basic 36-region, 22-commodity model developed by Roningen (1986). The countries in each region, and the commodities, are listed in table 5. Commodities not covered include wool, for which China has been an important market in recent years. Clearly, any changes in Chinese policies regarding wool may affect Australia's wool trade and returns to Australian wool producers. However, wool is not included in the standard SWOPSIM modelling framework, and its inclusion was beyond the scope of this paper. As the analysis here is mainly concerned with changes to Chinese policies for food commodities, this limitation has little effect on the usefulness of the model in the present application.

5 Country and commodity groupings in the model

Regions		Commodity groups	
CH	China	BF	Beef
AU	Australia	PK	Pork
US	United States	ML	Mutton and lamb
EC	European Community (EC-10 plus Spain and Portugal)	PM	Poultry meat
JP	Japan	PE	Poultry eggs
DX	Developed Cairns Group: Canada, New Zealand	DM	Dairy fresh milk
CX	Developing Cairns Group: Brazil, Argentina, Indonesia, Thailand, Malaysia, Philippines	DB	Dairy butter
OX	Other Exporters: Other Western Europe, South Africa, Other South-East Asia, Central America and Caribbean	DC	Dairy cheese
SE	Soviet Union and Eastern Europe	DP	Dairy powder
DM	Developing Importers: Egypt, Middle East and North Africa, Nigeria, Other Subsaharan Africa, Mexico, Venezuela, Other Latin America, India, South Korea, Taiwan Province, Other East Asia, Other South Asia, Other Asia and Rest of the World	WH	Wheat
		CN	Corn
		CG	Other coarse grains ^a
		RI	Rice
		SB	Soybeans
		SM	Soybean meal
		SO	Soybean oil
		OS	Other oilseeds ^b
		OM	Other meals ^c
		OO	Other oils ^d
		CT	Cotton
		SU	Sugar
		TB	Tobacco

^a Barley, millet, mixed grains, oats, rye, sorghum. ^b Copra, cottonseed, flaxseed, palm kernels, peanuts, rapeseed, safflower, sesame seed. ^c Meals produced from oilseeds other than soybeans. ^d Oils produced from oilseeds other than soybeans.

Data requirements

Three sets of information are required to implement the SWOPSIM models. For each country or region and commodity included in the model, information or estimates are needed for: production, consumption and net trade, and associated world and domestic prices; agricultural support and tax policies; and various elasticities, including demand and supply elasticities.

The current version of the model is based on 1986 production, consumption, trade and price data and estimates of agricultural support (or taxation — whether explicit or implicit) in each country included. These data are taken from the world agricultural database maintained by the Foreign Agricultural Service of the US Department of Agriculture (see Sullivan et al. 1989). Own- and cross-price elasticities of supply and demand for each country have been compiled by the Economic Research Service from the available literature. Details of the elasticities used in the SWOPSIM framework are provided in Gardiner, Roningen and Liu (1989).

The base parameters for the SWOPSIM modelling system were assembled originally in about the mid 1980s (see Roningen 1986). It seems probable that, given the data then available, the base SWOPSIM parameters for China would have been derived on the basis of demand and supply responses over a period in which both production and consumption decisions would have been constrained significantly by the extensive quantitative controls used under the system of central planning which China had adopted since 1949. As outlined in chapter 2, agricultural policy in China has changed

considerably since 1978. For these reasons, the SWOPSIM parameter set for China was reviewed to ensure that the estimates used in this study reflected the latest judgments about the current price responsiveness of Chinese agricultural supply and demand. Modifications made to the base SWOPSIM data set included the revised PSEs and CSEs presented in the previous section, and a modified supply and demand elasticity set developed as part of this study (see appendix B).

The review of the Chinese elasticities was based on the overall premise that, in general, producers and consumers would now be more responsive to price changes than under the previous system of central planning. There are three principal reasons for this view. First, the extensive central planning controls have been relaxed over the past decade, so that consumers and producers are now more able to respond to prices than before. Second, the government has actively encouraged people to be more responsive to market signals, partly by changing incentive systems but also by legitimising market-oriented responses. Third, the experience of the past decade shows that the economy has responded to the new system of management.

The nature of agricultural production and consumption in China posed a number of problems for the application of SWOPSIM to China. As noted above, subsistence production accounts for a high proportion of the output of peasant households. As the publicly available data on Chinese production do not distinguish the quantities used for subsistence, subsistence production was implicitly valued at market prices. This is appropriate as market prices would be

used by peasants to decide, at the margin, whether to sell their output or to use it for household consumption.

Urban food consumption is subject to rationing. Ideally, rationed and non-rationed consumption of any given product should be modelled separately, because of their different response to price changes. However, details of ration quantities and elasticity estimates for China which take rationing into account are not readily available. Therefore, it was not possible to incorporate rationing explicitly into this analysis.

Policy experiments

Three policy experiments were carried out in this study. The first two experiments (but not the third) consisted in comparing the results of policy simulations for a future year with those of a reference scenario for that year.

Reference scenario

The reference scenario was established for 1996. The year 1996 was chosen as it is ten years from the 1986 base year of the SWOPSIM model. This reference scenario should not be interpreted as a forecast for 1996: it simply provides a base against which the results of the experiments can be compared. The reference scenario was based on the assumption that agricultural support in both China and all other countries included in the model remain unchanged at their 1986 levels, together with plausible assumptions for income, population and agricultural supply growth rates for each country or country grouping and commodity included. Agricultural support levels around the world are, of course, already different

from what they were in 1986. This does not, however, affect the usefulness of the reference scenario for comparative purposes where the interventions being varied are confined to specific industries in China.

For China, the assumptions used in this analysis include an annual average GDP growth rate of 7 per cent (based on International Monetary Fund (1990) and Asian Development Bank (1990)) and an annual population growth rate of 1.4 per cent (based on United Nations (1989)). Agricultural supply growth rates used for China are based on Yang and Tyers (1989). In general, the supply growth rates chosen are lower than those achieved since the reforms in China, as those growth rates are unlikely to be sustainable in the medium to long run without further increases in relative prices facing producers. The assumed rate of GDP growth may seem high, but this too is conservative relative to the rates attained during the early 1980s.

Experiment 1: Self-sufficiency in basic foods

The first experiment was designed to assess the effects of attaining (or preserving) self-sufficiency in basic food commodities — specifically, wheat, rice, pork, sugar and coarse grains — by 1996. The market distortions required to achieve self-sufficiency in basic food commodities were introduced into the simulation through increases in producer prices for these commodities, leaving both components of CSEs unchanged.

Experiment 2: Increased wheat imports, without consumption subsidy

The second policy experiment was primarily intended to simulate an easing

of wheat import controls. The degree to which import controls might be relaxed, and the resultant change in imports, are difficult to judge. As discussed earlier, such a reform might be instituted in response to a rise in demand for wheat, particularly in the coastal regions where economic activity, domestic incomes and the availability of foreign exchange earnings are likely to expand. (In practice, the present controls might well be relaxed progressively so that Chinese policy makers could gauge the effects of such a change and modify it if considered necessary.) At the same time, however, in response to rising income levels the government might also reduce or eliminate consumption subsidies on grains — particularly on high quality grains, for which the income elasticity is likely to be greater than that for low quality grains (Lin 1990). Since 1985, the government has in fact adopted a strategy of steadily reducing the proportion of farm production that it purchases and then sells at lower than market prices, and consumers are therefore required to purchase ever larger shares of their consumption in the free market (Anderson 1990).

In the second experiment it was therefore assumed that the consumption subsidies on wheat are removed completely, as well as the import controls being relaxed. Since Chinese import controls are not explicitly represented in the SWOPSIM model, their relaxation had to be represented indirectly. This was done by raising the demand schedule to the extent necessary for imports to equal 20 Mt of wheat in 1996 in the absence of the government consumption subsidy. On the supply side, implicit taxation per tonne was left unchanged.

Income was also left at the same level as in the reference scenario. The assumed increase in Chinese wheat imports was 8.5 Mt, since wheat imports in the 1996 reference scenario are 11.5 Mt.

