CHINA'S AGRICULTURAL AND RURAL DEVELOPMENT IN THE EARLY 21ST CENTURY

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Agricultural and Rural Development Task Force
China Council for International Cooperation on
Environment and Development

Center for Chinese Agricultural Policy
Chinese Academy of Sciences

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PREFACE

This monograph discusses several of the key agricultural and rural development policy issues faced by China in the first years of the 21st century. It derives from a series of workshops and meetings held in China in 2003 and 2004 under the aegis of a China Council for International Cooperation on Environment and Development (CCICED) task force on the subject.

CCICED was established in 1992 by the State Council of China. It is a high-level advisory body with approximately 40 Chinese and international members having knowledge and experience in many fields relevant to issues in environment and development. Its mandate is to 'further strengthen cooperation and exchange between China and the international community in the field of environment and development'. CCICED provides recommendations to the Government of China on policy and institutional change to support sustainable development.

CCICED is supported in its current phase by small task forces of Chinese and international experts who undertake specific short-term assignments to study issues of current interest to the Government of China. The Agriculture and Rural Development Task Force (ARDTF) was established in 2003 to investigate a series of issues affecting the incomes, development opportunities and living conditions of rural citizens. The specific issues included:

- reform of rural fiscal policy and public services
- grain marketing and grain-reserve management reform
- trade liberalisation and poverty
- farmer associations in agricultural and rural development
- labour migration off the farm
- agricultural research, extension services and water management
- land security and rental markets for cultivated land

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- reform of rural financial services
- food security
- cultivated land protection
- environment and rural development.

The ARDTF reported to the CCICED 2004 Annual General Meeting, at which the theme was agriculture and rural development. This publication is based on the ARDTF report to CCICED and contains the report executive summary, a set of policy briefs on the above issues and supporting research papers written by task-force members and invited Chinese and international experts. The papers arose from collaborative policy research carried out between Chinese government and university economists and social scientists and counterparts in a number of countries, in particular the USA, Canada and Australia.

ACIAR was invited to take part in the task force and to publish this monograph because of the large number of projects—pipeline, current and completed—it has facilitated and funded in the subject areas. These include the following collaborative projects on the topic areas designated:

Trade

- Achieving food security in China – implications of WTO accession (ACIAR project no. ADP/1998/128)
- Rural poor and smallholders in western China under WTO: a regional and community level analysis (ADP/2002/114)
- Economic analysis of technical barriers limiting agricultural trade of China (ADP 2004/044)

Food security and grain storage

- Emergence and integration of regional grain markets in China (ANRE1/1992/028)
- Chinese grain market policy with special emphasis on the domestic grain trade (ADP/1997/021)
- Outlying developing countries in world food consumption patterns (ADP/2002/049)

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Livestock industry policy

- Economic aspects of raw wool production and marketing in China (ADP/1988/011)
- Analysis of socio-economic and agribusiness developments in the Chinese beef and cattle industry (ASEM/1995/002)

Natural resource management policy

- Institutions and policies for improving water allocation and management in the Yellow River Basin (ADP/2000/120)
- Sustainable land use change in the north west provinces of China (ADP/2002/021)

Research and extension policy

- Priorities for public investment in Chinese agriculture (ADP/1996/228)

The publication is available in Chinese and English and on the websites of the Australian Centre for International Agricultural Research at <www.aciar.gov.au>, the Center for Chinese Agricultural Policy, Chinese Academy of Sciences at <www.ccap.org.cn>, the China Council for International Cooperation in Environment and Development <http://www.cciced.org> and <http://www.harbour.sfu.ca/dlam/>, and China–Canada Cooperation in Agriculture <www.ccag.com.cn>.

We wish to acknowledge the excellent contributions of the members of the ARDTF and the many Chinese and international experts who participated in the writing and review of chapters of the monograph. We especially wish to thank staff at the Centre for Chinese Agricultural Policy, Chinese Academy of Sciences, for their dedicated support of the task forces.

Bernard Sonntag, Jikun Huang, Scott Rozelle and John Skerritt
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EXECUTIVE SUMMARY

INTRODUCTION

Remarkable achievement in the past

Two decades of reform have changed the economic landscape of China. In the 1990s, per-capita grain output reached a level similar to that in developed countries. Many farmers shifted into higher-value crops, making decisions increasingly on market-oriented principles. China's research system has steadily produced new technologies that have raised productivity at almost double the rate of population growth. The nation has by far the most sophisticated agricultural biotechnology program in the developing world—indeed, many of its breakthroughs are of global importance. Emerging domestic markets deliver new technologies to farmers throughout the nation and the output of farmers that use them is being delivered to consumers across ever-widening reaches of the nation. The markets for some agricultural commodities are among the least distorted in the world. Rising food exports demonstrate that China's farmers can now compete in international markets.

Off the farm, more than 40% of rural residents have employment; about 100 million of them have left home and moved to urban areas for employment, most of them young and eager to make new lives in the cities. Rural incomes have risen significantly and hundreds of millions of people have escaped poverty during this time. Growth in agriculture, non-farm employment and rural industry, and the transformation of domestic and international markets, have changed the face of rural China and are playing key roles in the nation's modernisation.

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National development goals and challenges

While past accomplishments are impressive, there are still great demands ahead. With the transition from a planned to a market-oriented rural economy well advanced, China's main challenge has shifted to one of development. In the coming years, however, the development process will be fundamentally different from the efforts in previous times when meeting the nation's food needs, poverty reduction and economic growth were the main goals.

In China's new environment the main measure of success will be the extent to which the rural economy can become an integral part of the nation's push towards modernisation. For China to successfully modernise, the nation's economy will have to experience a fundamental transformation—from rural to urban and from agriculture to industry and services. The necessity of this shift is borne out by the development experience of every other high-income country in the world. There are no middle- or high-income countries in the world that have more than 10% of their population engaged in agriculture. Change in this direction is consistent with the nature of China's economy. Land holdings are so small and other resources are so scarce that farming activities alone cannot continue to raise the incomes of most rural households. The challenges are how China can establish effective linkages between rural and urban areas and encourage a large labour shift out of agriculture.

The new leaders of China have recognised that policy reforms, especially agricultural and rural policy reforms, have vital roles in the success of sustained rural development. The national development goals articulated in the 'Five Balanced Development Strategies' are ambitious and several of the strategies and reforms proposed are bold. National leaders nevertheless also realise that there are many barriers to achieving China's goals. Factors that contributed to the success of the nation's economy in the past have become obstacles to future progress. The new government is interested in new ideas to help China's economy make rapid and harmonious change. The policy suggestions in this summary raise new and practical ways for leaders to implement the Five Balanced Development Strategies.

The Agricultural and Rural Development Task Force

The China Council for International Cooperation on Environment and Development established the Agricultural and Rural Development Task Force in 2003 to produce policy-oriented ideas and recommendations that will help China's leaders to create

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a vision for agricultural and rural development in the coming years. To that end, the task force undertook analyses of a specific set of policy issues of current interest within the Government of China. The mandate of the task force was to make policy change recommendations that are consistent with national goals of income growth and poverty reduction and environmental sustainability. The task force also examined how the proposed policy changes will affect food security given its prominence in current policy making and its inextricable relationship with the rural economy.

ASSESSING THE IMPACTS OF POLICY CHANGES

In an ideal world it would be possible to measure the rural economy's contribution to the modernisation of the overall economy and China's other goals. Unfortunately, no single such measure exists. In this section, three measures are discussed that can be used to measure progress towards China's goals.

Farm household income

The continued slow growth of the income of individuals in rural areas compared with those in urban areas is thought to pose a threat to both social and political stability and sustainable development. The growing income disparity between regions and among farmers within regions further threatens social stability. Among the points made in China's new Five Balanced Development Strategies, balanced development of rural and urban economies and balanced development of more-developed and less-developed regional economies are priorities. In this atmosphere, the level of rural income and its growth are fundamental measures of success.

The following are key questions in farmer incomes that need to be answered:

- Can farmers, particularly the poor, benefit from general economic growth so that income disparity between rural and urban, across regions, and among farmers within regions is reduced in the future?
- What policies (and their priorities) are appropriate for achieving agricultural/rural development and the income growth of farm households?
- What are the roles of agricultural development and off-farm employment in stimulating the income growth of farm households?

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- Should China invest its limited fiscal and financial resources on improvement of the quality of rural China's human and physical resources or on income transfer and agricultural subsidies?
- What are the roles of marketing and government programs in achieving the goal of balanced income growth?
- Can the government develop and encourage new public–private partnerships to help accelerate income growth and extend it to those in poorer areas?

To create a new environment that enables the rural economy to become integrated into the nation's economic development generally, it should be recognised that, beyond income, the most important policy measures are those that raise the quality of rural China's human and physical resources and accelerate building of the infrastructure within which those in the rural economy operate. With better access to resources, rural residents will acquire the skills and abilities to integrate themselves into the nation's industrialising and commercialising cities. These changes will lead to increases in the income of, and consumption by, rural residents.

Successful development policy, however, also must recognise that modernisation (and long-run income growth) is a slow process that will depend on maintaining a healthy agriculture and rural economy. Rising incomes can fund household investments in education and health and other human and physical assets that will increase productivity in the longer run. While average farm income will continue to grow with the growth of the general economy, income disparity between rural and urban, among regions, and among farmers within regions will increase further in the coming years if appropriate policies and reforms are not implemented.

The nation's grain (food) security

Food security is an important national goal. With its unique historic legacy and the nation's large population and limited resources, it is understandable that China's leaders continue to place high priority on food security.

This issue was dealt with by the task force in a way that does not detract from the pursuit of income in either the short or long run. Since the traditional way of thinking about national food security was often at odds with the goal of improving rural incomes, the government is urged to reset the priority on food security from the current focus on both food and feed grain to food grain only. Also, policies that seek

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to improve the access of households, especially poorer ones, to food, when domestic prices are either high or low will be effective in ensuring food security of another kind; that is, household food security. While the government needs to develop some welfare and insurance-oriented provisions in the pursuit of household food security, the best way to meet it may be to implement productivity-enhancing policies that are needed for rural income growth, and make sure that they are also targeted at households in poorer and vulnerable areas. If these suggestions can be accepted, most rural development policies focused on raising incomes are consistent with food security.

The following key questions in grain and food security need to be answered:

- Is China's food and grain supply security a serious problem now?
- Will China's food and grain security be a problem in the future?
- What should be the focus in China's food security? All grains or food grains? Should the focus be on national self-sufficiency or ensuring that all households have access to food?
- Is the conversion of agricultural land to other uses a serious problem? What impact will this have on China's grain security? Likewise, does the nation's program for setting aside cultivated land in poor and remote mountainous areas (the Grain for Green program) have a large negative impact on grain food security?
- What are the key determinants of China's future grain security? Can China rely on long-term productivity growth for grain security?
- How can the nation best manage its grain reserve system?

Environment

The enormous strides China has made in agricultural productivity, food output and poverty reduction are remarkable and well documented. However, these achievements have been made at a high cost to the environment. Farm incomes are now under pressure, in part because of degradation of the resource base. Environmental problems include desertification, soil erosion, grassland degradation, salinity on irrigated land, organic matter and fertility loss, burning of crop residues, aquifer depletion, high levels of heavy metals, nitrates and pesticide residues in soils and water, animal wastes and loss of biodiversity. Some environmental trends are still in the wrong direction.

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Many current policies and practices are impediments to environmental sustainability because of their adverse effects on the land and water resource base. Environmental and economic objectives are frequently in conflict. Technological change, by itself, is unlikely to generate a sustainable agriculture sector. Policies and practices with complementary economic and environmental objectives are needed and are possible. The following are key questions in environmental sustainability of agriculture:

- Are R&D programs and extension services developing and delivering appropriate technologies and information?
- Are public-good services in rural China adequate to educate farmers in production technology, marketing and financial management in a market economy?
- When national and regional programs are set up to combat environmental problems, are sufficient fiscal resources and institutions in place to implement and enforce the policies?
- Are financial services in rural China adequate to enable farmers to adopt environmentally friendly practices and technology?
- Are policies and programs available to enable resource-limited farmers to leave agriculture?

A NEW FRAMEWORK FOR SUSTAINABLE AGRICULTURAL AND RURAL DEVELOPMENT

To meet the goals of more balanced development and raising farmer incomes, both policy shifts and changes in government services are needed. First, *reforms are needed in the organisation of government*. A new framework is needed for managing fiscal and other governmental matters, including the development of a plan to manage the environment and to generally meet the needs of China's modernising and increasingly market-oriented economy. New institutions need to instill a new ethic into government; officials need to change their roles, becoming facilitators of economic growth, equity and environmental protection, rather than direct actors. Reforms are also needed to encourage the emergence of new partnerships with rural citizens. China needs to promote voluntary, independent farmer associations and new arrangements with private enterprises that can help in the process of development and assist government in taking care of those who are in danger of being left behind.

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Second, a concentrated effort is needed to *improve the resource base of the rural economy*. It is a government responsibility to prioritise and mobilise investments into those projects that have public-good characteristics and to encourage private firms and individuals to make productive investments that will raise incomes and provide employment. Despite the great progress of the past 50 years, many parts of the agricultural and rural sectors remain underdeveloped. There are 50 million more farmers in China than at the beginning of reform. Farms are fragmented, small and getting smaller. Other resources—such as water and forests—are becoming ever more scarce. Farm prices, at least for certain internationally traded commodities, will almost certainly fall as the nation implements its World Trade Organization (WTO) commitments.

In such an environment the state and its partners have much to do to help farmers increase their resource base. China's most abundant resource, the *labour* of its rural population, needs to be the target of a sustained drive to increase the value of its human capital, with investments into education, rural health and other areas. The *productivity* of agriculture and the rural sector will require modern technologies, those that are affordable and suitable to small farmers. *Land* and *water* also require large investments and new institutional arrangements that can increase the productivity and incomes of households; at the same time, rental markets for cultivated land are needed to allow those left behind in farming a way to access greater areas of China's most scarce resource. Finally, the rural sector needs a healthy and effective financial system to transfer capital from those who want to save to those who have an opportunity to invest.

In short, if the government can create new institutions to transform its role in development, foster a new partnership with the people and improve the nation's resource base, rural incomes can rise and the rural economy will be a force in China's modernisation drive. If appropriate decisions are made, the policies will not adversely affect national food security and many policies will enhance the security of households. There are few inherent conflicts with environmental concerns and, where they do exist, they can be offset by the adoption of appropriate complementary policies. Although complicated, these are essential components for successful implementation of the Five Balanced Development Strategies.

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Creating a new role for the state

For the state to assume its new role as a facilitator of economic activity rather than as a direct economic actor, a new approach needs to be instilled. Key areas for policy initiatives are discussed below.

Changing government functions

The emphasis should begin to be on those activities that are truly for the public good; the private sector should be regulated, but the goal should be to allow individuals and private firms to provide quality goods and services on the basis of market-determined prices and quantities. Markets should be fostered and the sources of market failure should be a target of policy revisions to ensure better performance. The government needs to allow the private sector to take over many of the activities that are currently being carried out by state agencies and quasi-state organisations.

Clear division of central and local government roles

The roles of different levels of government need to be delineated. When a level of government has a particular set of duties, duplication of tasks should be avoided and resources needed for their timely and quality completion should be assured.

Poverty, equity and the environment

In addition to helping overcome market failure, the main set of tasks for the government includes measures for reducing poverty, maintaining equity and improving the environment. To carry out these policies, the government needs to focus on building a rural fiscal system, facilitating rural markets, and promoting farmer associations as a way to foster new relationships between the party and the people.

Rural fiscal policy

China needs a healthy public fiscal system to enable government to provide an environment for growth and development, including basic infrastructure and social services. For the rural sector, this includes providing or facilitating investments in farmland improvements, agricultural research and development, extension services, infrastructure such as roads and communications, and social services (such as education, health and social security). The fiscal system also sets incentives that guide the allocation of resources and influence development. Key areas for policy initiatives include the following:

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Fundamental restructuring of the fiscal system

Fundamental restructuring of the system is needed to set priorities on services to be provided and to organise the fiscal system in such a way that each policy function is fully funded. A new commitment to transferring more funds to the rural economy is needed.

Reform of the current tax system to suit each region of the country

The current tax reform and agricultural tax reductions, although useful and successful in many places, are restricting development and income growth in others. Allowances are needed for regional differences. The impact of agricultural tax reform needs to be carefully assessed.

Review critical services and make a clear division of responsibility between government and the private sector

An in-depth review is needed to assess the government tasks that are critical public services. Others should be dropped. Those remaining should be divided into those that must be delivered by the government (e.g. road building and maintenance, and the rural public-health system) and those that can be provided by the private sector (e.g. certain types of agricultural extension).

Need for new systems of governance

Lack of transparency and accountability in the local governance institutions is a fundamental problem in the management of fiscal resources and investment efforts. The creation of institutions that provide for more transparency and accountability is needed for any of the new initiatives to be successful.

Better marketing environments for development

Markets are needed for fostering specialisation and for allowing farmers to reap the benefits of increased access to urban consumers and international markets. In the past decades, despite attempts to control China's commodity markets, they have developed rapidly and have become increasingly efficient, competitive and integrated. Indeed, many of China's markets for agricultural commodities and basic inputs are among the least distorted in the world. Despite this success, markets for some commodities remain vulnerable to government intervention.

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Labour markets are important in facilitating the flow of labour among regions, and have improved dramatically over time. However, there are still considerable barriers to movement that need to be eliminated.

The following are key areas for policy initiatives:

Fostering domestic commodity and labour markets

Initiatives needed include: enhancing grain market reform; removing special considerations that have given advantages to state marketers in long-distance grain trade; improving policies that will facilitate more-liberalised regional labour markets (for example, the elimination of the *hukou* system).

Deepening integration across the border

Initiatives needed include: accelerating technology transfer/imports; taking a pro-active role in the WTO Doha Round negotiation; implementing pro-poor policies to target those who are hurt and vulnerable during the course of trade liberalisation.

Market infrastructure development

Initiatives needed include: investments in transportation, communications and marketing information networks; the development of a futures market for major agricultural commodities.

Building partnerships with farmer organisations

In an economy with millions of smallholders and an emerging market economy, it is imperative that farmers be able to organise to facilitate their interactions in commercial and investment transactions. Organisation will help farmers in the adoption of new technology, access to inputs and marketing of their output. In particular, value-adding activities often benefit from cooperation. The following are key areas for policy initiatives:

Need for government support

Although the impetus to meet and act as a group must come from the farmers themselves, the government can create an environment in which independent associations can thrive. Government input could include legal support, financial aid, technical services such as training of leaders, and provision of technical and marketing information services provision.

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New laws and regulations are critically needed

China needs to speed up the formation of farmer associations (FAs). New laws and regulations should promote and protect FAs. The legal status of groups needs to be clear. FAs need to have the ability to enter into contracts, act as legal guarantors and take loans. In short, FAs need the authority to be able to act for the members of their group. Along with this new authority, responsibility is also needed. Hence, as well as additional authority, new rules and regulations are needed that protect the membership from the leadership, including the way in which the leadership is selected and monitored.

A catalyst is needed

The experience of FAs in other countries has shown that, even when a favourable legal and regulatory framework exists, an independent catalyst (that is, some person or group outside the government) is often needed to get FAs started, and to expand and perform better. While China has a number of FA-promoting agencies, they are controlled by government. Alternative models should be sought to create catalysts that are first and foremost responsive to the needs of farmers and FAs. In some nations, special services are set up to promote FAs; in others, cooperative extension agencies are created within the agricultural university system. The main role of such advocacy organisations is to facilitate the creation of associations and provide information that allows their members to promote their groups' interests. Training of FA leaders is also critical.

INVESTING IN AGRICULTURAL AND RURAL RESOURCES

Although there are many investment needs, four main categories of investment should receive special attention: investment in labour; technology for raising productivity and promoting water savings; land rental markets; and reforming rural financial markets.

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Preparing for migration out of rural areas

Labour markets are the conduits for the forces of a nation's transformation from a rural to urban society. There are different channels: urban migration; local off-farm wage earning jobs; self-employment. All are needed to provide the enormous numbers of jobs that will allow farmers who do wish do so to move off the farm. Policies are needed to stimulate demand and encourage supply.

The following are key areas for policy initiatives on the demand side:

Restructuring China's economy

Encourage labour-using industrial development and discontinue policies that favour capital-intensive industrial expansion. Creating new and more non-farm jobs is essential for China to have a successful economic transformation from a rural- to an urban-based economy.

Eliminating restrictions on labour hiring

Remove barriers and regulations that prevent firms from hiring migrants; reduce regulations that are preventing employment from occurring in the manufacturing and service sectors.

Providing better financial services

Continue to improve the banking environment so banks can finance local enterprises and the self-employed.

The following are key areas for policy initiatives on the supply side:

The three most important policies are:

- improve rural education
- improve education of rural migrants in cities
- improve skills training of migrants in rural and urban areas.

Additional priorities should be to improve the provision of rural health services and health insurance, enforce land laws to encourage rental opportunities without threatening security of renters' land rights and eliminate barriers in cities that reduce the benefits of migrants and discourage farm families from moving to the city permanently.

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Raising productivity on the farm

Land management

Successful transformation of China's economy has been based on agricultural growth. In the past three decades, agricultural growth has been remarkable. The growth has come from increases in material inputs and productivity as well as institutional changes. The already high input levels in many areas of China and diminishing marginal returns, however, mean that increasing inputs will not provide further large increases in output. Water shortages and increasing competition from industry and domestic use do not provide much hope for large gains in the area under irrigation and the total output from irrigation expansion. Incentives provided in the early 1980s resulted in large, one-time shifts in productivity, but this source has been shown to be largely exhausted in China.

Given current technology and policies, China's farmers are approaching an upper limit to their ability to supply greater quantities and higher values of foods from their current resources. In the future, almost all gains will have to come from second- and third-generation green revolution technologies such as biotechnology and agricultural structural changes. New research and development (R&D) and extension efforts are needed to create and spread the next generation of technologies.

Key areas for policy initiatives in land-enhancing technologies include the following:

- Deepening agricultural research and extension reforms

China's leaders should take a decisive step to further its reforms in agricultural R&D so that a modern and effective agricultural research and extension system can be created. Some research institutes need to be closed; others need to be commercialised; others need to be merged; yet others need to be expanded. There are too many poorly trained agricultural research scientists; current resources and additional new resources need to be focused on the best. China needs to clearly delineate public and private roles in agricultural R&D and establish effective mechanisms for public–private partnerships. The reforms should also recognise that not all agricultural research institutes and technologies can be commercialised. Commercial businesses of the research institutes require a market-oriented institutional and

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management system. Human resource skills of most researchers and academics in marketing and business management are generally inadequate for successful enterprise development.

- China needs to substantially increase its investment in agricultural research and extension

Commercialising part of its current agricultural research and extension systems does not imply reducing the government's role in financing agricultural research and extension. Agricultural research driven by commercial interests would naturally be directed towards the most commercially viable products and technologies, and would leave research directed to food security, poverty reduction, and environmental sustainability seriously under-funded.

The current needs for agricultural research and extension indicate that public funding should be a primary source of support for these activities in the decade ahead. Difficulties in implementing and enforcing a strong intellectual property rights system also imply the importance of a viable public financial support system for agricultural research and extension.

Public agricultural research investment should be increased to 1% of total agricultural GDP in the near future, from the current level of less than 0.3%, with at least a similar public investment in agricultural extension. China should also continue to encourage the development of biotechnology and its application to agricultural production and processing.

Water management

Water shortages are a serious barrier to growth. They are limiting efforts to alleviate poverty, and are becoming a major source of environmental problems. Current policies have either not worked or have not led to real water savings. Many traditional strategies are unlikely to solve China's water shortages since there is little incentive to adopt new technologies or they do not lead to real water savings. Even with south to north transfer, there will still not be enough water to solve the crisis. A fundamental shift is needed in the way water is managed. The Chinese Government should consider taking the following steps in order to begin to manage north China's water resources:

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- Water savings in irrigated agriculture need to focus on reducing the water consumed per unit of crop production. This requires an integrated approach of improvements in irrigation technology, agronomic practices, and farm water management.
- Water management agencies need more authority to implement the difficult measures that are needed.
- To achieve true water savings while avoiding inequitable outcomes, a system of water rights for *both* surface- and groundwater is needed, with rights extending to individuals that live in specific areas and the total amount of the rights limited to water availability after taking into account the environment and other needs.
- After water rights are established, China needs to begin the investments and management shifts that will allow for volumetric pricing and regulation of water.
- With the institutions and facilities in place to implement a system of water rights and volumetric charges for water, the nation can begin to move forward to take several concrete steps such as raising water prices, promoting new, water-saving technologies, and reforming management institutions in order to achieve cropping intensity levels and cropping patterns, as well as municipal and industrial use levels that will be sustainable.
- Efforts on the conservation side must be matched on the pollution abatement side in order to stop the mounting, and often irreversible, damage to China's water resources.

Encouraging land rental markets

China's size and the nature of its integration into the world economy imply that rural development has to respond to big challenges that cannot be solved by resorting to government intervention, but instead require the operation of well-functioning rental markets for cultivated land. For markets to work well, there must be an absence of barriers that are impeding the linkage of land and labour markets, such as market imperfections, institutional rigidities and other barriers.

A key area for policy initiative is guaranteeing permanent land-use rights. Several specific policies can facilitate the improvement of permanent use rights. First, the new *Rural Land Contracting Law* needs to be more rigorously enforced. The provisions are pro-rental, but understanding of the law is still weak. Second, a province-wide (or region-wide) system of land registration is needed to ensure the security

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of land holdings for the duration of rental arrangements. Finally, demand for land rental could increase if mortgages were allowed, since borrowing against land could break capital constraints that are dampening the demand for land and may facilitate out-migration by providing the liquidity needed for moving.

Experimenting with rural finance

Mobilising and efficiently using available financial resources is important for achieving high rates of economic growth, especially in developing countries where such funds are typically in short supply. As economies grow, financial institutions often play an important role in directing resources to their most productive use. As a result, greater financial intermediation (loans as a share of GDP) usually accompanies higher incomes. One of the most important lessons from other developing countries is that poorly functioning rural banking systems reduce growth and retard poverty-reduction efforts. This is almost certainly true for China.

Although China has made a number of efforts to reform its rural financial system in the past, most agree the measures taken so far have not been successful. The reforms have been incomplete, and rural bankers have little incentive to provide good service. China often uses state control of the banking system to pursue policy goals that are not always consistent with efficient intermediation. Recent state banking reforms in China have reduced access to commercial loans by rural borrowers. Informal institutions have thrived across China, replacing formal banking channels, in effect taking control over rural financial markets out of the oversight of the state. Competition from such sources is indirect and less effective in promoting efficient management.

The following are key areas for policy initiatives:

Promoting comprehensive reform of the rural financial system

Resolution of the outstanding problems of China's rural financial system cannot be confined to minor repairs and adjustments to the current system. It is necessary to take a holistic view and undertake comprehensive reform of rural finance across the institutional spectrum—the Agricultural Bank, the Agricultural Development Bank and the rural credit unions—with the aim of establishing a complete and more-vigorous rural financial system. Far-reaching reforms of Rural Credit Cooperatives (RCCs) are needed; experimentation should be allowed; it is critical to try to provide the new management teams with strong short and long-term incentives.

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Enacting new laws and regulations to promote and formalise rural informal credit markets

In addition to RCCs, non-state banks should be encouraged. A regulatory environment that encourages safe and efficient banking practices is needed, but set up in a way that facilitates the entry of private banks and other moneylending and deposit-taking institutions. More flexibility is needed on the number of products and lending practices.

Enhancing micro-finance programs

The government should try to encourage micro-finance and allow localities to experiment with their own forms. Regulations that keep NGOs from operating and expanding their operations should be eliminated. Micro-finance units should be allowed to take deposits.

A NEW FRAMEWORK FOR THE NATION'S GRAIN (FOOD) SECURITY

China has a large resource base and a solid record of productivity in the past to ensure national grain and food security. China can achieve its high level of food grain security in the coming decades. There is a need to shift the focal point of China's grain and food security. China has been a net food-exporter since 1983. In recent years, China has become a net grain-exporter. From a national food-security point of view, China is probably the most secure nation in the developing world. In the future, even if the nation completely liberalised all trade (which is beyond its current trade commitments under the WTO), economists in China forecast that, in 2020, rice and wheat requirements will still be almost fully produced in China. In the coming years, China needs to make fundamental changes in national priorities on food and grain security and in the way that the grain economy is managed.

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The following are key areas for new initiatives or shifts in policy:

Shift in emphasis from food or grain security to food grain security

In order to maintain the spirit of China's food-security policies without imposing excessively costly and ineffective restrictions, the national government should redefine its food security goals in terms of rice and wheat, the two major food grains. This would provide considerable protection against any external economic threat while being attainable without causing major distortions.

Shift in emphasis from aggregate national food security to household food security

While China as a nation does not face a food-security problem (provided it continues to promote productivity-enhancing technologies and invest in its rural infrastructure), there are still tens of millions of households that live at or under the poverty line. For many of these poor households, there are significant risks that sooner or later they will not have sufficient food to keep their members healthy and productive. The main focus of national food-security policy should be on these households. The measures to make these households food secure are mostly consistent with the measures that are needed to increase income, promote movement into the off-farm sector and generally make rural households more productive and increase their access to resources. Supplemental measures are also needed in the short run to protect these households against large negative-income shocks. Policies that take away incentives for households to improve themselves must be avoided. Policies that provide good incentives include rural health insurance to help protect farmers from the effects of sickness and injury. Maintaining the ability of the government to deliver food in times of natural disaster also is needed. Such measures will be effective in raising incomes and promoting the transformation of the rural economy; they will also improve household food security.

Emphasising long-term productivity growth instead of short-term subsidy programs

China's food-grain security program will rely mostly on raising long-run productivity. Although well-intentioned and welcomed by farm households (every farm household likes receiving money), programs such as the grain direct subsidy that was implemented in 2004 could be very costly, reduce the government's fiscal resources for public services, and have much less effect on national grain security

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than other measures. Unless the government commits to long-term subsidy programs, farmers will likely not spend much of their subsidy; they will save it. Hence, the return on such investments will be low. Instead, investments in R&D, extension, education, health, irrigation and other rural infrastructure, have been shown to have high multiplier effects, especially in poor areas.

Balancing land uses between agriculture and non-agriculture

Considerable quantities of land are being converted from agriculture into built-up areas. Although conversions may have increased since 2000, according to research by the Chinese Academy of Sciences using highly reliable Landsat data, the amount of land that was converted from cultivated to non-agricultural uses between 1985 and 2000 was more than offset by land converted for cultivation. China had 2% more cultivated land in 2000 than it did in 1985. Although the quality of the new cultivated land is lower than that of the land converted to non-agricultural uses, the fall in bio-productivity is less than 0.5%. Hence, far from losing production potential, between 1985 and 2000 China's output potential actually increased by 1.5%. At least until 2000 then, the conversion of cultivated land into non-agricultural uses has had no effect on grain production and prices.

With the future of China's development relying on rapid industrialisation, it is certain that there will be high demand for further conversions. Employment, income and productivity growth are all associated with the conversion of land from low-productivity agriculture to high-productivity industry and services. Compared with other nations (e.g. Japan, Korea, the US and many European countries), China's rate of cultivated land conversion is low.

While industrialisation and modern development demand that conversions continue, land-use policies need to promote rational use. The policies should not be across-the-board bans on conversions, but should emphasise long-run land-use planning. Modern urban-planning methods should be used to determine these needs. The incentives for local governments to convert land to non-agricultural uses for fiscal reasons can be reduced by reducing the role of the government in the conversion process. After land plans are in place, development should be done by the private sector, and negotiations for land purchase should be made directly with rural residents. To make this process work, rights need to be given to farmers to ensure that those who lose their land are directly and fairly compensated. New measures also are needed for improvement and enforcement of land laws and regulations to

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ensure that land acquisition is implemented fairly. These include a clear definition of land ownership and use rights; a clear differentiation of land acquisition for public uses and private business activities; market-based compensation for land acquisition; and awareness, transparency and accountability.

A system of land conversion permits that allows only a limited amount of land to be converted each year might be considered for use across China. It is important to make such permits tradable so that the locations of development are optimised.

Removal of fragile land from cultivation

Grain for Green, the nation's program to set aside cultivated land, has removed more than seven million hectares of land from cultivation. While there have been serious implementation problems, it should be recognised that, on the whole, the program has been successful in reducing soil erosion and increasing forested area and has done so by providing farmers with compensation that has led to higher incomes and rising asset values.

Despite its vast scope, there is no evidence that Grain for Green has had any substantive effect on grain prices and there is no basis for stating that the program would have any significant effect on national food security. While research shows that Grain for Green rather than land conversion to built-up area has caused most of the decline in cultivated land in recent years, the productivity of the land that was converted to forested area was extremely low. According to research conducted by the Center for Chinese Agricultural Policy using its policy analysis model, the price impact of Grain for Green was minimal. Of the 40% grain price increase that occurred between 2003 and 2004, less than 5 percentage points of the increase was due to the program. While the scope of the original program may need to be reevaluated because of implementation problems, the program should not be halted on the basis of food-security concerns.

Changing national grain reserve management practices

Although some aspects of the grain-reserve management system have improved in the past several years, it is still one of the weakest and least understood parts of China's food-security program. In many ways, despite the reforms, it is dysfunctional. The rules for management and release are unclear. There is confusion among the different holders of grain. The lack of transparency creates chaos in grain markets and contributes to greater variability in grain prices. Because no-one knows the level of

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stocks or the quantities of planned (or actual) release, domestic producers and traders and international trading agencies cannot make decisions based on full information. Rules for purchases and sales need to be open; public information on markets can internalise all of the factors that will influence short- and long-run price expectations, which will affect production, storage and sales decisions.

ENVIRONMENTAL IMPACTS OF POLICY CHANGES

In all of the issues studied by the Task Force, the positive economic effects of recommended policy changes are likely to also result in better environmental management in rural China, though some regional impacts may be negative. Observations on specific aspects follow.

Rural fiscal policy

Implementation of recommendations on fiscal policy would increase resource allocation to rural China in public-good services such as education, health and rural infrastructure, redefine roles of the various levels of government and the private sector and develop more equitable, regionally sensitive tax policies. Given the established positive relationships between income and environment and education and environment, rural fiscal-policy reform should result in better environmental performance in rural China.

Better marketing environments for development

Competitive domestic commodity and labour markets, trade liberalisation and market infrastructure development are expected to increase rural incomes and positively affect rural resource management.

Building partnerships with farmer associations

Legislative changes to facilitate voluntary, independent farmer associations that can operate in the interests of their own members in adoption of new technology, access to inputs and marketing are expected to improve the incomes of farmers, as they have in developed economies. International experience demonstrates that farmer associations have been leaders in improved land and water-resource management. It is in farmers' own economic interests to improve the long-term productivity of their resource base.

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Preparing for migration out of rural areas

The resource base of farmers who stay in rural areas will be augmented by the departure of their neighbours. This will improve their income potential and provide incentives for better stewardship of their land base.

Raising productivity on the farm

Increased public investment in R&D and extension services is expected to produce and extend environment-friendly technologies in areas such as pest and fertility management, conservation tillage and planting systems, grassland management and biotechnology; all of which can produce positive environmental outcomes.

Encouraging land-rental markets

Well-functioning land-rental markets and more-secure land-use rights will expand the resource base of farmers who remain in rural China. More-secure tenure will encourage improved stewardship of resources.

Experimenting with rural finance

Financial services to rural residents in China are weak. This discourages holding of savings as deposits and encourages savings to be held in assets such as animal herds/flocks, with consequent damage to grasslands and water resources. Reforms that would facilitate rural services such as credit unions and sustainable micro-finance programs would have positive environmental spin-offs. Better access to credit is needed to facilitate adoption of new technology for better land and water management.

Grain marketing

Greater transparency in management of grain reserves, enhanced private-sector participation in grain markets and narrowing of grain self-sufficiency targets to a national food-grain security target would reduce pressure on fragile landscapes and the consequent environmental costs.

Protection of cultivated land

Loss of cultivated land to urban and industrial uses is an inevitable and necessary cost of development. More-secure land-use rights and more-transparent and equitable processes for land acquisition would reduce excessive land taking and

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mitigate environmental effects. The 'Grain for Green' program is targeted to remove fragile land from cultivated uses and thus should have positive environmental effects. Continuation of the program with more-effective implementation is needed.

Trade and poverty

Trade liberalisation has and will have mixed environmental effects. Changes in comparative advantage resulting from changes in relative input and product prices are expected to reduce output of some land-intensive products in north China, with consequent reductions in environmental pressure on land and water resources. Intensity of production is likely to increase in horticultural crops and rice in coastal provinces, with increased application rates of fertilisers and pesticides. Application of food-safety standards inherent in WTO accession may induce or force rationalisation of input application rates if Chinese farmers expect to compete in domestic and international markets. This could produce positive environmental effects.

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PART ONE

CREATING A NEW ROLE FOR THE STATE IN THE EARLY 21ST CENTURY

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CHAPTER 1

POLICY OPTIONS FOR A CHANGING ROLE OF GOVERNMENT

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1.1 RURAL FISCAL PROBLEMS AND POLICY REFORMS

CCICED ARD Task Force members

The conduct of rural public finance is arguably China's biggest problem. The fiscal system, as designed, is out of date, generates inadequate revenues, poorly redistributes revenues collected and does not provide enough public goods. There are problems both on the revenue and expenditure sides and in the way public goods and services are financed.

We applaud the spirit of the recent tax-reform measures. The reduction of taxes and fees on rural people is welcome. The recent reduction and planned future elimination of the agricultural tax also sends a strong signal that the government is serious about shifting its priorities and is becoming more supportive of the rural economy. However, in the context of the broader fiscal environment in rural China, economists do not believe that the recent 'tax for fee' reforms can solve rural China's fiscal problems. Tax for fee is an attempt to reduce the tax burden on farmers in a system that is already characterised by insufficient revenue generation and public service spending at all levels. Studies have shown that savings to farm households are minimal and, when collections fall, public services fall. Fiscal resources in poor areas are already insufficient to meet investment requirements. Over 70% of counties and townships are in chronic deficit. While there are many adverse consequences of indiscriminate fee collection, the root cause may be the system's own design. Increased pressure on counties and townships to generate revenues to meet the system's unfunded mandates leads to excessive fee collection. The problem is most severe in China's poorest areas. The tax system, which remains heavily industry-based, can distort investment incentives and induce local governments to promote industrial development even in areas without a comparative advantage in

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manufacturing. China's own economists have shown that these elements of the tax system retard development. The 1994 tax reform increased the tax-collection power of the central government to allow more equitable redistribution. However, while more revenues have flowed into central coffers (reducing local revenues), little has been shifted to poor areas, and the new tax policy continues to favour relatively affluent areas, exacerbating rather than alleviating the rural fiscal crisis.

Our main point is that rural fiscal reform needs to go beyond tax for fee reform and consider the way expenditures are managed. The first step needs to be a review of the public goods and services that are needed in rural China. Realistic goals and priorities should be established for their provision. Each level of government needs to be handed clear responsibilities for the provision of a subset of public goods. The resources required to provide public goods also need to be clearly defined. Leaders need to ensure that sufficient resources are available to support the expenditures needed to meet their mandates. In the process, expenditures also need to be reorganised. Many tasks can be delegated to non-state entities. Many countries in the world have used alternative institutional arrangements to deliver key rural public goods without the direct involvement of government. For example, a county school board with responsibility for running school services would not need to rely on cadres in the government, but instead would establish an office in each township staffed with personnel appointed by the board. The financial flows would be entirely within the system. Although there would have to be some coordination with government, most educational duties would be inside the school system. Similar changes could be made in the health and agricultural-extension systems. In doing so, the size of government could be better controlled and local governments downsized.

IMPACT ASSESSMENT

Provision of rural social services

Persistent fiscal gaps, or shortfalls between required expenditures and fiscal capacity, have several adverse effects. One is that many rural governments are unable to provide the level and quality of social services mandated by national policy.

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Investments

Deferred investment is an immediate victim of fiscal shortfall. As officials struggle to meet wages and other immediate needs from diminishing revenues, these needs are displacing development-oriented investments. Even if budgetary officials are directed to allocate funds to fixed investment, the funds are often diverted or borrowed, and, if not returned, the investment is not just delayed but permanently deferred.

Rural education

Calls from the national government to bolster rural education only recently began to be matched by earmarked allocations. National officials have set high educational goals and an education expenditure target of 4% of GDP was to be met by 2000, up from 2.66% in 1994. Although spending has risen, the goal still has not been met. Pleas to local governments to increase education funding more rapidly than the growth in financial revenue have gone largely unheeded, and meeting the target appears improbable. Insufficient fiscal revenues have undermined the quality of education as measured by a number of human-capital indicators. For example, a State Statistical Bureau survey shows that 30 million Chinese students have never been to school or have dropped out, 4 million drop out of school each year because they cannot afford the cost, and only 64% of rural students complete primary education without repeating a year.

However, when funds do arrive, the outcome is dramatic. Visits to selected poor areas in recent years have found that education expenditure in the form of earmarked transfers has risen. While improvement is by no means universal, in some of the areas where tuition fees have fallen and the number and quality of teachers have risen, education rates have risen rapidly. In fact, compared with most countries in the world, China's primary education rates are not bad. Most educational rates are 100% in rich areas and over 90% in poor areas. Of course, in areas where not all children go to school, the incidence of drop out is not evenly distributed. *Han* girls in poor areas have schooling records far inferior to other groups.

The more problematic area has been in trying to promote universal middle-school education. Middle-school fees are high. Many parents who want to fund their children's education are unable to do so. In addition, there is a demand problem in some areas, especially those with poor quality of education and few outside employment

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opportunities, as parents cast doubt on the return they can get for their educational dollars (even though nationwide the returns to education in both rural, migrant and urban labour markets have risen rapidly). A system of free education or, at the very least a needs-based system that provides scholarships for the poor, needs to be implemented by the government, so China can boast that anyone in the country that wants to go to school can do so!

Rural health

Ministry of Public Health goals call for 8% of rural budgets to be spent on health care. National officials have mandated improved facilities, expanded coverage, and minimum training for doctors. Rules describe what is expected of county and township leaders for establishing ideal rural-health systems. However, like education, the actual resources allocated to achieve national objectives fall far short of needs. The national government allocates only 2.4% of its recurrent budget for health-care services, and only 1.2% of the capital-construction fund. The situation is more severe in poor areas.

Extra-budgetary revenue sources

A second adverse effect of fiscal pressure is the growing reliance on off-budget finance. The ability of local governments to raise revenues varies greatly and determines the quantity and quality of local public services. County and township officials are evaluated on their fulfilment of mandates. This is an important reason for increasing local fee assessments, rising numbers of personnel and rising burdens.

To meet the revenue requirements of these expenditure demands, county and township governments attempt to increase revenue from off-budget sources. Without legal taxing authority or ability to borrow, counties and townships have developed off-budget sources, primarily extra-budgetary funds (EBFs) and self-raised funds (SRFs). The Ministry of Finance has reported that, nationally, off-budget revenues bring total revenue collection to about 30% of GDP.

Although the growth of off-budget revenues has eased fiscal pressures for many localities, it has also produced adverse consequences. It has hastened the decline of the formal fiscal system, by providing an alternative tax source that is fully retained. It has created a tax system that is ad hoc, nontransparent and regressive, and beyond the reach of the formal fiscal system. The lack of legitimacy may be a greater source

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of rural discontent than the total burden. It also has become more regressive, since poorer areas have fewer firms and less chance of collecting fees from the conversion of land to non-agricultural uses. In fact, poorer areas that have tried to replace the revenue of their failed or privatised firms with real-estate development have often failed and incurred losses. This has created part of the non-productive conversion of agricultural land to non-agricultural uses.

Perhaps the worst consequence of off-budget financing is the tendency of county and township governments to give policy and regulatory agencies control over the assets they regulate or operate (or the resources they are charged with protecting). Officials then encourage agency officials to use these assets to generate income for staff salaries and other expenses. There are many examples of misuse of these resources. Agricultural extension agents turn into pesticide salesmen; grain reserve managers become grain traders; those in charge of protected areas exploit them for their revenues.

POLICY RECOMMENDATIONS

Radical and bold experimentation needed

Although fiscal reforms are complicated and will entail fundamental reorganisation, their implementation may be China's greatest policy priority. While increased transfers to eliminate unfunded mandates are the key to the solution of the rural fiscal crisis, the reforms also need to completely restructure local government and fundamentally reorganise public finance. Such reforms will be disruptive, but they need to be implemented in a comprehensive way. To minimise the disruption for the nation as a whole, we believe rural fiscal reforms can begin with regional experimentation. New systems of tax assignments are needed. The roles of townships need re-evaluation. The relationship between provinces and counties needs to be reorganised.

Policy options for investments

Rapid economic growth has not benefited everybody equally, thus worsening income distribution and regional inequality. The Gini coefficient has risen from 0.33 in 1980 to 0.46 in 2000. The income difference between the rural and urban sectors has become increasingly large. The average rural income was 60% of urban income

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in 1984, but had declined to only 33% in 2002. The income gap between the coastal areas and the western region has also widened dramatically. With poor infrastructure and a shortage of human capital in less-developed regions, it will be hard for farmers to switch from grain production to high-value-added crops or to non-farm activities. All of these factors may lead to an even higher concentration of rural poor in these regions if proper government policies are not implemented.

There is considerable evidence that China is at a crossroads in agricultural development as the country appears to be moving from taxing to subsidising agriculture. How to design an agricultural support policy to achieve equitable and sustainable growth is a hotly debated topic. Based on the evidence from both China and India, we offer the following policy suggestions to achieve the stated national objectives.

More public spending in rural sectors. Empirical evidence has shown that investment in rural areas can yield large returns. The government should therefore continue its efforts to increase overall investment in rural areas. Rural investment accounted for only 19% of total government expenditures in 1997, but rural residents account for 69% of China's total population. Moreover, almost 50% of national GDP was produced by the rural sector (agriculture and rural enterprises) in 1997. The government's rural spending as a percentage of rural GDP is only about 5% compared with 11.6% for the whole economy. For the past several decades, China has implemented an investment policy that is urban and industry biased. As a result, the rural–urban income gap is large and has increased. Any policies that discriminate against the rural sector will worsen the disparities and should be discontinued.

More investment instead of more subsidies. The India case study clearly indicates that initial subsidies on inputs and output may help small farmers. As time passes, however, these subsidies become increasingly large and very difficult to remove. The subsidies, including those on fertiliser, irrigation, power, and credit, amounted to about 2% of the national GDP, and 8–10% of agricultural GDP in 2000. Such subsidies are in direct competition with long-term capital investment in roads, rural education and agricultural research. China has already reached the initial stage of the agricultural transformation even though it did not provide direct subsidies on either inputs or output. China should not follow India's path to subsidise its agriculture. Instead, the government should use its limited public resources for improving human and physical conditions in rural areas to enable farmers either to engage in production of higher-value commodities or to migrate to non-farm activities.

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Correcting regionally biased government policy. In addition to biased regional investment policy, predatory pricing policy on natural resources by the government has been a major culprit in worsening regional inequality. Under China's previous centrally planned economy, natural resources such as minerals and forests were owned by the central government. These resources were shipped to eastern China at low prices, thereby transferring rents to the coastal areas. The western provinces, although rich in these resources, benefited little from their exploitation. Even worse is the latest reform of these state-owned enterprises, which left millions of workers laid off and degraded environments under the responsibility of local governments. In response, the central government should redirect its public resources towards the western region where it has been shown the investments have high returns and large poverty-reducing effects. This is consistent with the national strategy to develop western China. Investment in agricultural research, education and rural infrastructure there should be the government's top priority. Among all the options, the most critical is universal and free primary (ideally 9 years) education funded by the central government.

CONCLUSION

Policy makers and researchers are debating how to increase farmers' incomes, and reduce regional inequality and rural poverty. There are several policy options. One option is to increase price and income support for farmers, as many OECD countries have done for the last several decades. Another option is to use trade barriers such as tariffs and import quotas to insulate the domestic market from international markets. But implementation of one or other of these two options will cause either a huge government financial burden or an increase in domestic food prices and higher costs for consumers. Adoption of these options would also lead to large net-social-welfare losses due to misallocation of resources among economic sectors. Also, before beginning subsidy programs, leaders should be aware of international experience: once programs are started they are difficult to stop; political support does not come from maintaining financial support to farmers, but only by increasing it. This will inevitably lead to an upward spiral of support with little benefit attached.

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Another option is to liberalise the agricultural sector immediately, with no preconditions. This option will allow scarce resources to be allocated on the basis of the comparative advantage among sectors and between China and international markets. Overall efficiency and net social welfare will be gained. But we argue that there must be conditions accompanying liberalisation. One of the conditions is to increase investments in agricultural research, irrigation, and rural infrastructure. This is essential for long-term food security and is a critical precondition to improve overall efficiency of agriculture and increase the living standards of the rural population.

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1.2 RURAL FISCAL POLICY: THE KEY TO CHINA'S DEVELOPMENT IN THE 21ST CENTURY

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China needs a healthy public finance system to enable government to provide an enabling environment for growth and development, including developing basic infrastructure and social services and alleviating poverty. For the rural sector, this includes providing or facilitating investments in farmland improvements, agricultural research and development, extension services, infrastructure such as roads and communications, and social services (such as education, health and social security). The fiscal system also sets incentives that guide the allocation of resources and influence development.[1]

[1] In this volume we have included two papers: this one on rural fiscal problems; and another by Shenggen Fan on public goods investment. This separation was made because of the complexity of the two sets of issues and the division of responsibility that was needed to pull together the information on both subjects. While these are presented separately, it should be emphasised that, in the long run, decisions on fiscal reforms and annual budgeting must be integrated with rural capital investment decisions. Currently, there is a great deal of separation between the two. It will only be after this artificial separation is removed that rural services, which are closely connected to both capital investment and rural fiscal management, can be rationalised.

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China has one of the world's most decentralised systems for providing government services. In many countries, subnational governments provide day-to-day administrative and social services, but financing typically comes from the national treasury. Local governments in China, however, are largely self-financing, a trend that has increased during the reform period. China's provincial county and township governments in rural areas financed 48% of budgetary expenditures from local sources in 1990, but collected 66% of the revenues (Figure 1.1), a level much higher than in most countries.

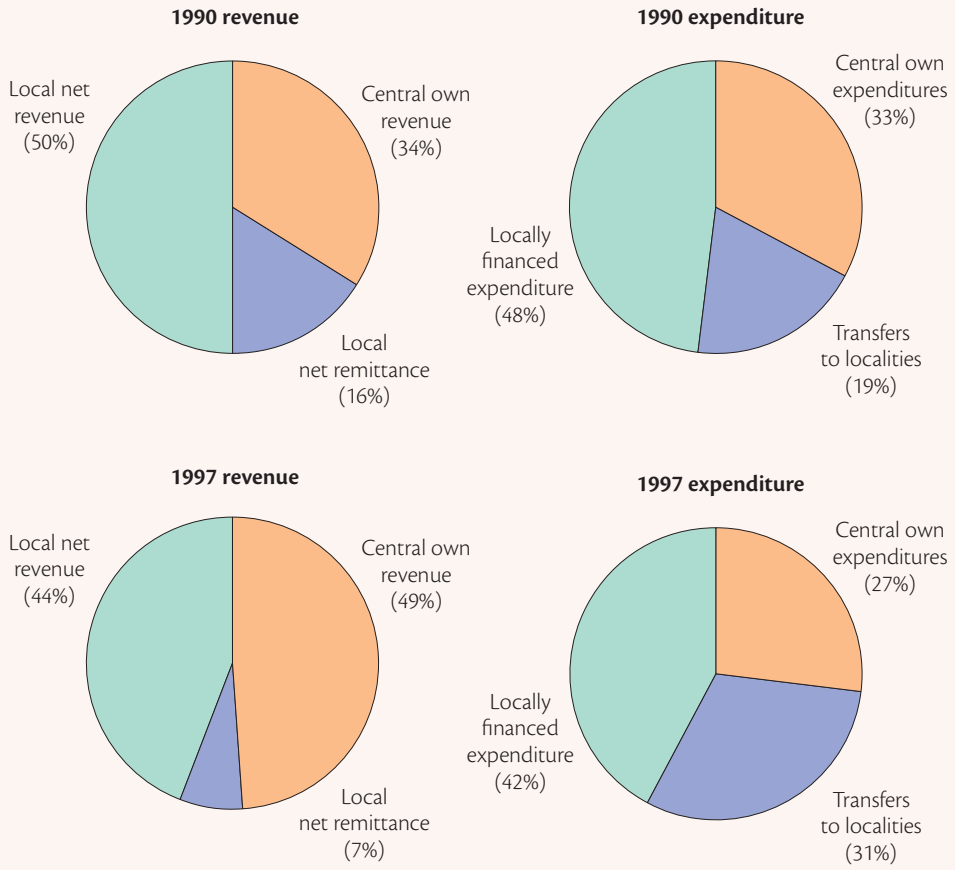

Figure 1.1 China: national and subnational shares of revenues and expenditures

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THE CONDUCT OF RURAL PUBLIC FINANCE

A typical county budget is divided into three main parts, with roughly 40–45% of the total spent on social services, 25–30% on administration, and 10–15% on capital expenditures. The expenditure shares are changing as an increasing share of the budget is spent to meet social services mandated by the central government and pay nationally set salary levels. A distinguishing feature of China's fiscal system is that rural government functions overlap and are performed jointly by the county and the township or town, with some help from village committees and/or the local party. At the end of 1997, China had some 2100 counties and county-level cities, 44,700 townships and towns, and 740,000 village entities. This vast governmental apparatus is staffed by a large and rapidly growing number of officials, whose salaries and benefits have commanded an increasing share of the budget. In contrast, while agricultural investment absorbs an important share of both capital and administrative expenditures, its share has declined over time.

A big issue is whether China's local-level government has grown too large. There is great interest in understanding how to set up a framework for the right size of government. Researchers in China also are trying to understand the incentives for local governments to grow. Is it for efficiency, or is it a response of a self-protecting, self-perpetuating local bureaucracy? There also is a perception among observers that one of the main reasons for the fall of investment in the late 1990s was that funds were being diverted to pay the salaries of those in the bloated bureaucracy. Some have even gone so far as to suggest getting rid of some or all of township government, leaving, at most, a working office of the county bureaucracy. Work by Bai Nansheng (pers. comm.), however, suggests that one of the main reasons for the expansion of the bureaucracy was more demand driven by the tasks assigned by higher level governments. In his research he found that most government officials were carrying out productive tasks.

Traditionally, the expenditure responsibilities of township governments have two primary focuses: first, social services, principally education, health and welfare; and second, administration of law and order and disaster relief. In contrast, the expenditure responsibility of the county is primarily in providing infrastructural support to the economy—agricultural extension, water conservation, farm mechanisation and other capital investments in the rural sector. In recent years, there have been

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attempts to bring the spending responsibilities for critical line items, such as rural education, back to the county. There is a perception among scholars that this is happening in some regions. However, it is by no means universal.

Although villages are not a formal part of the government and do not have independent fiscal power, they still play an important role in China's fiscal system. When people's communes were disbanded in the early 1980s, production brigades and teams reverted to their traditional name of 'village'. However, they inherited a framework of governance from the collectives, and exercise significant expenditure duties, such as salary or subsidy payments to village officials, social welfare for the aged and infirm, and sometimes supplementary education or health provision. Although in recent years in some places the flow of funds to schools from above has increased and teachers' salaries have begun to be paid in a timely fashion, villages still play an important role in building and maintaining schools. Most local health-care expenditure responsibilities (for hiring a village doctor and building a clinic) are left to the village. During the collective era, these obligations were financed from local proceeds. To the extent that many villages continue to carry on these functions, they often have had to find off-budget mechanisms for financing them, usually through non-tax levies on rural incomes and production. In recent years, especially in the area of health (but even in education in some villages, though still a very small share) villages have looked to the private sector to provide some of the services.

A legacy of the planned economy is the treatment of the agricultural sector as marginal to the fiscal system—it is neither a significant source of revenues nor a major recipient of fiscal transfers. In the planned economy, the real fiscal transfers took place through the price mechanism ('the price scissors') that extracted surpluses from the agricultural sector by setting low prices for agricultural raw materials and high prices for manufactured inputs and consumer goods (CCICED 2004). Support to agriculture included subsidies that were outside the fiscal system; they were provided through government-controlled low prices for some agricultural inputs (fertilisers, fuel and electric power) and investment in industries that produced agricultural inputs. As these price-based taxes and subsidies have disappeared, the tax contribution by agriculture, and allocations to the rural economy, have fallen.

Although the common perception of most is that the tax burden rose rapidly in recent years, Tao et al. (2005) have shown that this is, in fact, not so. Instead, as a percentage of rural per-capita incomes, the rural tax rate is about constant. However,

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in examining China's regions by rich and poor, we find that, in some sense, China's tax system has become regressive. In richer areas, the share of income that is going for taxes has fallen. It has risen in poor, farming areas. One of the main findings of Tao's work is that taxes are associated with those left in the village, and those left in the village are mostly farming people. This is an unintended outcome. In contrast, few taxes are assessed on workers that earn a wage or those that go into petty self-employment. According to our data on self-employment, the median tax rate on a self-employed business is around only 5%.

In part in response to these findings and rising concern about the low incomes of those that are mostly engaged in farming, in recent years the government has taken a series of steps to cut taxes, both through reform of the local fiscal system and in directly reducing or eliminating taxes in the rural areas. In its tax for fee reform, officials sought to limit the total amount of tax burden on farmers to 5% of income per capita. This movement has run into many problems, and experiments have not been implemented nationwide. Although the reforms stopped tax and fee collections, services also fell. Instead, the government has reduced unilaterally the taxes that it has been assessing for many years and extracting from rural areas (so it will not have an impact on services). In 2002, the special product tax that was being assessed on horticulture commodities, cash crops and some livestock and aquaculture sales was eliminated. In recent months, the government has stated that it was eliminating the agriculture tax in many, mostly poor, farming areas. While not accounting for a great proportion of the tax burden on farmers, the tax-reduction effort is a powerful statement of the government in telling the farming community that the government is taking action.

These changes to rural public finance have occurred in the context of stop–start fiscal reform that has lagged behind China's transition to a market economy throughout the past two decades. During the entire early and middle-reform era, the revenue-generating capacity of the old system has been eroded with dismantling of planning mechanisms, and the nationwide budget (all jurisdictions) has declined from more than 30% of GDP in the late 1970s to the current 10 to 12% of GDP (Figure 1.2). In contrast, treasuries in other East Asian and developed countries command 20–30% of GDP (some highly socialistic nations such as Denmark and Israel approach 50%). This fiscal decline reduced the capacity and willingness of higher-level government to transfer resources to the rural sector.

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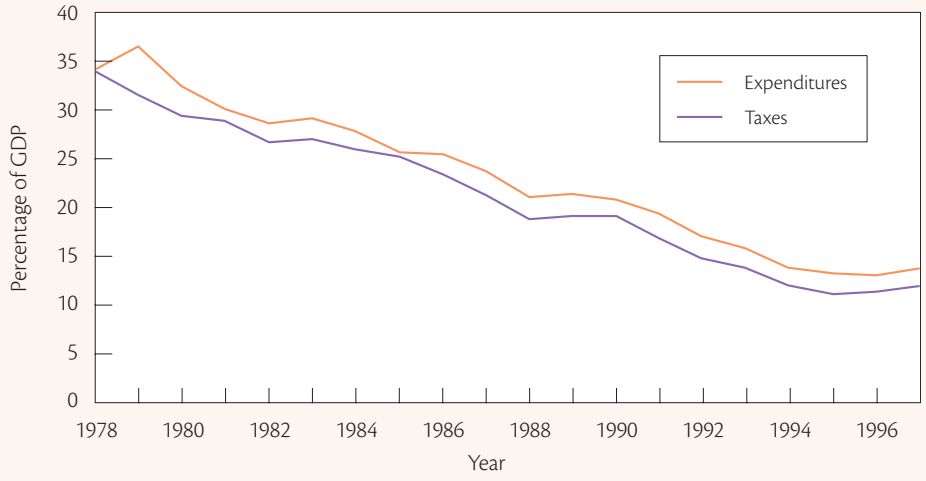

Figure 1.2 Taxes and expenditures in China as a percentage of GDP

TAX REFORM

Concern with central revenue decline led to a comprehensive reform of the fiscal system in 1993, as part of the effort to modernise macro-economic policy. The main issues were: defining a more stable and rising revenue base; making the tax structure more transparent and less distortional; and modifying national–subnational revenue sharing. Key provisions included the adoption of a value-added tax (VAT) and revenue-sharing arrangements. The new tax policy appears to have met some of its goals. It has stemmed the rapid fall of tax revenues as a share of GDP (Figure 1.2), and central government control of revenues and expenditures has reversed (Figure 1.3). In recent years, the central government has also been gradually establishing an income tax.

But while in recent years the central government has begun to extract more fiscal resources, and revenues have risen, redistribution from rich to poor has not occurred. While the resources have flowed back into the central government coffers, work by Wong and others (Wong et al. 1995; Wong 1997) shows that the flows back to the localities have been regressive. Tax rebates to local government have largely

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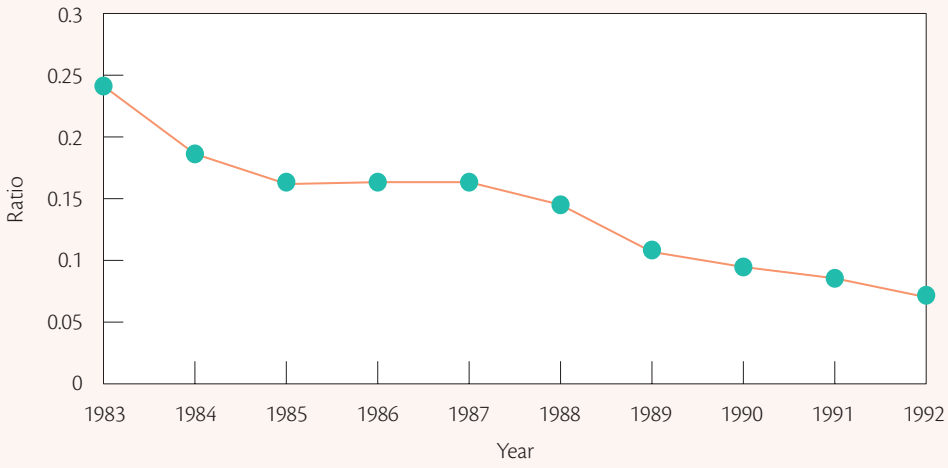

Figure 1.3 Investment to wage spending ratio, Shaanxi, 1983–92

favoured the rich provinces and lower jurisdictions. When asked to explain, most officials say that the sharing rule is in place to provide incentives for richer areas to expand economic activities and collect taxes.

The tax system remains centred on industry. (The VAT is assessed primarily on industrial products.) Rural governments have become increasingly dependent on VAT revenues generated by township and village enterprises (TVEs), and the increased remittances of VAT to the national government have almost certainly increased rural budget deficits, as little progress has been made in revenue redistribution. The reforms did not counter regressive intergovernmental tax sharing and redistribution issues, and thus created serious shortfalls in many rural counties and townships. Tax sharing is based on collection, so that rich provinces receive more central transfers and rebates than do poor provinces (Rozelle et al. 2003). Thus, overall intergovernmental transfers are strongly disequalising. For example, Guizhou, Shaanxi and Sichuan provinces had budget deficits exceeding 20% in the mid 1990s, even after including central government transfers.

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GOVERNMENT TRANSFERS

Subventions from national and provincial governments remain an important component of the budgets of counties and townships. However, the untied transfers that formerly provided resources to counties and townships for general expenditures are increasingly replaced by specific, earmarked transfers for agricultural infrastructure investment, education and health-care support, welfare and disaster relief. A 1988 national policy fixed general transfers in nominal terms, irrespective of requirements; in real terms, inflation has since eroded more than two-thirds of their value. The consequences of this erosion are most serious in poor counties.

Targeted transfers are eroding less rapidly, but the reforms have imposed greater fiscal demands on localities, as transfers are inadequate to meet mandated expenditures. Unfunded public-service mandates abound; for example, the central government often announces targets, such as specific reductions in school drop-out rates or improvements in infant mortality, but the funds to achieve the goals are not provided. To meet these obligations, county and township governments must raise the financial resources. Many observers have blamed the fee-grabbing and informal taxation, which is often idiosyncratic and non-transparent (and most hated by farmers), on the system of unfunded mandates.

There have been several efforts seeking to increase the transfer of funds to poorer, rural areas. The great western development plan is a typical example. The national Grain for Green program is another. There has been a push in recent years to increase the central government's earmarked transfer for rural education. In all of these efforts, however, there are questions about the program, the effectiveness of the investment and the appropriateness of the design of the projects. Resource-hungry local governments jump at the opportunity to receive such funds. Oftentimes, however, they come with strings attached, frequently requiring matching funds or at least project implementation effort. In many cases, the projects are focused on activities (e.g. airports or freeways) that do not meet the real needs of the villagers. In some cases for some villages, forestry projects require the abandonment of livestock operations. In short, one of the main problems of fiscal transfers today is lack of a clear governance process that gets the right amount of funding to the right project.

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Indeed, the fiscal system is even more in need of reform. Most modern fiscal systems have a clear delineation of expenditure responsibilities and revenue source to fund each set of outlays. In China this is largely unclear, especially at the lower levels of government. In fact, lower levels of government have almost no tax base. One of the main goals of rebuilding the fiscal system is to create a scheme that is modern and sustainable.

IMPACT ON INVESTMENT AND THE PROVISION OF RURAL SOCIAL SERVICES

Persistent fiscal gaps, or shortfalls between required expenditures and fiscal capacity, have several adverse effects. One is that many rural governments are unable to provide the level and quality of social services mandated by national policy.

Investments

Deferred investment is an immediate victim of fiscal shortfall. As officials struggle to meet wages and other immediate needs from diminishing revenues, these needs are displacing development-oriented investments (Figure 1.3). Even if budgetary officials are directed to allocate funds to fixed investment, the funds are often diverted or borrowed, and, if not returned, the investment is not just delayed but permanently deferred.

Rural education

Calls from the national government to boost rural education only recently began to be matched by earmarked allocations. National officials have set high educational goals and an education expenditure target of 4% of GDP to be met by 2000, up from 2.66% in 1994. Although spending has risen, the goal still has not been met. Pleas to local governments to increase education funding more rapidly than the growth in financial revenue have gone largely unheeded, and meeting the target appears improbable. Insufficient fiscal revenues have undermined the quality of education as measured by a number of human-capital indicators. For example, a State Statistical Bureau survey shows that 30 million Chinese students have never been to school or have dropped out, 4 million drop out of school each year because they cannot afford the cost, and only 64% of rural students complete primary education without repeating a year.

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However, when funds do arrive, the outcome can be dramatic. Visits to selected poor areas in recent years have found that education expenditure in the form of earmarked transfers has risen. In some of the areas where tuition fees have fallen and the number and quality of teachers have risen, education rates have risen rapidly, but such improvement is by no means universal.

In fact, when compared with most countries in the world, China's primary education rates are not bad. Most educational rates are 100% in rich areas and over 90% in poor areas. Of course, in areas where not all children go to school, the incidence of drop out is not evenly distributed. Minorities, and *Han* girls in poor areas, have schooling records far inferior to those of other groups.

The more problematic area has been in trying to promote universal middle-school education. Middle-school fees are high. Many parents who want to fund their children's education are unable to do so. In addition, there is a demand problem in some areas, especially those with poor quality education and few outside employment opportunities, as parents cast doubt on the return they can get for educating their daughters (even though nationwide the returns to education in both rural, migrant and urban labour markets have risen rapidly).

Rural health

Ministry of Public Health goals call for 8% of rural budgets to be spent on health care. National officials have mandated improved facilities, expanded coverage and training standards for doctors. Rules describe what is expected of county and township leaders for establishing ideal rural health systems. However, like education, the actual resources allocated to achieve national objectives fall far short of needs. The national government allocates only 2.4% of its recurrent budget for health-care services, and only 1.2% of the capital construction fund. The situation is more severe in poor areas.

School fees and health charges have soared in recent years. West (1997) reports that, in many areas, there are both rising drop-out rates due to difficulty in meeting these new schooling costs, and falling maternal and infant health-care visits because of rising costs. In areas where funds cannot be raised, education and health services have disappeared or declined in quality, resulting in the large-scale departures of teachers, doctors and other professionals.

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EXTRA-BUDGETARY REVENUE SOURCES

A second adverse effect of fiscal pressure is the growing reliance on off-budget finance. The ability of local governments to raise revenues varies greatly and determines the quantity and quality of local public services. County and township officials are evaluated on their fulfilment of mandates. This is an important reason for increases in local fee assessments and rising burdens (Wen and Zhu 1998).

To meet the revenue requirements of these expenditure demands, county and township governments attempt to increase revenue from off-budget sources. Without legal taxing authority or ability to borrow, counties and townships have developed off-budget sources, primarily extra-budgetary funds (EBFs) and self-raised funds (SRFs). From the late 1980s through the early 1990s, the proportion of total funds from these sources rose continuously, reaching 28.6% in 1992 (Table 1.1). At the township level, EBFs are fewer (compared with cities) and consist mostly of rural education and agricultural tax surcharges. The majority of off-budget revenues come from SRFs, which include miscellaneous fees (assessed on local enterprises), rental income (from leased collective assets) and remittances from TVEs. The Ministry of Finance has reported that, nationally, off-budget revenues bring total revenue collection to about 30% of GDP (Nyberg and Rozelle 1999).

Although the growth of off-budget revenues has eased fiscal pressures for many localities, it has also had adverse consequences. It has hastened the decline of the formal fiscal system by providing an alternative tax source that is 100% retained. It has created a tax system that is ad hoc, nontransparent, regressive and beyond the reach of the formal fiscal system. The lack of legitimacy may be a greater source of rural discontent than the total burden. Also, in the late 1980s and early to mid 1990s, local officials came to rely almost exclusively on enterprises for SRFs; thus the poorest rural jurisdictions had the weakest potential for supplementing budgets from these sources. As privatisation has taken over and diminished the direct access that governments have to the funds of their firms, local governments have moved heavily into real-estate development. Like the promotion of industry, however, only rich areas have much of a chance to reap the benefits of land sales and development. In fact, in poorer areas that have tried to replace the revenue of their failed or privatised firms with real-estate development, much as in the past their investments have failed and cost the locality more than it has earned.

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Table 1.1 Township finance in China, 1986–93. Values are percentages

	1986	1987	1988	1989	1990	1991	1992	1993
Total revenue	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Budgetary revenue	83.3	82.7	80.0	75.9	74.6	72.0	71.5	73.8
Extra-budgetary revenue	5.0	4.7	5.6	6.0	6.4	6.9	7.1	6.5
Self-raised funds	11.7	12.6	14.4	18.1	19.0	21.1	21.5	19.8
Total expenditure	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Budgetary expenditure	77.4	76.6	74.3	69.4	69.0	66.4	65.9	67.6
Extra-budgetary expenditure	6.4	6.1	7.0	7.2	7.4	7.7	7.6	7.0
Self-raised funds	16.2	17.3	18.7	23.4	23.6	25.9	26.5	25.4

Source: Ministry of Finance, 1994.

Perhaps the worst consequence of off-budget financing is the tendency of county and township governments to give policy and regulatory agencies control over the assets they regulate or operate (or the resources they are charged with protecting). Officials then encourage agency officials to use these assets to generate income for staff salaries and other expenses. This is a pervasive issue that will resurface in subsequent discussions of natural-resource management and agricultural extension. There have been efforts to control it, but the reactions of local government have been almost as rapid as any action from above.

EQUALISATION ISSUES

Previous studies have noted unusually large differences in per-capita budgetary revenues among provinces (World Bank 1992; Wong et al. 1995). However, revenue and expenditure differences are also large at subprovincial levels and, with decreasing transfers, per-capita revenue and expenditure have become increasingly correlated. While the VAT was designed to permit the central government to control greater fiscal resources, negotiations have enabled provinces to keep a

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large proportion of the taxes they generate. This retention of taxes, combined with the regressive rebate, mitigated the more progressive non-tax transfers and the intended redistribution impact. The subtle shift in resource flows that is shown in the report of the CCICED task force (CCICED 2004) may indicate a slight shift in priorities, but if the experience of other East Asian countries is useful, a much more fundamental shift of priorities is needed, as are massive investments of funds in many rural areas.

FISCAL CRISES IN POOR COUNTIES

In recent years deficits have become persistent in poor counties. In 1994, half of China's counties had difficulties meeting even basic expenditures such as wage disbursements (Park et al. 1996). Counties can generate extra revenues by selling urban permits, borrowing funds earmarked for other uses (such as family planning or school construction), or borrowing from local state-owned enterprises or banks—a frequent, although illegal, practice. Poorer counties are revenue-starved even more than is reflected in acknowledged net deficits; hidden deficits are represented by budgetary funds diverted from prescribed uses to pay salaries and wages. Salary and wage payments are often deferred, and some county and township governments have declined to pay for employee benefits such as health reimbursements. (Counties can appeal to upper-level governments for special subsidies or increases in fixed subsidies, but these adjustments are made in only special cases, such as natural disasters.) These hidden deficits indicate that financial statistics systematically underestimate true fiscal deficits.

EFFECT OF BUDGET PRESSURES ON PUBLIC EXPENDITURE PATTERNS

The pressure to eliminate deficits may result in underinvestment in public goods, especially in poorer areas (where needs are greatest) and increase incentives for local governments to maximise revenues rather than social welfare (Wu 1994). Local governments placing priority on meeting their wage bills has led to deferred maintenance and deteriorating capital stock in many of the poorer counties—and consequently to declining efficiency of resource use (Nyberg and Rozelle 1999).