Experiment 3: Full liberalisation

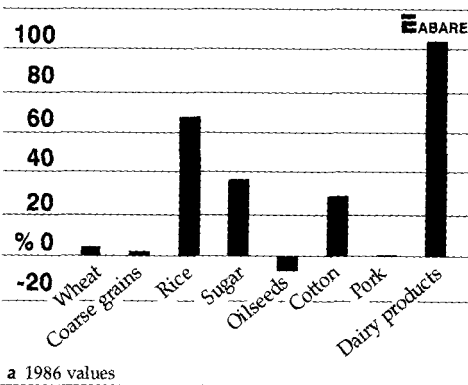
The final experiment was designed to illustrate the effects of complete liberalisation of agricultural policies — that is, the elimination of all government intervention tending to distort production or consumption of agricultural commodities in China. This experiment, in which all PSEs and CSEs were reduced to zero, was performed relative to the 1986 SWOPSIM data base rather than the 1996 reference scenario. This was done because the results depend on agricultural protection levels worldwide, and these cannot safely be projected. It consisted of two parts: in the first part, it was assumed that only China liberalises its agricultural policies; in the second, both China and major developed countries (the United States, the European Community and Japan) liberalise their farm policies together.

Results

Reference scenario

In general, in the reference simulation world prices for agricultural commodities are moderately greater in 1996 than the historical 1986 levels (see figure A). This is largely due to the increase in demand associated with the rise in income and population assumed for many of the agricultural importing countries, including China. The large price increases for rice and dairy products are partly due to the relatively small share of these commodities traded in

A World price changes 1986 -96: reference scenario



world markets. If a relatively small share of a commodity's production is traded in world markets, a larger price adjustment will be required to clear the market for any given change in demand and supply. Also, in many countries changes in the world prices of dairy products and rice are only partially transmitted to domestic markets, and for that reason also relatively large world price adjustments are required to clear the market in response to changes in demand and supply in key markets.

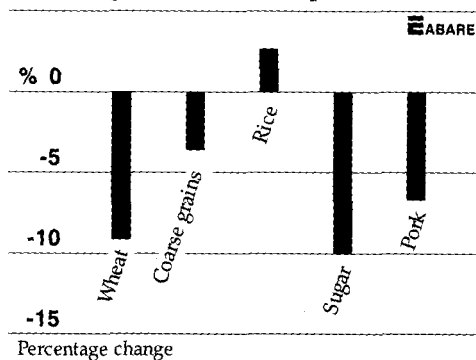
There is a decline in China's self-sufficiency in basic food commodities other than rice (see table 6). For grains as a group (wheat, coarse grains and rice) the self-sufficiency is 2 percentage points lower in 1996 than in 1986. (Self-sufficiency is measured as the percentage of domestic consumption that is produced domestically.) China switches from exporting 5.5 Mt of coarse grains in the base year to importing 1.3 Mt in the reference scenario. There is also an increase in wheat imports of 5.4 Mt. These changes outweigh an increase in Chinese rice exports of 2.4 Mt. China also switches from being a pork exporter (105 kt) to being an importer (1.9 Mt).

The (conservative) growth in GDP assumed here would be likely to increase the demand for the more income-elastic food commodities, particularly wheat (for preparing 'convenience foods' such as bread and noodles) and high protein foods such as livestock products (Yang and Tyers 1989). As a result, considerable deficits would be expected for commodities such as wheat, coarse grains and pork. This is the principal reason for the fall in rates of self-sufficiency for these products shown in table 6.

Experiment 1

Two important changes occur when China attains self-sufficiency in basic food commodities. First, in order to raise production and achieve self-sufficiency, producer prices are increased considerably by 1996 (see table 6). Second, because of China's importance in world trade for many agricultural products, its self-sufficiency leads to a rise in world supply and consequently a reduction in world prices (relative to the reference scenario) for all the basic food commodities except rice (see figure B).

B Experiment 1 - self-sufficiency: changes in 1996 world prices



6 Changes in the Chinese market for basic foods: experiment 1

Variable and commodity	Base year (1986) ^a	Changes under reference scenario (1996) ^b	Additional changes with self-sufficiency (1996) ^c
<i>Producer prices</i>	US\$/t	%	%
Wheat	142	–	15.4
Coarse grains ^d	114	–	4.0
Rice	138	15.6	–
Sugar	168	6.1	12.5
Pork	895	–	5.0
<i>Consumer prices</i>	US\$/t	%	%
Wheat	126	–	17.3
Coarse grains ^d	109	–	4.1
Rice	129	16.6	–
Sugar	168	6.1	12.5
Pork	895	–	5.0
<i>Production</i>	kt	%	%
Wheat	90 040	22.5	7.1
Coarse grains ^d	87 010	33.9	–
Rice	172 224	18.7	–
Sugar	5 250	62.3	8.4
Pork	17 960	63.5	2.4
<i>Consumption</i>	kt	%	%
Wheat	96 143	26.6	–3.0
Coarse grains ^d	81 527	44.5	–
Rice	171 587	17.4	–
Sugar	6 164	63.6	–8.5
Pork	17 855	75.1	–3.9
<i>Net trade</i>	kt	%	%
Wheat	–6 103	87.8 ^e	^g
Coarse grains ^d	5 483	^f	^g
Rice	637	372.0	–45.0
Sugar	–914	71.2 ^e	^g
Pork	105	^f	^g

^a Historical data. ^b Changes relative to base year; price changes are in real terms. ^c Changes relative to reference scenario. ^d Corn plus other coarse grains. ^e Increase in net imports. ^f Trade switches from net export to net import. ^g China changes from being an importer in the reference scenario to being self-sufficient (net trade zero). – Less than 2 per cent in absolute value.

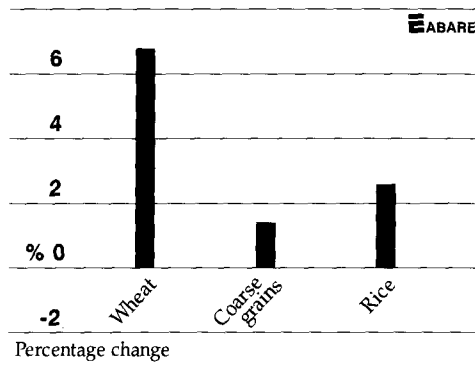
The achievement of self-sufficiency in basic food commodities results in a reduction in the value of China's 1996 food imports of US\$6.1 billion (in 1986 prices) compared with the reference scenario. The largest reductions in the value of imports occur for pork (US\$4.5 billion) and wheat (US\$1.4 billion). There is also a reduction in the value of Chinese exports (US\$900 million) for the reason given above, rice being the major contributor (US\$500 million).

The reductions in world prices for wheat, coarse grains, sugar and pork have some adverse effects on the major agricultural exporting countries. For example, the values of US and Australian wheat exports in 1996 (in 1986 prices) decline by US\$718 million and US\$324 million respectively.

Experiment 2

In the second experiment, in which consumption subsidies on wheat are removed and wheat imports increase (by the assumed amounts shown in table 7) in response to expansion in domestic demand, the 1996 world price of wheat increases as illustrated in figure C. Although this price increase is rather

C Experiment 2 - increased wheat imports: changes in 1996 world prices



modest, it indicates the importance of China in world grains trade. The table shows the extent of the decline in China's self-sufficiency in wheat. The value of China's wheat imports increases by US\$1.2 billion (in 1986 prices). Changes in the value of trade for other commodities are minor.

The increased world price of, and volume of trade in, wheat has some beneficial effects on the major wheat exporting countries. For example, the values of 1996 US and Australian wheat exports, in 1986 prices, increase by US\$606 million and US\$257 million respectively.

7 Changes in the Chinese market for grains in 1996, relative to reference case: experiment 2

Commodity	Change in producer price	Change in production	Change in consumer price	Change in consumption	Change in net trade		Change in self-sufficiency ratio ^a
	%		%		%	%	kt
Wheat	2.5	-	17.1	8.1	74.5 ^{bc}	-8 536 ^{bc}	-6.4
Coarse grains ^d	-	-	-	-	16.3 ^c	-209 ^c	-
Rice	-	-	-	-	-13.1 ^e	-394 ^e	-

^a Self-sufficiency ratio is domestic supply as percentage of domestic consumption. ^b Assumption. ^c Increase in net imports. ^d Corn plus other coarse grains. ^e Decrease in net exports. - Less than 2 per cent in absolute value.

Experiment 3(i): unilateral case

As shown in table 8, three important changes (relative to the historical situation) occur in China as a result of unilateral liberalisation of domestic agricultural policies. First, the prices of livestock products, rice and oilseeds are increased, encouraging additional production of these commodities and reducing their domestic consumption. Since China exports these commodities, the additional production increases exports. Second, China switches from being a net exporter of coarse grains to a net importer. This shift is largely due to the additional quantities of coarse grains required for the expanded Chinese livestock sector, particularly the pork industry. (China uses a substantial proportion of coarse grains — 60 per cent of corn and 40 per cent of other coarse grains, as against 6 per cent of wheat — as livestock feed.) Third, imports of wheat and sugar are lower by 29 per cent and 96 per cent respectively.