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The impact of fiscal reforms on the ability of county and township governments to make productive investments in infrastructure and social services has important implications for economic development in poor regions. Some of the fall in investment in poor counties might be expected to be compensated by increased spending through other channels, especially China's poverty program. Recent research in Sichuan, however, shows that local investments in education, health and agriculture do lead to growth, but poverty program investments typically replace, rather than supplement, budgetary investments (Rozelle et al. 2003); and on-budget investments and social services have declined from the mid 1980s to the 1990s.

Deficit counties have also begun to reduce their wage obligations through wage suspension, staff termination and reorganisations that reassign, but do not terminate, local government personnel. Some county and township government bureaus have been redesignated as companies, with worker pay linked to profits. Other bureaus and agencies have been urged to design and pursue revenue-generating activities; and many staff (both those reassigned and still in government) pursue entrepreneurial activities, such as opening restaurants and hotels, or engaging in trade.

As China moves into the 21st century, radical new policies are going to have to be used to confront problems in poor areas. Traditional programs, such as subsidised credit loans, dragon head firms and micro-credit-based investment schemes have all proved to be distorting and unsustainable. One of the biggest problems has been the mindset that all areas, no matter how poor or how remote, should seek to develop a sustainable economy. But development economics has shown that farm families in many regions are in a holding pattern. A vast majority of them need to move out. Factories in the cities and coastal areas will be the beneficiaries of the shifts of labour out of the regions. Hence, in almost all developed countries, poor areas need large, sustained transfers that are targeted at building-up human capital so the young and able can move, and at improving the agricultural and infrastructural base enough to allow households to live above poverty and provide themselves with a minimum standard of living and enough extra to accumulate sufficient assets to invest in their children's education and their own move out of the region. The current fiscal system in poor areas does not do this.

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CONCLUSIONS AND RECOMMENDATIONS

The conduct of rural public finance affects the entire nation's stability and long-term growth prospects. However, the rural fiscal system generates inadequate revenues, and poorly redistributes those that are collected. Unless improved, many scholars believe that the fiscal system will likely constrain long-term development.

Fiscal decentralisation has transferred to subnational jurisdictions control over most resources and residual rights over most incremental revenues. National directives and tax-collection problems have also reduced resource redistribution (Wong 1997). Fiscal reforms have hardened budget constraints for all subnational jurisdictions, and fiscal sharing rules have increased tax-collection efforts in both rich and poor regions (Park et al. 1996; Wong 1997). Some scholars have identified growth-inducing effects in China's fiscal reform—supported by empirical evidence (Oi 1999; Lin et al. 1997). However, the reforms are incomplete. Indeed, they have hardly begun. Widespread fiscal crises suffered by so many rural governments have reduced potential economic growth, welfare and equity, and have led to investment starvation. Some 70% of the counties and townships have net-deficit budgets, and their policy obligations continue to rise.

China's tax system is characterised by deficient revenue generation and public-service spending at all levels. The tax system remains heavily industry-dependent and has neither made tax assignments clear, nor given rural communities a revenue base on which to build rational fiscal plans. The 1994 tax reform increased the tax-collection power of the central government, which would allow more equitable redistribution. However, while more revenues have flowed into central coffers (reducing local revenues), little of the increase has been shifted to poorer or deficit areas, and the new tax policy continues to favour relatively affluent areas, exacerbating rather than alleviating the rural fiscal crisis. If there is one policy prescription that should be brought forth to leaders, far more important than any reform of the mechanisms of the fiscal system, it is that there needs to be a new commitment from the very top to dramatically increase the flow of fiscal resources into rural areas. China is a rapidly growing country and is increasingly generating fiscal resources at the national level that could be used in rural areas, but which have, to date, only marginally been set aside for use in the rural fiscal system. China must shift increasingly more resources into its rural areas or it is taking a chance that they may become a source of irreversible problems.

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Fiscal resources in poor deficit areas are insufficient to meet the rural sector's development–investment requirements. Increased pressure to generate revenues at county and township levels leads to biased development policies and may become distortionary and inimical to economic development. For example, investments in revenue-deficit regions may tend to be industry biased, because of the relative ease of tax and fee extraction, even if investments in agriculture might better serve growth and distributional goals. It should be noted that fiscal problems, while serious in the poorest parts of China, are equally serious in many areas that have not been targeted by leaders for massive investment. Specifically, no one will deny that the fiscal problems in poor areas of western China are serious. However, there is another argument that says that, since these areas have been the target of a large effort to increase public goods investment, they are not the worst areas of the country. There are many rural areas in central China—in Hunan, Hubei, Henan, Anhui and Jiangxi—that arguably face the most serious fiscal crises in China, since they are relatively poor and have not received the same attention of national poverty-alleviation efforts as have other parts of the country.

REFERENCES

CCICED (China Commission for International Cooperation for the Environment and Development) 2004. China's agricultural and rural development in the new era: challenges, opportunities and policy options: an executive summary of policy report. Beijing, CCICED Agricultural and Rural Development Task Force, September 2004.

Lin, J., Zhiqiang Liu and Funing Zhong 1997. Fiscal decentralization and rural development in China. Peking University, Center for Economic Research, Working Paper.

Nyberg, A. and Rozelle, S. 1999. Accelerating China's rural transformation. Washington, DC, World Bank.

Oi, J.C. 1999. Rural China takes off: the institutional foundations of economic reform. Berkeley, University of California Press.

Park, A., Rozelle, S., Wong, C. and Changqing Ren 1996. Distributional consequences of reforming local public finance in China. China Quarterly, 147, 751–778.

Rozelle, S., Zhang, L. and Huang, J. 2003. China's war on poverty: assessing targeting and the growth impacts of poverty programs. Journal of Chinese Economics and Business Studies, 1, 301–317.

China's agricultural and rural development in the early 21st century
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ACIAR Monograph No. 116 (Printed version published in 2005)

Tao, Ran, Lin, J.Y., Mingxing Ling and Qi Zhang 2005. The problem of taxing farmers in China. Agricultural Economics, in press.

Wen, Tiejun and Shouyin Zhu 1998. Reform of agricultural tax system and 'farmer's burden'. Beijing, Ministry of Agriculture, Research Center of Rural Economy, July 1998, mimeo.

West, L.A. 1997. Provision of public services in rural PRC. In: Wong, C.P.W., ed., Financing local government in the People's Republic of China. Hong Kong, Oxford University Press.

Wong, C.P.W., ed. 1997. Financing local government in the People's Republic of China. Hong Kong, Oxford University Press.

Wong, C.P.W., Heady, C. and Wing Thye Woo 1995. Fiscal management and economic reform in the People's Republic of China. Hong Kong, Oxford University Press.

World Bank 1992. China: strategies for reducing poverty in the 1990s. Washington, DC, World Bank.

Wu, Guobao. 1994. Difang zhengfu xingwei yinxiang: yusuan shouru, zengzhang, yu tupin mubiao de chongtu [Goal conflicts, budget solvency, and poverty alleviation in China], *Kaifa luntan* [The Tribune of Economic Development], Volume 6.

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1.3 INVESTMENT OR SUBSIDIES: WHERE SHOULD CHINA BE HEADING?

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INTRODUCTION

Economic reforms initiated in 1978 have brought rapid economic growth in China and fundamental changes in the national economic system. The role of the agriculture sector has declined as manufacturing and service sectors have grown much faster than the rest of the economy.[1] Due to the declining comparative advantage of the agriculture sector, the resource base to sustain agricultural production has declined. For example, employment of land, labour, capital and water has shifted from agricultural to non-agricultural uses. Agriculture and food production are currently threatened by these changes. China's entry into the World Trade Organization (WTO) in December 2001 has accelerated this process. As supply tightened, domestic prices of major agricultural products have exceeded international levels for the past several years. Various measures of protection and support such as aggregate measure of support and producer subsidy equivalents show that China is in transition from taxing to subsidising agricultural production. Is this new development a short-term phenomenon or the beginning of long-term protection following the path of the OECD countries? Implementation of either of these approaches would have profound and long-term implications for China's agricultural and general economic development.

[1] In 2003, agricultural GDP accounted for only 15% of the total GDP while it was more than 50% in 1952.

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The rapid economic growth has not benefited everybody equally, thus worsening income distribution and regional inequality. The Gini coefficient, which measures the inequality of income distribution within a country, has risen from 0.33 in 1980 to 0.46 in 2000. The income difference between rural and urban sectors has become increasingly large. The average rural income was 60% of urban income in 1984, but had declined to only 33% in 2002. The income gap between the coastal areas and the western region has widened dramatically over the past two decades. In 2002, per-capita gross domestic production (GDP) in Shanghai was 9–10 times higher than Guizhou. With poor infrastructure and a shortage of human capital in less-developed regions, it will be hard for farmers to switch from grain production to higher-value crops or to non-farm activities. All of these factors may lead to an even higher concentration of rural poor in these regions, if proper government policies are not implemented.

Policy makers and researchers are debating on how to increase farmers' incomes, and how to reduce regional inequality and rural poverty. There are several options facing Chinese policy makers. One option is to increase price and income support for farmers, as many Organization for Economic Cooperation and Development (OECD) countries have done for the past several decades. Another option is to use trade barriers such as tariffs and import quotas to insulate the domestic market from international markets. But adoption of either of these options would lead to a huge government financial burden or an increase in domestic food prices and higher costs for consumers. Both of these options would also lead to large net-social-welfare losses due to misallocation of resources among economic sectors.

Another option is to liberalise the agricultural sector immediately, with no preconditions. This option would allow scarce resources to be allocated on the basis of comparative advantage among sectors and between China and international markets. Overall efficiency and net social welfare will be gained. But we argue that there must be conditions to liberalisation. One of the conditions would be to increase investments in agricultural research, irrigation and rural infrastructure. This is essential for long-term food security and a critical precondition to improve overall efficiency of the agriculture sector and increase the living standards of the rural population.

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The objectives of this paper are to review recent information from China and India on measures of government support to agriculture and to analyse how this support, including subsidies and investments, has contributed to growth and poverty reduction in rural areas. As China is at the crossroads in supporting its agriculture, the information provided will contribute to the debate on future reforms of the Chinese agriculture sector. The rest of the paper is organised as follows. First there is a review of different estimates of support to agriculture in China. The paper then presents the evidence on how subsidies and investments have contributed to growth and poverty reduction, using the cases of India and China. The paper concludes with some policy implications.

LEVELS AND CHANGES OF AGRICULTURAL SUPPORT

To measure the exact amount of support or taxing in agriculture is difficult, and it is even more difficult to compare these measures between countries due to complexity of policies and policy instruments implemented over time in various countries. There are several ways to measure the support or tax levels in the agricultural sector. In the past 10 years, one indicator that has become increasingly popular is the producer subsidy equivalent (PSE). The PSE is an indicator of the value of the monetary transfers to agriculture resulting from agricultural policies in a given year. Both transfers from consumers (through domestic market price) and transfers from taxpayers (through budgetary or tax expenditures) are included. Five categories of agricultural policy measures are usually included: transfers to producers affecting producer and consumer prices simultaneously (market price support); transfers directly from taxpayers to producers without raising prices to consumers (direct income payment); transfers to producers through lowering input costs; reductions in costs to the agricultural sector as a whole that are not received directly by producers (general services); and other measures such as subnational supports funded by provincial or local governments or certain tax concessions.

Due to the different data and methods used, the estimates for Chinese agriculture vary greatly. Cheng (2001) estimated the PSEs for China over the period 1985–95. His results show that Chinese support to agriculture was still negative until 1994, but in 1995 it became positive at 4% of total production value. Tian et al. (2002) also estimated PSEs for Chinese agriculture (Figure 1.4). Although their estimates were negative even until 2000, there was a clear declining trend in the taxing of agriculture.

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From 1990 to 1993, the implicit taxes in Chinese agriculture as percentages of agricultural production value were in a 14–22% range. But from 1994 to 2000, the percentages declined to 1–8%. Regardless of data sources and methods, the implicit taxes on agriculture have declined in the 1990s. Using a different method and adjusted price data, Mullen et al. (2004) found a similar trend. In 2001, the protection on Chinese agriculture for five commodities included in their studies was approaching zero.

A more-recent development in the measurement of agricultural support is the aggregate measure of support (AMS), which measures only support related to trade distortions, but very few countries have reported such measures. It is even more difficult for China to make such measures due to lack of the data needed. The only estimate we found is that of Sun (2001). They found that the AMS in 1998 was about 2% of total production value for Chinese agriculture. This again indicates that the level of protection of Chinese agriculture has been minimal or negative in recent years.

There are various pieces of evidence that the Chinese Government has increased its support to agriculture through several means such as income support to boost grain production, poverty relief funds and public investment. But these different avenues of support may result from different policy objectives. The efficiency of these support measures deserves greater attention.

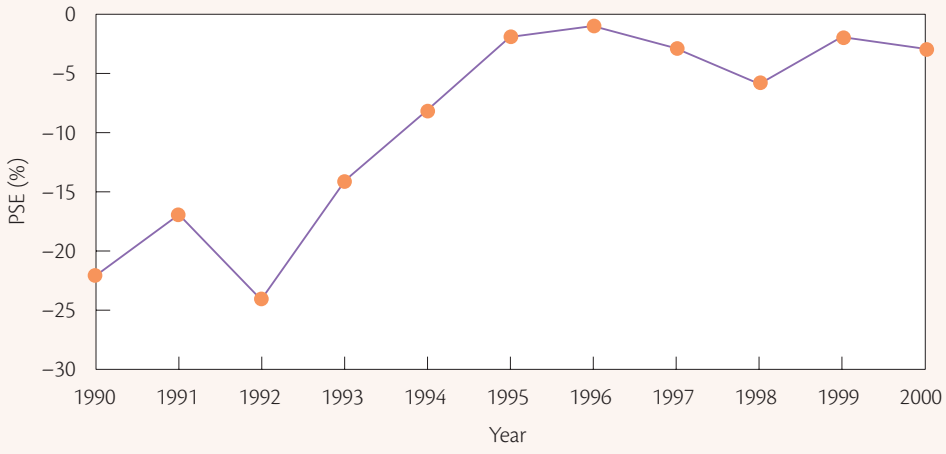

Figure 1.4 Producer subsidy equivalent (PSE) to agriculture in China, 1990–2000

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INVESTMENT VERSUS SUBSIDIES: EMPIRICAL EVIDENCE FROM CHINA AND INDIA

In this section, we use case studies from China and India to show how different government support mechanisms (investment, subsidies or anti-poverty programs) may result in different development outcomes. For the past several decades, there have been many attempts to estimate the impact of public spending (including investment and subsidies) on economic growth and poverty reduction. A significant feature in the literature is that most of the previous studies have considered only one type of government spending or investment at a time. As a result, it is difficult to compare the relative returns to both growth and poverty reduction of different types of spending or investment. Most studies have also used a single-equation procedure. There are at least three disadvantages to this approach. First, investment or spending affects poverty through multiple channels. For example, improved rural infrastructure due to government spending will not only reduce rural poverty through improved agricultural productivity, but also affect rural poverty through improved wages and non-farm employment. It is difficult to capture these different effects in a single-equation approach. Second, including only one type of public spending in estimating poverty reduction will lead to an upward bias in the estimated impact of that particular spending. Finally, it is difficult to compare the effects of different types of spending on both growth and poverty reduction.

In order to systematically assess the impact of different types of public spending on both agricultural growth and poverty reduction, the International Food Policy Research Institute (IFPRI) has undertaken several case studies that take account of the multiple pathways by which spending can influence growth and poverty. The underlying conceptual framework is summarised in Figure 1.5.

Public spending affects rural poverty through many channels. It increases farmers' incomes directly by increasing agricultural productivity, which in turn reduces rural poverty. Indirect impacts come from higher agricultural wages and improved non-farm employment opportunities induced by growth in agricultural productivity. Increased agricultural output due to public investment often yields lower food prices, again helping the poor indirectly because they are often net buyers of food grains. In addition to its productivity impact, public spending directly promotes rural wages, non-farm employment and migration, thereby reducing rural poverty.

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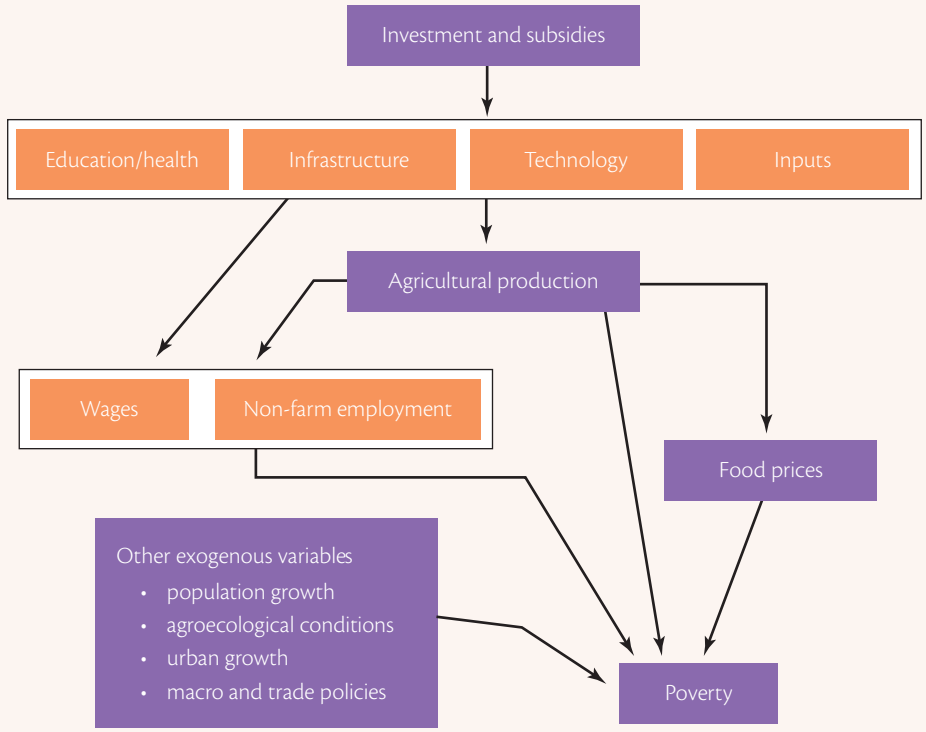

Figure 1.5 The channels through which public spending affects rural poverty

For example, improved road access helps farmers set up small, rural, non-farm businesses such as food-processing and marketing enterprises, electronic repair shops, transportation and trade, and restaurant services.

To capture all these various pathways, the IFPRI studies use a simultaneous-equation approach to model agricultural production, rural wages, non-farm employment, agricultural prices, and the relationships between government spending and physical stocks of public capital, considering the lead and lag effects of various investments. The model is estimated econometrically using time-series data at sub-regional levels for case-study countries. Once estimated, the model can be used to calculate the marginal impacts of additional units of investment in different types of infrastructure, human capital and technology.

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India

Poverty in rural India has declined substantially in recent decades; from about 60% of the population in 1970 to about 25% today. This steady decline was strongly associated with agricultural growth, particularly the green revolution, and with expansion of non-farm rural activities. Both increased in response to massive public investments in agriculture and rural infrastructure. Using a multi-equation model, the marginal returns to different types of government spending on agricultural growth and poverty reduction were estimated (Table 1.2). The marginal impact and elasticity of different types of government subsidies and expenditures on rural poverty were calculated for four decades: 1960s (1967–70), 1970s, 1980s, and 1990s (1990–97). In terms of returns to agricultural GDP, most of the investments and subsidies in the 1960s generated returns that were larger than their costs. In particular, roads and education investments had benefit–cost ratios of 6 to 9. Subsidies on irrigation, fertiliser and credit yielded benefits that were 2–4 times the amount spent. Agricultural research also had very favourable returns with a benefit–cost ratio of 3. This is the time when India began to introduce high-yielding varieties, fertiliser and credit as a technology package, which yielded high pay-offs. In the 1970s, the returns to these subsidies and investments declined, but most of them remained positive. Education generates a high return, followed by agricultural research, whereas most subsidies showed lower returns compared with the previous decade.

In the 1980s, a similar pattern of returns continued, except for credit and fertiliser subsidies. Credit subsidies showed an increasing return while fertiliser subsidies became uneconomic in the 1980s. At the same time, investments in roads, education, irrigation and agricultural research and development (R&D) still showed very high returns. In the 1990s, most of the subsidies became uneconomic, with the exception of credit subsidies. Subsidies on irrigation have no significant impact on agricultural production, and fertiliser and power subsidies have returns lower than their costs. On the other hand, investments in roads, education, irrigation and agricultural research still generate high returns, and there is no sign that these returns will decline in the near future.

As regards the poverty-reduction impact, most government investments and subsidies had a large impact in the 1960s and 1970s, and even into the 1980s. In the 1960s, it was investment in roads that had the largest poverty-reduction effect. For every million rupees spent on roads, 1272 rural poor were lifted above the poverty line in the 1960s.

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Table 1.2 Returns in growth and poverty reduction to investments and subsidies in India

	1960s	1970s	1980s	1990s
Returns in agricultural GDP (rupees per rupee spending)				
Roads	8.79	3.80	3.03	3.17
Education	5.97	7.88	3.88	1.53
Irrigation investment	2.65	2.10	3.61	1.41
Irrigation subsidies	2.24	1.22	2.28	n.s.
Fertiliser subsidies	2.41	3.03	0.88	0.53
Power subsidies	1.18	0.95	1.66	0.58
Credit subsidies	3.86	1.68	5.20	0.89
Agricultural research and development (R&D)	3.12	5.90	6.95	6.93
Returns in rural poverty reduction (number of poor reduced per million rupees spending)				
Roads	1272.29	1345.68	295.43	334.98
Education	411.03	468.65	447.21	108.75
Irrigation investment	182.73	125.49	197.27	66.91
Irrigation subsidies	149.11	67.51	113.50	n.s.
Fertiliser subsidies	165.87	180.88	48.14	23.67
Power subsidies	78.68	52.31	82.52	26.90
Credit subsidies	256.60	92.54	258.51	41.73
Agricultural R&D	207.30	325.57	345.24	323.01

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Education spending had the second-largest impact, and more than 400 poor would be lifted above the poverty line for every million rupees spent. Subsidies on credit, fertiliser and irrigation also resulted in very favourable returns for poverty reduction. For every million rupees spent, 256, 180, and 149 poor, respectively, were lifted above the poverty line. In the 1970s, roads, education and agricultural research yielded the largest poverty-reduction impact, ranging from 300 to 1400 poor lifted above the poverty line per million rupees spent. Subsidies on fertiliser also showed a strong poverty-reduction impact. However, in the 1980s, while roads, agricultural research, education, and credit subsidies and irrigation investments continued to have a strong effect on poverty reduction, the impact of subsidies on irrigation, fertiliser and power had declined drastically to only 48–113 poor reduced per million rupees spent. By the 1990s, all subsidies had become insignificant, while investments in roads, education, and agricultural research still showed large poverty-reduction impacts, and there is no sign that these effects will decline in the near future.

Two conclusions can be drawn from this study. First, initial subsidies for credit, fertiliser and irrigation were crucial for small farmers to adopt the new technologies. Small farms are often losers in the initial adoption stage of a new technology as prices are pushed down by greater supply of agricultural products coming from large farms benefiting from the new technology.

Second, agricultural research, education and rural infrastructure are the three most-effective public-spending items for promoting agricultural growth and poverty reduction throughout all the periods under study. On the other hand, in more recent years, input subsidies (including fertiliser, electrical power, credit and irrigation) yielded very low marginal returns in both agricultural growth and poverty reduction, despite their large impact in earlier decades.

The results have important policy implications. For the last two decades, we have seen a declining trend in government investment in the agricultural sector and an increasing trend in government subsidies. These subsidies, including those on fertiliser, irrigation, power and credit, amounted to about 2% of the national GDP (Figure 1.6), and 8–10% of agricultural GDP (Gulati and Narayanan 2003). These subsidies are in direct competition with long-term capital investment in roads, rural education and agricultural research. To sustain long-term growth in agricultural production and thereby a long-term solution to poverty reduction, the government should cut these subsidies and increase investments in agricultural R&D, rural infrastructure and education.

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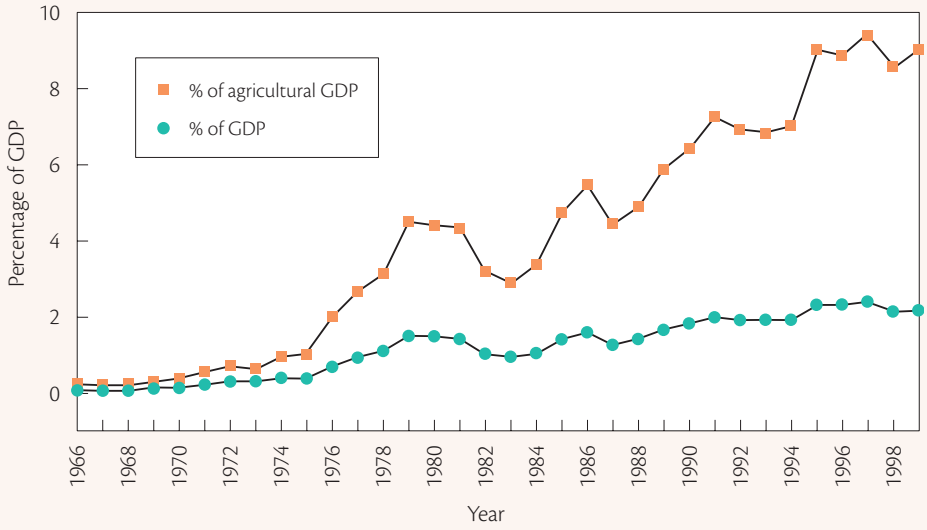

Figure 1.6 Input subsidies as a percentage of GDP and agricultural GDP in India, 1966–1998

China

China has been very successful in reducing its rural poverty during the past two decades, the number of poor falling from 250 million in 1978 to 29 million in 2001. Contributing to this success were a series of policy and institutional reforms, promotion of equal access to social services and production assets, and public investments in rural areas. Yet, as China's economy continues to grow, it is becoming harder to further reduce poverty and inequality. How the government can better design its policies, particularly public-investment policy, to promote growth while reducing poverty and regional inequality is hotly debated in both academic and policy circles.

Using provincial-level data for 1970–97, Fan et al. (2005) used a simultaneous-equation model to quantify the effects of different types of government expenditure on growth and poverty reduction. The results (Table 1.3) show that government spending on rural infrastructure (roads, electricity, and telecommunications) had

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substantial impacts in reducing poverty, owing mainly to improved opportunities for non-farm employment and increased rural wages. However, these impacts were not as large as from investments in education and agricultural R&D. Disaggregating the analysis into different regions reveals that, for all types of government spending, the poverty-reducing impacts were highest in the west (the least-developed region), while impacts on agricultural production growth were the highest in the central region (more-developed region) for most types of spending. Furthermore, investments in the western region led to the greatest reductions in regional inequality for all types of government spending, while investments in either the coastal or central regions exacerbated existing regional inequalities.

Table 1.3 Returns to rural investment in China, provincial-level analysis

	Coastal	Central	Western	Average
Returns to agricultural GDP (yuan per yuan expenditure)				
Research and development (R&D)	8.6	10.02	12.69	9.59
Irrigation	2.39	1.75	1.56	1.88
Roads	1.67	3.84	1.92	2.12
Education	3.53	3.66	3.28	3.71
Electricity	0.55	0.63	0.4	0.54
Telephone	1.58	2.64	1.99	1.91
Returns to poverty reduction (no. of poor reduced per 10,000 yuan expenditure)				
R&D	1.99	4.4	33.12	6.79
Irrigation	0.55	0.77	4.06	1.33
Roads	0.83	3.61	10.73	3.22
Education	2.73	5.38	28.66	8.8
Electricity	0.76	1.65	6.17	2.27
Telephone	0.6	1.9	8.51	2.21
Poverty loan	0.88	0.75	1.49	1.13

Notes: Marginal returns are calculated for 1997.
Sources: Fan et al. 2005.

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The above study involved highly aggregated types of investment. The high aggregation may mask important differentials even within the same type of investment. For example, within roads, different types may have different impacts on growth as well as on poverty reduction. For this reason, Fan and Chan-Kang (2004), using provincial-level data for 1982–1999, developed an analytical framework to estimate the effects of different types of roads on growth and poverty reduction in China. Their study differs from the previous study in two aspects: first by differentiating high and low-qualtity roads, and second by expanding the measured impacts from just rural areas to both rural and urban areas.

The most significant finding of this study is the high returns from low-quality roads, which are mostly rural roads (Tables 1.4 and 1.5). The marginal impact of investments in low-quality roads is more than four times greater than that for high-quality roads. Even in terms of urban GDP, the return from low-quality roads (or rural roads) was greater than that of high-quality roads. While high-quality roads do not have significant impact on agricultural GDP, low-quality roads can generate more than 1.48 yuan worth of agricultural GDP for every yuan invested. Investment in low-quality roads also generates a high return in rural non-farm GDP. Every yuan invested in low-quality roads yields more than 5 yuan of non-farm rural GDP. In terms of urban poverty reduction, the impact from low-quality roads is larger than the corresponding impact from high-quality roads. Likewise, the effects of low-quality roads on rural poverty reduction are larger than those from high-quality roads.

TOWARDS A MORE-EFFICIENT AND EQUITABLE DEVELOPMENT STRATEGY

There is considerable evidence that China is at a crossroads in agricultural development, as the country has moved from taxing to subsidising agriculture. How to design an agricultural support policy to achieve long-term, sustained, equitable and sustainable growth is a hotly debated topic among Chinese policy makers and researchers. Based on the evidence from both China and India, the following policy suggestions to achieve the stated national objectives are offered.

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Table 1.4 Returns to GDP of road investment in different regions in China

	High-quality roads	Low-quality roads
Returns in total GDP (yuan per yuan)		
Average	1.55	5.99
Northeast	1.35	3.61
North	1.48	6.11
Northwest	1.13	1.44
Central	1.71	6.57
Southeast	1.61	18.63
Southwest	1.91	7.47
South	1.29	7.57
Returns in urban GDP		
Average	0.99	3.53
Northeast	0.95	2.33
North	0.97	3.70
Northwest	0.69	0.81
Central	0.90	3.18
Southeast	1.07	11.45
Southwest	1.05	3.78
South	0.88	4.78

	High-quality roads	Low-quality roads
Returns in agricultural GDP		
Average	n.s.	1.48
Northeast	n.s.	0.64
North	n.s.	1.26
Northwest	n.s.	0.45
Central	n.s.	2.50
Southeast	n.s.	2.85
Southwest	n.s.	3.23
South	n.s.	1.77
Returns in rural non-farm GDP		
Average	0.65	5.34
Northeast	0.51	2.38
North	0.63	4.74
Northwest	0.45	1.19
Central	0.85	7.97
Southeast	0.75	15.01
Southwest	0.54	5.39
South	0.51	6.21

Note: Except returns in agricultural GDP to high-quality roads, all estimates are statistically significant at the 10% level.

Sources: Fan and Chan-Kang (2004).

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Table 1.5 Returns to poverty reduction of road investment in different regions in China

	High quality roads	Low quality roads
Returns in urban poverty reduction (number per 10,000 yuan)		
Average	0.05	0.19
Northeast	0.11	0.30
North	0.03	0.12
Northwest	0.15	0.19
Central	0.05	0.21
Southeast	0.01	0.15
Southwest	0.11	0.40
South	0.01	0.03
Returns in rural poverty reduction, official data		
Average	0.08	1.12
Northeast	0.04	0.36
North	0.07	0.97
Northwest	0.28	1.30
Central	0.05	0.64
Southeast	0.01	0.32
Southwest	0.40	5.70
South	0.02	0.45
Returns in rural poverty reduction, Xian and Sheng data		
Average	0.31	5.67
Northeast	0.14	1.46
North	0.52	8.61
Northwest	0.59	3.39
Central	0.35	7.20
Southeast	0.10	4.70
Southwest	1.01	22.18
South	0.08	2.16

Note: All estimates are statistically significant at the 10% level.

Sources: Fan and Chan-Kang (2004).

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More public spending in rural sectors

There is empirical evidence (e.g. Fan et al. 2004) that investment in rural areas can yield large returns. There is therefore good reason for government to continue its efforts to increase overall investment in rural areas. Rural investment accounted for only 19% of total government expenditures in 1997, but rural residents accounted for 69% of China's total population. Moreover, almost 50% of national GDP was produced by the rural sector (agriculture, and rural township and village enterprises) in 1997. Government rural spending as a percentage of rural GDP is only about 5%, compared with 11.6% for the whole economy. For the past several decades, China has implemented an urban and industry-biased investment policy. As a result, the rural–urban income gap is large and has increased over time. Any policies that discriminate against the rural sector will heighten the existing disparity and should be discontinued.

More investment rather than more subsidies

The India case study clearly indicates that initial subsidies on inputs and output may help small farmers adopt new technologies and gain access to markets. But, as time passes, these subsidies have become increasingly large and very difficult to remove. The subsidies, including those on fertiliser, irrigation, power and credit, amounted to about 2% of the national GDP and 8–10% of agricultural GDP in 2000 (Gulati and Narayanan 2003). They are in direct competition with long-term capital investment in roads, rural education and agricultural research. China has already reached the initial stage of the agricultural transformation even though it did not provide direct subsidies in either inputs or output. Therefore, China should not follow India's path to subsidise its agriculture. Instead, the government should use its limited public resources for improving human and physical conditions of rural areas to enable farmers to engage in high-value production or migrate to non-farm activities.

Correcting government regional biased policy

In addition to biased regional investment policy, predatory pricing policy on natural resources by the government has been the major culprit in worsening regional inequality. For the past several decades, particularly under the previous centrally planned economy, natural resources such as minerals, oil, gas and even land have been owned by the central government. These resources were shipped to the eastern regions at low prices or even gratis, thereby transferring rents to the coastal areas.

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The western provinces, although rich in these resources, benefited very little from their exploitation. Even worse is the latest reform of these state-owned enterprises, which laid off millions of workers and left local governments with the responsibility for degraded environments.

In particular, the central government should redirect its public resources towards the western region. The western region shows the highest returns to all kinds of public investments targeted at reducing rural poverty and regional inequality. This is consistent with the national strategy to develop western China. Investment in agricultural research, education and rural infrastructure there should be among the government's top priorities. The most critical need is universal and free primary (ideally 9 years) education funded by the central government.

Promoting a more sustainable and environmentally friendly development strategy

China's agriculture has been growing at more than 4% per annum. However, this rapid growth has been achieved at the cost of a degraded environment and exploitation of natural resources. Soil erosion, acid rain, water and air pollution, land degradation, soil salinisation, desertification, deforestation, grassland destruction and loss of biodiversity and wildlife habitat are widespread in China. Western China's environment is fragile. Most of the cultivated land is prone to wind and water erosion. Desertification and grassland destruction are concentrated in the region.

The vast western region hosts the majority of China's wildlife, and thus provides important potential for tourism in the future. This will be crucial for China's future economic development and the wellbeing of all Chinese citizens. Therefore, protection of the environment in western China needs to be a priority in future development initiatives.

Reforming the fiscal system for more-equitable regional growth

China is highly decentralised in its government spending. Local governments account for more than 70% of total government spending. The central government plays a limited role in equalising regional development through its financial transfers. Most of the transfers from central government to local governments are tax rebates. This mode of transfer is seriously biased against the poor provinces in western China. In fact, this may be one of the major factors underlying the increased

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regional inequality after 1988 when China introduced its new financial responsibility system. Under this system, every province signs a contract with the government covering the obligations and responsibilities of each party. This system gives each province more incentive to develop its economy through retention of more revenue. However, poor provinces suffer because their tax bases are low. As a result of this policy, inequality in per-capita government fiscal resources has increased dramatically. For example, the gap in per-capita expenditure between the richest and poorest provinces increased from 6.1 times in 1990 to 19.1 times in 1999 (Wong 2003).

CONCLUSIONS

As the industrial sector continues to expand and the comparative advantage of the agriculture sector continues to decline, Chinese policy makers are facing a critical choice in agricultural and rural policy. There are several options that can be drawn from the experience of other, more developed countries. One option is to increase price and income support for farmers as many OECD countries have done for the past several decades. Another option is to use trade barriers such as tariffs and import quotas to insulate the domestic market from international markets. But both of these options will cause either huge government spending or sharp increases in domestic food prices and higher costs for consumers. Both of these options will also lead to large net-social-welfare loss due to misallocation of resources among sectors.

A third option is to liberalise the agricultural sector immediately, with no preconditions. This option will allow resources to be allocated on the basis of comparative advantage among sectors and between China and the international market. Overall efficiency and net social welfare will be gained. But we argue that liberalisation must have conditions, which raises a fourth option. One of the conditions is to increase investments in agricultural research, irrigation and rural infrastructure. This is essential for long-term food security, but is also a critical precondition to improve overall efficiency of the agricultural sector and to increase the living standards of the rural population.

The recent trend of government investment in agriculture and rural areas is troubling. Due to the public-goods nature of government investment, the private sector and farmers are not willing or able to offset the investment gap left by the government. Thus, they need favourable policies in order to induce investment. The government

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needs to maintain or even increase such investment if China is to achieve long-term and sustained food security and overall economic development. As the country moves to a new development stage, poverty reduction should continue to be one of the top development priorities. The pro-poor fiscal policy should focus on the development of the rural sector in the western region, and increase central government investment in education and infrastructure there. In particular, the central government should gradually increase its education investment in western rural areas to provide free education for all children to the ninth grade as a minimum standard.