The value of China's exports of the commodities included in the model increases by US\$17.5 billion. The major increase is in pork (US\$13 billion), with large increases also in oilseeds (US\$2.1 billion) and rice (US\$1 billion). The value of China's imports increases by US\$2.2 billion, mainly in oilseed meals and oils (US\$1.9 billion). China's imports of wheat and sugar are reduced by US\$240 million and US\$120 million respectively.

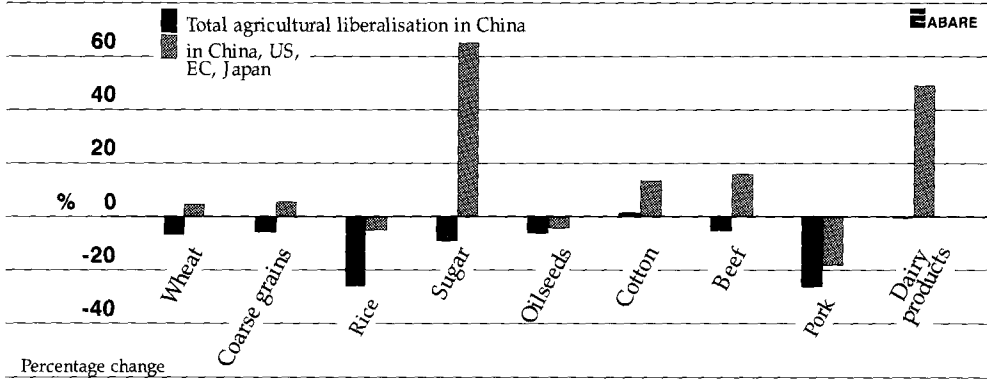
A fall in world pork prices (associated with the increase in excess supply in China following unilateral liberalisation of agricultural policies) discourages production in other countries such as the United States and the European Community. This reduces the demand

for livestock feed ingredients such as coarse grains in these countries, exerting downward pressure on world coarse grain prices. Furthermore, it leads to an increase in the exportable surplus of coarse grains in the United States and the European Community. According to the results of this experiment, US coarse grain exports increase by US\$603 million, while EC coarse grain exports (which do not include corn) increase by US\$102 million.

The main changes in world prices resulting from the unilateral liberalisation of agricultural policies in China are shown in figure D. World prices of many of the agricultural commodities considered in this study would decline if China were to unilaterally liberalise its agricultural policies. In the simulation, the reductions in world prices are largely due to excess supply (and for some products, reduced excess demand) created by the expansion of Chinese domestic production and reduction in consumption, resulting from the removal of policies which implicitly tax production and subsidise consumption of agricultural products. The world price changes are largest for pork and rice — around 26 per cent in both cases. This is because the existing arrangements result in a particularly heavy 'tax' burden on the production of pork and rice, and China accounts for a substantial proportion of world production and consumption of these commodities.

The reduction in world prices reduces the value of total exports from countries such as the United States and Australia. The overall value of US exports is US\$200 million less than in the historical case. There are large reductions in export values for wheat (US\$290 million), rice

D Experiment 3 - full liberalisation: changes in 1986 world prices



(US\$200 million) and oilseeds (US\$460 million), partly offset by the increase in the value of coarse grain exports (US\$603 million). For Australia, the total value of exports is reduced by US\$450 million, the reductions being largest for wheat (US\$160 million) and beef (US\$150 million). The decline in the value of beef exports is largely a reflection of the fall in world beef prices associated with a reduction in excess demand in China following unilateral liberalisation of agricultural policies.

Experiment 3(ii): multilateral case

Changes in the domestic price, production, consumption and net trade of agricultural commodities in China resulting from full liberalisation of agricultural policies in the United States, the European Community, Japan and China are generally in the same direction as those under unilateral liberalisation, but larger (see table 8).

The value of China's exports of commodities represented in the model increases by US\$28 billion, pork again being the major contributor to the increase (US\$18.7 billion). Rice exports

increase by US\$3.9 billion, while oilseed exports increase by US\$2.3 billion.

These results need to be viewed in the context of the relative importance of the different industries in Chinese agriculture. In particular, pork production is a key agricultural industry, second only to rice production in terms of gross value of output (see table 12). China is one of the largest producers and consumers of pork in the world, accounting for about 34 per cent of global production and consumption in recent years. Furthermore, Chinese pork exports account for around 13 per cent of world exports outside the European Community (US Department of Agriculture 1990). As shown in tables 1 and 2, pork producers in China are highly taxed (-77 per cent PSE) while Chinese pork consumers are heavily subsidised (85 per cent CSE). Hence, the modelled rise in pork production and fall in pork consumption which underly the rise in the exportable surplus of pork following the assumed removal of producer taxes and consumer subsidies, while substantial, are not implausible. Nevertheless, the results obtained from a constant-elasticity model in cases such

8 Changes in the Chinese market, as in 1986: experiment 3

Commodity	Change in producer price %	Change in production %	Change in consumer price %	Change in consumption %	Change in net trade %	kt
<i>(i) Total liberalisation in China</i>						
Wheat	—	—	14.1	—	-29.0 c	1 773 c
Coarse grains a	-5.4	-2.8	—	9.5	d	d
Rice	8.9	2.2	17.5	—	e	6 427
Oilseeds b	10.2	3.1	—	-25.3	e	8 174
Sugar	16.4	3.3	17.5	-11.4	-96.2 c	878 c
Cotton	-12.3	-6.6	5.1	—	-37.5 f	-198 f
Pork	30.4	19.6	38.7	-22.6	e	7 548
<i>(ii) Total liberalisation in China, United States, European Community and Japan</i>						
Wheat	13.5	4.5	27.5	-2.1	-98.5 c	6 013 c
Coarse grains a	5.0	—	9.3	7.9	d	d
Rice	39.1	6.1	49.6	-5.4	e	9 631
Oilseeds b	13.8	—	3.7	-26.6	e	7 995
Sugar	111.4	44.7	112.6	-43.2	g	g
Cotton	-2.0	-9.9	15.4	-3.5	-47.4 f	-245 f
Pork	45.3	26.1	53.6	-28.2	e	9 727

a Corn and other coarse grains. b Soybeans and other oilseeds. c Decrease in net imports. d Trade switches from net exports to net imports. e Large proportionate increase in net exports from a small base. f Decrease in net exports. g Trade switches from net imports to net exports. — Less than 2 per cent in absolute value.

as this, where large price changes are involved, need to be interpreted with caution.

The total value of China's imports of products included in the model increases by US\$1.4 billion. An increase in imports of oilseed meals and oils (US\$2 billion) is partly offset by reductions in the value of wheat and sugar imports (US\$700 million and US\$120 million respectively).

The changes in world prices resulting from the multilateral liberalisation are also shown in figure D. In contrast to the situation where China liberalises unilaterally, in this experiment price increases predominate. There are large price increases for sugar and dairy products, and smaller increases for

wheat, coarse grains and cotton. For those products whose world prices fall — namely rice, oilseeds and pork — the reductions are smaller than when China liberalises unilaterally. These results indicate that the agricultural policies of the United States, the European Community and Japan depress world prices. Agricultural liberalisation in these countries therefore either partially offsets or more than offsets the reductions in world prices which occur when China liberalises unilaterally.

The increases in world prices results in large increases in the value of exports for both the United States (US\$3 billion) and Australia (US\$2 billion). For the United States, the major change is in beef, where there is a switch from net

imports of US\$1.5 billion to net exports of US\$1.9 billion. Other large increases in US exports occur for butter and milk powders (US\$970 million) and wheat (US\$810 million). For Australia, the largest increases in the value of exports occur for beef (US\$660 million), sheep meat (US\$530 million) and sugar (US\$380 million). It should be stressed that these increases in export earnings are largely a reflection of a rise in world prices (16 per cent for beef, 29 per cent for sheep meat and 65 per cent for sugar) which occurs because the price effects of the assumed total liberalisation of farm policies in the United States, the European Community and Japan more than offset the impact on prices of liberalisation in China.

An effect not taken into account in experiment 3 is that of increased earnings of Chinese agricultural producers (following the removal of policies which implicitly tax agriculture) on their consumption of farm products. Given that farmers account for nearly 70 per cent of the labour force (State Statistical Bureau 1990) they play an important role as consumers of farm products. Increased farm incomes should lead to some increases in consumption of farm products in rural areas.

An issue not taken explicitly into account in this analysis, because of the partial equilibrium nature of the SWOPSIM model, is the effect of policy changes in the Chinese agricultural sector on resource reallocation between the agricultural and non-agricultural sectors. The overall expansion in Chinese agriculture following these policy reforms would come about, at least in part, by some resources being drawn out of the non-agricultural sector. In other

words, any additions to overall production and income generated in the Chinese agricultural sector, following the assumed policy reforms, are likely to be offset to some extent by reductions in output and income in the non-agricultural sectors. Thus, the overall, net increase in income in the Chinese economy following agricultural policy reforms will include elements not modelled here.

The welfare effects discussed below are the net income gains resulting from price and quantity changes in the agricultural sector. These net income gains are not large relative to the value of the additional output of many agricultural commodities produced in China under the different policy experiments. Nevertheless, a substantial proportion of this additional net income would be likely to be spent on farm products, thus reducing exportable surpluses or raising import demand to some extent. This income effect is not captured in the present analysis.

Welfare effects

In table 9, changes in annual economic welfare in China and the major trading countries and regions in each experiment are presented. Total world economic welfare increases in the second and third experiments but not the first. The largest increases in both world and Chinese welfare (US\$44 billion and US\$3.6 billion, respectively) occur in the second part of the third experiment, where China, the United States, the European Community and Japan fully liberalise their respective farm policies together.

Experiment 1

The welfare results of the first experiment indicate that achieving self-

9 Summary of changes in annual welfare in selected regions a b

Welfare measure	China US\$m	United States US\$m	European Community US\$m	Cairns Group		World total US\$m	
				Japan US\$m	Australia US\$m		Other US\$m
<i>Experiment 1: Self-sufficiency, 1996</i>							
Total welfare	-5 927	231	-23	231	-175	-52	-5 099
Producer surplus	4 384	-2 735	-1 463	-148	-268	-868	-2 292
Consumer surplus	-3 601	2 647	1 433	284	80	754	3 380
Government savings	-6 710	319	7	95	13	62	-6 187
<i>Experiment 2: Increased wheat imports, 1996</i>							
Total welfare	529	95	2	-67	106	116	575
Producer surplus	671	941	183	22	131	480	3 290
Consumer surplus	-2 372	-660	-181	-78	-16	-328	-4 700
Government savings	2 230	-187	-	-11	-9	-36	1 986
<i>Experiment 3 (i): Total liberalisation in China, 1986</i>							
Total welfare	2 080	1 886	1 163	955	-121	-135	7 613
Producer surplus	7 005	-7 570	-5 051	-715	-491	-3 445	-15 692
Consumer surplus	-10 798	8 765	6 595	1 294	362	3 180	16 116
Government savings	5 873	691	-382	377	8	130	7 189
<i>Experiment 3 (ii): Total liberalisation in China, United States, European Community and Japan, 1986</i>							
Total welfare	3 553	9 016	16 288	14 303	667	843	44 265
Producer surplus	21 545	-21 545	-33 580	-22 560	1 109	2 308	-50 722
Consumer surplus	-23 864	1 282	35 194	31 724	-421	-1 453	40 087
Government savings	5 873	29 280	14 674	5 139	-21	-12	54 900

a Changes in welfare are measured (in 1986 values) by changes in producer and consumer surplus and changes in government expenditure on agriculture. The sum of these gives an indication of net domestic welfare gains or losses brought about by policy changes. A detailed discussion of the measurement of welfare in the SWOPSIM modelling framework is given in Haley and Dixit (1988). b Results for the Soviet Union, Eastern Europe, Other Exporters and Developing Importers are not reported here. For these regions as a group, they are the difference between the world total and the total for the regions listed above.

sufficiency in basic food commodities in China through increased producer prices would, under the assumptions employed, result in gains to producers of over US\$4.4 billion a year. However, increases in government expenditure would amount to US\$6.7 billion, while losses to consumers as a result of higher consumer prices (even assuming the

continuation of government-funded food subsidies) would amount to US\$3.6 billion. The overall effect of achieving self-sufficiency by the means assumed would be a decline in net economic welfare in China.

Since it would cause world food prices to decline, the achievement of food self-sufficiency by China would

have an adverse impact not only on China but also on food exporters such as the Cairns Group, including Australia (see table 9). In these exporting countries, in the simulation, the producer losses outweigh the government savings and consumer gains which result from the reduction in world prices.

A similar pattern of welfare changes is also evident in the European Community. In this experiment, most of the benefits to EC consumers accrue from lower world prices for livestock products, particularly for pork. Pork imports to the European Community are subject to import tariffs rather than variable levies as in the case for many other farm products. As a result, the decline in world pork prices is transmitted through to consumers in the European Community. On the other hand, agricultural producers, including pork producers, incur losses due to reduced world prices for most of the commodities covered in this experiment. On balance, producer losses outweigh the consumer gains in the European Community, leading to a small net welfare loss of around US\$23 million. It is important to note here that, in the European Community, while per-person pork consumption is high at around 40 kg a year (OECD 1990a), the gains to consumers from lower pork prices do not offset the overall losses to pork producers, because the European Community is a net exporter of pork and continues to be in this experiment.

In contrast, there are net welfare gains for both the United States and Japan. In the case of the United States, a fall in world prices leads to losses to grain producers which outweigh the benefits to domestic consumers. On the other

hand, the benefits accruing to US consumers of pork and sugar offset the losses to producers of these products. This is particularly the case for pork. The United States is a large consumer of pork (per-person consumption being around 30 kg a year, as compared with, for example, 17 kg a year in Australia and 16 kg a year in Japan: OECD 1990b) and a large net importer. On balance, this leads to a small overall net welfare gain of around \$US230 million. Japan is a major net importer of most agricultural products, and here the reductions in world prices lead to consumer gains which alone outweigh producer losses.

Experiment 2

In the second and third experiments, overall welfare in China and its major trading partners generally increase. An important difference between experiment 1 and experiment 2 is that the latter simulates a move toward a more market oriented trade strategy. With the increase in wheat imports and removal of consumer subsidies on wheat, net annual economic welfare in China increases by about US\$500 million. This increase consists essentially in gains to producers (US\$670 million) due to an increase in the world wheat price, since the government savings roughly equal the losses to consumers. The rise in the world price for wheat also benefits producers in major exporting countries. These benefits more than offset the losses incurred by consumers in these countries, leading to net welfare gains particularly in Australia and in the United States.

Experiment 3(i)

According to the results in the final experiment, unilateral liberalisation of

Chinese agricultural policy would provide large welfare gains (see table 9). In the simulation, total world annual welfare increases by about US\$7.6 billion, nearly 30 per cent of which accrues to China. The welfare gains in China are due to both increased returns to domestic producers and government savings, which together outweigh the losses to consumers from the removal of consumer subsidies.

For rural producers — who, as has been noted, account for about 70 per cent of China's consumers — consumer losses would be offset by their gains as producers. The losses suffered by urban consumers would not be offset in a similar manner. However, the increase in rural income might lead to an expansion in demand for manufactured goods and services provided by the urban sector, thus raising urban incomes. Assessment of such second-round effects is beyond the scope of this study.

The reductions in world prices resulting from total liberalisation in China lead to small increases in net welfare in the United States and the European Community. This result may at first sight appear to be inconsistent with the fact that both regions are net exporters of agricultural products. However, these welfare results are the outcome of changes in consumption and production of several agricultural products. For example, the fall in world prices in this experiment leads to benefits to US consumers of a number of products, including pork, poultry meat and beef, and these consumer gains more than outweigh the losses incurred by US producers of these commodities. This is particularly the case for pork, because the estimated decline in world prices is

large (around 26 per cent) and because the United States is a large consumer (per-person pork consumption is much higher than in many other developed countries, and the United States accounts for about 11 per cent of world pork consumption: US Department of Agriculture 1990) and a major net importer of pork. On the other hand, for commodities such as grains and soybeans, the losses incurred by US producers due to lower world prices outweigh the gains accruing to domestic consumers of these products. On balance, the gains to consumers (particularly for livestock products such as pork) offset the producer losses, leading to a net welfare gain.