REFERENCES

Cheng, G., 2001. WTO's rules for agricultural trade and China's agricultural development. Beijing, China Economic Press.

China State (National) Statistical Bureau 1982–2003. China statistical yearbook. Beijing, China Statistical Publishing House.

Fan, S. and Kang-Chan, C. 2004. Road development, economic growth and poverty reduction in China. Washington, DC, International Food Policy Research Institute, mimeo.

Fan, S., Thorat, S. and Rao, N. 2005. Investment, subsidies, and pro-poor growth in rural India. Washington, DC, International Food Policy Research Institute, Mimeo.

Fan, S., Zhang, L. and Zhang, X. 2004. Investment, reforms and poverty in rural China, Economic Development and Cultural Change, 52, 395–422.

Gulati, A. and Narayanan, S. 2003. The subsidies syndrome in Indian agriculture. New Delhi, Oxford University Press.

Mullen, K., Sun, D., Orden, D. and Gulati, A. 2004. Produce support estimates (PSEs) for agriculture in developing countries: measurement issues and illustration from India and China. Washington, DC, International Food Policy Research Institute, MTID Discussion Paper 74.

Sun, D. 2001. Study on Chinese agricultural trade under WTO. Beijing, China Agricultural Publishing House.

Tian, W., Zhang, L. and Zhou, Z. 2002. The experience and issues in measuring the level of agricultural support in China. Paper presented in workshop on agricultural policy adjustments in China after WTO accession, 30–31 May 2002, Beijing, China.

Wong, C. 2003. China: national development and sub-national finance. Beijing, CITIC Publishing House.

World Bank. 2001. China: overcoming rural poverty. Washington, DC, World Bank.

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CHAPTER 2

A BETTER MARKETING ENVIRONMENT FOR DEVELOPMENT: DOMESTIC MARKETS

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2.1 CHINA'S GRAIN MARKETING AND RESERVE SYSTEM

CCICED ARD Task Force members

Few accomplishments can rival the government's liberalising of domestic grain markets. China's grain markets today are among the most competitive and integrated in the world. The cost of shipping goods across China has fallen; the cost of shipping maize, rice and soybeans in many parts of China is about equal to the cost of shipping grain down the Mississippi River in the US. Markets also have integrated rapidly; by 2002, prices between almost all pairs of markets across China—even those as distant from one another as Xian and Guangzhou or Heilongjiang and Shanghai—move consistently together. Much of the gain is due to the construction of roads and improved communications. The improvements in China's market also arise from increased competition; since the mid 1990s, thousands of private traders have entered the commodity markets and actively trade. Thousands of wholesale and retail trading companies currently trade into and out of all major metropolitan markets, a fact that makes competition in China's grain markets much more intense than in most developed countries where typically a handful of firms dominate national grain trade (e.g. in the US, the market share of the top five grain-trading firms is more than 80%; in China, the market share of the top five trading firms is certainly less than 5%).

The emergence of domestic agricultural commodity markets is playing a major role in transforming the landscape in rural China. There is a sharp move towards specialisation. In the same way that specialised agricultural villages and regions appeared in Japan in the 1920s, 1930s and 1950s, and in South Korea and Taiwan in the 1970s and 1980s, specialised villages in every conceivable commodity are appearing in China today. Such specialisation facilitates the adoption of new

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technologies, improvement in product quality, greater access to markets and overall higher incomes. Certainly, this shift needs to be encouraged in the future. Based on this, China deserves market status under the World Trade Organization.

With such well-functioning domestic output markets, it is not surprising that the government is considering implementation of a new set of grain policy reforms. The main target of the reforms is the reversal of the national grain-procurement and marketing policy regime that has been built up since 1998. Initiated in 1998, the grain policy, called the 'Three policies agenda' (or *Sanxiang Zhengce*) has cost the national government hundreds of billions yuan. Most economists and policy officials recognise, however, that there has been little positive return. Fiscal expenditures have built nothing and productivity has not been enhanced. Little of the funding has gone to farmers. Instead, the policy built-up a large grain inventory and a growing set of bad loans in the Agricultural Development Bank. Although there has been little effect on national markets, grain policies and institutions have slowed down (or halted) the development of efficient private-sector storage and behaviour that will help markets smooth price fluctuations across seasons and over longer periods.

Recognising these shortcomings, the State Council ordered a bold new set of reforms in June 2004, called the new 'Regulations on grain circulation management'. The new regulations provide guidelines for the full liberalisation of China's domestic grain markets. The task force believes these changes are positive, assuming they are implemented, but additional policy changes are needed to ensure that several major issues are dealt with completely.

MAJOR ISSUES

China's grain system: 'old debt, old grain and old people'

The high level of accumulated debt, perhaps more than any single issue, hampers the state grain sector from moving toward more market-oriented reform. Statistics from various sources indicate the magnitude of losses in grain marketing, including losses resulting from price interventions and deficits from business operations, at 300 to 600 billion yuan. The losses come from a variety of sources, including misappropriation or illegal diversion of budgetary allocations to other uses and losses from the payment of interest, reserve management and asset depreciation from

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China's large grain reserves. Most of the expenditures were funded by bank loans. The size of this accumulated debt is such that local governments and grain bureaus could never absorb it.

At one point before 2003, the quality of China's grain in the state-run grain reserve system was also a major issue. After purchasing enormous quantities of grain in the late 1990s, reserve officials had no option but to hold stocks for many years. Stocks deteriorated in quality. More recently, the low quality of grain in the national stocks has become a less pressing issue.

Dealing with the large number of workers in the grain system is another challenge in implementing new grain-marketing reforms, despite progress in the past. Although the state grain system reduced its staff by more than 1 million employees between 1999 and 2002 (mostly by commercialising certain functions), there are still more than 2 million employees. The main area of redundancy is the 1.4 million people who are still engaged in procurement and marketing activities. This part of the grain system is performing functions that are being carried out by hundreds of thousands of private traders. The annual volume of procurement is less than 90 tonnes of grain per person, which, given the level of budgetary support for the procurement bureau, is grossly inefficient and leads to high losses in China's competitive grain markets.

Grain direct subsidy

During the past two decades, China stands out as a country that has used little in the way of agricultural subsidies. While many other countries have heavily subsidised their farmers, China has had one of the lowest levels of aggregate measure of support in the world; between 0 and 2% of agricultural gross domestic product. Subsidies are not effective tools to promote long-run development. Instead, they are costly, and in almost all nations have a tendency to become permanent programs. International experience has shown that farmers, after they have received subsidies for several years, begin to believe that the government is not helping them, that they are entitled to the payments and will credit policy makers only if subsidies continue to rise, a phenomenon that never stops until the budget gives out. Moreover, phasing out subsidies almost always leads to serious social and political upheaval. Hence, one of the major issues for grain policy is to decide how to move in the future in the area of grain subsidies.

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National grain reserve issues

China's policy towards its national grain reserve is not well defined and almost certainly is hindering the development of efficient marketing institutions. National grain reserves in China focus excessively on holding large-scale strategic reserves. While one approach is to ensure that there are stocks of food to smooth prices across seasons and years, the costs of China's strategy are too high. The high costs are due, among other things, to the excessive quantity of grain reserves, the inefficient location of stocks (international best practice dictates most reserves be held in production regions, while much of China's stocks are held in consumption regions) and the absence of a clear set of rules and regulations to manage procurement, release and pricing. Because of poor system design, inappropriate management typically fails to smooth short-term fluctuations in grain prices and has been shown to make them worse at times. Grain stocks should be used to smooth only short-term fluctuations in market supply; they should not be expected to cover long-term shortfall. Instead, to ensure long-term grain supply, the nation needs to rely on a set of policies that uses financial reserves (instead of grain reserves) with international markets and increases the efficiency of domestic production by allocating funds to productivity-enhancing investments.

Understanding the level of China's grain stocks is a major issue. Nowhere else in the world is the level of grain reserves regarded as a state secret. Not knowing the level of stocks and the rules governing their release are circumstances incompatible with a market-oriented agriculture economy. The task force believes that much of the recent rise in grain prices would have been avoided if grain stocks had been managed in a transparent and open manner. The lack of transparency in reserve quantity, throughput and operation misleads producers, consumers and grain traders and thus hinders the prediction of short and long-term grain price. As long as the government manages its stocks in this way, it will never get help from the private sector in holding and managing a large share of grain stocks for the nation.

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POLICY RECOMMENDATIONS

Grain market reforms

Three major sets of policies are critically needed:

1. Resolve old debt

This is a precondition for grain market reform. The large amount of debt hampers initiation of reform of the grain bureaus. With so much debt, there is little or no incentive for the state grain enterprises under the grain bureau to reform. The task force suggests that the government issue a public bond to absorb and eliminate most of the 'old debt'. Currently, China's public debt accounts for less than 20% of GDP, which is much less than in countries belonging to the Organization for Economic Cooperation and Development (average 74% of GDP).

2. Reduce redundant staff

Successful reform of the state-owned grain system depends on how the overstaffing issue is resolved. We estimate that 60–70% of the existing staff needs to be reassigned to make the current state-owned grain-trading enterprises competitive. This should be implemented carefully through a one-time early retirement payment or some alternative mechanism that minimises the potential for social destabilisation. The grain enterprise should not be responsible for the welfare of former employees. Grain trading is so competitive that firms must be allowed to compete as if they were in the private sector. The budget to support such a program could come from various sources, including government budgets or auctioning some of the system's assets and subsidiary firms.

3. Deepening reform of state-owned grain enterprises

Once the debt and overstaffing problems are resolved, there is one more policy to implement: complete and unconditional commercialisation of state-owned grain-trading and marketing enterprises. The experience of China to date is that, if firms are given complete property rights, commercialisation leads to more-efficient operation, higher employment and higher profits. The break with the state needs to be clear and final. Currently, grain-procurement enterprises have control over large

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volumes of fixed assets, to which they usually do not have official title. Title issues need to be clearly resolved, with few or no residual ties. It is better to give the assets away than to have lingering title issues.

Eliminate the 'Grain direct subsidy' program and reallocate the budget to the provision of rural public services

The task force suggests that the government consider phasing-out the current 'Grain direct subsidy' program. Instead, the current and future funds that are earmarked for subsidies should be reallocated to support additional investments in rural education, agricultural research and extension, irrigation and other rural infrastructure. The rates of return to a number of investments in the rural economy are high and lead to reduction in poverty. We do not believe fragmented payments of 20–30 yuan per mu given to households will have a large multiplier effect. In fact, unless households believe these payments are permanent, economic logic (the permanent income hypothesis) suggests there will be no return.

National grain storage/reserve

Three sets of policy initiatives are needed:

1. Clarifying policy objectives for the government grain storage/reserve program

This is a major policy measure to ensure food security, to help stabilise the market price and to aid farmers with production decisions. However, this does not mean that the government must run the reserve system. With appropriate policies, it can entrust much of the actual operation to commercial enterprises through competitive bidding. Although grain reserves can be used to smooth sharp, short-term fluctuations in market price when necessary, it is recommended that the band of fluctuation not be set too narrow. Government involvement also must be made clear and done according to simple and well-thought-out rules. Price fluctuations are an effective signal to achieve dynamic balance between demand and supply. Seasonal differences in price are necessary for commercial enterprises to maintain 'normal' stocks in running their business (and they must have good profit-maximising incentives to seek profits from storage). Eliminating price differences by managing a buffer stock system with a narrow price band will make commercial enterprises unwilling to keep their own stock.

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2. Consolidating measures to achieve food security effectively and efficiently

A new plan is needed for a nationally integrated grain reserve. To achieve a particular level of self-sufficiency, a nationwide unified reserve program incurs much less cost than segmented programs run by each province. In fact, it has been estimated that the national grain-reserve system could be less than 80 million tonnes, only a small fraction of current reserves. China's grain output displays the least amount of variability in the world and with a modest-size reserve, fluctuations of greater than 20–30% could be eliminated more than 95% of the time. If management of the domestic grain system were coordinated with international trade (which can rely on private and commercialised enterprises), the policy costs for grain reserves could be further reduced (with a holding of only 30 million tonnes) and the level of security enhanced. In contrast, according to estimates by China's economists, to smooth output fluctuations completely in each province (as is mostly done now), the reserves managed by each province would total 346 million tonnes (with no help from international markets). The criteria to trigger an increase or decrease in grain reserves should be set objectively. Full 100% smoothing of annual output fluctuations is too costly and also may distort price signals, leading to continued imbalance in the grain market, and may actually reduce the degree of food security.

3. Disclosure of the grain reserve quantity, throughput and operation

The reserve requirement, throughput and operating rules need to be transparent. Transparency is absolutely critical. It is conducive to the formulation of price expectations in the short- and long-run, which is needed to help make better decisions about grain production, consumption, storage and marketing.

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2.2 THE EMERGENCE OF AGRICULTURAL COMMODITY MARKETS IN CHINA

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China's reformers, more than anything, have followed a strategy based on providing incentives through property-rights reforms, even though in China the shift to private ownership is today far from complete. The reforms started with the household responsibility system (HRS), a policy of radical decollectivisation that allowed farmers to keep the residual output of their farms after paying their agricultural taxes and completing their mandatory delivery quotas. Farmers also began to exercise control over much of the production process (although in the initial years, the local state shared some control rights and in some places still does today). In this way, the first reforms in the agricultural sector reshuffled property rights in an attempt to increase work incentives and exploit the specific knowledge of individuals about the production process (Perkins 1994). In executing the property-rights reforms, leaders also fundamentally restructured farms in China. Within a few years, for example, reformers completely broke up the larger collective farms into small household farms. In China today there are more than 200 million farms, the legacy of a HRS policy that gave the primary responsibilities for farming to the individual household. McMillan et al. (1989), Shenggen Fan (1991), Lin (1992) and Jikun Huang and Rozelle (1996) have all documented the strong, positive impact that property-rights reforms had on output and productivity.

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In addition to property-rights reform and transforming incentives, the other major task of reformers is to create more-efficient institutions of exchange. Markets—whether classic, competitive ones or some workable substitute—increase efficiency by facilitating transactions among agents to allow specialisation and trade, and by providing, through a pricing mechanism, information to producers and consumers about the relative scarcity of resources. But markets, in order to function efficiently, require supporting institutions to ensure competition, define and enforce property rights and contracts, ensure access to credit and finance and provide information (McMillan 1997; World Bank 2002). These institutions were either absent in the Communist countries or, if they existed, were inappropriate for a market system. Somewhat surprisingly, despite their importance in the reform process, there is much less work on the success that China has had in building markets and the effect that the markets have had on the economy.

In part in response to the lack of research on markets and their impacts on China's rural economy, in this paper our major goal is bring together the facts on the emergence of China's markets. To do so, we will have four specific objectives. First, we document the policy environment that has unfolded during the reform era. Second, we examine the data, looking at spatial patterns of market price contours over time. Third, we examine the extent to which market prices are integrated—both between regions and between regional marketing centres and villages. Finally, we examine how the emergence of markets has affected the behaviour of producers and their productivity.

In order to examine so broad a topic, we need to limit the scope of the analysis. To do so, we primarily restrict ourselves to China's main staple commodities—rice, maize and soybeans. These commodities—especially maize and soybeans—are ideal, since the quality differences among regions are relatively narrow, a characteristic that facilitates integration analysis. Because of regional quality differences, analyses on rice markets are performed on a regional basis. Data on the major commodities also are more readily available over time and across space. As their share of the economy grows, more work is needed on cash crops, livestock and aquaculture products.

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COMMODITY PRICE AND MARKETING POLICIES

Price and market reforms are key components of China's strategy to shift from a socialist to a market-oriented economy. The price and market reforms initiated in the late 1970s were aimed at raising farm-level procurement prices and gradually liberalising the market. These reforms included gradual increases in the agricultural procurement prices toward market prices, reductions in procurement quota levels, the introduction of above-quota bonuses for cotton, tobacco and other cash crops, negotiated procurement of surplus production of rice, wheat, maize, soybean, edible oils, livestock, and most other commodities at price levels higher than those for quota procurement, and flexibility in marketing of surplus production of all categories of agricultural products by private traders. It is interesting that, in the initial years, there was little effort to move the economy to one in which almost all resources and factors were allocated according to market price signals.

As the right to private trading was extended to include surplus output of all categories of agricultural products after contractual obligations to the state were fulfilled, the foundations of the state marketing system began to be undermined (Rozelle et al. 2000). After a record growth in grain production in 1984 and 1985, a second stage of price and market reforms was announced in 1985, aimed at radically limiting the scope of government price and market interventions and further enlarging the role of market allocation. Other than for rice, wheat, maize and cotton, the intention was to gradually eliminate planned procurement of agricultural products; government commercial departments could continue to buy and sell only at the market. For grain, incentives were introduced through the reduction of the volume of the quota and increase in procurement prices. Even for grain, after the share of compulsory quota procurement in grain production reached 29% in 1984, it fell to 18% in 1985 and 13% in 1990. Concomitantly, the share of negotiated procurement at market price increased from only 3% in 1984 to 6% in 1985 and 12% in 1990.

Because of the sharp drop in the growth rate of grain output and the rise in food prices in the late 1980s, the pace of marketing reform stalled. Mandatory procurement of rice, wheat, maize, soybean, oil crops and cotton continued. To provide incentives for farmers to raise productivity, and to encourage sales to the government, quota procurement prices were raised over time. The increase in the nominal agricultural procurement price, however, was lower than the inflation rate, which led to a decline in the real grain price (Jikun Huang et al. 2004).

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As grain production and prices stabilised in the early 1990s, however, another attempt was made to abolish the grain ration system. Urban officials discontinued sales at ration prices to consumers in early 1993. For a year and a half, the liberalisation move succeeded. Then, while it appeared that both the state grain distribution and procurement systems had been successfully liberalised, food prices rose sharply, as did other prices in the economy. Some people blamed the nation's inflation on the rises in food prices. As a result, the state compulsory quota system was re-imposed in most parts of China in 1995, but at a lower procurement level. The share of grain compulsory quota procurement in total production stayed at only 11% in 1995–97.

Since the middle 1990s, several new policies—some pro-market, others anti-market—were implemented. Immediately after the price rises in the middle 1990s, China started the provincial governor's 'Rice bag' responsibility system. The policy was designed to strengthen national food self-sufficiency by making provincial governors and governments responsible for balancing the supply and demand of cereals in their provinces and for stabilising local food markets and prices. Policies under the system included re-imposing grain rationing to poor consumers, investing in production bases inside the province and attempting to keep grain from being shipped out of the province. If implemented, this policy may have reduced short-run agricultural price fluctuations, but it would not have been without costs. It has been widely believed that the policy may have adverse impact on the efficiency of resource allocation, diversification of agricultural production and farmers' incomes. Moreover, a great number of efforts to restrict the flow of grain were not successful. Market flows continued as the share of total government procurement (both quota and negotiated procurement) in domestic production fell from 26% in 1994 to 22% in 1996, being driven by the profits that traders could earn by shipping grain from low to high-price areas (Jikun Huang et al. 2004).

With three record levels of grain production in China in the late 1990s, and almost zero or negative inflation since 1997, rising grain stocks and declining food prices showed the economy had bounced back. However, in some sense, the government's policies were a victim of their own success. With prices falling sharply, leaders worried of a repeat of the mid 1990s. Instead of proceeding with market reform, leaders actually opted to try to exercise greater control over grain prices by price protection policy.

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In fact, leaders in the late 1990s attempted to curb market forces more than in earlier retrenchments but by a completely different measure. Market intervention policy shifted from taxing grain producers through lower government quota procurement price (lower than market price) to prevent the grain price falling through implementation of grain protection price (higher than market price). To reduce the financial burden of the protection price policy, in 1998 the central government initiated a controversial policy change prohibiting individuals and private companies from procuring grain from farmers.[1] In contrast to past policies, grain quota procurement prices were for the first time set at a level more than market prices, which meant a transfer in favour of those farmers able to sell at that price (Jikun Huang and Chen 1999). Leaders expected that they could monopolise grain markets through the commercial arms of the grain bureaus, and that the grain bureaus would be able to sell the grain procured at an even higher price in the market and meet the nation's goal of raising farmer income. If the state could have exercised monopoly power in grain markets, it is possible that they could have implemented the price supports while enabling the state grain companies (i.e. the commercial arms of grain bureaus) to earn a profit while reducing the government's financial burden of maintaining the state-run grain procurement and marketing system. The loser under this policy would have been the consumer, who would have had to pay a higher price for grain.

The win–win (from the government's point of view) policies, however, did not work, primarily because the government could not suppress market activities of traders and employees of the commercialised grain system. While the above-market prices were offered to farmers in some years, cash-strapped grain bureaus could not procure all of the grain that farmers wanted to sell. Grain production increased, but since grain bureaus were trying to sell grain to urban and commercial users at above-market prices, they had few takers. Unable to stop the activities of millions of private grain traders, urban users continued to buy from their original channels at market-set prices. Not surprisingly, stocks started to accumulate, the real price in the market fell even further, and the commercialised grain bureaus that had been forced to buy grain at high prices, now had huge stocks of grain that was worth less than they had bought it for and their debts became higher than ever.

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

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In the early 2000s, marketing reforms were once more launched. Restrictions on marketing were removed. New efforts to commercialise the grain bureaus were begun. The support prices that had been given to some farmers in some areas were eliminated. In short, a new effort was made to push the policy environment to be even more market-oriented. In fact, as seen from this recounting of nearly 25 years of reform, marketing reform has been an on-again/off-again policy effort. When grain prices are low and grain relatively abundant, markets are liberalised. But in times of rising prices, policy makers make efforts to curb market actions. What is unclear, however, is how effective policy was in dampening market activity or facilitating the operation of well-functioning markets. It is to this question that we turn in the next three sections.

DATA

To assess the nature of China's markets in the past 10 years, we use data from a number of different sources.[2] First, we use a set of price data collected by China's State Market Administration Bureau (SMAB—*data-set 1*). Nearly 50 sample sites from 15 of China's provinces report prices of agricultural commodities every 10 days. This means there are 36 price observations available for each market site for each commodity each year. The prices are the average prices of transactions that day in the local rural periodic market. The Ministry of Agriculture assembles the data in Beijing and makes them available to researchers and policy makers. Unfortunately, the quality of the data has deteriorated since 2000.[3]

[2] Although it would be ideal to use a single data-set for examining all markets for all crops for all time periods, such a data-set does not exist, unfortunately. Instead, we use available data. However, as is seen in the analysis, there is enough overlap in the data-sets to allow us to compare answers using alternative sources of information. In nearly every case, the results are robust to the choice of data-set.

[3] After 2000, the data series are characterised by many missing values and data entries that obviously are not correct. It is unclear why the quality deteriorated after 2000, but it could be due to the fact that, with the rise of alternative data sources (collected by the private sector), these data (which were collected by several government agencies) were less necessary.

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Using the SMAB data, we can examine rice, maize and soybean prices from 1996 to 2000 (except for maize data, which were available only through 1998). The three crops are produced and consumed in nearly every province in China. Rice price data are available for 31 markets. Because of quality differences among rice varieties in different regions of China, we look at price integration among markets within four regions: South China (South), the Yangtze Valley (YV), the North China Plain (NCP, including Northwest China) and Northeast China (NE). For the provinces included in the sample, rice prices are available for over 90% of the time periods. Prices for maize and soybean data are available for 13 and 20 markets, respectively.[4] Product homogeneity in the case of maize and soybeans makes it possible to examine price integration among markets across a broader geographic range. We compare our results for the late 1990s (1996 to 2000) to results from 1988 to 1995 that were produced with the same data and published in Park et al. (2002).[5]

The second source of data on China's domestic market (*data-set 2*) comes from a price data-set collected by the Jilin Province Grain and Oil Information Center (GOIC). For maize, weekly between 10 August 1998 and 24 February 2003, prices are reported for 15 of China's main maize production and consumption provinces, including

[4] Since we use data over time, we need to convert prices to a real basis. Nominal prices from our data-set are deflated using monthly consumer price indexes calculated and reported by the China National Statistical Bureau. Deflation facilitates transaction-cost comparisons across time and allows us to disregard transaction-cost increases within periods associated with inflation.

[5] To produce the results, we run co-integration tests on each pair of markets using the data for each year. So, in other words, we use 36 observations (since the price data are available every 10 days) and count the number of pairs of markets that are co-integrated in a statistically significant way (see footnote 6 and text for explanation of testing). For example, for the case of soybeans, for the late 1990s (1996 to 2000), this means that we are examining the extent of integration between 190 ($20 \times 19/2$) pairs of markets in each of 5 years, which equals a total of 950 pairs of markets. Hence, since we found that prices in 646 markets were integrated (according to the testing procedure), we report that 68% of markets are integrated in the late 1990s. Since we use only 36 observations per test, and since co-integration tests typically perform better with longer time series, by splitting our data into annual increments, we are biasing the results against accepting integration. We do this in order to make our analysis comparable to that of Park et al. (2002) who followed a similar procedure.

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Heilongjiang, Jilin, Liaoning, Hebei, Shandong, Jiangsu, Zhejiang, Shanghai, Hubei, Sichuan, Hunan, Fujian, Guangdong, and Guangxi (Meyer 2002). Since 7 September 1998, there is a price from Liaoning for Dalian, the main port from which exports to foreign and domestic markets served by ship.

To examine maize markets more carefully in the northeast region of the country and through the country in the post-accession period, we used another data-set collected by the Jilin Province GOIC (*data-set 3*). The data in this set are first available after 26 October 2001, and they continue through 25 February 2003. This data-set is more detailed for two reasons. First, it includes prices from three markets in Heilongjiang, three markets in Jilin, three in Liaoning (including Dalian and two in production regions), and market sites in Guangdong, Fujian, Jiangsu and Hubei. Second, the data-set reports data more frequently, typically twice a week (every third day, then every fourth day).

The data from the Jilin Province GOIC appear to be high quality compared to the price series in data-set 1.[6] Unlike the other price data-sets that are available in China, there are few missing observations. There are also relatively few inconsistencies in the data. In other data-sets, corrections frequently need to be made to the data to account for missing observations and to adjust for prices when they are written down in price 'per jin' even though the data category is supposed to be price 'per kilogram'. Unlike our previous analyses of prices using other data-sets from China, we made *no* correction to the data after they were provided to us by the US Grains Council.

In our discussions with the Monitoring and Marketing Divisions (MMD) of the National Grain and Oilseed Information Corporation (the division in charge of collecting the data) we discovered that the data were mostly from members of the marketing arms of local grain-storage bureaus (that are making daily maize and

[6] For illustrative purposes (e.g. for our coefficient of variation analysis and for the determinants of price analysis), we compare some of our results to results from 1988 to 1995 that were reported in Park et al. (2002) and to results from 1996 to 2000 for Huang et al. (2004). Note, however, the data sources, while attempting to measure the same prices, may be different, and hence not entirely comparable, due to differences in data-collection methods. In other words, while illustrative of changes over time, the comparisons should be used only generally to help put the situation in the post-accession period into the context of China's maize and other markets during the 1990s.

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soybean sales), traders in major ports (Dalian and Guangzhou) and end users (in the south). In the most common way in which data are collected, a member of MMD will make a call to the grain bureau personnel, trader and end user twice a week (Monday and Thursday). For example, in Dalian we were told that each Monday and Thursday about nine traders who are involved with shipping grain from Dalian to South China are called. These traders tell the MMD official the average price at which maize is leaving Dalian at a FOB price. In the northeast (e.g. Jilin), we were told that the MMD calls several grain bureaus in a region and has them provide unit value prices (value of shipments divided by volume) for the day. The MMD official averages the price in the district.

The soybean data come from the same source, the Jilin Province GOIC, but are collected somewhat differently (data-set 4). Only monthly soybean data are available. There are data for more than 30 markets. The data series are complete and, overall, the quality of the data appears to be equal to the maize data-set.

PRICE TRENDS AND SPATIAL PATTERNS OF MARKET EMERGENCE

In this section, we use the data on prices to describe China's agricultural markets. To do so, we first plot the data over time and examine how prices move together in markets in the same geographic region and in markets separated by long distances.[7] Next, we more rigorously examine transportation gradients in China's rice, maize and soybean markets. To put the results in perspective, we examine these over time and compare those of China with those of the US. Our hypothesis is that if prices in markets in different parts of China move together and if they create spatial patterns similar to those found in more market-oriented economies, then our data are producing quantitative evidence that China's markets are emerging as functional and increasingly efficient.

[7] It is possible that prices move together because they are planned. However, this hypothesis is tested in the market integration analysis section of the paper. If prices are planned, in all likelihood the price series would be stationary and the differences between them could be defined by a set parameter. As seen in the analysis, this not the case. Market analysis would suggest a market process is underlying the creation of the prices, not planning.

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Price trends

Maize

Using data-set 3, we can see how closely prices in northeastern China track each other (Figure 2.1, Panels A and B). In Panel A we plot the Dalian domestic price versus the prices in the three Heilongjiang market sites (chosen because they are the northeastern markets furthest from Dalian). While varying over time, the Dalian domestic price remains at about US$127/tonne between December 2001 and February 2003. During the same period, the prices in each of the three Heilongjiang markets move almost in perfect concert with one another. While also varying over time, the prices in Heilongjiang during the post-accession period are around US$110–155/tonne. Visual inspection also shows that although the market in Dalian and those in Heilongjiang are more than 1000 km apart and prices vary by US$12–17/tonne, the prices in many periods are moving together. When the prices in Dalian move up (down), the prices in Heilongjiang tend to move up (down).

Similar patterns of price movements are found to exist between the two markets in western and central Liaoning and Dalian (Panel B). In fact, the prices in the two Liaoning producing areas track each other even more closely than the markets in Heilongjiang, a finding that perhaps is not surprising given that Liaoning is a smaller province with better transportation and communication infrastructure. The co-movements of prices among the producing areas in Liaoning and the consumption centre of the province, Dalian, are readily perceptible. The narrower price gaps among producer (lower trend lines) and user areas (higher trend line) are a reflection of the smaller distance (compared with the Heilongjiang–Dalian figure).

Using data-set 1, the patterns of movement across further points of China display similar patterns of close movements of prices (Figure 2.2, Panels A and B). While prices have moved together since the mid 1990s between Dalian and Guangdong and between Dalian and Fujian, the tracking among markets appears to be even closer in recent years. Almost every turning point (a shift from low to high or high to low) in Guangdong and Fujian can be found in the Dalian market. The close movement of prices occurs even though the main way in which grain moves between the two sets of markets is by sea. With the advent of private shipping and commercial trading, there are now many shipping lines and trading companies that move grain between the northeast and southern China's main consumption

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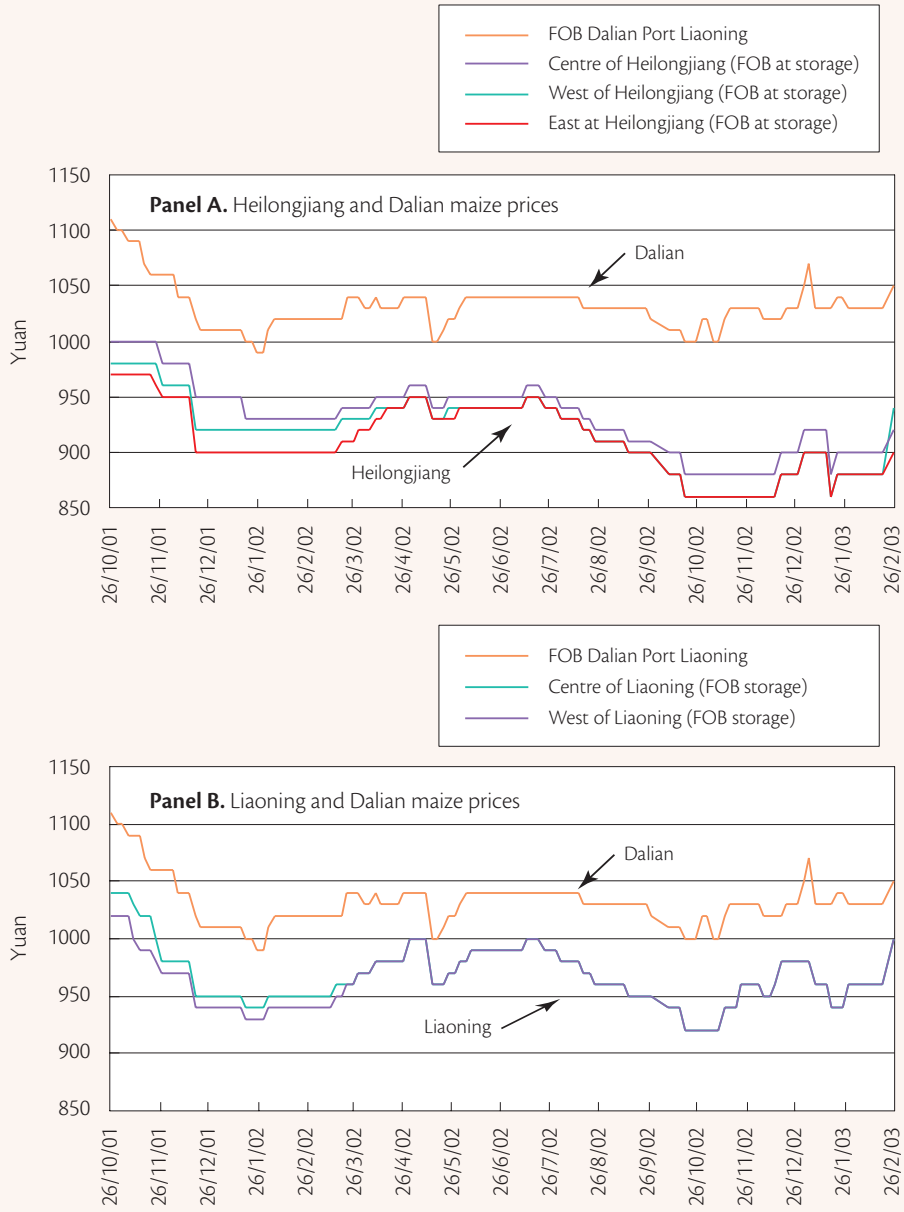

Figure 2.1 Maize prices (yuan/tonne), in Heilongjiang, Liaoning and Dalian, October 2001–February 2003

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areas. The results from Figure 2.1, Panels A and B, when linked with those from Figure 2.2, demonstrate that prices in Heilongjiang appear to depend on shifts in feed demand and maize availability in Guangdong and Fujian.

Soybeans

Using data-set 4, we find soybean prices similarly move together for pairs of markets, both in the same region and across more-distant locations. The bottom two price series in Panel A of Figure 2.3, trace the price trends for soybeans in Heilongjiang and Jilin. The two series are almost indistinguishable, with Heilongjiang prices slightly lower for almost the entire period. The Guangdong price, the top line in Panel A, also shows that prices move in concert with one another inside China's domestic market, even though the markets are thousands of kilometres apart. In only two short periods—early 2000 and late 2002—does that gap between the two markets deviate from a fixed margin which is almost equal to the transport price between the northeast and the south.

Panel B in Figure 2.3 shows that prices appear to be even more integrated in the south. The prices throughout the entire period are so close that it is difficult to distinguish the individual price series. This degree of apparent integration is almost certainly a function of the nature of the market. During the period for which we have data (1999–2003) more than half of the soybeans in southern China were from imports. According to traders in the US and China, the price for landing a shipload of soybeans in Shanghai is virtually the same as doing so for a shipload in Guangdong.

Cross-commodity trends

In addition to observing co-movements of maize prices between regions over time during the post-World Trade Organization (WTO) accession period, our data (data-set 3) also show that prices of different feed types move together (Figure 2.4). In south China, early rice is frequently used as a feed, albeit a slightly inferior one in the view of most livestock producers. However, even though the price of maize is higher than feed rice across China, the ratio of maize to feed rice is almost identical in markets in different provinces. Figure 2.4 illustrates that even though the ratio of maize to feed rice varies over time in Guangdong and Fujian, the trends in the ratios in each of the provinces are almost identical.