In the European Community, most of the benefits to consumers accrue from lower world prices for pork. As noted above, the existence of tariffs (rather than variable levies) on pork imports in the European Community allows the lower world prices of pork to flow through to EC consumers. Furthermore, the fall in world pork prices in this experiment is large enough to make the European Community switch from being a net exporter. As a result, EC consumers gain substantially, given that the per-person consumption of pork in the Community is somewhat above that in the United States and much greater than in many other developed countries. For many of the other commodities, the losses incurred by producers are similar to, or slightly in excess of, the gains to consumers resulting from lower world prices. On balance, the consumer gains (accruing particularly to consumers of pork) outweigh the producer losses, leading to a net welfare gain in the European Community. It should be

stressed here that the net welfare gain to the European Community in this experiment is largely attributable to the substantial fall (26 per cent) in world pork prices, which generate significant consumer benefits. This is in contrast to experiment 1, where the fall in world pork prices is relatively small (6 per cent). Furthermore, in that experiment, the benefits (associated with lower world prices) to pork consumers in the European Community are not large enough to offset the losses to producers, given that the Community is a net pork exporter and remains so in experiment 1.

Japan, being a major importer of agricultural products, gains from the lower world prices. In contrast, in the Cairns Group of countries, where farm output is large relative to consumption, the producer losses slightly outweigh the consumer gains so that there is a net welfare loss. In contrast to the United States and the European Community, where agricultural exports equal only around 1 per cent of GDP, in the Cairns Group of countries agricultural exports account for a much greater share of GDP. For example, the share of agricultural exports in GDP in Australia, Argentina, New Zealand and Malaysia are around 4 per cent, 8 per cent, 15 per cent and 22 per cent respectively (OECD 1990*b*; World Bank 1990; OECD 1991). Furthermore, unlike in the United States and the European Community, the pork trade of many of the Cairns Group of countries is relatively small. For example, in recent years, net trade in pork in Australia has been around 10 kt (exports), as against about 500 kt (imports) in the United States (OECD 1990*a*).

As has been mentioned, experiment 3 contains no representation of the effect

of the increased earnings of farmers on their consumption of farm products. This additional consumption demand for farm products could exert upward pressure on their prices. In that case, the welfare impact of unilateral Chinese policy reforms on Australia and other Cairns Group countries might conceivably be positive. Modification of the SWOPSIM model to incorporate these effects is beyond the scope of this paper.

Experiment 3(ii)

In contrast to unilateral policy reform by China, in the simulated liberalisation of farm policies in China, the United States, the European Community and Japan together there are substantial welfare gains to the international community (see table 9). These gains are largely internal effects of each country's policy reforms: reduction in domestic budgetary expenditure in the United States, considerable benefits to domestic consumers in Japan, and a combination of the two in the European Community. Net welfare benefits also accrue to Cairns Group countries, including Australia, because increased returns to domestic producers more than offset the consumer losses due to price increases resulting from reforms in other countries.

From these results, it is evident that both China and other agricultural trading nations, including Australia, would achieve greater benefits in terms of economic welfare if Chinese agricultural liberalisation were accompanied by liberalisation by other major trading nations.

Sensitivity analysis

The question naturally arises as to how sensitive the results are to changes in

values of the various parameters. The key parameters relevant to the present study are the own-price elasticities of demand and supply for particular products in China. To test the sensitivity of some important model results to these parameters, a method proposed by Pagan and Shannon (1984) was used. This method involves computing 'sensitivity elasticities' for each key parameter — that is, the percentage changes in the results (in this case, world prices) produced by a 1 per cent change in each parameter value.

Six parameters were tested: the own-price elasticities of demand and supply in China for wheat, rice and pork (chosen because of their relative importance in Chinese agricultural production and consumption). Experiment 3(ii) was repeated six times, with each of these parameters in turn increased by 1 per cent while all the other parameters were unchanged.

The results of the sensitivity analysis are given in table 10. It can be seen that, in the model, 1 per cent changes in the own-price elasticities of demand and supply for wheat, rice and pork in China

have little effect on the world prices of these products. If the sensitivities of world wheat, rice and pork prices can be taken as a general guide, these results suggest that the changes in the world prices of the commodities included in the model are generally not highly sensitive to changes in the assumed own-price elasticities of demand and supply in China. Hence, the results of the experiments (which mainly depend on the world price changes) are relatively robust around the current values of these key parameters.

10 Sensitivity elasticities of world prices with respect to parameter changes: experiment 3 (ii)

Variable	Effect of 1 per cent change in:	
	Own-price elasticity of demand for commodity indicated	Own-price elasticity of supply for commodity indicated
	%	%
World price of wheat	-0.02	-0.05
World price of rice	-0.07	-0.06
World price of pork	-0.09	-0.14

Concluding remarks

Farm production in China has grown markedly since market and price reforms were introduced in 1978. Nevertheless — particularly in view of the relatively small per-person endowment of arable land in China compared with agricultural exporting countries in the Asian-Pacific region and North America — agricultural production as a share of GDP is likely to decline as the overall economy expands. An important consequence of this, given China's current agricultural pricing policies, would be a fall in the level of food self-sufficiency and a rise in food imports.

Discussion of the results

If China pursued the goal of food self-sufficiency through increasing producer support, there would be benefits to agricultural producers at the expense of consumers, while at the same time there would be increases in government expenditure. Producers of commodities which China would otherwise import, such as wheat, coarse grains and sugar, would benefit more than producers of commodities in which China is already self-sufficient such as rice.

The estimates reported here support the view that the self-sufficiency option would be costly in terms of net economic welfare for both China and efficient agricultural exporters such as Australia and other Cairns Group countries. In these countries net welfare would

decline, because of reductions in world food prices ranging (in the simulations) from 3.5 per cent for coarse grains to 9 per cent for wheat, consequent on the cessation of imports by China.

The results of this study also suggest that easing wheat import controls and removing consumer subsidies for wheat in line with rising income levels would be beneficial to China in the sense that it would increase economic welfare. Furthermore, this combination of policies would tend also to result in net welfare gains to many of China's trading partners.

The extent to which China might relax wheat import controls would largely depend on its capacity to pay for additional imports. An important source of the foreign exchange required is China's labour-intensive manufacturing exports. Since the mid-1970s, China has continued to increase its exports of labour-intensive manufacturing products to major developed countries. China's capacity to still further increase its foreign exchange earnings from such exports in the medium term could hinge on whether further increases of these exports would be possible without depressing world prices and/or being constrained by protective responses by developed countries.

Anderson (1990) is optimistic on these points, for several reasons. First, China's share of developed country markets for labour-intensive

manufacturers is still very small. Second, other developing country exporters have been able to increase their shares of developed country markets during the past two decades despite increases in trade barriers aimed at limiting their import penetration. Third, further expansion in China's labour-intensive manufacturing exports is likely to crowd out some exporters among the Asian newly industrialising countries and encourage them to shift their production and trade specialisation toward more skill-intensive manufactures. Hence, Anderson (1990) concludes that, if China is prepared to permit the necessary structural changes to occur in its economy, it is likely to be able to continue to earn sufficient foreign exchange by exporting labour-intensive manufactured goods to enable it to pay for substantial quantities of imported farm products.

According to the results of this study, if China were to unilaterally remove the distortionary elements of its current agricultural policies its farm output would expand and, for some commodities, consumption would contract. In consequence, world prices of several agricultural commodities would decline. The simulation indicated a 7 per cent decline in wheat prices and 26 per cent reductions in rice and pork prices. Furthermore, the estimates reported here support the view that economic welfare in China would be likely to increase if unilateral liberalisation of domestic agricultural policies was adopted. This increase would take the form of increased producer returns and reduced government expenditure on consumer subsidies (leading to government budgetary savings) which according to the

simulation would together exceed the reduction in consumer welfare.

The unilateral liberalisation of domestic agricultural policies in China, however, would not be beneficial to all other countries. The estimates reported in this study suggest net welfare gains for the United States, the European Community and Japan, despite losses to some of their agricultural producers. In these countries, the gains to consumers from lower world agricultural commodity prices which would result from the removal of agricultural taxation in China (allowing increases in China's farm output) would exceed the reduction in welfare to producers. However, some agricultural producers, particularly the coarse grains producers of the United States and the European Community (who are major suppliers to China) would benefit from the additional imports of coarse grains required by the expanding Chinese livestock sector. On the other hand, the Cairns Group, including Australia, would according to the simulation incur net welfare losses — though these losses would be small relative to the large increase in aggregate world welfare. In these countries, the losses to producers due to lowered world prices would outweigh the rise in welfare to consumers.

The results of this study also indicate that the welfare gains accruing to China and its major trading partners would be greater if the agricultural policies of the United States, the European Community and Japan were fully liberalised at the same time as those of China. In this case, there would be net welfare gains also to the Cairns Group as a whole and to Australia. Therefore, it is in the interests of both China and other

agricultural trading nations that Chinese agricultural reform take place in conjunction with liberalisation by other major trading nations rather than unilaterally.

As China is seeking to join the GATT, it is likely that substantial changes to its agricultural and trade policies will be required in order to comply with GATT rules and any agreements reached during the Uruguay Round of multilateral trade negotiations. The 'full liberalisation' experiments undertaken in this study provide an indication of the economic benefits and costs which may accrue to China if its distortionary agricultural policies are completely removed.

Factors not modelled in this study

A number of points need to be borne in mind when interpreting the results presented in this study. First, the analysis employs a partial equilibrium modeling framework confined to the agricultural sector. Therefore, developments in other sectors of the economy are not taken into account. Reforms in the Chinese labour market and in other sectors of the economy are likely to affect China's agricultural sector. Conversely, changes in the structure of farm production and in producer income consequent on reforms of agricultural policies may also affect the development of other sectors.

Second, as has been noted in chapter 3, the SWOPSIM model is unable to take into account certain characteristics of developing countries with large agricultural sectors.

Third, some of the elasticities used in this model were estimated using data

from periods when the supply, demand and policy conditions were different from those simulated in this study, both for China and for other countries.

Fourth, the model used in this analysis was based on 1986 price and quantity data and assistance estimates. As 1986 was a year of depressed world commodity prices, it is possible that the implicit taxation of producers and subsidisation of consumers in China reported in this study were unusually low. On the other hand, if some of the products produced in China (for example, rice) are of lower quality than those generally traded on world markets, the PSE and CSE estimates reported here for those products will be overestimates of the implicit taxes on Chinese producers and subsidies on Chinese consumers. These two effects may partially offset one another.

A factor not taken into account in the analysis, particularly with respect to the implications of complete agricultural trade liberalisation in China, is improvement in the entrepreneurial attributes of the Chinese labour force in response to the rise in economic incentives and individual decision making opportunities following policy reforms. 'Entrepreneurial attributes' here includes a disposition to accept new ideas and try new methods, and a greater concern for planning, organisation and efficiency. An improvement in such attributes would result in farmers becoming more technically efficient in the sense of being able to produce more agricultural output from a given level of inputs, thereby raising farm incomes and welfare.

Such an expansion in agricultural output, in isolation, would be likely to

increase China's exportable surpluses and reduce its import demand for farm products in general. On the other hand, if similar improvements in entrepreneurial attributes also occurred in the non-agricultural sector following economy-wide policy reforms, both farm and non-farm output would be likely to expand. The consequent growth in overall incomes and the associated expansion in domestic food demand might or might not be met by the additional domestic farm output. In other words, the net impact on agricultural import demand or exportable supply

might be either positive or negative and could be assessed only through further empirical research.

In summary, the policy experiments undertaken in this study support the view that liberalisation of China's agricultural policies — in the form either of easing import controls and removing consumer subsidies on wheat, or of eliminating government intervention in a wide range of agricultural commodities — is preferable on economic welfare grounds to the pursuit of food self-sufficiency, both from China's own standpoint and from that of many of its trading partners.

Calculation of PSEs and CSEs for Chinese Agriculture

II Policy effects measured

Policy instrument	Affected subsidy equivalent	Policy explanation	Estimation procedure
State procurement pricing	All PSEs	Part of total production takes place within a planning system, in which specific quantities of output are supplied to the state at specified procurement prices.	The difference between the procurement price and the market price is multiplied by the quantity of commodity procured (Webb 1989; authors' field work).
Border measures	All PSEs and CSEs	Trade and marketing of agricultural commodities are controlled by the Central Government using various border measures, though some restrictions on import and export of grain by provincial governments have been relaxed.	The difference between the domestic market price and a world reference price is multiplied by the quantity of commodity supplied (for PSEs) or by the quantity of the product consumed (for CSEs) (China Agricultural Yearbook 1987; Food and Agriculture Organization 1987; Webb 1989; US Department of Agriculture 1989; authors' field work).
State consumer subsidies	All CSEs	Government subsidises the consumption of agricultural commodities, by paying the difference between its official procurement prices and its official urban retail prices and by subsidising importation, marketing and processing of food commodities.	Total subsidies are allocated for each commodity based on values of sales at state prices (Ministry of Finance 1989a).
Disaster relief	All PSEs	State provides payments to mitigate the effects of natural disasters.	Payments are distributed over products by national share of total value of output (Ministry of Finance 1989a).
Interest subsidies	All PSEs	Concessional lending to agriculture by Agricultural Bank of China.	Value of concessions is distributed over products by national share of total value of output (Agricultural Bank of China 1987; Almanac of

Advance payments	PSEs for selected major crops	Agricultural Bank of China gives advance payments at concessional interest rates to producers of selected crops for deliveries under state contracts.	China's Finance and Banking 1988). Value of concessions is distributed by share of total value of deliveries under state contracts (Agricultural Bank of China 1987; Almanac of China's Finance and Banking 1988).
Input pricing	All PSEs	State distributes fertilisers, diesel oil and plastic sheets to crop producers at prices which are above the border prices. State subsidises electricity supply and imports of fertilisers and chemicals to livestock producers.	The implicit taxes and subsidies are allocated among industries by their share of total output of the using industries (Almanac of China's Foreign Economic Relations and Trade 1987; Almanac of China's Commerce 1988; State Statistical Bureau 1988; Ministry of Finance 1989a).
Research and development	All PSEs	State expenditure on agricultural research and development.	Distributed over products by share of total value of output (Ministry of Finance 1989a).
Transfers through the tax system	All PSEs	Farm households are subject to higher rates of taxation than private non-agricultural businesses.	The difference between the amount of tax paid by farm households and the amount they would pay if taxed at the same rate as non-agricultural businesses is distributed over products by share of total value of output (State Statistical Bureau 1987; Ministry of Finance 1989b).
Infrastructure development in agriculture	All PSEs	State expenditure on agricultural infrastructure development such as water conservation.	Distributed over products by share of total value of output (Ministry of Finance 1989a).
Transfers from enterprise profits	All PSEs	Part of the profits remitted to local governments by rural non-agricultural enterprises is used to support agriculture via improvements in infrastructure.	Distributed over products by share of total value of output (State Statistical Bureau 1987).
Other state outlays on agriculture	All PSEs	Other state budgetary expenditure on the agricultural sector, including 'outlays on communes'.	Distributed over products by share of total value of output (Ministry of Finance 1989a).

12 Gross values of production and consumption at market prices, 1986

Commodity	Production	Market price	Gross value of production	Consumption ^a	Gross value of consumption
	kt	yuan/t	yuan m	kt	yuan m
Beef	589 b	5 565 c	3 278	563	3 133
Pork	17 960 b	3 256 d	58 478	17 855	58 136
Mutton	622 b	3 949 d	2 456	620	2 448
Poultry	1 879 b	3 862 d	7 257	1 851	7 149
Eggs	5 550 b	3 013 d	16 722	5 494	16 553
Milk	2 899 b	1 584 e	4 592	2 899	4 592
Wheat	90 040 b	517 e	46 551	96 143	49 706
Corn	70 856 b	422 e	29 901	65 653	27 706
Other coarse grains	16 154 b	390 e	6 300	15 874	6 191
Rice	172 224 b	501 e	86 284	171 587	85 965
Soybeans	11 614 b	930 e	10 801	10 535	9 798
Soybean meal	1 280 e	421 e	539	828	349
Soybean oil	240 e	3 360 e	806	361	1 213
Other oilseeds	20 730 b	1 203 c	24 938	20 243	24 352
Other meals	6 880 e	573 e	3 940	5 688	3 258
Other oils	4 188 e	3 170 e	13 276	4 307	13 653
Cotton	3 540 b	3 216 f	11 385	3 013	9 690
Sugar	5 250 c	610 f	3 203	6 164	3 760
Total			330 707		327 651

^a Difference between production reported in this table and net trade obtained from Almanac of China's Foreign Economic Relations and Trade (1987). ^b China Agricultural Yearbook (1987). ^c Webb (1989). ^d State Statistical Bureau (1988). ^e Authors' estimates during field work. ^f Procurement price, since virtually all cotton and sugar are procured by the state.