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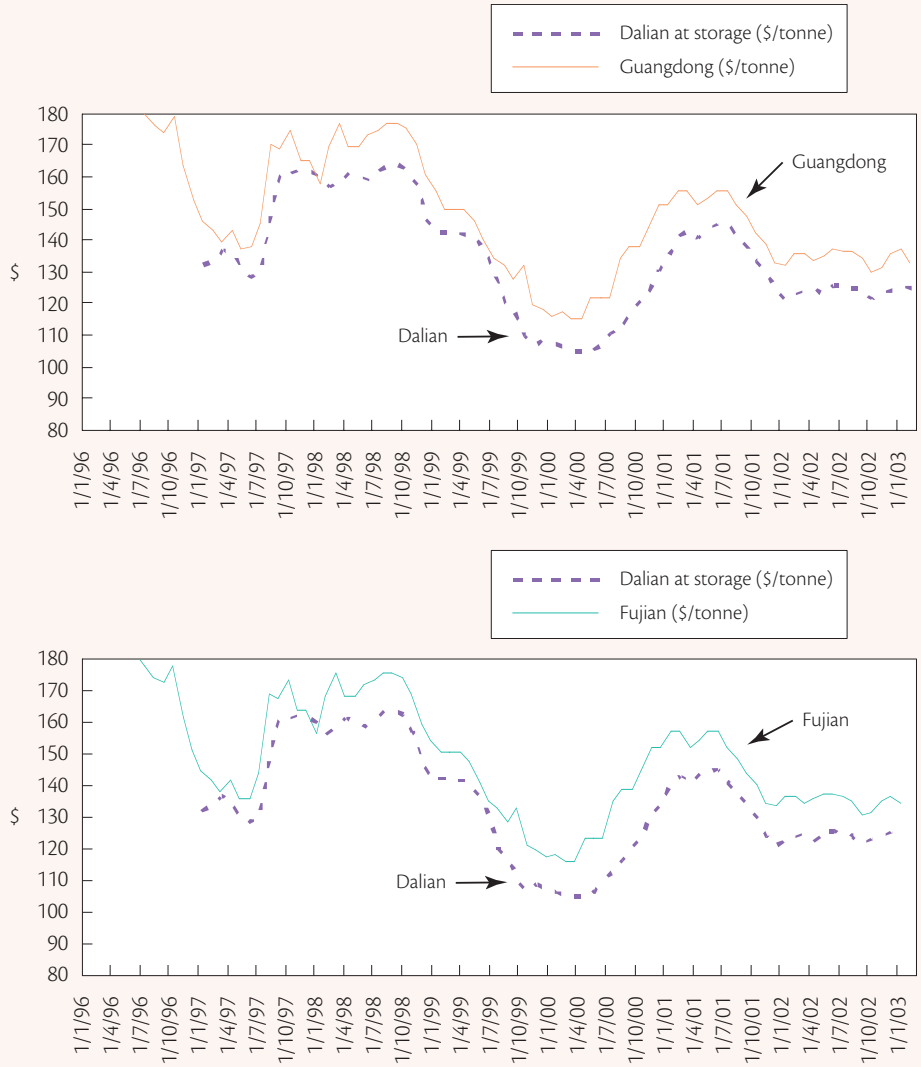

Figure 2.2 Maize prices ($/tonne) in Guangdong, Fujian and Dalian January 1996–February 2003

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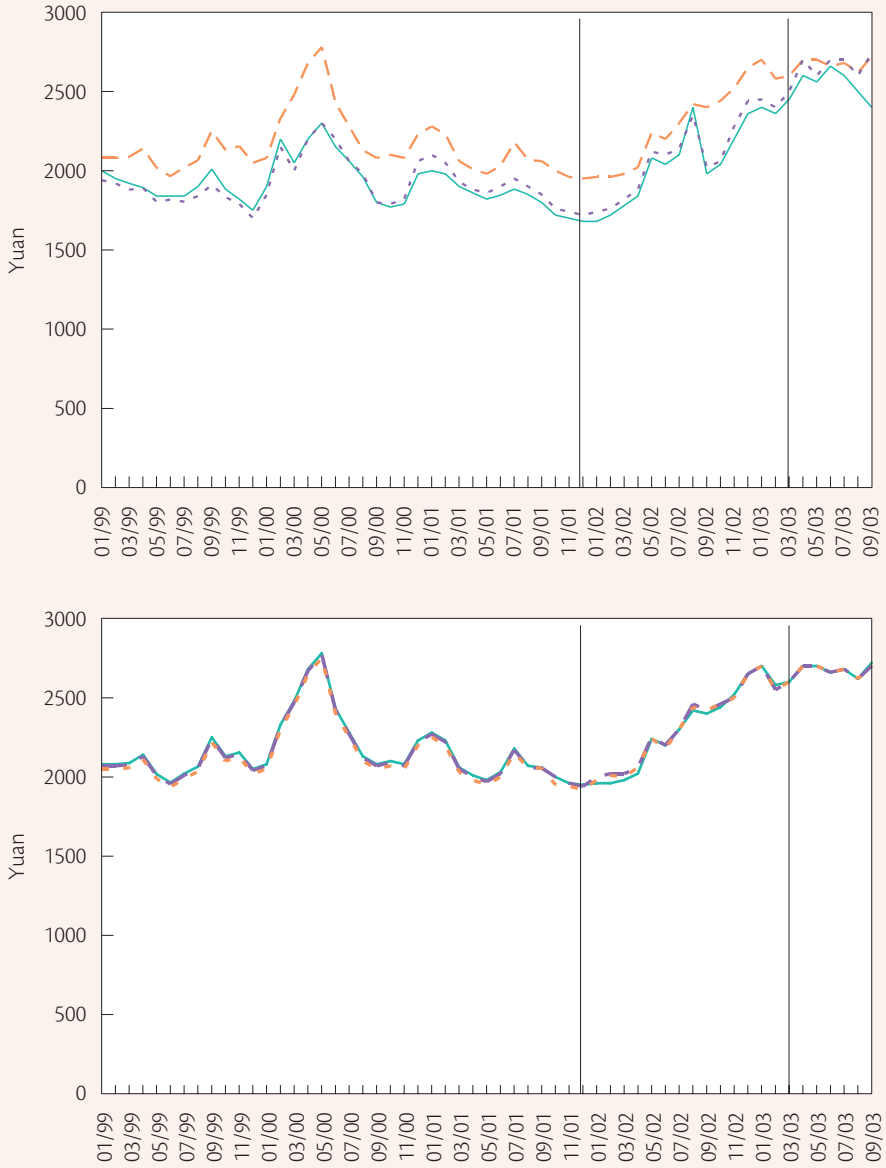

Figure 2.3 Soybean prices (yuan/tonne) in Heilongjiang, Jilin, Guangdong, Shanghai and Jiangsu, January 1999–September 2003

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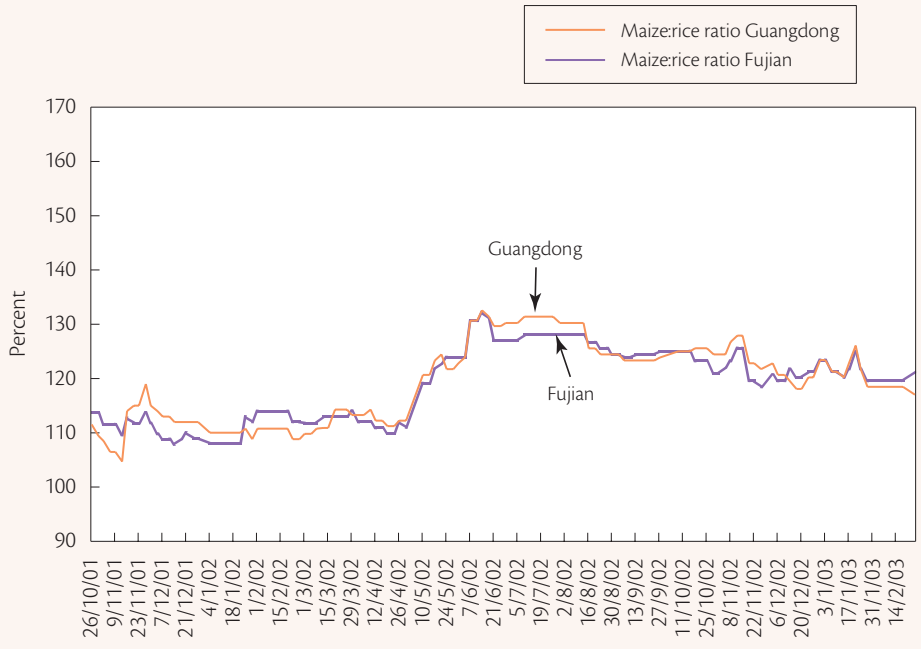

Figure 2.4 The ratio of maize to feed rice (paddy) prices in Guangdong and Fujian provinces between October 2001 and February 2003

Figure 2.5 shows the same co-movement of prices occurs in the soybean market. The prices of soybeans and soybean meal almost perfectly track one another for the entire sampling period between 1999 and 2003. Interestingly (although not shown), when the price of soybean oil is added, oil prices (albeit higher) after 2000 also move together with soybean and soybean meal. Before 2000, restrictions in the import market for oil kept the soybean oil price *abnormally* above the price of soybeans and soybean meal.

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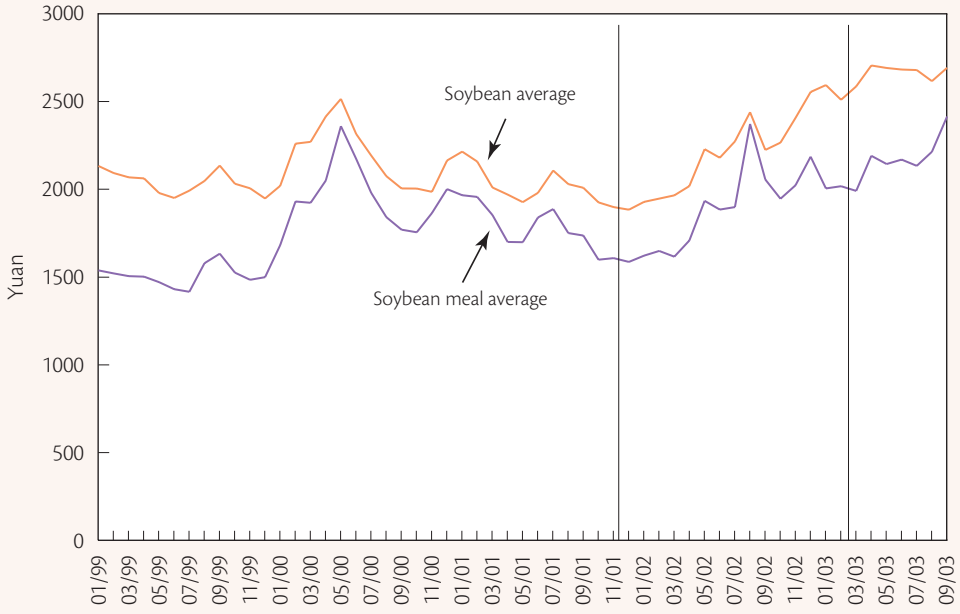

Figure 2.5 Comparisons of China's average soybean and soybean meal prices (yuan/tonne), January 1999–September 2003

Price determination

We also can statistically analyse of the behaviour of prices of China's major commodities in another dimension. In this subsection we examine price behaviour across space, holding time constant. If China's markets function well, then there is a greater likelihood that when a price changes in one region of the country (e.g. there is a price shock arising in Dalian that occurs from increased demand for exports or shipments to elsewhere in China), that prices will change throughout the rest of China. If price formation does not appear to be consistent with the existence of adequately functioning markets, price shifts at the border (e.g. Dalian) may not be experienced elsewhere in China. Indeed, if markets in China are fragmented, shifts in prices in the coastal areas near the border could be sharper (for a given shift in demand), while in large regions of the country away from the border, producers could be shielded from them. Hence, the hypothesis to be tested is that

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price relations across China's regions exhibit characteristics that make it appear as if China's domestic producers, consumers and traders face price pressures created in part by market forces. As a standard, we compare our results from northwestern China with those from the Mississippi Valley in the USA.

A simple plotting of the relationship between the price of maize in Dalian and prices in Liaoning, Jilin and Heilongjiang during the post-accession period (December 2001–February 2003) illustrates a price contour that is consistent with the existence of well-functioning markets (Figure 2.6). Since the main demand centre in the northeast and point of export for maize to foreign markets and to southern China is Dalian, one would expect that, in an integrated marketing system, as a market became more remote, the price should fall. Indeed, the price in a market 1000 km from Dalian (e.g. the Jilin market) is, on average, about RMB70/tonne lower than the price in Dalian. In percentage terms, this equates to a price for maize in Jilin that is 6% lower than that in Dalian.

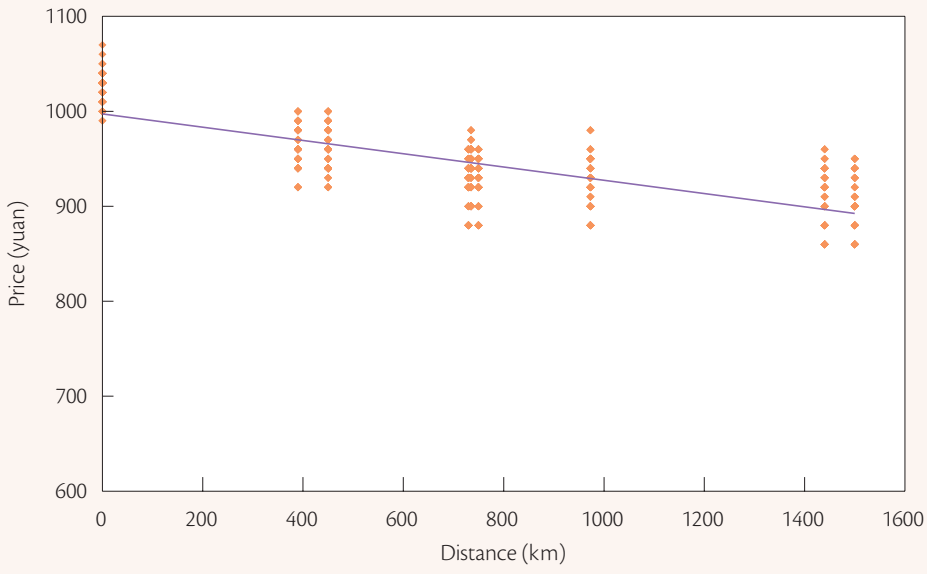

Figure 2.6 Change in maize price across northeastern China as markets increase in distance from the port of Dalian, 2000–2003

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The spatial graph is even more evident when using data-set 1 to look at the price of rice as markets become more distant from the coastal benchmark markets (Figure 2.7). For example, the prices for indica rice in markets in southern China are plotted on the basis of their distance from Guangzhou. Prices for the Yangtze River Valley marketing sites are plotted with reference to Shanghai; those for northern China against Tianjin; and those for the northeast against Dalian. Plotted this way, price relations clearly show the fall in prices as markets move inland, away from the coast. In Figure 2.7, a random period (July 1998) was chosen, although the exact same figure can be drawn with the data from any marketing period. Although not shown here, similar spatial patterns are found for soybeans.

Multivariate spatial analysis

The results of regression analysis of the relationship between prices (entered in the equation in either linear or log form) in the local market and the distance from port and a series of time period dummies (one for each time period of analysis—that is, one for every ½ week in the sample and an interaction term) are similar for maize

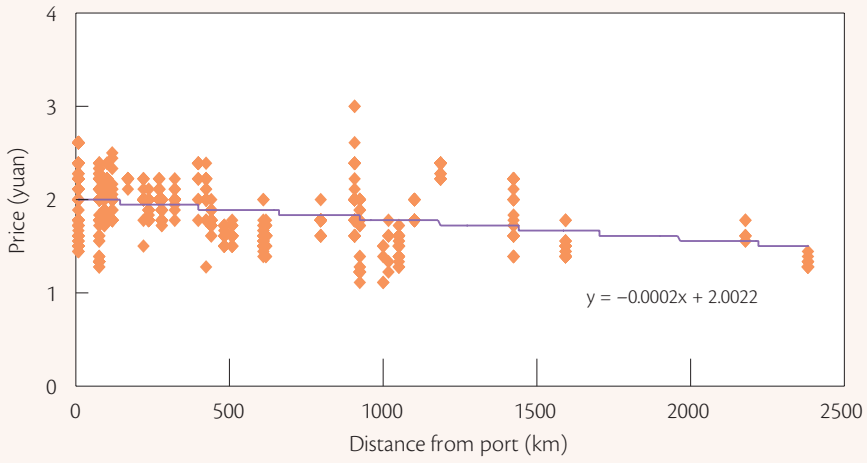

Figure 2.7 Changes in rice price across China as markets increase in distance from port (in four marketing areas — southern China, Yangtze River Valley, northern China and north-eastern China), July 1998

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in the northeast (Table 2.1). Holding all other factors constant, as maize-marketing sites become more distant from Dalian, the price falls (row 1). The magnitudes of the coefficient on the distance from Dalian change for each of the periods, but their sizes still fall in a reasonable range (for each 1000 km, the price of maize falls by RMB54.4/tonne (column 1)). In log form, our results show that, for each 1000 km, the price falls by 5.6% (column 2). We also ran similar regressions with data-set 1 for 1998 to 2000 and generated similar results (not shown). In fact, the coefficient on the distance variable in the logarithmic equation was even lower for all of China, most likely reflecting the higher costs of transportation in the northeast, a place in which transportation has always been relatively constrained.

The spatial pattern of rice prices (Table 2.2) is similar to that of maize. A similar set of regressions was run for our rice price for 2000. In the case of rice, however, we had to account for quality differences that essentially segment China's rice markets. In column 1, we use data for all regions but include location dummy variables, one for markets in southern China, one for those in the Yangtze River Valley, one

Table 2.1 Price and log price determination regression for all periods (10/2001–3/2003)

Explanatory variables	(1) Dependent variable: price at level (yuan)	(2) Dependent variable: log price
Distance from Dalian (1000 km)	−54.4* (30.2)	−0.056* (30.35)
Distance × group dummy	−0.0235* (9.66)	−0.00003* (10.54)
Group dummy	−89.55* (9.90)	−0.093 (10.02)
Constant	1058.84* (165.24)	6.97* (1064.88)
Time period dummies	Included	Included
Adjusted R-square	0.82	0.83
No. of observations	1152	1152

Note: Values in parentheses are *t* statistics. Coefficients marked with an asterisk are statistically different from zero at the 1% level of significance. The group dummy (gd) picks up a time period effect. When gd = 0, the time period is early in the WTO accession period (that is, before October 2002), gd = 1 indicating the recent period (that is after October 2002). The F-test statistic in (1) is F[2, 1022] = 120.87, in (2) is F[2, 1022] = 133.66. Both models reject the null hypothesis that there is no structure change.

Data source: data-set 3 (see text for details).

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for those in northern China (included as the base location) and one for those in northwestern China. The results of location-specific regressions are in columns 2 to 4 (though because there were not enough observations, results could not be reported separately for the northeastern region). In addition, a square term was included in the rice regressions to allow for non-linear shifts over space, a term that could help account for quality differences also. However, even with these modifications, the spatial patterns came through clearly. As markets move progressively further away from China's major port cities, the price falls. Since these ports (Guangzhou, Shanghai, Tianjin/Beijing and Dalian) are also major consumption centres, this price pattern is exactly what would be expected in a market economy.

When examining the magnitude of the transportation gradients estimated in Table 2.2 (and similar ones estimated from regressions for rice in 1998 and 1999 and for maize and soybeans for 1998 to 2000—not shown), we find three characteristics (Table 2.3). First, and interestingly because they build the case for robustness, the

Table 2.2 Ordinary least squares regression explaining rice prices in China's main marketing regions, 2000 (data source: data-set 1)

Explanatory variable	Full sample	South China	Yangtze River	Yellow River
Dist-port	−0.00004** (-1.89)	−0.0004** (-4.38)	0.0001 (1.30)	-0.00007** (-2.13)
Dist-port^2	+1.9*e−8** (2.99)	+2.7*e−7** (5.59)	−1.5e−7** (5.02)	2.8*e−8** (3.31)
Dist-road	−0.005** (11.6)	−0.004** (7.10)	−0.008** (5.36)	0.0003 (0.31)
Dist-rail	−0.001** (5.60)	−0.001** (7.18)	−0.0001 (0.06)	−0.002** (3.22)
Region dummies				
South	0.20**			
Yangtze	−0.04**			
Northeast	−0.06**			
Period dummies	Included	Included	Included	Included
No. of obs.	1132	304	327	501

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magnitudes of the transportation/transaction costs are similar to those reported in Park et al. (2002). Using a completely different methodology, a method that uses a maximum likelihood estimator examining the price differences between markets when traders arbitrage away price difference between markets, our estimates in Table 2.3, which were generated from regressions similar to those in Table 2.2, are almost the same. Second, the transportation gradients are falling over time. Although we can not pinpoint the exact source of the fall in the transportation gradient, as in Park et al. (2002), the patterns are consistent with a marketing environment in which there is an improving infrastructure and more competitive markets. Finally, the results show that the transportation gradients in China are similar to those found in the US. When plotting similar data and running similar regression on maize in the Mississippi valley we find a pattern of spatial price spread similar to that in China. In other words, assuming our findings are representative of average transportation gradients in China and the US, these results show that the time when China's inland markets were isolated by poor transportation and other infrastructure weaknesses may be past. In other words, it appears as if the aggressive investment in roads and other infrastructure projects in the past decade has dramatically improved the ability of traders to move agricultural commodities, at least staple crops, around China at costs that rival those of the US.

Table 2.3 Percentage change in maize, soybean and rice prices for every 1000 kilometres of distance from port

	Maize	Soybean	Rice
China 1998	–4	–10	–10
China 1999	–4	–11	–9
China 2000	–3	–8	–7
USA 1998	–5	–3.5	n.a.

Note: Values for column 3 (rice, China) from Table 2 (and similar regressions for 1998 and 1999); values for columns 1 and 2 (maize and soybeans, China) from regressions for maize soybeans for China that are similar to those for rice. Values for US from spot market prices reported by the Chicago Board of Trade for 15 markets in 1998.

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MARKET INTEGRATION IN CHINA

In this section we use more-formal tests of market integration. In the first subsection we use traditional co-integration analysis to examine how prices move together over time. We do the analysis in several periods; the late 1990s for rice, maize and soybeans (using data-set 1) and, because we use the same data as used in Park et al. (2002), we can compare the results with those from the early 1990s. Using data-sets 3 and 4, we also examine co-integration for maize and soybean markets.

Co-integration analysis

Co-integration means that, although many developments can cause permanent changes in the individual elements of tested series, i.e. grain price in this paper, there is some long-run equilibrium relation tying the individual components together, represented by the linear combination, as in equation (1). Here we apply the Engle-Grange co-integration approach (Engle and Grange 1987) to test China's market integration. The basic intuition behind this is that if one can write two price series in the following way:

$$U_t = P_t^i - bP_t^j \qquad (1)$$

if each price series is stationary, then this condition implies the existence of a long-run equilibrium. In other words, in the long run, the two series will eventually return to a constant mean and there is a long-run, deterministic relationship between them. Two stationary series are not co-integrated. Moreover, a linear combination of these two prices shows that it is efficient to predict one market's price based on the information of another market's price.[8] If the price series are not stationary, we then need to test whether each of the elements of the price series are co-integrated and, if they are, at what order are they co-integrated (i.e. co-integrated to the order 1, I(1) or higher). This is done by applying a unit root test. Our analysis shows that all price series for the commodities in China's grain markets in the late 1990s are stationary.

[8] Note that we do not need to have the *b* coefficient equal to unity to conclude co-integration and integrated markets (which is only needed if one wants to apply the much more restrictive criteria of the Law of One Price).

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Using our stationary price series, the next step uses the ordinary least squares regression of one price series on another to test for co-integration:

$$P_t^i = \alpha + \lambda t + \beta P_t^j + e_t \qquad (2)$$

where t is the common trend of the two price series (which can also be thought to be the difference between time trend in one series and that of the other) and where e_t is the error term. The main reason for running equation (2) is that it provides the residuals, e_t, to use in the augmented Dickey-Fuller (Engle and Grange 1987) test:

$$\Delta e_t = + \delta e_{t-1} + \sum_{j=2}^{N} \gamma \Delta e_{t-j} + \xi_t \qquad (3)$$

If the test statistic on the δ coefficient is less (i.e. more negative) than the relevant critical value from the Dickey-Fuller table, the null hypothesis ($e_t = 1 \times e_t - 1$) may be rejected and the two series are said to be co-integrated to order (1,1). According to Engle and Grange, this implies that the two markets from which the price series come are integrated. In our analysis, we assume markets are integrated when the test statistic demonstrates that the two series move together at a 10% level of significance.

Results—increasing integration during the 1990s

The results of the co-integration analysis illustrate that China's markets have continued to develop in the late 1990s, especially when the results are compared with the market integration research in the late 1980s and early 1990s (Table 4). In middle part of the reform era (1988–1995), a time when markets were starting to emerge, 20–25% of markets showed signs that prices were moving together during the study periods and sub-periods (Park et al. 2002). According to the findings of Park et al. (2002), although there were many market pairs in which prices did not move together, between the late 1980s and mid 1990s, there was evidence of rising integration.

Using the results from the early 1990s as a baseline and using data-set 1, our current analysis shows that, during the late 1990s, China's markets continued along their previous path of maturation. In the late 1990s, examining the co-movement of prices among pairs of markets in our sample, we see a significant increase in the fraction of market pairings that are integrated. In fact, some markets in China are remarkably integrated. In the case of maize, for example, in 89% of the cases, prices in one market

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move at the same time as they do in another (Table 2.4, column 2). This is up from only 28% of the time in the early 1990s. The share of market pairings (for soybeans, japonica rice and indica rice) that exhibit price integration also increases (rows 2 to 4). The integration of these markets is notable because, in many cases, the pairs of markets are separated by more than 1000 km. For example, we find soybean and maize prices in many years to be integrated between markets in Shaanxi and Guangdong provinces and between those in Sichuan Province and southern Jiangsu.

Table 2.4 Percentage of market pairs that test positive for being integrated based on Dickey-Fuller Test in rural China, 1988 to 2000

Commodity	1989–1995	1996–2000
Maize	28	89
Soybeans	28	68
Rice, Yellow River Valley (mostly japonica rice)	25	60
Rice, Yangtze Valley and South China (mostly indica rice)	25	47

Note: results for the two periods both use data from the State Market Administrative Bureau (SMAB). For results from 1989–1995 for maize and rice, see Park et al. (2002). Rice results are for the whole country in 1989–1995. Results from soybeans for 1989–1995 from Wang (1998). Results from 1996–2000 are by authors using data-set 1 (see text for details).

Despite the significant progress in terms of integration, our results do also show that there are pairs of markets during different years that are not integrated. For example, in one-third of the cases, japonica rice prices moved in one market but did not in another. The case of indica rice trade is even more notable. One explanation for such a result is that there is some kind of institutional breakdown or infrastructure barrier (e.g. some policy measure or a weak link in the transportation or communication infrastructure) that is fragmenting China's markets for certain commodities, as shown by Park et al. (2002). Nevertheless, it might also be that, since every province in China both produces and consumes rice, the following circumstance might arise. If, during a particular year in a particular area, supply is just equal to demand and price differentials between regions stay within the band between regional 'export' and 'import' prices, moderate price movements in another area may not necessarily

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induce a flow into or out of the region that is in equilibrium. Hence, even with the non-trivial number of cases in the late 1990s in which market prices in pairs of markets do not move together, based on each of the market performance analyses, one must conclude that the impacts of WTO on China's agriculture will increasingly be experienced across wide regions of the nation, from coastal to inland areas.

Results—maize and soybeans, 2000–2003

The results of the co-integration analysis for maize in the post-2000 period (using data-set 3) also support both our descriptive findings and the conclusions of the determinants of commodity price analysis. Using the Dickey-Fuller tests, all pairs of markets in the northeast are integrated in a statistically significant way (Table 2.5). Compared with the results in the late 1990s (reported in Table 2.4 and discussed in the previous subsection) our analysis shows that, since 2000, maize markets in China have continued to become more integrated. Literally all pairs of markets (100%) in the northeast sample are integrated.

In addition, the other pairs of key maize markets on the national level, for example, between Dalian and Guangzhou and Dalian and Fujian, also are integrated (Table 2.6). The integration of these markets is notable because the pairs of markets are separated by more than 1000 km in many cases. During the post-2000 period, the co-movement of prices between pairs of markets in a national sample of prices showed that maize markets were almost fully integrated (about 93% of the pairs). [Interestingly, although the linkage of price movements in the Dalian and Hubei and the Dalian and Jiangsu markets is not statistically significant, we do find that the Dickey-Fuller statistic is not far from the critical value.] These results show that maize markets nationally have continued along their previous path of maturation. Compared with the late 1990s, the percentage of integrated markets rose from 89% to 93%.

Soybean markets in the post-2000 period are also integrating rapidly. Correlation coefficients among all major soybean markets show a high degree of price co-movement (Table 2.7). In 28 of 36 unique pairs of markets, the correlation coefficient exceeds 0.9. In most cases, the coefficients are above 0.95. In the other eight cases, the correlations are still high. In no case does the coefficient fall below 0.86. Clearly, even between markets as far apart as Heilongjiang and Guangdong, prices are correlated.

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Table 2.5 Co-integration tests on northeast maize markets and Dalian market

Region	Test statistics	Lags	5% critical value	Conclusion
Augmented Dickey–Fuller tests				
1. Centre HLJ	−1.98	9	−2.89	Each one is unit root and proved to be I(1), stationary at 1st difference
2. East HLJ	−1.99	9		
3. West HLJ	−1.78	9		
4. Centre JLN	−1.99	9		
5. East JLN	−1.72	9		
6. West JLN	−1.62	9		
7. Centre LNG	−2.24	10		
8. West LNG	−2.07	10		
9. Dalian port	−2.80	16		
Augmented Dickey–Fuller tests for paired markets				
1. Centre HLJ/Dalian	−3.34	9		All paired markets are co-integrated Dalian market is integrated with all other regional markets.
2. East HLJ/Dalian	−3.49	9		
3. West HLJ/Dalian	−3.16	9		
4. Centre JLN/Dalian	−3.49	9		
5. East JLN/Dalian	−3.24	9		
6. West JLN/Dalian	−3.33	9		
7. Centre LNG/Dalian	−3.98	9		
8. West LNG/Dalian	−3.84	9		

Notes: 1. Augmented Dickey-Fuller test was implemented over the paired markets. 2. Guass program file 'adf-test.prg' is used. 3. Data-set 2 used (see text for details). Price series is bi-weekly and data are analysed at the market level (that is, there is more than one observation per province).

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Formal co-integration analysis confirms the results of the correlations. According to our results using data-set 4, all of China's major soybean markets are now integrated with markets in two regions, Heilongjiang and Guangdong (Table 2.8). We use the Heilongjiang market as a benchmark since Heilongjiang is by far the nation's top producer–marketer of soybeans. Guangdong, in contrast, is China's largest consumer of soybeans, for both oil and feed. The other markets in our sample represent all of the other soybean using markets for which data are available. In the top part of the table we show that each series has a unit root and follows a I(1) pattern, or is stationary in first differences.

Table 2.6 Co-integration tests on major maize consumption markets and the Dalian market, 1999–2003

Region	Test statistics	Lags	5% critical value	Conclusion
Augmented Dickey-Fuller tests				
1. Dalian port	0	7	–2.89	Each one is unit root and proved to be I(1), stationary at 1st difference
2. Hubei	–0.8	4		
3. Jiangsu	–1.89	10		
4. Fujiang	–1.8	7		
5. Guangdong	–1.71	7		
Augmented Dickey-Fuller tests for paired markets				
1. Hubei/Dalian	–2.46	6		Hubei and Dalian are not co-integrated
2. Jiangsu/Dalian	–2.71	6		Paired markets are co-integrated with Dalian, 5%.
3. Fujiang/Dalian	–5.09	6		
4. Guangdong/Dalian	–6.15	6		

Notes: 1. Augmented Dickey-Fuller test was implemented over the paired markets. 2. Guass program file 'adf-test.prg' is used. 3. Data-sets 2 and 3 used (see text for details). Price series are monthly and at the provincial level. 4. Johansen test on all markets confirmed the results that there are three co-integrating equations.

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Table 2.7 Correlation coefficients between each price series for all soybean markets in data

	Guangdong	Shanghai	Jiangsu	Jiangxi	Hebei	Henan	Shandong	Tianjin	Heilongjiang
Guangdong	1	0.998	0.997	0.996	0.874	0.914	0.916	0.865	0.926
Shanghai	0.998	1	0.999	0.998	0.874	0.918	0.920	0.863	0.926
Jiangsu	0.997	0.999	1	0.998	0.877	0.923	0.924	0.867	0.927
Jiangxi	0.996	0.998	0.998	1	0.891	0.933	0.935	0.881	0.940
Hebei	0.874	0.874	0.877	0.891	1	0.956	0.965	0.992	0.956
Henan	0.914	0.918	0.923	0.933	0.956	1	0.990	0.948	0.966
Shandong	0.916	0.920	0.924	0.935	0.965	0.990	1	0.955	0.971
Tianjin	0.865	0.863	0.867	0.881	0.992	0.948	0.955	1	0.946
Heilongjiang	0.926	0.926	0.927	0.940	0.956	0.966	0.971	0.946	1

Data source: data-set 4 (see text for details).

Examined in this way, we find that all markets are co-integrated with both Heilongjiang and Guangdong. The Dickey-Fuller test statistics of co-integration are all significant for all pairs of markets. This means that, in the post-2000 period, if the price moved in either Guangdong (from a consumption shock) or in Heilongjiang (from a production shock), prices moved in all other China soybean markets. Clearly, when compared with the results in Table 2.4 (which showed 68% of China's soybean markets to be integrated in the late 1990s), soybean markets have become more integrated. Although we do not pinpoint the precise reason for the rising integration—see Park et al. (2002) for a more complete analysis—the rising integration is likely due to improved infrastructure (transportation and communication), more competition in the transport sector (with the rise of private trucking) and the emergence of a huge cohort of small, private traders.

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Table 2.8 Co-integration tests on China's soybean markets with Heilongjiang and Guangdong markets as centre markets

Market	Test statistics	Conclusion
Augmented Dickey-Fuller tests (5% critical value with constant)		
Heilongjiang	−1.05	Each one is unit root, and thus, I(1).
Tianjin	−0.48	
Hebei	−0.26	
Shanghai	−1.15	
Jiangsu	−1.08	
Jiangxi	−1.09	
Shangdong	−0.33	
Henan	−0.17	
Guangdong	−1.22	
Augmented Dickey-Fuller tests for paired markets (critical value with constant and trend: (5%) −3.46; (1%) −4.06)		
Centre markets: Heilongjiang		
Tianjin	−3.87*	All markets are integrated with Heilongjiang market
Hebei	−3.73*	
Shanghai	−4.11**	
Jiangsu	−4.07**	
Jiangxi	−4.23**	
Shandong	−4.77**	
Henan	−4.8**	
Guangdong	−4.01*	

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Table 2.8 (continued)

Market	Test statistics	Conclusion
Centre markets: Guangdong		
Heilongjiang	−4.1**	All markets are integrated with Guangdong market.
Tianjin	−3.6*	
Hebei	−3.54*	
Shanghai	−3.61*	
Jiangsu	−3.63*	
Jiangxi	−3.67*	
Shandong	−4.27**	
Henan	−4.52**	

Notes: 1. Augmented Dickey-Fuller test was implemented over the paired markets. 2. Program in Eviews. 3. Data source: data-set 4 (see text for details).

Assessing village-to-regional market integration

The inter-regional integration of markets, however, is only half of the story. While the analysis in the previous section demonstrates a remarkable degree of integration between markets on the coast and those inland, such an analysis is still not sufficient to be able to state with confidence that households in China's villages are integrated into the nation's marketing network. To complete our integration analysis, we also need to examine the extent to which villages are integrated into regional markets.

Our test of village–regional market integration tests if farmers in China's villages are price takers or if they reside in villages that are isolated to the extent that local prices are determined by local supply and demand. The equation to test for village–regional market integration is:

$$P_i = a_0 + a_1 A_i + b_1 T_i + d_1 D + e_i \qquad (3)$$

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In briefest terms, if variables that affect local grain availability, A_i, in village *i* significantly affect the village's price, P_i, we will assume villages are isolated and markets do not extend into China's villages; in contrast, if the variables that affect local availability do *not* affect the price, we conclude that villagers are price takers and markets can be thought to be integrated. Availability in each village during the survey year is measured as the sum of production, P_i, and storage, S_i. We would expect that a rise (fall) in availability would negatively (positively) affect the village's price if markets are isolated. In contrast, we would expect changes in local availability to have no effect on the village's price if markets are integrated. Since it is total availability that matters (note that $A_i = P_i + S_i$), it is total availability (or production plus storage at the beginning of the period) that should enter equation (3). In our analysis, we run equation (3) separately for rice, wheat, maize and soybeans.

When examining the impact of local grain availability on the household's grain price in equation (3), other factors, D_i, need to be controlled in our cross-sectional analysis. In equation (3), we assume that D_i includes two components, one spatial—measured as the distance of the village from the county seat (the typical site of the regional market; the further the village is from the county seat, the lower the price); and the other temporal—the timing of the grain sale (if the sales of grain by the households in the village were during the first three months after the harvest, we would expect a lower price). Because village price levels in different provinces also are expected to vary due to each province's location (with respect to the port) and infrastructure (e.g. the quality of its road and rail network), we also include a provincial dummy. In the case of rice, since quality varies so much from region to region, we include regional quality dummies (one for each of south China; the Yangtze River Valley; and north/northeast China).

The data for this study were collected in a randomly selected sample of 60 villages in 6 provinces of rural China (henceforth, the China National Rural Survey—CNRS). The sample approached national representativeness. To accurately reflect varying income distributions within each province, one county was randomly selected from within each income quintile for the province, as measured by the gross value of industrial output. Two villages were randomly selected within each county. The survey teams used village rosters and our own counts to randomly choose 20 households, both those with their residency permits (*hukou*) in the village and those without. A total of 1199 households was surveyed.