13 Producer transfers due to procurement pricing and border measures, 1986

Commodity	Production	Quantity procured	Procurement price	Market price	Border price ^a	Transfers due to:	
						Procurement pricing ^b	Border measures ^c
	kt	kt	yuan/t	yuan/t	yuan/t	yuan m	yuan m
Beef	589	183 d	3 753 e	5 565	8 064 f	-331	-1 472
Pork	17 960	6 286 d	3 098 e	3 256	5 842 g	-993	-46 450
Mutton	622	75 d	3 681 e	3 949	5 139 g	-20	-740
Poultry	1 879	157 d	3 824 e	3 862	3 756 f	-6	199
Eggs	5 550	612 d	2 867 e	3 013	3 058 g	-89	-249
Milk	2 899	0	0	1 584	1 817 f	0	-675
Wheat	90 040	19 714 d	454 h	517	552 g	-1 242	-3 109
Corn	70 856	10 193 d	328 h	422	414 g	-958	589
Other coarse grains	16 154	271 d	345 h	390	375 f	-12	250
Rice	172 224	20 622 d	351 h	501	718 g	-3 093	-37 312
Soybeans	11 614	2 190 d	793 h	930	967 g	-300	-434
Soybean meal	1 280	0		421	809 f	0	-497
Soybean oil	240	0		3 360	1 740 f	0	389
Other oilseeds	20 730	9 138 g	743 h	1 203	1 368 g	-4 203	-3 425
Other meals	6 880	0		573	478 f	0	652
Other oils	4 188	1 742 d	2 678 i	3 170	1 354 f	-857	7 607
Cotton	3 540	3 321 d	3 216 g	3 216 j	2 801 g	0	1 468
Sugar	5 250	5 250 k	610 g	610 j	784 g	0	-915
Total						-12 106	-84 124

^a Since the yuan is overvalued, border prices are based on an adjusted exchange rate. Following Yang and Tyers (1989), Webb (1989) and Cowitt (1989), official rate is adjusted by one-third of the difference between the official and prevailing 'open' market rate in 1986, which results in an adjusted exchange rate of 3.64 yuan/US\$. ^b Procurement price minus market price multiplied by quantity procured. ^c Market price minus border price multiplied by production volume. ^d Almanac of China's Commerce (1988). ^e State Statistical Bureau (1988). ^f Following Webb (1989), 1986 Hong Kong import price from FAO (1987). For commodities which are not imported by Hong Kong in significant quantities the import price for the whole Asian region is used. ^g Webb (1989). ^h State Price Bureau (1988). ⁱ State Price Bureau (1989). ^j Procurement price — see table 12. ^k Total production, since virtually all sugar is procured by the state.

14 Consumer transfers due to border measures, 1986

Commodity	Consumption kt	Market price yuan/t	Border price yuan/t	Consumer transfer ^a yuan m
Beef	563	5 565	8 064	1 407
Pork	17 855	3 256	5 842	46 178
Mutton	620	3 949	5 139	738
Poultry	1 851	3 862	3 756	-196
Eggs	5 494	3 013	3 058	246
Milk	2 899	1 584	1 817	675
Wheat	96 143	517	552	3 320
Corn	65 653	422	414	-546
Other coarse grains	15 874	390	375	-245
Rice	171 587	501	718	37 174
Soybeans	10 535	930	967	393
Soybean meal	828	421	809	322
Soybean oil	361	3 360	1 740	-585
Other oilseeds	20 243	1 203	1 368	3 344
Other meals	5 688	573	478	-539
Other oils	4 307	3 170	1 354	-7 823
Cotton	3 013	3 216	2 801	-1 249
Sugar	6 164	610	784	1 074
Total				83 688

^a Border price minus market price multiplied by volume of consumption.

Sources: See tables 12 and 13.

15 Calculation of PSEs, 1986

Industry	Procurement pricing yuan m	Border measures yuan m	Disaster relief ^a yuan m	Advance payment ^b yuan m	Interest subsidies ^b yuan m	Policy transfers	
						Input subsidies and pricing ^c yuan m	Education, R&D ^a yuan m
Beef	-331	-1 472	9		2	5	4
Pork	-993	-46 450	153		28	81	72
Mutton	-20	-740	6		1	3	3
Poultry	-6	199	19		3	10	9
Eggs	-89	-249	44		8	23	21
Milk		-675	12		2	6	6
Wheat	-1 242	-3 109	122	8	22	-1 434	57
Corn	-958	589	78	5	14	-921	37
Other							
coarse grains	-12	250	16	1	3	-194	8
Rice	-3 093	-37 312	226	16	41	-2 657	106
Soybeans	-300	-434	28	2	5	-333	13
Soybean meal		-497	1				1
Soybean oil		389	2				1
Other oilseeds	-4 203	-3 425	65	4	12	-768	31
Other meals		652	10		2		5
Other oils	-857	7 607	35		6		16
Cotton		1 468	30	2	5	-351	14
Sugar		-915	8	1	2	-99	4
Total	-12 106	-84 124	865	40	157	-6 628	407

^a Ministry of Finance (1989a). ^b Almanac of China's Finance and Banking (1988); Agricultural Bank of China (1987). ^c Almanac of China's Commerce (1988); Almanac of China's Foreign Economic Relations and Trade (1987); Ministry of Finance (1989a); State Statistical Bureau (1988).

15 Continued

Policy transfers (cont.)

Industry	Tax transfers ^d yuan m	Infra-structure development ^a yuan m	Transfers from rural enterprise profit ^e yuan m	Other state outlays ^a yuan m	Total yuan m	Value of production yuan m	Percentage PSE ^f %
Beef	-5	30	5	81	-1 673	3278	-51.0
Pork	-90	538	82	1 450	-45 129	58 478	-77.2
Mutton	-4	23	3	61	-663	2 456	-27.0
Poultry	-11	67	10	180	480	7 257	6.6
Eggs	-26	154	24	415	324	16 722	1.9
Milk	-7	42	6	114	-493	4 592	-10.7
Wheat	-71	428	65	1 155	-3 998	46 551	-8.6
Corn	-46	275	42	742	-142	29 901	-0.5
Other							
coarse grains	-10	58	9	156	285	6 300	4.5
Rice	-132	794	121	2 140	-39 752	86 284	-46.1
Soybeans	-17	99	15	268	-652	10 801	-6.0
Soybean meal	-1	5	1		-490	539	-90.9
Soybean oil	-1	7	1		400	806	49.6
Other oilseeds	-38	229	35	619	-7 439	24 938	-29.8
Other meals	-6	36	6		705	3 940	17.9
Other oils	-20	122	19		6 928	13 276	52.2
Cotton	-17	105	16	282	1 554	11 385	13.7
Sugar	-5	29	5	79	-891	3 203	-27.8
Total	-507	3 042	465	7 742	-90 647	330 707	-27.4

^d Ministry of Finance (1989b); State Statistical Bureau (1987). ^e State Statistical Bureau (1987). ^f Total policy transfer divided by gross value of production.

16 Calculation of CSEs, 1986

Commodity	State consumer subsidy ^a	Transfers due to border measures	Total policy transfer	Gross value of consumption	Percentage CSE ^b
	yuan m	yuan m	yuan m	yuan m	%
Beef	289	1 407	1 696	3 133	54.1
Pork	3 507	46 178	49 685	58 136	85.5
Mutton	244	738	982	2 448	40.1
Poultry	70	-196	-126	7 149	-1.8
Eggs	114	246	360	16 553	2.2
Milk		675	675	4 592	14.7
Wheat	6 417	3 320	9 737	49 706	19.6
Corn	1 343	-546	797	27 706	2.9
Other coarse grains	619	-245	374	6 191	6.0
Rice	8 902	37 174	46 076	85 965	53.6
Soybeans	619	393	1 012	9 798	10.3
Soybean meal		322	322	349	92.3
Soybean oil	413	-585	-172	1 213	-14.2
Other oilseeds		3 344	3 344	24 352	13.7
Other meals		-539	-539	3 258	-16.5
Other oils	3 715	-7 823	-4 108	13 653	-30.1
Cotton	1614	-1 249	365	9 690	3.8
Sugar	16	1 074	1 090	3 760	29.0
Total	27 882	83 688	111 570	323 139	34.5

^a Ministry of Finance (1989a). ^b Total consumer transfer divided by gross value of consumption.

Agricultural supply and demand elasticities for China

Supply elasticities

A summary of the matrix of supply elasticities for China is presented in table 17 (omitting individual cross-price elasticities). Note that the aggregate elasticities — that is, the elasticities with respect to a uniform price change in all the commodities represented in the model — generally differ very little from those in the base SWOPSIM data set: the major changes to the parameter set have been confined to the partial elasticities — that is, the own- and cross-price elasticities.