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The data from the survey allow us to construct a number of variables that potentially could affect the price that the farmer received in the village. The CNRS project team gathered detailed information on both the production and marketing behaviour of all of the farmers in the sample and the characteristics of each village and its relationship to the nearest regional market. From each individual respondent in the survey in each village, we know the price and timing of the sale for each commodity. We average the price associated with all of household sales in the village, weighting each sale by its size in kilograms. With the information on timing, we can construct a set of variables that measures the proportion of village sales that occurs within each of the first three months after the harvest. From a community questionnaire, we know how far, in kilometres, the village's centre is from the nearest paved road and the distance to the county market. Finally, for each crop that the farmer cultivates, we know if the farmer's crop suffered a shock, recording both the incidence and the percentage by which the yield fell. These are aggregated to the village level. We do not include any variable that controls for the presence of a community buffer-stock system, primarily because such an institution is almost never observed in modern China. However, farmers, at least in the past, have been known to hold large stores of grain. It is possible that, in an isolated village, if a production shock occurred and the local price began to rise, farmers could draw on their own stocks and the local price could fall and exhibit no net change (thus making it appear that villages were integrated into the regional market, when in fact they were not). We use beginning of year stocks of farm households, aggregated to the village level, to measure the potential that household stocks could play in increasing availability. We can ignore sales among farmers within a village, since such transactions are rare (according to our data, less than 4% of sales are among farmers in the same village).

To test our hypothesis, we regress grain price, P_i, on total grain availability, A_i, for each of the i main staple crops (where $i = 1$), holding the other variables, T_i and D, constant. In our analysis, we measure total grain availability in three ways: as the production shock, P_i, by itself; as the production shock, P_i, and grain storage, S_i; and as the interaction between the grain storage variable and the production shock variable (or a direct proxy of $A_i = P_i + S_i$). Since the third definition (the interaction effect) is the most intuitive (because it captures total grain availability of the village in one variable), we report in Table 2.9 the results from the regressions that use this version of the variable [the results of the regressions using the alternative variables are reported in Jikun Huang et al. (2004)]. If villages are isolated from the regional markets, when there is a positive production shock and high levels of grain

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storage—that is, when the interaction term is large—the coefficient on the interaction term should be negative and significant. If markets are integrated into China's larger marketing networks, the coefficient should be insignificant.

Our analysis clearly shows markets in China are integrated down to the village level (Table 9). The signs of the coefficients (and levels of significance in some cases) on the variable measuring the distance of a village from the regional marketing centre demonstrate that the further a village is from a market, the lower the price the farmer receives. More importantly for our purposes, the *t*-ratios of the coefficients of the village supply shock variables are all small, signifying that the output of the local village's crops does not affect the local price. The main implication of this finding is that it is primarily factors outside the village that are affecting the prices that farmers receive, making them price takers. Moreover, when we interact our main variables of interest with a dummy variable that equals one when a village is poor (i.e. a village that is in the bottom two income deciles), the coefficient is still insignificant. In other words, farmers in China's villages, even remote, poor ones, are linked to China's regional markets.

EFFECTS OF MARKET EMERGENCE

Few authors have attempted to quantify the gains from market liberalisation. Part of the problem may be the short period of analysis, the inability of standard methodologies and measures or indicators of market liberalisation to separate efficiency gains of market reform from overall gains in the reforming economy, and the breadth of the studies. For China, Guangzhong Wen (1993) found total factor productivity (TFP) growth had stopped in the post-1985 period, a trend he blames on the failure of the market liberalisation stage of reform. Wen's conclusions have two shortcomings. First, his analysis ends in 1990, a period that might be too early to have allowed the liberalisation reforms to take effect. Second, he is examining the net change in TFP only and does not account for other factors that could be affecting productivity. Holding the effect of technology constant and using data through 1995, Songqing Jin et al. (2002) find that TFP growth restarts in the 1990s, a finding that they claim could be linked to increased liberalisation of the economy. Like Wen, however, they do not explicitly examine the improvements in efficiency that are associated with market development. Shenggen Fan (1999) uses stochastic, frontier production, decomposition analysis to isolate the efficiency gains of Jiangsu provincial

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rice producers in the late reform era, a time when most of the property-rights reforms had already been implemented and a time when market liberalisation was just getting started. Fan finds that there have been only limited gains in allocative efficiency since 1984, a result that he suggests is due to the partial nature of China's market liberalisation. Unfortunately, Fan does not explicitly model the interactions

Table 2.9 Ordinary least squares regression explaining effect of local grain availability on the price level of major crops in China's villages in 2000 (dependent variable: village-level price).

Explanatory variable	Rice	Wheat	Maize	Soybean
Local grain availability				
Village-level climate shocks (production shock)[a]	–	–	–	–
Village-level grain storage at the beginning of year (grain storage)[a]	–	–	–	–
Interaction: production shock * grain storage[a]	–3.15e–06 (1.31)	7.50e–07 (0.37)	–3.91e–07 (0.33)	0.000045 (0.15)
Control variables				
Distance to the nearest county (km)	–0.00074 (0.74)	–0.0079 (2.1)*	–0.0005 (0.55)	–0.032 (2.76)*
Variables representing proportion of grain marketed during each of first three months after harvest	–	Included	Included	Included
Quality dummies	Included	–	–	–
Provincial dummies	Included	Included	Included	Included
Adjusted R-square	0.16	0.38	0.50	0.15
No. of observations	31	30	28	17

Note: T-ratios in parentheses. Coefficients marked with an asterisk (*) are statistically significant from zero at the 5% level.

[a] Independent measures of production shocks and grain storage are not included in this version. See Appendix Tables 1 and 2 in Jikun Huang et al. (2004) for versions that include these variables.

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between property-rights reform and market liberalisation. Also, his study examines only one crop in one province, a fact that limits the generalisation of his study, since it is possible that many of the gains from market liberalisation may come from shifting among crops (and between cropping and non-cropping activities).

The only truly systematic attempt to measure the returns to market liberalisation in China is in our papers with de Brauw (de Brauw et al. 2000, 2004). These papers develop measures of increased responsiveness and flexibility within a dynamic adjustment cost framework—as developed by Epstein (1981)— to estimate the return to market liberalisation reforms, holding the incentive reforms and other factors constant. The authors find that the behaviour of producers in China has been affected by market liberalisation, but that the gains have been relatively small. Small gains in responsiveness (that are measured by price elasticities of factor demand for variable inputs—in this case, fertiliser) between the early and late reform periods are attributed to the gradual market liberalising changes of the late 1980s. Farmers also have increased their speed of adjustment of quasi-fixed factors (which, in the case of China's agriculture, include labour and sown area) to price changes (and other shifts in exogenous factors) between the early and late reform period.

The research reported in de Brauw et al. (2004) also measures the effects on overall welfare of the increased flexibility and responsiveness. The research found that the magnitude of the gains in efficiency from increased responsiveness and flexibility in the late reform period is positive and significant. However, the magnitude is substantially less in percentage terms (less than 1% *per year*) than that from the incentive reforms in the early reform period (up to 7% per year or about 40% over the whole period). In conclusion, it is argued that although the gains are small, they are still positive and China's gradual market reform policy appears to have avoided the collapse that was experienced throughout central and eastern Europe and Commonwealth of Independent Sates nations. It is also quite feasible that additional gains have occurred as integration has continued in the late 1990s and post-2000 period.

Unfortunately, the results of the de Brauw et al. paper cannot examine the interactions among property-rights reform and market liberalisation effects since they rely on the assumption that the time period of the reform identifies the effect of individual policies (that is, all of the property-rights reforms were complete before 1984 and market liberalisation did not begin until after 1985). The results also only

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examine the effect of market liberalisation. In Lin (1991) and Jikun Huang and Rozelle (1996), however, it is shown that the effects of property rights are enhanced when coupled with market liberalisation. If so, then the gains that were measured in de Brauw et al.'s paper and attributed to property rights, should be attributed, at least in part, to improvements in markets.

CONCLUSIONS

In this paper, we have shown, in a number of ways, the steady improvements in agricultural commodity markets that have occurred in China during the past decade. Whether we use descriptive statistics or more formal techniques, our results are consistent with the emergence of markets for rice, maize and soybeans. Moreover, markets are robust, even when looking across long distances and at different times. Transaction costs also appear to have continued to fall.

Although people who visit rural China are not surprised at these findings, such a picture of markets may be surprising when juxtaposed against the policy background. During this period when we have measured the steady increase in performance of markets, there has been an unbroken cycle of reform and reversal. Hence, despite attempts to slow down or stop the operation of markets during this time commodity markets have steadily strengthened in rural China.

The power of markets to continue to integrate, despite policy intervention attempts, perhaps more than anything shows the power of China's gradual method of transition. As argued by McMillan (1997), China's market reform has really been one of entry-driven competition. In the case of China, entry has come from both the commercialisation of the state and the emergence of a private trading sector. In doing this, China enfranchised millions of individuals in commodity trading. While this has produced the rise in integration and fall in transaction costs that have been documented in the paper, it also has eroded the power of the state to control the markets with the traditional command and control methods. Our results suggest that if the nation's leaders want—for whatever reason—to affect the price generated by the market in the future, they are going to have to devise new ways of influencing prices. Undoubtedly, as in other economies, China will increasingly have to use more indirect methods (such as floor-price supports), instead of trying to suppress trade. This means, of course, that traditional ways of dealing with markets administratively

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(such as the rice bag responsibility system) do not work and should be discontinued. There are now just too many traders to deal with, as shown by the integration trends that continued to increase even when the nation tried to stop trading.

Indeed, one of the real messages from our work is that China's leaders, domestic and foreign traders and other observers should all realise that rural China now has among the least-distorted and most-integrated agricultural markets in the world. Of course, for poverty alleviation and other purposes this is often a two-edged sword. However, with good markets, if policy makers make good investments and execute good policies, those that are involved with the production and consumption activities will benefit and such policies can be executed with a minimum amount of distortion.

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REFERENCES

de Brauw, A., Jikun Huang and Rozelle, S. 2000. Responsiveness, flexibility and market liberalization in China's agriculture. American Journal of Agricultural Economics, 82, 1133–1139.

— 2004. Gradualism and China's agricultural transition. Economics of Transition, 12, 427–466.

Engle, R.F. and Grange, C. 1987. Co-integration and error correction: representation, estimation and testing. Econometrica, 55, 251–276.

Epstein, L. 1981. Duality and functional form for dynamic factor models. Review of Economic Studies, 48, 81–95.

Guangzhong Wen 1993. Total factor productivity change in China's farming sector: 1952–1989. Economic Development and Cultural Change, 42, 1–41.

Jikun Huang and Chen, C. 1999. Effects of trade liberalization on agriculture in China: commodity and local agricultural studies. Bogor, Indonesia, United Nations ESCAP CGPRT Centre.

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Jikun Huang and Rozelle, S. 1996. Technological change: rediscovering the engine of productivity growth in China's rural economy. Journal of Development Economics, 49, 337–369.

Jikun Huang, Rozelle, S. and Min Chang 2004. The nature of distortions to agricultural incentives in China and implications of WTO accession. World Bank Economic Review, 18, 59–84.

Lin, J.Y. 1991. Prohibitions of factor market exchanges and technological choice in Chinese agriculture. Journal of Development Studies, 27(4), 1–15.

—1992, Rural reforms and agricultural growth in China. American Economic Review 82, 34–51.

McMillan, J. 1997. Markets in transition. In: Kreps, D. and Wallis, K.F., ed., Advances in economics and econometrics: theory and applications. Cambridge, Cambridge University Press, 2, 210–239.

McMillan, J., Whalley, J. and Lijing Zhu 1989. The impact of China's economic reforms on agricultural productivity growth. Journal of Political Economy, 97, 781–807.

Meyer, T. 2002. Moving China's maize: a descriptive survey of China's corn supply. Working Paper, US Grains Council.

Park, A., Hehui Jin, Rozelle, S. and Jikun Huang 2002. Market emergence and transition: transition costs, arbitrage, and autarky in China's grain market. American Journal of Agricultural Economics, 84, 67–82.

Perkins, D. 1994. Completing China's move to the market. Journal of Economic Perspectives 8.2, 23–46.

Rozelle, S., Park, A., Jikun Huang and Hehui Jin 2000. Bureaucrat to entrepreneur: the changing role of the state in China's transitional commodity economy. Economic Development and Cultural Change, 48, 227–252.

Shenggen Fan 1991. Effects of technological change and institutional reform on production growth in Chinese agriculture. American Journal of Agricultural Economics 73, 266–275.

— 1999. Technological change, technical and allocative efficiency in Chinese agriculture: the case of rice production in China. Washington, DC, International Food Policy Research Institute, EPTD Discussion Paper, January 1999.

Songqing Jin, Jikun Huang, Ruifa Hu and Rozelle, S. 2002. The creation and spread of technology and total factor productivity in China. American Journal of Agricultural Economics, 84, 916–930.

Wang, Li. 1998. Soybeans, diversity and productivity in China. Unpublished Masters thesis, Center for Chinese Agricultural Policy, Chinese Academy of Agricultural Sciences, Beijing, China.

World Bank 2002. Building institutions for markets. Washington, DC, World Development Report 2002.

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2.3 IMPROVING SECURITY AND EFFICIENCY OF THE GOVERNMENT GRAIN RESERVE SYSTEM

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CLARIFYING THE POLICY OBJECTIVE OF A GOVERNMENT GRAIN RESERVE

According to the definition of the Food and Agriculture Organization of the United Nations (FAO), the ultimate objective of food security is to ensure that 'all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life' (FAO 1983). Undoubtedly, the primary goal of food security is to ensure long-term grain supply capability for the whole nation through domestic production and reliable imports. However, even with sufficient total supply from a long-term perspective, shortages may still occur from time to time at various locations. At the same time, there always exist disadvantaged groups of people who lack the capability to access 'sufficient, safe and nutritious' food, even in a country with high income and surplus supply. To ensure that all people have access to adequate food at all times requires various policy measures, one of which is the establishment of a grain reserve to stabilise grain supply against significant short-run fluctuations. Obviously, the grain reserve, since it is not for profit, has to be established by the government.

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Annual grain supply consists of three components: total output, total net imports and changes in reserve stocks. From a long-run point of view, ensuring grain supply in an importing country requires imports and, if possible, expansion of domestic production. In a country like China, with a large and growing population facing limited and falling land and water-resource bases, expansion of domestic production requires increasingly greater efforts and costs, and increases in imports may be inevitable. Keeping a large reserve, no matter how big it is, cannot increase long-run supply, as the grain in reserve has itself to come from either domestic production or imports. Changes in reserve stocks can only be used to smooth short-term fluctuations in domestic markets; they are not capable of covering long-term supply shortages. However, though it might have secondary importance, grain reserve is still crucial to food security, and how to improve its efficiency to better serve its policy objective is the focus of this paper.

There are different reasons for storing grain: to match continuing consumption demand all year round with periodical harvests (and imports); to ensure smooth operation of processing and marketing within individual enterprises; and to safeguard national supply against unknown potential significant shocks in domestic production and/or irregular supply in the international market. Under a market system, commercial enterprises may be motivated to run their own working stocks serving the first two purposes, if the price differences among seasons make this operation profitable. In order to smooth large and uncertain fluctuations in market supply, a certain quantity of grain must be stored as reserves. Storage involves various costs including interest and losses in both volume and value due to quality deterioration etc. Price risk is also a potential cost of keeping grain stocks for reserves. However, commercial enterprises are not likely to be interested in running grain reserves to safeguard food security against uncertain inter-temporal output fluctuations as it does not necessarily bring profit but often incurs financial losses (Zhong 1995).

As commercial enterprises are generally not willing to perform this function, the responsibility for maintaining grain reserves usually rests with government. However, this does not necessarily mean that the government has to run the reserve system itself. As cost efficiency is an important, sometimes dominant, factor that determines the fate of any major policy, the government may entrust the operation to commercial enterprises through competitive bidding, in order to reduce the policy costs and to increase the actual security level.

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The objective of government reserves should be food security rather than price stabilisation and/or support. However, as the operation of government grain reserves does affect market price, it is therefore often regarded in China as a policy measure to achieve price stabilisation and/or support objectives. But it should be noted that serious problems would occur if price stabilisation was set as the objective of a government grain reserve. First, to stabilise price under any situation requires that more grain be stored than that simply needed for smoothing significant fluctuations in physical supply. Thus, costs increase. In addition, the subsequent, smaller seasonal price difference will make it less profitable for commercial enterprises to operate working stocks for their own business. They may reduce the size of their working stocks and rely on the government to provide supply at any time. Therefore, the government may have to take over the responsibility as a final supplier for all needs, implying an even higher burden on its budget.

Second, the objective of food security would be undermined if price stabilisation were set as the goal for a government reserve. Price fluctuation is often an efficient signal to guide subsequent production, consumption and trade. Its proper functioning is essential to ensure long-run balance in the grain market. If price signals are disturbed by the operation of the grain reserve to achieve price stabilisation, increasing and accumulating imbalances in the grain market are likely to be observed in subsequent years. In this case, not only will the policy costs of the grain reserve increase, but also its function will be disturbed. The government may face the risk of insufficient stocks when real need actually arises.

Although a grain reserve could be used to moderate sharp price fluctuations in the short run, it is not recommended that this be done frequently. Price fluctuations are an effective signal to bring dynamic balance between demand and supply, and seasonal price differences are necessary for commercial enterprises to maintain 'normal' stocks in running their own business. Eliminating such price differences will lead to an accumulated imbalance in the market and commercial enterprises unwilling to keep their own stocks, relying rather on government to take over the responsibility for all types of stocks and to bear the costs. In this case, the policy costs of a grain reserve will increase for other goals, and the function of the grain reserve will be disturbed.

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In summary, different policy measures are required to achieve different food-security objectives. A grain reserve serves the purpose of balancing year-to-year market demand and supply by smoothing out large variations in grain production over the years. Therefore, the changes in grain reserves should be determined mainly by the difference between actual and expected total output, with certain considerations for the cumulative changes in stock. They should also be coordinated with annual imports and exports in both types and volumes. A competitive mechanism should be introduced into the operation of the reserve system, in order to bring down the operational costs and to enhance food security in an economically sustainable manner.

IMPROVING EFFECTIVENESS AND EFFICIENCY OF THE GOVERNMENT GRAIN RESERVE THROUGH INTEGRATED APPROACHES

As with any other policy, the success of the grain reserve program depends largely on whether or not the policy costs are kept at an acceptable level. There is no doubt that reducing costs of running the grain reserve will ensure success of the program and hence raise the food-security level. The primary objective of the grain reserve is to smooth inter-temporal and inter-regional output fluctuations, i.e. sharing production fluctuations among different time periods and regions just like an insurance program. As in any insurance program, the cost of running grain reserves depends on the preset security level as well as the area covered by the reserve system. To achieve a certain security level, a unified, nationwide reserve program is likely to incur much lower costs than segmented programs run by each province to smooth local fluctuations. In addition, proper utilisation of international markets may actually substitute for part of the domestic reserve, further reducing policy costs for running the grain reserves.

However, use of the international market would be feasible and beneficial only if there is enough long-term supply in the international market, and the fluctuation of supply in the international market is not positively correlated with that in the domestic market. In the next section, we will analyse the feasibility of China using the world market for food-security purposes, and compare national versus regional reserve programs in the section after that.

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1. Potential long-run supply in the world grain market

The world's food-security status has improved in recent decades. The world total and per-capita grain outputs were 553 million tonnes (t) and 234 kg, respectively, immediately after World War II. Those values increased to 1.84 billion t and 380 kg in 1985, representing increases of 245% and 62%, respectively, in 40 years. World total grain output increased further to 2.07 billion t in 1997. Table 2.10 shows that world grain production averaged 1.76 billion t per year for the first three years of the 1990s and 1.88 billion t for the last three years of the decade, an increase of 7.1%. The world end stock of grain also increased with output, from 250 million t in 1996 to 313 million t in 1998, equivalent to 14.2% and 16.8%, respectively, of total annual consumption.

Table 2.10 World grain production and consumption trends

	1990–1991	1991–1992	1992–1993	1993–1994	1994–1995	1995–1996	1996–1999	1997–1998	1998–1999	1999–2000	2000–2001
Sown area (million ha)	694	692	694	686	687	681	702	693	685	673	667
Output (million t)	1768	1708	1790	1714	1763	1711	1870	1890	1873	1873	1839
Growth rate (%)		3.4	4.8	4.2	2.8	3.0	9.3	1.1	0.4	0.0	1.8
Export (million t)[a]	202	221	219	202	216	204	210	207	223	240	233
Consumption (million t)[b]	1724	1722	1752	1760	1777	1764	1837	1862	1842	1876	1876
End stock (million t)[c]	339	325	363	317	303	250	284	313	524	520	494
Stock/consumption (%)	19.7	18.9	20.7	18.0	17.1	14.2	15.5	16.8	28.4	27.7	26.3

Source: World economic yearbook, various issues. Beijing, China Economic Press.

Note: Rice statistics in this table refer to milled rice, not paddy. The value would be more than 100 million t larger if measured as paddy.

[a] Intra-EU and intra-CIS trades are not included.

[b] Changes in stock are included.

[c] Measured in various marketing years; data are missing for some countries.

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It is estimated that the world grain output will continue to increase at a rate of 1.8% per year, with annual consumption increasing by less than 1.6%. Assuming the same trade dependency rate of grain as at present, world grain exports in 2010 will reach 328 million t. According to the FAO, there are no insurmountable technological and resource constraints in grain production from a global perspective. While the annual output increase of grain could be as high as 1.8%, the annual growth rate of population could decline to 1.3% or even lower (Lin 1996). Based on those studies, the growth rate of grain production is likely to continue to surpass that of population, resulting in increased per-capita supply over time.

There are still rich resources under-utilised in many parts of the world. According to the United Nations, more than 360 million hectares of arable land remain idle, much of which could easily be brought into cultivation. One example is idle land in North America and the EU; if brought into production, it may yield some 40 million t of grain. Besides, the land productivity in many countries is not as high as it could be, due to the low returns at current low prices. Grain price increases in the face of a possible shortage in supply would prompt a large supply response.

The impact of technology innovation on grain output should not be neglected either. The world average yield is not at all as high as it could be. If in the next few decades it reaches that of the US at the present time, total world grain output would reach 3.3 billion t (Xu 1998), enough to satisfy global demand for grain. The development and application of suitable technology to increase yield will occur when it is profitable to do so. Additional potential exists with the development and application of modern biotechnology.

2. Correlation of output fluctuations between China and the rest of the world

The long-run supply capacity in the world market does not necessarily guarantee that imports will be available to China at all times. As grain production fluctuations occur in both China and the rest of the world, it is important that they do not occur simultaneously and in the same direction if the world market is to be used as a substitute for domestic grain reserves.

An analysis has been made of the correlation of grain output fluctuations between China and the rest of the world (ROW), using data from the past two decades. Since soybean is used in large quantities as a feed grain in China, it is also included in our

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study. It should be explained that the output fluctuation is defined as the difference between the actual and expected 'normal' outputs of the year. In other words, it is taken as the variation of the actual output compared with the long-term trend.

Table 2.11 shows the expected 'normal' output of grain and the fluctuation for China and ROW (cereals output is used for ROW) during 1978–2001.

From Table 2.11 it can be seen that the directions of fluctuations in China and the ROW are opposite for 14 of the 24 years. The calculated correlation coefficient shows that there is no significant correlation between the two series of fluctuations (see Table 2.12 for details). The result is in line with a common understanding that the wide diversity of climatic, topographical, technological, institutional and policy factors in different countries should mitigate against convergence of production fluctuations. Table 2.12 lists the correlation coefficients between output in China and ROW for the major grains—rice, maize, wheat and soybean. It can be seen that there is no significant correlation between the production fluctuations for most of the commodities. The sign of coefficients for rice and maize is negative, showing different directions of fluctuations in the two markets, and suggesting that international markets could profitably be used to smooth domestic fluctuation. A more-detailed study will be carried out to analyse the coefficient for wheat, 0.36, which is relatively higher than all other values in the table.

Since most grain exports come from a few exporting countries, a study was made of the correlations between fluctuations in China and the major exporting countries. The results are given in Table 2.13.

The results show negative correlation coefficients for maize and rice between China and major exporters, while those for soybeans are higher but not significantly so. For these commodities there is little correlation of output fluctuations between China and major exporters.

Wheat is the major grain that China imports. The results in Table 2.13 show relatively high positive fluctuation coefficients between wheat outputs in China and some major exporters. However, although the coefficients of output fluctuation between China and Canada, China and EU-15 are above 0.4, the coefficients between China and other major exporting countries—USA, Australia and Argentina—are either lower or negative, implying no statistical correlation.

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Table 2.11 Fluctuations in cereals output (million t) in China and the rest of the world, 1978–2001

	China			World, excluding China		
Year	Actual output	Expected output	Variations	Actual output	Expected output	Variations
1978	273.0	290.2	−17.2	1309.1	1278.6	30.5
1979	292.7	297.5	−4.8	1244.9	1296.2	−51.2
1980	280.3	304.8	−24.5	1269.9	1313.7	−43.8
1981	286.4	312.1	−25.7	1346.3	1331.2	15.1
1982	315.4	319.4	−4.0	1377.2	1348.7	28.5
1983	345.6	326.7	18.9	1281.2	1366.2	−85.0
1984	365.9	334.0	31.9	1420.7	1383.7	37.0
1985	339.9	341.3	−1.4	1481.2	1401.2	79.9
1986	352.1	348.6	3.5	1481.5	1418.8	62.8
1987	359.2	355.9	3.3	1411.9	1436.3	−24.4
1988	351.8	363.2	−11.4	1375.2	1453.8	−78.6
1989	367.6	370.5	−2.8	1503.3	1471.3	32.0
1990	404.4	377.8	26.6	1547.1	1488.8	58.3
1991	398.5	385.1	13.4	1490.9	1506.3	−15.4
1992	404.3	392.4	11.9	1569.0	1523.8	45.2
1993	407.9	399.7	8.3	1495.0	1541.3	−46.4
1994	396.5	407.0	−10.5	1560.3	1558.9	1.4
1995	418.7	414.3	4.4	1478.2	1576.4	−98.2
1996	453.7	421.6	32.1	1617.4	1593.9	23.6
1997	445.9	428.9	17.1	1648.2	1611.4	36.8
1998	458.4	436.2	22.2	1627.9	1628.9	−1.0
1999	455.2	443.4	11.7	1629.8	1646.4	−16.6
2000	407.3	450.7	−43.4	1652.5	1663.9	−11.4
2001	398.4	458.0	−59.6	1702.4	1681.4	21.0

Note: Expected output is measured by linear regression against time.

Data source: FAO production yearbook, various years.

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Table 2.12 Correlation of grain and soybean output fluctuations between China and the rest of the world

	Cereals	Rice	Maize	Wheat	Soybeans
Correlation coefficient	0.09	−0.20	−0.15	0.36	0.01

Data source: FAO production yearbook, various years.

Table 2.13 Correlation coefficients for grain and soybean output fluctuations between China and major grain exporting countries

Maize	Major exporters −0.08	USA −0.05	Argentina −0.13	South Africa −0.19		Thailand −0.17
Rice	Major exporters −0.20	Thailand −0.28	USA −0.55	India −0.02	Pakistan −0.08	Vietnam −0.28
Wheat	Major exporters 0.44	USA 0.27	Canada 0.43	Australia −0.06	EU−15 0.43	Argentina −0.02
Soybeans	Major exporters 0.02	USA 0.004		Argentina −0.13		Brazil 0.18

Data source: FAO production yearbook, various years.

A similar study has been conducted to analyse the correlation between wheat output fluctuations in China and other major importers. The low correlation coefficients (Table 2.14) show that the probability of other major world importers having abnormally low outputs, and turning to the international market for imports at the same time as China, is very low.

Table 2.14 Correlation of wheat output fluctuations between China and major importers

	Major importers	Japan	Italy	Brazil	Former USSR
Correlation coefficient	−0.17	0.24	0.25	0.15	−0.2

Data source: FAO production yearbook, various years.

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CHINA'S CAPACITY FOR FOREIGN EXCHANGE PAYMENT

Besides the availability of grain in the world market, in terms of both long-run supply capacity and short-run output fluctuations, another important concern for China's use of international grain markets is the availability of financial resources. This concern is basically related to China's foreign exchange earnings (FEE) flow in each year, as well as China's foreign exchange reserve (FER) stock accumulated in any given year when China has a high demand for grain imports.

China's foreign exchange earnings and foreign reserve levels for the 1990–2001 period are summarised in Table 2.15.

Table 2.15 China's foreign exchange earnings (FEE) and reserves (FER), 1990–2001 (US$ billion)

Year	1990	1993	1995	1996	1997	1998	1999	2000	2001
FEE	57.37	86.56	147.24	171.68	207.25	207.59	220.96	279.56	229.40
FER	11.09	21.20	73.58	105.03	139.89	144.96	154.68	165.57	212.17

Data source: China foreign economics and trade yearbook, various years. Beijing, China Economic Press.

China's trade has increased very rapidly in the past 20 years. However, the imports of food, and grain in particular, did not increase at the same pace as total imports. Their shares in total imports declined from 10–20% in the early 1980s to less than 10% and 5%, respectively, in the mid and late 1980s, and then to less than 5% and 2%, respectively, in the 1990s. In the first years of the 21st century, the proportion of grain imports in the total is below 0.5% (see Table 2.16 for details).

In the 1990s, the foreign exchange payment needed for grain imports was around US$1–2 billion, only 2.5% of the annual exchange earnings, and of the FER. Even if grain imports rise substantially in the future, there should be no FER shortage for their purchase.

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Table 2.16 China's total and food imports

Year	Total imports	Food and live animals used chiefly for food		Grains		
	US$ billion	US$ billion	% as total imports	US$ billion	% as total imports	% as food imports
1980	20.02	2.96	14.79	2.48	12.39	83.78
1981	22.01	3.62	16.45	3.24	14.73	89.50
1982	19.28	4..0	21.78	3.41	17.69	81.19
1983	21.39	3.12	14.59	2.48	11.59	79.42
1984	27.41	2.33	8.50	1.83	6.68	78.54
1985	42.25	1.55	3.67	1.00	2.37	64.52
1986	42.90	1.62	3.78	1.08	2.52	66.67
1987	43.21	2.44	5.65	1.75	4.05	71.72
1988	55.28	3.48	6.30	1.90	3.44	54.60
1989	59.14	4.19	7.08	3.00	5.07	71.60
1990	53.35	3.34	6.26	2.35	4.40	70.36
1991	63.79	2.80	4.39	1.64	2.57	58.57
1992	80.59	3.15	3.91	1.75	2.17	55.56
1993	103.95	2.21	2.13	1.01	0.97	45.70
1994	115.69	3.12	2.70	1.32	1.14	42.31
1995	132.08	6.13	4.64	3.61	2.73	58.89
1996	138.84	5.67	4.08	2.58	1.86	45.50
1997	142.36	4.30	3.02	0.92	0.65	21.40
1998	140.17	3.79	2.70	0.72	0.51	19.00
1999	165.699	3.62	2.20	0.52	0.32	14.48
2000	225.094	4.76	2.11	0.59	0.26	12.48
2001	243.613	4.98	2.04	0.63	0.26	12.74

Data source: China foreign economics and trade yearbook, various years. Beijing, China Economic Press. China statistical yearbook, various years. Beijing, China Statistical Press.

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SUMMARY

The foregoing analysis shows that there is no significant correlation between grain output fluctuations in China and the rest of the world over the past few decades. In the future, the magnitude of fluctuations in domestic production caused by policy changes is not likely to exceed that in the past 20 years in both China and other major grain producers. Improved decision-making in grain production will confine output fluctuations more to the domain of natural conditions. The wide diversity of geographical positions and natural conditions among different countries in the world makes the probability of natural disasters occurring in all countries at the same time very low. On the other hand, development of science and technology will enable humankind to better fight unfavourable natural conditions for better harvests.

All of these factors indicate that the fluctuation of grain output between China and the rest of the world in the future should not be large compared with previous experience. Assuming future production fluctuations follow the previous trend, the availability of grain in the world market for China's import needs should be assured, and China has sufficient foreign exchange earnings to import the quantities of grain and other food items that it needs.

ESTIMATING THE LONG-RUN LEVEL OF GOVERNMENT GRAIN RESERVE NEEDED

Given the security objective set, the level of grain reserve needed is determined by the level of annual fluctuations and the distribution of the fluctuations over time, as well as the area covered by the reserve program. If a reserve program is set to smooth out all fluctuations completely, the quantity required must be larger than for a program with the lesser objective of smoothing out only part of the fluctuation and leaving the rest to the market. If a grain reserve program is set to smooth output fluctuations in each province independently, the sum of the required maximum capacity will be much larger than the quantity required by an integrated, nationwide reserve program. If the world market is used to absorb part of the domestic fluctuations, then the grain reserve needed is smaller than that required under a closed market/reserve situation.

The following study shows that the establishment of an integrated national market with partial use of the world market is one of the most important policy measures to improve food security in terms of stabilising domestic supply at low cost.

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1. Regional versus national grain reserve programs

There are different ways to measure fluctuation between years and hence the suggested quantities of stocks to absorb it may vary. Our attempt to determine the fluctuation is based on the difference between the actual and expected outputs each year, with the latter estimated by a simple, linear regression against time.

The estimate in this study is made for the years 1965–99. China experienced extreme disasters in grain production during the early 1960s, largely due to policy failures. It is generally recognised that China recovered from the crisis in 1965, when economic growth returned to normal patterns. Grain production dropped sharply in the past few years; since that might exaggerate the time trend, figures for recent years are excluded.

The actual grain output, the estimated expected values, the calculated annual fluctuations, and the accumulated fluctuations are given in Table 2.17. The largest accumulated positive fluctuation occurred in 1967 at 31.50 million t, and the largest accumulated negative fluctuation in 1981 at 53.71 million t. If we assume that the reserve is able to provide normal supply in all bad years and absorb surplus output in all good years, the maximum capacity should be 85.21 million t.

However, the above analysis is made under the assumptions of an integrated national grain market and an effective and integrated grain reserve program. If the grain market is segmented at provincial level, and/or if the grain reserve programs are managed independently by provincial governments, to smooth out production at provincial level the maximum capacity of grain reserves required will be much larger. The same estimation approach is applied to each province in China for the same time period. The results are summarised in Table 2.18.

It is understandable that the ratio of variation is much higher at the provincial level than at the national level: it is determined by the size of coverage if other conditions are the same. Of the total 29 provinces, there are 20 that have a maximum ratio of variation exceeding 20% of output, and 6 provinces where it exceeds 30%. Some provinces have a ratio of variation greater than 50%. Without an inter-regional transfer scheme, the maximum capacity of grain reserves would be 346 million t under segmented provincial grain reserve programs, almost four times as high as that required under an integrated, national reserve program. It can be expected that the reserve capacity required would be even larger if segmented programs ran at sub-provincial levels.

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Table 2.17 Variations in China's grain output, 1965–1999

Year	Actual output (million t)	Expected output (million t)	Variation (%)	Ratio of variation	Accumulated variation
1965	194.50	188.7	5.8	3.10	5.8
1966	214.00	198.3	15.7	7.93	21.6
1967	217.80	207.9	9.9	4.78	31.5
1968	209.10	217.5	−8.4	−3.87	23.1
1969	211.00	227.1	−16.1	−7.09	7.0
1970	240.00	236.7	6.2	2.64	13.2
1971	250.10	246.3	3.9	1.57	17.1
1972	240.50	255.9	−15.4	−6.02	1.7
1973	264.90	265.5	4.7	1.77	6.4
1974	275.30	275.0	0.2	0.08	6.6
1975	284.50	284.6	−0.1	−0.05	6.5
1976	286.30	294.2	−7.9	−2.70	−1.4
1977	282.70	303.8	−21.1	−6.95	−22.5
1978	304.80	313.4	−8.7	−2.76	−31.2
1979	332.10	323.0	9.1	2.81	−22.1
1980	320.60	332.6	−14.4	−4.33	−36.5
1981	325.00	342.2	−17.2	−5.03	−53.7
1982	354.50	351.8	1.6	0.46	−52.1
1983	387.30	361.4	25.9	7.16	−26.2
1984	407.30	371.0	36.3	9.78	10.1
1985	379.10	380.6	−1.5	−0.39	8.6
1986	391.50	390.2	1.3	0.34	9.9
1987	403.00	399.8	4.9	1.24	14.8
1988	394.10	409.4	−10.1	−2.46	4.7
1989	407.60	419.0	−4.6	−1.09	0.2
1990	446.20	428.6	23.3	5.43	23.5
1991	435.30	438.2	−2.9	−0.66	20.6

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Table 2.17 (cont'd) Variations in China's grain output, 1965–1999

Year	Actual output (million t)	Expected output (million t)	Variation (%)	Ratio of variation	Accumulated variation
1992	442.70	447.8	−5.1	−1.14	15.5
1993	456.40	457.4	−0.9	−0.19	14.6
1994	445.10	467.0	−21.9	−4.68	−7.3
1995	466.60	476.6	−9.9	−2.09	−17.2
1996	504.50	486.2	18.4	3.78	1.2
1997	494.20	495.7	−1.6	−0.32	−0.4
1998	512.30	505.3	7.0	1.38	6.6
1999	508.40	514.9	−6.6	−1.27	0.0
Maximum capacity required					85.21

Data source: China agricultural yearbook, various issues. Beijing, China Agricultural Press.

2. Complete versus partial absorption of supply fluctuations

The policy objective of the reserve program may not necessarily be complete absorption of all fluctuations; instead, the government may choose a lower food-security goal, allowing a certain degree of fluctuation in grain supply to be absorbed by the market. First, grain and food-processing industries could serve as a buffer for the fluctuations, and animal production could also adjust to a large extent to the changing grain supply in the market. Second, consumption of grain is elastic to price change resulting from supply fluctuation. A well-functioning market itself is an effective instrument to absorb fluctuations.

If the policy goal allows the market to absorb part of the fluctuations, say 2% of the variation in the normal output, then the reserve program regulates the variation above 2% and does not further interfere with the market. Under this assumption, the reserve level needed would be much lower than that for a 100% absorption program. A further step will be the integration of the domestic market with the rest of the world. If surplus grain is sold onto the world market during good harvests and additional supply is bought during bad harvests, the international spatial market is actually turned into an inter-temporal one, or a kind of reserve.

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Table 2.18 Variations in China's grain output at provincial level 1965–1999

Region	Maximum variation (%)		Accumulated variation (million t)		Reserve capacity required (million t)
	Positive	Negative	Positive	Negative	
Beijing	17.40	−27.24	1.61	−0.67	2.29
Tianjin	43.44	−29.89	0.80	−0.98	1.79
Hebei	14.84	−15.46	6.11	−7.96	14.07
Shanxi	15.39	−18.81	2.55	−2.90	5.45
Inner Mongolia	109.77	−38.43	10.54	−12.83	23.37
Liaoning	23.33	−29.97	7.11	−6.18	13.29
Jilin	39.69	−27.89	8.71	−8.34	17.05
Helongjiang	53.47	−32.86	15.75	−19.67	35.42
Shanghai	19.49	−17.30	0.97	−1.24	2.21
Jiangsu	22.36	−15.97	15.52	−13.27	28.78
Zhejiang	28.96	−16.71	12.28	−11.12	23.40
Anhui	13.28	−24.86	8.63	−5.47	14.11
Fujian	13.56	−19.13	3.00	−3.16	6.16
Jiangxi	21.39	−12.72	5.45	−5.28	10.73
Shangdong	24.58	−12.93	7.28	−8.75	16.03
Henan	16.33	−10.98	5.62	−7.67	13.29
Hubei	13.49	−20.11	7.25	−6.96	14.21
Hunan	20.17	−14.55	13.51	−10.93	24.45
Guangxi	10.92	−11.44	4.79	−3.39	8.18
Guangdong	23.41	−19.60	5.44	−3.79	9.22
Sichuan	15.47	−13.25	11.99	−14.48	26.46
Guizhou	21.71	−22.50	3.35	−5.65	9.01
Yunnan	10.85	−12.41	2.18	−3.21	5.39
Tibet	22.72	−28.21	0.34	−0.41	0.74
Shaanxi	12.77	−19.96	3.59	−2.45	6.04
Gansu	22.27	−18.29	2.76	−2.49	5.25

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Table 2.18 (cont'd) Variations in China's grain output at provincial level 1965–1999

Region	Maximum variation (%)		Accumulated variation (million t)		Reserve capacity required (million t)
	Positive	Negative	Positive	Negative	
Qinghai	16.45	–23.74	0.23	–0.35	0.58
Ningxia	78.85	–30.83	1.27	–1.60	2.87
Xinjiang	72.50	–22.75	3.60	–2.94	6.54
Sum					346.4

Data source: China agricultural yearbook, various issues. Beijing, China Agricultural Press.

Two scenarios are simulated in this study. Scenario I assumes that the reserve regulates only when fluctuation exceeds 2% of normal output, while scenario II further assumes that the reserve regulates only half of the fluctuation exceeding the 2% level, leaving the other half to the international market. The results of the simulation are given in Table 2.19.

It can be seen from Table 2.19 that scenario I requires a maximum reserve capacity of 59.34 million t, 26 million t lower than that in the case where the reserve is to absorb 100% of output fluctuations (see Table 2.17), while scenario II requires only 29.8 million t of reserve capacity. Under this scenario, the international market functions as a reserve facility to regulate domestic supply, with lower costs to provide the same level of food security. The combined utilisation of both domestic and international markets, complementary with the government reserve program, should be considered as one of the optimal alternatives to enhance food security in terms of stabilising domestic supply.

3. Cost comparison

A rough, categorised comparison of the policy costs is provided below. First, the difference between the costs of infrastructure investment is quite significant. If the maximum level of smoothing annual grain supply is the policy goal set for the reserves, the total storage capacity should be 85 million t or 346 million t, respectively, depending on whether the reserve program is integrated at national or segmented at provincial levels. In the former case, possible additional costs are related to transportation facilities required to link spatial markets. However,

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Table 2.19 Simulations of grain reserve operations (million t)

Year	Scenario I[a]		Scenario II[b]	
	Annual change	Accumulated changes	Annual change	Accumulated changes
1965	2.07	2.07	1.03	1.03
1966	11.75	13.82	5.87	6.91
1967	5.78	19.60	2.89	10.10
1968	−4.07	15.53	−2.03	8.02
1969	−11.56	3.97	−5.78	2.13
1970	1.51	5.49	0.76	2.90
1971	0	5.49	0	2.90
1972	−10.28	−4.79	−5.14	−2.29
1973	0	−4.79	0	−2.29
1974	0	−4.79	0	−2.29
1975	0	−4.79	0	−2.29
1976	−2.05	−6.83	−1.02	−3.32
1977	−15.03	−21.87	−7.52	−10.83
1978	−2.40	−24.26	−1.20	−12.02
1979	2.63	−21.64	1.31	−10.71
1980	−7.75	−29.39	−3.87	−14.57
1981	−10.35	−39.74	−5.18	−19.70
1982	0	−39.74	0	−19.70
1983	18.64	−21.10	9.32	−10.48
1984	28.88	7.78	14.44	3.78
1985	0	7.78	0	3.78
1986	0	7.78	0	3.78
1987	0	7.78	0	3.78
1988	−1.90	5.88	−0.95	2.85
1989	0	5.88	0	2.85
1990	14.69	20.57	7.35	10.06
1991	0	20.57	0	10.06
1992	0	20.57	0	10.06

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Table 2.19 (cont'd) Simulations of grain reserve operations (million t)

Year	Scenario I[a]		Scenario II[b]	
	Annual change	Accumulated changes	Annual change	Accumulated changes
1993	0	20.57	0	10.06
1994	−12.52	8.05	−6.26	3.94
1995	−0.41	7.65	−0.20	3.73
1996	8.66	16.31	4.33	8.06
1997	0	16.31	0	8.06
1998	0	16.31	0	8.06
1999	0	16.31	0	8.06
Maximum capacity required		59.34		29.8

[a] Scenario I assumes that no change occurs in the government grain reserve if the annual fluctuation in grain output is less than 2% of the expected one, and all excessive fluctuations will be balanced by operations of grain reserves.

[b] Scenario II assumes that all excessive fluctuations will be balanced by operations of grain reserves and international trade in equal shares.

Data source: China agricultural yearbook, various issues. Beijing, China Agricultural Press.

transportation facilities are used by all sectors for different purposes, so their costs are also shared by other economic activities. The part of the costs to be shared by grain reserves is likely to be reduced gradually, as the growth of the whole economy is much faster, and as transportation conditions improve accordingly. In the latter case, the costs of building warehouses to store an additional 261 million t of grain, as well as the costs of maintenance and depreciation associated with the storage facilities, are extra, and are much greater than the abovementioned additional costs for transportation facilities. And these costs are likely to increase, as the maximum reserve capacity is likely to increase with total grain production and supply.

Second, the difference between direct annual storage costs is likely to be huge. The day-to-day operation of the reserves requires physical storage and financial costs, and incurs losses in both quantity and quality. Altogether, such costs are likely to be as high as 20% of the grain in reserves, in value terms. Therefore, the additional operational costs for segmented reserve programs are likely to be equivalent to 52 million t

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of grain, or around 10% of annual production, or several times total annual imports. Thirdly, the difference between marketing costs is not negligible. Grain must be collected and delivered to elevators and then shipped to final warehouses to be stored as reserves, and the procedure will be later reversed. An integrated program might lead to longer shipment distances; however, the larger quantity of grain to be shipped under a segmented arrangement would incur much greater marketing costs. If the marketing costs are equivalent to 10% of the grain marketed in value terms, and the average duration in reserves is assumed to be two years, then the additional annual marketing costs would be equivalent to 13 million t of grain for programs segmented at provincial level (216 million t of extra reserves, measured in maximum capacity, divided by 2 to yield the average quantity in storage, and then increased by 10%).

4. Summary

Compared with segmented grain reserve programs, a unified, national program requires a much lower reserve level and maximum reserve capacity to ensure the same level of food security, with only one-quarter of the maximum reserve capacity needed by segmented provincial programs. Furthermore, if part of the production fluctuation, say 2% of the annual expected output, is left to the market, the maximum reserve capacity needed would be further reduced by 30%. If the international market is also utilised, regulating 50% of the output fluctuation on top of the 2%, the maximum reserve capacity needed would be further reduced by another half.

POLICY IMPLICATIONS

An optimal government reserve program requires efficient use of scarce resources. This implies minimisation of cost or maximisation of net gains in achieving the specified objective. The grain reserves discussed in this paper are used to serve the policy goals of ensuring food security, defined as smoothing significant annual fluctuations in grain supply. As such, certain policy costs are inevitable and acceptable to the public. However, it is socially and politically desirable that the costs be minimised for the same level of food security. To a certain extent, the sustainability of a reserve program depends on keeping the policy costs at an acceptable level.

Obviously, the policy cost is determined by goals. In order to pursue a food-security objective, other goals should be excluded from the reserve program. Although grain reserve could be used to moderate sharp, short-term fluctuations in market

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price at any time when necessary, it is not recommended that this be done often. The objective of government reserves should be focused on smoothing significant inter-temporal fluctuations in market supply caused by crop failures.

It is also obvious that policy costs incurred with a grain reserve program depend on the coverage of the program. An integrated reserve program with proper use of both domestic and international markets is the most cost-efficient way to smooth inter-temporal output fluctuation and achieve the same level of food security.

The ultimate goal of a grain reserve program should be restricted to ensuring relatively stable food supply against inter-temporal fluctuations in domestic grain production and, to a lesser extent, against big fluctuations in the world market. The reserve should be operated as a unified national program and integrated with the world market. The physical operation of the reserve may be entrusted to commercial enterprises, and diversified international suppliers should be sought.

REFERENCES

Editorial Committee Various years. China agricultural yearbook. Beijing, China Agricultural Press.

— Various years. China foreign economics and trade yearbook. Beijing, China Economic Press.

— Various years. World economic yearbook. Beijing, China Economic Press.

FAO (Food and Agriculture Organization of the United Nations) 1983. Approaches to world food security. Rome, FAO.

— Various years. Production yearbook. Rome, FAO.

Lin, Z. 1996. The increasingly serious situation of world food security (shijie liangshi anquan xingshi riqu yanzhong). Reform (Gaige), 2, 32–38.

National Statistical Bureau Various years. China statistical yearbook. Beijing, China Statistical Press.

Xu, G. 1998. World grain demand and supply and China's countermeasures (shijie liangshi gongqiu xingshi yu woguo de duice). World Economy (Shijie Jingji), 3, 6–11.

Zhong, F. 1995. The impacts of stable policy and integrated market on food security in China (wending de zhengce he tongyi de shichang dui woguo liangshi anquan de yingxiang). Chinese Rural Economy (Zhongguo Nongcun Jingji) 7, 44–47.

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FURTHER READING

Carter, C.A. et al. 1996. China's ongoing agricultural reform. San Francisco, The 1990 Institute.

Casley, D.J. et al. 1984. Instability of production and its impact on stock requirements. Rome, FAO Monthly Bulletin of Agricultural Economics and Statistics.

Crosson, P. and Anderson, J.R. 1992. Resources and global food prospects: supply and demand for cereals to 2030. Washington, DC, World Bank Technical Paper 184.

Eaton, D.J. 1980. A system analysis of grain reserves. Washington, DC, US Department of Agriculture.

FAO (Food and Agriculture Organization of the United Nations) 1993. Agriculture towards 2010. Rome, FAO.

FAO (Food and Agriculture Organization of the United Nations)/WHO (World Health Organization) 1992. Nutrition and development: a global assessment. Rome, FAO.

Hazell, P., ed. 1986. Summary proceedings of a workshop on cereal yield variability. Washington, DC, International Food Policy Research Institute.

Islam, N., ed. 1995. Population and food in the early twenty-first century: meeting future food demand of an increasing population. Washington, DC, International Food Policy Research Institute 2020 Vision.

Mitchell, D. and Ingco, M. 1993. The world food outlook. Washington, DC, World Bank.

Valdes, A., ed. 1981. Food security for developing countries. Boulder, Colorado, Westview Press.

World Bank 1999. Global commodity markets. Washington, DC, World Bank.

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2.4 INTERNATIONAL EXPERIENCES IN GRAIN-RESERVE MANAGEMENT POLICIES:

LESSONS FOR CHINA

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INTRODUCTION AND CONTEXT

Understanding the evolution of the 'geopolitics' of food security in China is a precondition to making meaningful recommendations on lessons from other countries. The core of China's food-security policy objective appears to have been maintenance of a stable grain supply at relatively low and stable prices in urban areas rather than a focus on poor rural areas. This has been done through a system of policies and institutions relating to grain marketing, government-held grain reserves and grain self-sufficiency targets at national, provincial and local levels.

Part of the lingering geopolitics of basic food supply (in terms of calories from grain) can be traced back to the 1949 revolution. Mao took over a starving nation. Political stability required stability in the food supply, including regional considerations, in an era of poor communications and transportation. Regional food shortages are often the seeds of revolution. Furthermore, isolation from the rest of the world required a home-grown food supply. The policy response was a target of 95% local and regional food-grain self-sufficiency. This became part of the ideology and remnants of it remain in some political circles.

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The current situation is best summarised as follows. Although some aspects of the grain-reserve management system have improved in the past several years, it is still one of the weakest and least-understood parts of China's food security program. In many ways, despite the reforms, it is dysfunctional. The rules for management and release are unclear. There is confusion among the different holders of grain. The lack of transparency creates chaos in grain markets and contributes to greater variability in grain prices. Because no-one knows the level of stocks or the quantities of planned (or actual) release, domestic producers and traders and international trading agencies cannot make decisions based on full information. Rules for purchases and sales need to be open; public information on markets can internalise all of the factors that will affect short- and long-run price expectations which, in turn, will affect production and storage and sales decisions.

Even a cursory review of grain marketing and food-security issues in China and how these are dealt with in other countries suggests that there are no ready-made solutions to be found elsewhere. This paper attempts to identify some dimensions of other countries' approaches that may be relevant to a 'made in China' approach to grain-reserve management. It should be noted that grain-reserve management and food-security issues are part of a larger set of economic development and poverty-reduction issues, as well as reflecting changing roles of government and implementing agencies. Of necessity, not all of these dimensions can be fully explained (or understood!) in the review that follows. This paper focuses on circumstances in Asian countries, with only brief opening comments on the situation in exporting countries and Africa. It concludes with some general observations and recommendations.

EXPERIENCES IN OTHER COUNTRIES AND REGIONS

Exporting countries: North America, Australia and the European Union

The focus of most exporting countries' grain policies is on farm-income stabilisation and support, coupled with the objective of marketing surplus grain production through various export-enhancement schemes. Furthermore, the United States and the European Union do not view state-trading enterprises (STEs), such as the Canadian Wheat Board, with favour in the context of World Trade Organization

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(WTO) rules. This is especially true with the recent (July 2004) framework agreement for WTO negotiations in agriculture. Consequently, there isn't much to be drawn upon from grain-exporting countries' experience that would be relevant to China's grain-reserve management policies.

Africa

The situation in most African countries is not comparable to China's problem, in that the policy instrument for dealing with unstable domestic grain supplies tends to be foreign food-aid. This is a highly improbable policy option for China. Also, for the foreseeable future at least, the prospects for most African countries of achieving food-grain self-sufficiency to the degree that exists in China are not promising.

Asia

Indonesia

This section is a synthesis of information drawn from Bappenas (2001), Barichello (2000) and Suryana and Erwidido (1996). In Indonesia, the state trading enterprise Badan Urusan Logistik (BULOG) has played a pivotal role in the country's approach to managing grain reserves. More than 30 years ago, BULOG essentially was given the power to import and export a variety of agricultural products, including rice and wheat, with the general objective of stabilising prices. Initially, BULOG's objectives with respect to rice were to provide monthly rice rations to certain 'budget groups' and to stabilise rice prices. The initial emphasis was on ration provision, but this shifted to price stabilisation. Within price stabilisation, the priorities have shifted from maintaining a ceiling price for consumers towards maintaining a floor price for rice producers.

From an operational standpoint, BULOG set a price band within which domestic prices were maintained, often without regard to world prices of rice. The price floor was set to ensure that the real price of unmilled rice did not fall below approximately US$250 per tonne (in 1985). The ceiling price was set on the basis of domestic inflation targets and sufficiently above the floor price to encourage the private sector to hold rice stocks between harvests. Within a season, the domestic market was effectively closed, and storage and variable quotas were used to keep prices within the price band. When prices threatened to fall below the floor price, BULOG would raise prices by buying and storing rice. If stocks became too large, or

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if storage facilities were in short supply, BULOG would export rice. When domestic prices threatened to rise above the ceiling price, BULOG would release rice from storage or import rice from world markets to augment domestic supplies and hold down prices.

Although largely successful in stabilising domestic rice prices, as well as tracking world rice prices, the price-stabilisation program was very expensive in budgetary terms, because large subsidies had to be provided to BULOG to maintain large stocks, and to subsidise exports and imports. Successful stabilisation of rice prices enhanced the profitability of growing rice and biased farmers' decision-making towards rice. This discouraged diversification into higher-value crops and livestock. It also discouraged off-farm employment and migration out of agriculture. For a variety of reasons, including the financial crisis of 1997 and an unstable political and macro-economic environment, rice policy in Indonesia created an unbalanced and inconsistent set of programs for both producers and consumers (Bappenas 2001). A National Rice Policy Team was set up in 2001 to formulate a new rice policy approach. One of the recommendations from the team was that at least 90% of domestic rice consumption should come from domestic production—an objective that would be achievable most years. This is a useful reminder that rice from international markets can (and should) play a crucial role in a country's food-security strategy.

Malaysia

This section draws heavily on Wong (2004). Malaysia provides an excellent example of one of the few national food-grain agencies in Asia that has been commercialised. This commercialisation began in the mid 1960s and was stepped up in the early 1970s, coinciding with the advent of double-cropping brought on by irrigation development projects and the international rice-market crisis. The major privatisation drive occurred in the early 1990s, and was prompted by rapid trade liberalisation and government privatisation policy.

A key element of Malaysia's food-security strategy is a continuing policy of targeting a self-sufficiency ratio of 65%. This clearly signals that Malaysia will be a net importer of rice. Besides managing the grain supply, government has also intervened in increasing local rice production and promoting growth in the rice industry. These interventions include the implementation of a guaranteed minimum price, the establishment of the National Paddy and Rice Authority (Lembaga Padi dan Beras Negara, LPN), and promoting and developing local paddy farmers and

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rice millers through various social schemes. The government also maintains a rice stockpile to ensure that the country has a sufficient supply of rice at all times. LPN was dissolved in June 1994 and the Ministry of Agriculture assumed the regulatory functions, while the commercial activities were taken over by Padiberas Nasional Berhad (BERNAS). BERNAS was expected to operate strictly as a business, but was required also to carry out certain duties and responsibilities on behalf of the government. These included: ensuring a sufficient supply of rice at a fair and stable price while maintaining rice quality and standards; the management of the national rice stockpile; the disbursement of paddy subsidy payments; and the procurement of paddy from farmers as the buyer of last resort. BERNAS was privatised in 1996 because of its continuing lacklustre performance and the need to address the basic weaknesses and deficiencies of its operations, namely excess staff, non-business-oriented personnel, lack of research and development initiatives, and continuous losses from local rice production.

India

Although there appears to be a strongly held view among Chinese colleagues that 'India is different' and that nothing can be learned from that country, we have chosen to comment briefly on the Indian approach to food security, given that India has a very large population, an evolving set of agricultural policies and a huge food-security issue.

There are three main forms of intervention by the Government of India in the food-grain system: the procurement of food grains from farmers, storage and management of stocks of grain, and food-grain delivery to different parts of the country through the Public Distribution System (PDS) and other welfare programs (Swaminathan 2003). In response to severe crop failures and subsequent food shortages in the mid 1960s, the Indian Government established the Agricultural Prices Commission to design a policy of support prices for agricultural crops. The Food Corporation of India (FCI) was set up to implement procurement policies as well as handle the storage, transport, and distribution of food grain. At the same time, the PDS was expanded from selected food-deficit regions to become a universal welfare program under which all households were entitled to buy specific quantities of selected commodities (including wheat and rice) through a network of fair-price shops.

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Although a detailed assessment of India's food-security system is beyond the scope of this paper, some observations can be made (Mitra 2003). There have been successes, including the doubling of domestic food-grain production during the period 1975 to 2001 and a rise in the level of buffer stocks; indeed, during the 1990s, India actually exported food grains, albeit in very small quantities. Admittedly, this was happening during the green revolution, so it would be fallacious to attribute all of the growth in domestic production to the price-support policies. It would appear that the FCI and the PDS were reasonably successful in transferring grain from regions of surplus production to those where there were food deficits. Also, through buffer stocks, open market operations, and distribution through the PDS, variations in domestic prices were less than international price fluctuations. Regional and seasonal variations in price have also diminished over time. An important feature of the Indian system is that, while the supply of grain and associated subsidies are provided by the central government, actual implementation is the responsibility of state governments. Not surprisingly, the performance has varied significantly among states. Corruption and bad administration have led to large 'leakages' in certain regions. This, plus the high costs and the distortions in market functioning, have led to increased pressures to dismantle the system, or at least change it. Incompatibility with the requirements of the WTO on the matter of eligible subsidies has added to the pressures for reform.

By the late 1990s, India found itself in an anomalous situation where the central government (along with state agencies) had accumulated stocks of around 65 million tonnes of rice and wheat. This was about 40 million tonnes above the buffer requirements. [It should be noted that the poor growing season in 2002–03 has reduced stocks considerably.] At the same time, chronic food insecurity and undernourishment plagued millions of Indians, and agricultural prices had fallen dramatically. The FCI was under increasing attack for being too costly and inefficient. This led to the establishment of a High Level Committee on Long Term Grain Policy whose task was to examine all major aspects of grain policy, including procurement and price support to production, storage and distribution. The committee reported in 2002 with a wide-ranging set of recommendations. Some of these relate specifically to the FCI and may be insightful for the Chinese situation. The committee felt that the FCI had performed its core functions reasonably well and that it should remain in existence but should change the way it does business. A specific recommendation was that state agencies and private traders should play a greater role in the management and operation of the grain system. National-level legislation should

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remain in place to regulate the operation of state agencies and the private sector to ensure some consistency throughout the country. The committee did not support the complete privatisation of the FCI, because it felt that this would seriously erode its ability to provide price stabilisation on a national level. It would be useful for Chinese authorities to maintain a watching brief on how India proceeds with its reform of food-grain security.

Japan

The Japanese experience has little similarity to the situation that China faces in the management of its grain reserves. It does illustrate very graphically, however, the complex and costly situation that can arise when food self-sufficiency for political and cultural purposes is masked as food security. Just after World War II, the principal objectives of Japanese agricultural policy were to provide staple food supplies through the implementation of the 1942 *Food Control Law*, and to alleviate hunger, to carry out national land reform, and to create employment opportunities, as well as to democratise rural society (Meyerson 2000). As the Japanese economy grew, the government continued to support farmers' incomes, attempted to preserve Japan's self-sufficiency in consumer commodities such as rice, but came to rely heavily on foreign sources for many agricultural products. One of the foundations of the one-party dominance that emerged during the 1960s under the Liberal Democratic Party (LDP) was a rice-price policy that adhered to self-sufficiency in rice, virtually forbade rice imports, and supported the income of farm households to such an extent that the government's purchase price for rice rose to several times the world price. During the late 1970s to the mid 1980s, efforts were made to create a system of full-time commercial farming that would more closely match domestic production with consumption. At the same time, partially as a result of pressure for access to Japanese markets by the United States and other countries, gradual structural adjustments occurred, such as the beginning of the liberalisation of imports of beef and oranges.

In Japan, food security is often used as a major rationale for high levels of agricultural support. In reality, Japan has the wealth and ability to ensure its food-security needs through food imports to supplement domestic production. When there is a desire, politically and culturally, to protect agriculture, it is sometimes convenient to confuse self-sufficiency with food security (Bull and Roberts 2001). Japan's pricing policies have resulted in chronic overproduction of rice. This led to rising govern-

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ment stocks, and measures such as exporting into world markets or using it for feed. These measures proved to be very expensive and generated opposition from countries whose exports of rice or feed grains were hurt by Japan's actions. Although Japan has consistently resisted rice imports, it agreed to an import quota of almost 700,000 tonnes annually as part of the 1995 Uruguay Round of global trade negotiations. Most of this rice is not released directly into Japan's domestic market. Rather, imported rice often remains in government stocks until it is released as food aid to developing countries or sold as an input to food processors (Fukuda et al. 2003). The Japanese Government has also emphasised the 'multifunctionality' of domestic rice production, namely that rice cultivation is environmentally and aesthetically more beneficial than non-agricultural uses of land.

OBSERVATIONS AND CONCLUSIONS

It should be noted that grain-reserve management and food-security issues are part of a larger set of economic development and poverty-reduction issues, as well as reflecting changing roles of government and implementing agencies. Making policy recommendations for grain-reserve management in isolation is not likely to lead to useful results. However, it can be concluded that reforming grain marketing and food-security systems is very difficult, even in developed 'market' economies. China's food-security objectives, and the role of grain reserves in meeting those objectives, need to be clearly identified.

Constraints to a transition to more market-oriented policies for managing grain reserves include:

- financial — inadequate budget resources to fund either consumer or producer programs at levels that would have a significant impact
- strategic — terms of reference of implementing agencies are often internally contradictory and directly in opposition to basic market forces
- institutional — implementing agencies often have inadequate capacity and institutional incentives to fulfil their terms of reference.

The use of state trading enterprises similar to the Canadian Wheat Board and BULOG, are unlikely to be a viable policy instrument, given the opposition to them in the WTO context. Zhong and Zhu (2002) reviewed the literature on buffer stocks

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in India, Indonesia, the Philippines and Bangladesh and concluded that domestically owned buffer stocks are the costliest way of achieving price stability. More cost-effective policy instruments for price stability include open-market sales and imports.

The challenges to developing policies for managing grain reserves for food security in China are many and complex, and some are listed below. Lessons from other countries should be applied where appropriate.

- What, and how much, should be the grain reserve target? This needs to take account of international comparative advantages in grain production, policies on imports, the source of feed for animals, and quantity versus quality considerations. China, given its range of soils, climates and north–south geographic coverage (temperate to tropical), has among the most-stable grain production capabilities anywhere in the world. This suggests that the target can be quite low and still ensure supply security. It should be noted that over one-third of China's grain output is used for animal feed.
- Where should the reserves be located/controlled — national, provincial or local level? This needs to take account of regional comparative advantages in grain production, as well as adequacy of storage and transport infrastructure. In general, transportation and communications capability are improving, suggesting that dispersed storage is probably less important.
- What should be the role of privately held commercial stocks and the private sector in meeting food-security objectives? There are considerable holdings of private stocks in individual households now. The private grain trade is developing, but until government grain reserve systems are rationalised, its development will be hampered.
- What is the cost-effectiveness of various grain marketing and grain-reserve management options as they might be applied in China? Analyses conducted by the Center for Chinese Agricultural Policy and Nanjing Agricultural University indicate that, with a national rather than regional grain-reserve system and judicious use of the international market, the size and cost of the grain reserve could be quite low and still provide for a high level of food-grain security.
- What are the environmental implications and costs of various grain-marketing and grain-reserve management options? Elimination of regional self-sufficiency targets, as has already been done in some regions, would support environmental

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objectives. Options are available for China to simultaneously achieve its food-grain security goals at lower costs and reduce environmental costs associated with land and water management.

- Finally, how politically palatable is reform of the grain-marketing and grain-reserve systems? What is the process of transition? Without political will the grain-marketing and grain-reserve systems will not change as recommended or as suggested by experiences of others.

REFERENCES

Bappenas (National Development Planning Board, Indonesia) 2001. Reformulating national rice policy. Washington, DC, Bappenas/USAID Food Policy Advisory Team, Policy Brief No. 10.

Barichello, R. 2000. Evaluating government policy for food security: Indonesia. IAAE workshop on food security, Berlin.

Bull, T. and Roberts, I. 2001. Agricultural trade policies in Japan—the need for reform. Canberra, Australian Bureau of Agricultural and Resource Economics, Research Report 01.5.

Fukuda, H., Dyck, J. and Stout, J. 2003. Rice sector policies in Japan. Washington, DC, ERS/USDA, RCS 0303-01.

Meyerson, C. 2000. Domestic politics and international relations in trade policymaking: the United States and Japan in the GATT Uruguay Round agriculture negotiations. International Studies Association Annual Meeting, Los Angeles.

Mitra, S. 2003. Food security concerns in India as buffer stocks plummet. New Delhi, Government of India, Department of Food and Public Distribution, Foodgrains Bulletin.

Suryana, A. and Erwidido 1996. Agricultural policy reforms in Indonesia: accelerating growth with equity. Bogor, Indonesia, Food and Fertilizer Technology Center.

Swaminathan, M. 2003. Liberalization and policies of food security: the Indian experience. Addis Ababa, meeting of the Ethiopian Economic Association.

Wong, L.C.Y. 2004. Foodgrain marketing reform in Malaysia: the BERNAS experience. Beijing, CCICED, paper presented at the 2nd Expert Meeting of the Agriculture and Rural Development Task Force.

Zhong, F. and Zhu, J. 2002. Food security and optimization of grain reserves in China. Nanjing Agricultural University, unpublished report.

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CHAPTER 3

A BETTER MARKETING ENVIRONMENT FOR DEVELOPMENT: INTERNATIONAL MARKETS

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3.1 TRADE LIBERALISATION

CCICED ARD Task Force members

China has promoted international trade aggressively in the past two decades. At one time in the early 1980s, China was one of the most isolated nations in the world, with high rates of protection. Since then, leaders have reduced tariffs, removed licensing requirements, reduced the role of state trading and allowed thousands of enterprises to engage in import and export of most goods. In doing so, China has become a more open place. For example, average tariffs fell from more than 50% in 1991 to around 20% by the end of the 1990s. During this period, the total value of China's agricultural trade grew by about 6% annually and the growth of agricultural exports has exceeded that of imports.

Although there are concerns about the impact of an increasingly open economy on some groups of China's producers, there are many reasons to believe that the nation will benefit by carrying out its trade liberalisation plan. Workers gain access to employment; consumers benefit from lower prices; all producers benefit from lower fertiliser prices. If trade liberalisation leads to greater exports, farmers can benefit from higher prices.

In assessing China's current trade policy, we examined two sets of issues:

1. What will be the effect of the nation's accession to the World Trade Organization (WTO) and the extent of its participation in future trade liberalisation talks?
2. How will trade affect the poor?

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CHINA AND THE WTO: NOW AND IN THE FUTURE

While it is well-established that the economy as a whole benefits from accession to the WTO, the case of agriculture is somewhat mixed. Producers of rice, most vegetables and fruits, many livestock and aquatic products and other higher-value, labour-intensive goods will benefit if trade liberalisation leads to higher exports. While producers of barley, soybean and other edible oils were hurt by liberalisation during the 1990s, most of the fall in the prices of these commodities had already taken place before recent trade reforms, so the agreement will have little effect. Predominantly maize, cotton and wheat farmers will be adversely affected, but because most farmers are diversified and are able to change product mix when relative prices change, the overall cost will be small. The only groups that are likely to be adversely impacted are a subset of poor, inland farmers.

To get the most out of its trade policy, China needs to make complementary policy changes. Chief among these is to allow farmers to have access to the lowest-priced and most-productive inputs and technologies from inside or outside China. The WTO agreement challenges China's farmers with competition in output markets from producers in the rest of the world. To compete, farmers need to have access to the same low-cost inputs and high-quality technologies. There are many restrictions keeping seeds and other inputs from moving around the country. Also, there are barriers against the importation of inputs and technologies or investment by foreign technology firms. These should be sharply reduced and eventually eliminated in order to improve the income of farm households. According to international experience, the entry of foreign seed and technology firms into the country could lead to more competition and better transfer of technology.

Assessing China's position toward future trade talks—two years after WTO accession

While most of the facts on the accession to the WTO are well known, China faces another set of issues in thinking about how it should move forward in the next round of international trade talks. While there will always be uncertainty, research by economists inside and outside China is producing many ideas with broad consensus.

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- **Doha talks.** On the three 'pillars' of WTO agriculture negotiations now under way—market access, reducing export subsidies, and reducing domestic supports—China's interests lie in a robust liberalising outcome to negotiations.
- **Proponent of reform.** China is already bound by commitments that put it ahead of other countries in terms of openness, and neither a collapse of talks nor a modest outcome will put it on a more even footing—only an ambitious reform outcome will do that.
- **New analytical capacity.** China's analytical capabilities in agriculture policy making have increased significantly in recent years. Although still far behind many nations, including some developing ones, for the first time China has the expertise to make quantitatively derived choices about the best directions for its welfare. Chinese leaders know what is good for the country and can pursue policy choices with new confidence as a result.
- **Comparative advantage.** China's agriculture is evolving in the direction of national comparative advantage, in terms of sown area, investment in R&D and exports. China is shifting towards labour-intensive, high-value-added production, instead of the land-intensive crops it emphasised in the past and where it has less comparative advantage.
- **WTO has not been a killer of the rural economy.** The net negative impact on China's agriculture that some expected has not occurred; China's agriculture is doing well post-WTO accession.
- **Foreign market access.** China is increasingly concerned about market access problems abroad, as its competitive exporters bump into tariff and non-tariff barriers.
- **Free-trade agreements.** In regional free-trade agreements, China is showing its readiness for early and aggressive agricultural trade liberalisation, more so than almost all other developing countries, especially in the Asia–Pacific region.
- **Domestic adjustment.** Like all economies, China must address concentrated economic pain from structural adjustment at home if it is to push further reform; but China has sufficient WTO-consistent means to do so while remaining a good international player.

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- **Alternatives to farm employment.** Rural development is benefiting from strong industrial and tertiary services sector growth, gradually reducing the urgency of sustaining millions of farmers through agricultural supports.
- **Disputes manageable.** A number of residual non-WTO-compliant practices in China fuel disputes with trading partners; but the list of such problems, while more transparent and reported today, is shrinking relative to the volume of agriculture trade that is trouble-free. If China can continue to improve in managing ongoing trade problems, it could gain in credibility, which will allow it to be a positive player in future trade-reform efforts.

TRADE AND POVERTY

In the same way that the forces of development have generated progress and problems, the nation's efforts at pushing ambitious market-liberalisation policies have had both positive and negative consequences. Although the nation's accession to WTO will help rural residents and improve incomes generally, with competitive markets that extend to most parts of China, the effects of trade liberalisation—both those that raise and lower domestic prices—will be transmitted throughout the economy and could hurt subsets of households.

Unfortunately, until recently, researchers rarely tried to analyse how different types of households in different regions of China have been affected. Specifically, there has been almost no research to measure the effects of trade liberalisation on a commodity-by-commodity basis. Likewise, few researchers have tried to assess the effects of trade-policy changes on different types of households in different regions of the country. Without this type of analysis, it is difficult to assess household impacts. However, according to a new analysis by the task force that does trace trade effects to specific groups of farmers, the subset of all farmers that gets hurt from trade liberalisation is small, and is quite specific. In particular, *poor* maize, cotton and wheat-producing areas in the central and western parts of the nation are the ones that have suffered the most.

Several factors are responsible for these adverse effects. First, households in these poor areas—due to lower social capital—are less likely to be diversified into the off-farm sector. Thus, while richer households are able to offset the loss from trade liberalisation with gains from their participation in the off-farm sector, some poorer

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households are less able to do so (although the rise in migration is making this less of an issue). Second, it is often farmers in poor areas who grow the crops that are uncompetitive—maize, cotton and wheat. They are less likely to be in sectors in which China has a comparative advantage—e.g. horticulture and aquaculture. Finally, because farmers in poorer areas have less physical and human capital (including less access to credit) than those in richer areas, they often have difficulties in shifting from the agricultural commodities that are hurt by trade liberalisation into those that benefit.