The matrix of supply elasticities was developed in a two-step process. The first step required judgments to be made concerning the aggregate elasticities for each of the 22 commodities in the model. The second step was the specification of the own- and cross-price elasticities for individual commodities. This approach was adopted as a means of maintaining consistency between the many individual cells in the matrix, and to make more tractable the task of developing a large elasticity matrix.

The choice of aggregate elasticities for individual commodities was based on several factors, including natural resource constraints in the principal producing regions for the commodity, rotation and multicropping practices, and past responses to changes in producer prices.

Overall, the industries to which the highest aggregate elasticities are

attributed (table 17) are those which do not seem to be operating at levels close to major natural resource or other constraints on output, and industries which are not tied into rotation schemes. The smaller industries generally fit this category. For example, the livestock sector is smaller than the cropping sector in China, and production of livestock commodities is much less constrained by physical factors than is that of the major crops. Reflecting this difference, the aggregate elasticity for the livestock products in total is assumed to be 0.23, well above the aggregate elasticity of 0.13 assigned to crop commodities over a 5-year (medium term) period.

The major competing and complementary activities for each product in Chinese agriculture were identified using data available from the Institute of Agricultural Economics of the Chinese Academy of Agricultural Sciences and from the Chinese Ministry of Agriculture, together with published provincial data. Cross-price elasticities were then assigned, having regard to the size of the alternative activity in relation to the commodity under consideration. (For example, a small cash crop such as linseed competes directly with cotton, but even a relatively large percentage rise or fall in linseed production from recent levels would have only a small effect on the volume of resources devoted to cotton production.)

17 Comparison between China elasticities in the previous SWOPSIM data set and the present analysis

Commodity	Previous SWOPSIM data set (1)			This analysis (2)			Difference, (2) - (1)		
	Own-price	Cross-price a	Aggregate b	Own-price	Cross-price a	Aggregate b	Own-price	Cross-price	Aggregate
Supply elasticities									
Beef	0.21	0.03	0.24	0.35	-0.12	0.23	0.14	-0.15	0.01
Pork	0.50	-0.06	0.44	0.65	-0.21	0.44	0.15	-0.15	0.00
Mutton and lamb	0.25	-0.09	0.16	0.45	-0.12	0.33	0.20	-0.03	0.17
Poultry meat	0.49	-0.34	0.15	0.65	-0.20	0.45	0.16	0.14	0.30
Poultry eggs c	-	-	-	0.80	-0.06	0.74	na	na	na
Milk	0.30	0.06	0.36	0.55	-0.07	0.48	0.25	-0.13	0.12
Butter	0.15	-0.10	0.05	0.15	-0.10	0.05	0.00	0.00	0.00
Cheese	0.33	-0.28	0.05	0.33	-0.28	0.05	0.00	0.00	0.00
Milk powder	0.15	-0.10	0.05	0.15	-0.10	0.05	0.00	0.00	0.00
Wheat	0.15	-0.05	0.10	0.50	-0.17	0.33	0.35	0.12	0.23
Corn	0.18	-0.05	0.13	0.60	-0.45	0.15	0.42	-0.40	0.02
Other coarse grains	0.15	-0.01	0.14	0.50	-0.39	0.11	0.35	-0.38	0.03
Rice	0.15	-0.02	0.13	0.20	-0.07	0.13	0.05	-0.05	0.00
Soybeans	0.10	-0.01	0.09	0.25	-0.20	0.05	0.15	-0.19	-0.04
Soybean meal	0.30	-0.25	0.05	0.30	-0.25	0.05	0.00	0.00	0.00
Soybean oil	0.08	-0.03	0.05	0.45	-0.40	0.05	0.37	-0.37	0.00
Other oilseeds	0.10	-0.03	0.07	0.50	-0.11	0.39	0.40	-0.08	0.32
Other meals	0.30	-0.25	0.05	0.25	-0.25	0.05	-0.05	0.05	0.00
Other oils	0.49	-0.44	0.05	0.84	-0.79	0.05	0.35	-0.35	0.00
Cotton	0.10	0.00	0.10	0.70	-0.57	0.13	0.60	-0.57	0.03
Sugar	0.15	0.00	0.15	0.70	-0.66	0.04	0.55	-0.66	0.11
Tobacco	0.15	0.00	0.15	0.75	-0.31	0.44	0.60	-0.31	0.29

As indicated above, the partial elasticities used in the base SWOPSIM data set probably understate the responsiveness of Chinese farm industries following the policy reforms of the past decade. A recent wheat study by Thorpe (1988) using time series and cross-section data for 1982-84 supports this view. For example, Thorpe reports an own-price elasticity of wheat supply of 0.64, which is much higher than the elasticities used in the base SWOPSIM data set and in the Tyers and Anderson (1986) model.

Reflecting this judgment and evidence, the new matrix of partial supply elasticities developed here represents crop supply as generally more

elastic than indicated in the base SWOPSIM data set.

Demand elasticities

There is somewhat more quantitative data on which to draw for Chinese agricultural demand elasticities than for the supply elasticities. The literature on which the demand elasticity matrix in table 17 is based includes the work by Chow (1984), Song and Lui (1984), Van der Gaag (1984), Anderson and Tyers (1986) and World Bank (1987), the existing SWOPSIM data base and some unpublished estimates prepared by China's Institute of Agricultural Economics.

17 Continued

Commodity	Previous SWOPSIM data set (1)			This analysis (2)			Difference, (2) - (1)		
	Own-price	Cross-price ^a	Aggregate ^b	Own-price	Cross-price ^a	Aggregate ^b	Own-price	Cross-price	Aggregate
Demand elasticities									
Beef	-0.80	0.45	-0.35	-0.90	0.25	-0.65	-0.10	-0.20	-0.30
Pork	-0.40	0.01	-0.39	-0.80	0.01	-0.79	-0.40	0.00	-0.40
Mutton and lamb	-0.30	0.00	-0.30	-0.60	0.23	-0.37	-0.30	0.23	-0.07
Poultry meat	-0.60	0.28	-0.32	-0.80	0.03	-0.77	-0.20	-0.25	-0.45
Poultry eggs ^c	-	-	-	-0.55	-0.16	-0.71	na	na	na
Milk	0.00	0.08	0.08	-0.10	0.00	-0.10	-0.10	-0.08	-0.18
Butter	-0.50	0.20	-0.30	-0.50	0.00	-0.50	0.00	-0.20	-0.20
Cheese	-0.65	0.30	-0.35	-0.65	0.00	-0.65	0.00	-0.30	-0.30
Milk powder	-0.40	0.10	-0.30	-0.40	0.00	-0.40	0.00	-0.10	-0.10
Wheat	-0.10	0.04	-0.06	-0.20	0.06	-0.14	-0.10	0.02	-0.08
Corn	-0.13	0.02	-0.11	-0.50	0.04	-0.46	-0.37	0.02	-0.35
Coarse grain	-0.16	0.00	-0.16	-0.40	0.04	-0.36	-0.24	0.04	-0.20
Rice	-0.12	0.02	-0.10	-0.20	0.03	-0.17	-0.08	0.01	-0.07
Soybeans	-0.24	0.06	-0.18	-0.30	0.10	-0.20	-0.06	0.04	-0.02
Soybean meal	0.04	-0.28	-0.24	-0.21	-0.05	-0.26	-0.25	0.23	-0.02
Soy oil	-0.08	-0.03	-0.11	-0.30	0.15	-0.15	-0.22	0.18	-0.04
Other oilseeds	-0.44	0.38	-0.07	-0.80	0.73	-0.07	-0.36	0.35	-0.01
Other meals	-0.32	0.00	-0.32	-0.25	-0.01	-0.26	0.07	-0.01	0.06
Other oils	-0.50	0.00	-0.50	-0.30	0.01	-0.29	0.20	0.01	0.21
Cotton	-0.10	0.00	-0.10	-0.25	0.00	-0.25	-0.15	0.00	-0.15
Sugar	-0.46	0.00	-0.46	-0.75	0.00	-0.75	-0.29	0.00	-0.29
Tobacco	-0.05	0.00	-0.05	-0.30	0.00	-0.30	-0.25	0.00	-0.25

^a Sum of cross-price elasticities with respect to other commodities represented in the model. ^b Elasticity with respect to uniform change in prices of all commodities represented in the model. ^c Poultry eggs were not included for China in the original SWOPSIM data base. na not applicable.

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