According to China's own estimates, the annual loss to these households (which are the most vulnerable of all households) due to WTO accession is small. Research shows that the overall impact on the poorest of the poor averages only about RMB50 per household. A policy that compensated such households by RMB50 per year for the first several years after WTO (e.g. through a policy that eliminated tuition and school fees for households in these areas or paid the premium of rural-health policies) would offset the negative consequences. Therefore, given so small an impact on so small a part of China's rural sector, there are no grounds for slowing trade liberalisation based on the negative impacts of increased international trade. The negative effects are far outweighed by the positive ones.

There are some actions, however, that policy makers can take. For example, they need to try to encourage farmers in poorer, inland areas to shift their production (where appropriate) to more-competitive crops. This can be done with well-targeted investments and training programs. Investments should emphasise productivity-enhancing activities. Market information should be provided and farmers should make their own decisions. Officials may need to take other, non-trade actions to improve the livelihood of farmers in these areas. In many areas, farmers do not have an advantage in any farming activity. In such areas, rural education, better communications and other policies that might facilitate their shift into the non-farm sector may be the most beneficial policy.

FUTURE DIRECTIONS AND POLICY IMPLICATIONS

This summary of trends in China's agriculture sector after the nation's accession to the WTO does not dispute that China faces massive challenges in the agriculture sector. While overall welfare has improved in all income deciles, important local

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dislocations exist due to domestic adjustment and opening to foreign competition. China's system of agriculture-sector financial support and adjustment is primitive and in need of dramatic improvement. The private and public financial infrastructure to permit capital upgrading and rationalisation in the agriculture sector is not in place, thus constraining growth and adjustment. Vested interests, especially in niches in production or distribution still heavily influenced by state entities, cannot be properly contested due to the lack of political liberalisation needed to encourage competitive interest group politics.

But despite these problems, the direction of change in China's agriculture is manifestly towards reform, structural adjustment and economic rationalisation. China is closer to the end-point of that process than generally recognised, and shows a deep, probably irreversible, commitment to the process. China can point to demonstrated successes in raising incomes, overall welfare and productivity to justify (to itself) the pain of further adjustment, and has the policy skills to manage (if not minimise) adjustment costs.

In manufacturing, China did not need to 'make rules' in the international system to enjoy its comparative advantage as a factory to the world; it merely 'took rules' and adapted its domestic economy in such a way to profit from them. In agriculture the situation is different. Having moved well ahead of requirements in its commitments to join the WTO in 2001, it stands more liberal than other countries—especially many developing countries—on the major agriculture policy fronts. A collapse of WTO efforts to accelerate liberalisation for developed and developing countries—that is, the status quo—will leave China out on its own and fail to meet its interests. A diluted WTO outcome with modest reduction in protection by developed economies (the biggest distorters) and weak new commitments by developing countries would do little more for China than no agreement at all. Only a robust agriculture trade liberalisation agreement would allow China to actualise its agricultural comparative advantage in the same way that its manufacturing industries have benefited.

That outcome is not the default case for current WTO talks on agriculture. Privileges secured by developed economies and exceptions to WTO disciplines for many developing economies (exceptions which China has already largely foregone) are likely to be sustained. To avoid that scenario, China needs to get actively involved in WTO talks not as a follower or taker of rules, but as a proponent of reform.

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While new to the WTO, China has leverage usable for such an endeavour. China can concede still further liberalisation, for example by reducing subsidy ceilings or opening trade in commodities for which it has no advantage (e.g. sugar, dairy or wool) as a contribution. It can further increase the size of its tariff rate quotas on some of its major commodities (e.g. maize, wheat and rice). China can remind WTO members eager to sell it Airbuses, BMWs, GE power plants and Toshiba laptops that it has comparative advantage in higher-value-added, labour-intensive agriculture, and that this should be taken into account.

In short, China needs to be bold during the next round of the trade talks. It is in its interest to play an active role. It needs to press other nations to reduce barriers. It needs to stand with other developing countries to put pressure on developed countries to drop the excessive levels of subsidies that are distorting international trade. In pursuit of its interests and in a leadership role in the talks, it should press for developing countries to open their markets, using their own nation as an example.

Problems will occur because of new trade reforms. Some may suffer from increased openness. China needs to take actions to minimise the effects—on both the poor (discussed above) and on the environment (discussed in another brief).

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3.2 IMPACTS OF TRADE LIBERALISATION ON AGRICULTURE AND POVERTY IN CHINA

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INTRODUCTION

China's economy has experienced remarkable growth since the economic reform was initiated in the late 1970s. This has led to significant decline in the nation's poverty. The annual growth rate of gross domestic product (GDP) was nearly 9% in 1979–2003 (NSBC 2003a). In the past two and half decades, based on China's official poverty line, more than 230 million Chinese rural residents have escaped poverty, and the absolute level of poverty has fallen from 260 million people in 1978 to fewer than 30 million in 2002 (NSBC 2003b). The incidence of rural poverty has fallen equally fast, plunging from 32.9% in 1978 to less than 3% in 2002.

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While economic growth and reduction of rural poverty in the past are impressive, there are still great challenges ahead. Agricultural growth rate has declined since the late 1980s. High input levels in many areas of China, and diminishing marginal returns, mean that increasing inputs will not provide large increases in output. Water shortages and increasing competition from industry and domestic use do not provide much hope for large gains in area and yield from irrigation expansion. In the future, many have predicted that almost all gains will have to come from new technologies that could significantly improve agricultural productivity (Huang et al. 2002).

The economic growth is accompanied by large income disparities. The income gap among regions, between urban and rural, and among households within the same location has been continually increasing since the mid 1980s (Rozelle 1996). The rural-to-urban income ratio exceeded 3.4 in 2002 (NSBC 2003a). Income disparities have risen in rural areas. The rising income disparity in rural areas is indicated by rising Gini coefficients. The coefficient rose from 0.24 in 1980 to 0.35 in 2000 and 0.32 in 2001 (NSBC 2003b).

Trade liberalisation further challenges China's agricultural and rural economy. Agriculture has been at the centre of discussion of China's entry into the World Trade Organization (WTO), due in part to the vulnerability of parts of the rural economy and in part to the importance of agriculture in the political economy of a number of developed nations with which China negotiated its accession to WTO. However, debates on the future of China's agriculture continue. Some argue that the impact of WTO accession on China's agriculture will be substantial, adversely affecting hundreds of millions of farmers (Li et al. 1999; Carter and Estrin 2001). Others believe that, although some impacts will be negative and even severe in specific areas, the overall effect of accession on agriculture will be modest (Martin 2002; Anderson et al. 2004). In part, the confusion about the ultimate impact of WTO accession on agriculture can be traced to a general lack of understanding of the policy changes that accession will engender (Huang et al. 2004). Perhaps to a greater degree, the lack of clarity of the debate can be traced to a lack of understanding of the fundamentals of the distortions to China's economy on the eve of its WTO entry.

Although China's joining the WTO may have significant implications for world trade and China's economy, little empirical work has sought to answer basic questions about the expected effects of China's entry on the poor. In our previous work (Huang et al. 2003), we showed that, on balance, the nation's accession to WTO helps rural

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residents and improves incomes. Despite our earlier impact studies, which were conducted for 11 rural income groups of farmers in 3 regions (western, central and eastern China), the analyses are still too aggregated, as farmers and agricultural production differ significantly among provinces within the same region.

The overall goals of this paper are to develop a better understanding of China's agriculture and examine the impacts of trade liberalisation on China's agriculture and poverty. While this study focuses on agriculture, it does not mean that the effects on other sectors are not important. Indeed, several recent studies (Wang 2003; Anderson et al., 2004; Ianchovichina and Martin 2004) have shown that the impacts of trade liberalisation on the rest of the economy are substantial. In this study, the impacts on agriculture are analysed by commodity. Because different provinces and different farmers in the same province produce diverse commodities, we analyse the effects on households—and their implications for poverty—through simulation of household production and consumption changes in response to market price changes.

The paper is organised as follows. In the next, second section, we briefly give an overview of China's trade liberalisation. China's WTO accession and future trade liberalisation are described in the third section. The fourth section describes the methodologies and data used in this study. The results on the impacts of trade liberalisation on China's agriculture and poverty in China's post-WTO era are presented in sections 5 and 6. In the final section we draw some conclusions.

FOREIGN TRADE LIBERALISATION BEFORE CHINA'S WTO ACCESSION

1. Foreign exchange policy

China's open-door policy contributed to the rapid growth of its external economy. The expansion of the external economy has become one of the major driving forces of China's economic growth. The growth of trade also results in greater reliance on both domestic and international trade to meet consumer demand. Historically, the overvaluation of domestic currency for trade protection reduced agricultural incentives. Real exchange rates remained constant and even appreciated during the 30 years before reforms. Tradable commodities in the agricultural sector encountered a high level of state intervention (Huang and Chen 1999). After reform, however, the

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exchange rate depreciated rapidly, with the exception of several years of domestic price inflation during the mid 1980s. From 1978 to 1992, the real exchange rate depreciated 400%. Falling exchange rates increased export competitiveness and have contributed to China's phenomenal record in growth of exports of non-grain food products and the spectacular national economic performance of the 1980s.

The situation, however, has changed since the early 1990s. From 1992 to 1997, the real exchange rate appreciated by about 30%. Moreover, the pressure to appreciate the RMB (or Chinese yuan) from the major trade partners, particularly the USA, is growing. The Chinese Government, however, has insisted on maintaining its current exchange-rate policies, as the national leaders consider that a stabilised foreign exchange rate is a key to national economic stabilisation. Meanwhile, China has been accelerating the reform of foreign-exchange management through further liberalisation of foreign-exchange demand and supply and is considering gradually eliminating export tax rebates in order to avoid sharp increases in its foreign-exchange reserve.

2. Liberalising international trade

Changes in the exchange-rate system occurred at the same time that China also began to liberalise its international trading system. In the initial years, most of the fall in protection came from a reduction in the commodities that were controlled by single-desk, state traders (Huang and Chen 1999). For many products, competition among non-state foreign-trade corporations began to stimulate imports and exports (Martin 2002). Although several major agricultural commodities were not included in the move to decentralise trade, the moves spurred the export of many agricultural goods. In addition, policy shifts in the 1980s and 1990s also changed the behaviour of state traders. Leaders allowed the state traders to increase imports in the 1980s and 1990s.

Maize and cotton are two major commodities in which liberalisation had been minimal. For example, China used export subsidies in the years before its WTO accession to increase exports of maize and cotton. By providing exporters with payments to encourage the export of maize, leaders had increased the protection of domestic producers by raising the price of domestic commodities. In field interviews during 2001, we found that maize and cotton exporters received subsidies that averaged 34% and 10%, respectively, of their export prices. However, China eliminated export subsidies for cotton in 2002 and those for maize in early 2004.

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Moves to relax rights of access to import and export markets were matched by actions to reduce the taxes that were being assessed at the border. After the fall of restrictions on imports and exports of many of China's agricultural commodities, a new effort began in the early 1990s to reduce the level of formal protection. The simple, average agricultural import tariff fell from 42.2% in 1992 to 23.6% in 1998 and 21% in 2001 (MOFTEC 2002).

3. Impacts on trade

In the same way that trade liberalisation has affected growth in the domestic economy (Lardy 2001), changes in the external economy have affected the nature of China's trade patterns (Huang and Chen 1999). Whereas the share of primary (mainly agricultural) products in total exports was over 50% in 1980, it fell to only 10% in 2002 (NSBC 2003a). Over the same period, the share of food exports in total exports fell from 17 to 5%, and the share of food imports from 15 to 2%.

Disaggregated, crop-specific trade trends show equally sharp shifts and suggest that exports and imports increasingly are moving towards products in which China has a comparative advantage and therefore have also facilitated structural changes in its agriculture (Anderson et al. 2004). Net exports of land-intensive bulk commodities such as grains, oilseeds and sugar crops have fallen; exports of higher-valued, more labour-intensive products, such as horticultural and animal (including aquaculture) products, have risen. The proportion of grain exports, which was around only 20% of total agricultural exports in the 1990s, is less than half of what it was in the early 1980s. By the late 1990s, horticultural products and animal and aquatic products accounted for about 80% of agricultural exports (Huang and Chen 1999). These trends are even more evident when the trade data are grouped on the basis of factor intensity, as in Figure 3.1. Figure 3.1 also shows that trade liberalisation has improved resource allocation and increased China's net agricultural exports.

4. Nominal protection rates

Nominal protection rate (NPR) is defined as the percentage difference between the price at domestic market and the price at board for the same commodity. NPRs for each commodity were estimated in 2001 when China joined the WTO. For those commodities that either they simultaneously import and export significantly or for which the differences in imports and exports was not large in past decades, we estimated NPRs based on both cost, insurance and freight (CIF) (imported

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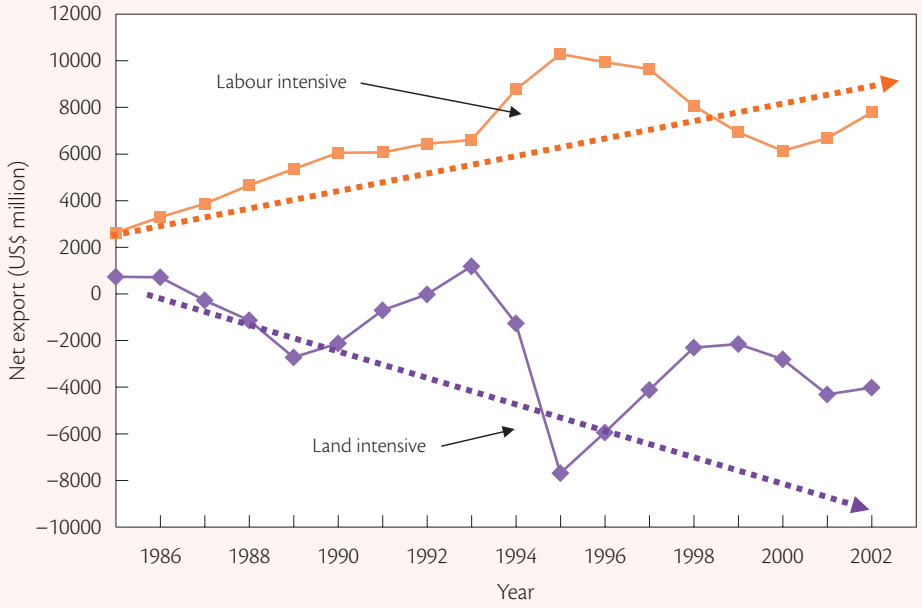

Figure 3.1 China's agricultural trade balance (US$ million) by factor intensity, 1985–2003. Data are from various publications of China's National Statistical Bureau and China's Customs Authority. Land-intensive products include grains, oils, sugar, cotton and wool. Labour-intensive products include livestock, fish, horticulture and beverages.

commodity) and free-on-board (FOB) (exported commodity) prices. These include rice, maize, cotton and beef. Because there are differences among major types of any individual agricultural commodity, we weighted to get average NPRs by either their sown area (for crops) or production shares (for meats), creating sets of more traditional, by commodity, aggregate NPRs. Wheat, for example, has a NPR of 15% when the individual NPRs are weighted by their area shares. On average, the price of all varieties of domestically produced wheat that are sold in the domestic markets of China's major port cities are 15% above the average CIF price of all types of imported wheat varieties. The results are summarised in Table 3.1.

Our findings show not only that significantly positive rates of protection exist for a number of China's major field crops, but also that they vary according to the position in which China finds itself (as a net importer or as a net exporter). Maize prices,

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Table 3.1 Net protection rate (NPR) and sources of policy distortion for various commodities in China, 2001

	Import-tariff equivalent				Export-subsidy equivalent			
	Tariff rate	Value-added tax	Net trade balance China	NPR	Tax rebate	Subsidy	Net trade balance abroad	NPR
Rice	1	13	3	17	1	0	−9	−8
Wheat	1	13	1	15				
Maize	1	13	8	22	32		0	32
Other grains	1	13	1	15				
Soybean	3	13	1	17				
Cotton	3	13	2	18	5	10	0	20
Oilseed	13	13	21	47				
Sugar crops	25	15	10	50				
Vegetables					1	0	−11	−10
Fruits					1	0	−11	−10
Pork (meat)					5	0	−25	−20
Beef	45	15	0	60	5	0	−13	−8
Mutton					5	0	−10	−5
Poultry (meat)	20	15	0	35	13	0	−30	−17
Eggs					1	0	−5	−4
Milk	50	17	0	67				
Fish					5	0	−20	−15

Source: Huang et al. (2004) and author estimates.

according to exporters, were more than 30%, on average, above world prices. In other words, traders would have lost more than 30% of the value of their shipment if the government did not subsidise the transaction. It is interesting to note that the level of protection of maize almost exactly corresponds to total export subsidies and tax rebates that were being paid to exporters of maize during the (northern) autumn of 2001 (Table 3.1). Protection rates when considering maize as an import differed among regions, however. For example, traders in the northeast told our survey team that, if they were not exporting and foreign maize were to come into China, the importer could make, on average, 22%.

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Table 3.1 also shows that, despite the large volume of increase of soybean imports in recent years, there is still a difference between the CIF and domestic price in the port. The average difference between the domestic price and the international price was 17%. In one sense, the fact that there is a remaining price gap is remarkable given that China imported 20 million tonnes of soybeans in 2003, the official tariff is only 3%, and the commodity can be traded by any foreign trade company (that is, trading firms do not need to secure a license or quota allocation). On the other hand, the remaining price gap reminds us that there may be other reasons for distortions, beyond tariffs and state trading. In fact, the gap between the domestic and international price fully demonstrates the effect of China's policy of assessing a value-added tax on imported soybeans at the border (13% of CIF).

Besides maize, some other commodities such as cotton, edible seeds and sugar were also fairly highly protected in 2001 (Table 3.1). The distortions for these commodities in the autumn of 2001 came from the official tariff rate, value-added tax, and the net trade balance (for sugar and edible oil seeds).

Our results also show that there are a number of commodities, besides rice, that had negative NPRs in 2001. Vegetable, fruits, pork and poultry producers are facing significant non-trade tariff barriers from the rest of the world when they are exporting these commodities.

CHINA'S WTO ACCESSION

In its most basic terms, the WTO commitments in the agriculture sector can be classified into three major categories: market access, domestic support and export subsidies. The commitments on market accession will lower tariffs on all agricultural products, increase access to China's markets by foreign producers of some commodities through tariff-rate quotas (TRQs) and remove quantitative restrictions on others. In return, China is supposed to gain better access to foreign markets for its agricultural products, as well as a number of other indirect benefits. Domestic support and export subsidies are the other two critical issues that arose during the course of negotiations. Together with a number of other market-access commitments, these make China's WTO accession unique among all other developing countries that have been admitted to the WTO's new environment.

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Some of the direct import market access commitments that China has made to WTO members actually do not appear to be substantial. Overall, agricultural import tariffs (in terms of a simple average) declined from about 21% in 2001 to 17% by 2004. This was a continuance of earlier trends; the simple average agricultural import tariff fell from 42.2% in 1992 to 23.6% in 1998. Although important, when taken in the context of the discussion in the previous section about China's external economy reforms of the last two decades, one would have to conclude that the commitments are merely an extension of China's past changes. The WTO commitments can, in this way, be thought of as just another step on China's road to opening up its economy.

Except for national strategic products such as grain, cotton, edible oil and sugar, other agricultural products (horticulture, livestock, wine, tobacco, soybean and barley) have become part of a tariff-only regime (Table 3.2). For most commodities in this group, effective protection fell by varying amounts by January 2002; most tariffs were set to fall even further by 2004. To the extent that tariffs are binding for some of these commodities, the reductions in tariff rates should stimulate new imports.

It is important to note, however, that although published tariff rates on all of these commodities will fall, imports will not necessarily grow summarily. Indeed, China has comparative advantage in many commodities under the single-tariff regime. For example, lower tariffs on horticultural products and meats might affect only a small portion of the domestic market (e.g. those parts of the market that buy and sell only products of very high quality—meats for five-star hotels that cater to foreigners). Although tariffs fall for all products, since China produces and exports many commodities at below world market prices, the reductions will not affect producers or traders.

Such movements, however, will almost certainly be (and can legally be) limited for a class of commodities called 'national strategic products'. China's WTO agreement allows officials to manage trade of rice, wheat, maize, edible oils, sugar, cotton and wool with TRQs. These commodities are covered under a special set of institutions. As shown in Table 3.3, the in-quota tariff is only 1% for rice, wheat and maize. However, the amount brought in at these tariff levels is strictly restricted. The in-quota volumes, however, are to grow over a three-year period (2002–2004) at annual rates ranging from 4% to 19%. China does not have to bring in this quantity, but provisions are

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in place that there is supposed to be competition in the import market, so if there is demand inside China for the national strategic products at international prices, traders will be able to bring in the commodity up to the TRQ level.

At the same time, there are, theoretically, still ways to import these commodities after the TRQ is filled. Most poignantly, tariffs on out-of-quota sales will drop substantially in the first year of accession and fall further between 2002 and 2005. But, during the transition period, most people believe such rates are so high (e.g. 65% for grains and sugar in 2004 and edible oils in 2005) that in the coming years they will not bind (Table 3.3).[1]

After the first four to five years of accession, a number of other changes will take place. For example, China agreed to phase out, after 2006, its TRQ for edible oils. But China is likely to maintain the TRQ for maize after 2005, though the amount of TRQ will certainly be raised. State trading monopolies also will be phased out for wools after 2004 and gradually disappear for most other agricultural products (Table 3.3). Although the China National Cereals, Oil and Foodstuffs Import & Export Co. will continue to play an important role in rice, wheat and maize, there will be an increasing degree of competition from private firms in the importing and exporting of grains in the future.

In its commitments to WTO accession, China also agreed to a number of other items, some of which are special to the case of China. First, China must phase out all export subsidies (most subsidies were used in maize export in 2001) and not introduce any new subsidies on agricultural products in the future. Moreover, despite clearly being a developing country, China's exemption for product-specific support is minimal and equivalent to only 8.5% of the total value of production of a basic agricultural product (compared with 10% for other developing countries). Some measures, such as investment subsidies for all farmers and input subsidies for the poor and other resource-scarce farmers, that are generally available for policy makers to use in developing countries, are not allowed in China (i.e. China must include any such support as part of its aggregate measure of support, which should be less than 8.5% of agricultural output values).

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[1] Although 65% above tariff rates seem high, it is important to note that, when compared with other countries, this is in fact low. In most Asian countries that have a TRQ system, high tariff bindings are at least twice as high as this.

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Table 3.2 Import tariff rates on major agricultural products subject to tariff-only protection in China

	Actual tariff rates in 2001	Effective as of 1 January	
		2002	2004
Barley	114 (3)[a]	3	3
Soybean	3[b]	3	3
Citrus	40	20	12
Other fruits	30–40	13–20	10–13
Vegetables	30–50	13–29	10–15
Beef	45	23.2	12
Pork	20	18.4	12
Poultry meat	20	18.4	10
Dairy products	50	20–37	10–12
Wine	65	45	14
Tobacco	34	28	10

[a] Barley was subject to licensing and an import quota. The tariff rate was 3% for imports within the quota, and no above-quota barley with a 114% tariff was imported in 2001.

[b] The tariff rate was as high as 114% before 2000 and lowered to 3% after early 2000.

Source: China's WTO Protocol of Accession, November 2001.

Table 3.3 China's tariff rate quotas (TRQ) on imports of various agricultural products

	TRQ (million tonnes)		Tariff (%)		Quota for non-state-owned enterprises (%) 2000–2005
	2002	2005	In-quota	Above-quota	
Wheat	7.3	9.6	1	65	10
Maize	4.5	7.2	1	65	25–40
Rice	2.6	5.3	1	65	50
Cotton	0.743	0.894	–	–	67
Soybean oil	1.7	3.2	9	121	50–90

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Because of its socialistic background and the difficulty that the world has had in assessing the scope of the government's intervention into business dealings of all types, China was forced to accept a series of measures governing the way that it will deal with the rest of the world in cases of anti-dumping and countervailing duties. Most simply, special anti-dumping provisions will remain for 15 years. According to these provisions, in cases of anti-dumping China will be subject to a different set of rules that countries can use to prove their dumping allegations. In addition, the methods that countries can use against China to enforce anti-dumping claims when they have won will differ from most of the world. In essence, this set of measures makes it easier for countries to bring, prove and enforce dumping cases against China. It should be noted, however, that although the rules differ from those governing trade among other countries, China will get the same rights in its dealings with other countries, an element that could help it in some cases in its dealings with dumping matters.

METHODOLOGY AND DATA

In order to evaluate the impact on agriculture and poverty of China's WTO accession in 2001–2005 and further trade liberalisation until 2010, a quantitative method has been developed based on the China Center for Agricultural Policy's agricultural policy simulation and projection model (CAPSiM). CAPSiM developed from a need to have a framework for analysing policies affecting agricultural production, consumption, price and trade at the national level. CAPSiM is a partial equilibrium model. We estimated most of the elasticities used in CAPSiM econometrically, using state-of-the-art econometrics and with assumptions that make our estimated parameters consistent with theory. Both demand and supply elasticities change over time. Income elasticities depend on income level, and cross-price elasticities of demand (or supply) depend on food budget shares (or crop area shares). Details of the model description can be found in Huang and Li (2003, in Chinese with updated version) and Huang and Chen (1999, in English in simplified version).

The analysis based on the original CAPSiM framework can be done only at the national level because it was designed to simulate the future effects of policy shifts in China as a whole. We modified the original model to allow us to disaggregate the national impacts into household production, consumption and poverty effects at the provincial level and to assess the impact that trade liberalisation will have on households in different income groups in the same provinces. Major modifications include

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the development of a price transmission model (transmit prices from implicit national market to local or provincial markets) and a household agricultural production and food consumption database, arranged by province and income categories.

Two scenarios were formulated. The baseline scenario assumes that China's economy continues to operate during the next 10 years as if there were no trade reform. The alternative, trade-liberalisation scenario assumes that China's NPRs move over the next 10 years to levels that are consistent with its WTO accession agreement to further cut remaining import tariffs by half between 2005 and 2010.

China's regional agricultural production differs largely due to its vast variation in climate and natural resources. For example, rice is the most important crop in southern China and accounts for more than half of the cropping areas in Jiangxi and Hunan, while wheat is the more important crop in the north China plain (e.g. Henan, Shangdong and Hebei) and northwest China (e.g. Qinhai, Gangsu and Ningxia), and soybeans dominate in Heilongjiang. Eastern China produces more vegetables and fruits than central and western China.

In order to make the analysis manageable, we classify all commodities into 12 crops or crop-groups and 7 livestock-product and fish groups. Presenting the results for all 19 commodities and groups is difficult. To simplify the presentation, we aggregate all commodities into two groups: importable and exportable. Exportable commodities are those that have negative NPRs and importable commodities are those with positive NPRs (see Table 3.1). We include beef and poultry, which are both exported and imported, in the exportable category.

IMPACTS OF TRADE LIBERALISATION ON CHINA'S AGRICULTURE

According to our analysis, China's WTO accession and further trade liberalisation will have impacts on the prices for nearly all crop and livestock commodities. Compared with the baseline (without WTO accession and any further trade liberalisation after 2001), the prices of most crop commodities decline in the coming decade (Table 3.4). For vegetables, fruits, meats and fish, however, the prices increase. While the declining patterns over time for most crops (exceptions are japonica rice, vegetables and fruits) are similar, the extent of price decline due to trade liberalisation varies significantly

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among commodities (Table 3.4). For example, for the commodities with small NPRs in 2001—such as indica rice, wheat, coarse grains, soybean and cotton—although trade liberalisation will affect domestic prices, the size of the effect is much less than those that had higher NPRs in 2001 (e.g. maize, oil and sugar crops). Compared with the baseline, China's WTO accession and further trade liberalisation will lower domestic prices of wheat, soybean and cotton by about 2–4% in 2005–2010. The impacts could be as high as 7–20% for maize, oil and sugar crops in the same time period.

On the other hand, trade liberalisation will increase domestic prices of those commodities in which China has comparative advantage in the international market. The expected rise in exports of these commodities increases their domestic prices. For example, we estimate that the prices of vegetables will be about 4–6% higher in the trade liberalisation scenario than the baseline in 2005 and 2010. Over the same period, the prices of pork and poultry will rise even more (by 7–14%; Table 3.4). A similar pattern of increase will occur in fish prices. Among all animal products, milk is an exception. Its domestic price will decline with trade liberalisation.

Overall, agricultural product and food prices are projected to rise slightly over the projection period. A Stone price index (in which prices of individual commodities are aggregated using weights constructed with value shares) was used to generate aggregated agricultural (crop + meat + fish) output prices, crop output prices and food prices. While the aggregated crop output price level falls by 2.26% in 2005 and 2.18% in 2010 under the trade liberalisation scenario (compared with the baseline scenario), overall agricultural prices will rise by 0.48% in 2005 and 1.8% in 2010. That overall agricultural prices do not fall with more trade liberalisation when the crop output prices do is simply because the prices of most meats and fish rise with trade liberalisation (Table 3.4). For aggregated food prices, we estimate a higher rate of increase under the trade liberalisation scenario because some crops with falling prices (e.g. cotton and most of maize) are not consumed as food. Compared with the baseline scenario, overall food prices with trade liberalisation will rise by 2.36% in 2005 and 4.37% in 2010.

The shift in prices due to trade liberalisation means that the incentives for agricultural producers will change, but unlike sector-wide policies, trade liberalisation policies are unique in that they frequently change the relative prices of domestic agricultural commodities because the impacts of trade policy differ among commodities. In general, trade liberalisation stimulates domestic production of

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sectors that are producing commodities in which the nation has a comparative advantage while dampening those in which producers do not have an advantage. As a result, trade policies can lead to different impacts, sometimes negative and sometimes positive. Moreover, because most of the commodities are competing for domestic resources such as land, labour and capital, cross-commodity substitutions could result from a policy targeting one commodity having an effect on another.

Table 3.4 Impacts of China's World Trade Organization and further trade liberalisation on agricultural output prices in China; percentage compared with the baseline, 2005–2010

Commodity	2005	2010
Rice	1.5	2.3
japonica	6.8	10.2
indica	−0.4	−0.6
Wheat	−1.7	−1.7
Maize	−6.6	−6.6
Sweet potato	−0.9	−0.9
Potato	−0.9	−0.9
Other cereals	−0.9	−0.9
Soybean	−0.9	−2.6
Cotton	−3.4	−3.4
Oil crops	−16.7	−20.2
Sugar crops	−9.3	−16.7
Vegetables	3.7	6.2
Fruits	3.7	6.2
Pork	8.3	13.9
Beef	2.9	4.8
Mutton	1.8	2.9
Poultry	6.8	11.4
Eggs	1.4	2.3
Milk	−9.9	−13.7
Fish	5.9	9.8

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Table 3.5 presents the results of our simulations on the impacts of China's WTO accession and further trade liberalisation on agricultural production in 2005 and 2010. The analyses show that trade liberalisation will affect domestic production moderately. The signs of impacts due to trade liberalisation are as expected. Overall, the impact on production is negative for wheat, maize, cotton, oil crops and sugar crops. In contrast, the impact is positive for those commodities in which China has comparative advantage, such as rice, vegetables, fruits, meat and fish (Table 3.5). Increased prices of these commodities due to trade liberalisation will generally stimulate their domestic production.

It is worth noting that domestic production will not increase for all commodities with higher prices. The production impacts are associated with both own-price and cross-price substitution impacts. Soybean, a crop that had been liberalised before China's WTO accession in 2001, is an interesting case for understanding the impact of trade liberalisation. Liberalisation of the soybean trade had led to a substantial increase of imports and a decline in the domestic price and production before China's WTO accession. Imports reached more than 15 million tonnes, to a level

Table 3.5 Impacts of China's World Trade Organization accession and further trade liberalisation on agricultural production; percentage change compared with the baseline, 2005–2010

Commodity	2005	2010
Rice	1.5	2.3
Wheat	−0.2	0.1
Maize	−3.5	−3.1
Soybean	1.0	0.2
Cotton	−0.3	0.1
Oil crops	−7.5	−9.0
Sugar crops	−2.5	−5.6
Vegetables	2.9	4.9
Fruits	3.3	5.4
Pork	7.6	11.0
Beef	3.5	4.8
Poultry	6.9	9.7
Milk	−5.6	−8.4
Fish	4.3	6.6

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similar to domestic production at the time China joined the WTO. While further trade liberalisation after China's WTO accession will reduce soybean price marginally (Table 3.4), the decline in soybean price is so small that the impact of its own price is less than the impacts due to changes in the prices of substitute commodities such as vegetables, fruits, rice and some coarse grains, and changes in input prices (e.g. fertiliser and pesticide) in the post-WTO-accession era.

As there are both positive and negative impacts of trade liberalisation on China's agriculture, we estimate overall positive impacts for the whole agricultural sector for average farmers (Table 3.6). When examining the overall effects of trade on agricultural production, several facts become clear. In contrast to some of the commodity-specific effects that were presented above, the overall effects of China's WTO accession and further trade liberalisation are positive. According to our analysis, agricultural output value for the average farm will rise 191 yuan (per capita about 46 yuan or US$5.60), accounting for 2.8% of total agricultural output in 2005 (Table 3.6). The net benefits in terms of output values will increase to 460 yuan in 2010, which is about 5.6% of household agricultural output values. These results are consistent with other studies that applied general equilibrium models such as the global trade analysis program, GTAP (Hertel 1997), which showed that the impacts of China's WTO accession on its agricultural output range from 4% to 6% (Wang 2003; Anderson et al. 2004; Ianchovichina and Martin 2004; van Tongeren and Huang 2004). About 20–30% of the benefit is due to the rise in prices and the other 70–80% to the growth in real output through changes in production patterns—movement from agricultural products with a lower comparative advantage to those with a higher comparative advantage. The importance of accounting for production responses to changing prices can be seen by noting the rise in overall production that occurs when imports rise and exports expand. Facing the price shifts, producers in China will, according to our simulation, respond by moving into the production of commodities that experience price rises and out of commodities that experience price falls. We forecast that, at the end of the period, enough structural change will have occurred to generate an overall rise in agricultural output. By 2005, while the output value of importable products will decline by 7.2% under the trade liberalisation scenario (compared with the baseline scenario), exportable products will rise by 9.3% (Table 3.6, column 2).

Between 2005 and 2010, the fifth and tenth years after the implementation of WTO rules, the rate of rise of household's agricultural output accelerates (Table 3.6, columns 3 and 4). Because liberalisation continues for both those products that are

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protected (especially for maize, sugar and edible crops) and those that are exportable (e.g. livestock, fish, vegetables and rice), agricultural output will continue to increase under a more liberalised trade environment in 2005–2010. However, because we have not accounted for the increased production output values that occur due to the higher inputs, increases in agricultural output values should not be considered as increases in agricultural income. When comparing our results to those of other trade models that have simulated the impact of the accession to WTO on China's agriculture, our results (which are couched in terms of output rather than income) are fairly consistent (around 2–3% agricultural income changes in 2005–2010; if one takes a fraction of output—say 50%—as increased profits).

Table 3.6 Impacts of China's World Trade Organization and further trade liberalisation on agricultural output value and food-consumption expenditure for average farm households in China in 2005 and 2010, compared with the baseline

	2005		2010	
	Changes in value (yuan/household)	Percentage change (%)	Changes in value (yuan/household)	Percentage change (%)
Agricultural output	191	2.8	460	5.8
Importable sector	−198	−7.2	−264	−8.5
Exportable sector	389	9.3	723	15.1
Food consumption	44	1.1	102	2.3
Importable sector	−16	−2.0	−17	−1.9
Exportable sector	61	1.9	119	3.3

Note: The importable sector includes wheat, maize, all coarse grains, soybean, edible oil, cotton, sugar and milk. The exportable sector includes rice, vegetable, fruits, all meats and fish.

Our simulations show that per-capita food consumption of importable commodities rises as their prices fall with trade liberalisation, while per-capita food consumption of the exportable commodities will decline. The larger impacts are found in edible oils, sugar, vegetables, fruits, livestock products and fish. The overall effects of trade liberalisation on food expenditures for average rural households are summarised in Table 3.6. Compared with production impacts, the overall effects of China's WTO

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accession on food consumption are more modest (Table 3.6, rows 4–6). By 2005, total household food expenditure will be 1.1% higher in the trade liberalisation scenario than that under baseline. The impact will rise to 2.3% in 2010.

Because overall food prices change with trade liberalisation, to examine the impacts of trade liberalisation on food consumption, we need to compare the food expenditure share changes with the overall food price changes in the projection period. Because aggregate food prices will rise by 2.36% in 2005 and 4.37% in 2010 under the trade liberalisation scenario (compared with the baseline scenario), this implies that increases in food expenditure due to trade liberalisation are all from the rise in food prices. Indeed, real levels of food consumption at constant prices will decline by about 1% in 2005 and 2% in 2010 due to trade liberalisation. Baseline projections show that, except for rice, self-sufficiency of all land-intensive crops will fall in the coming decade, and WTO membership will further lower the self-sufficiency levels of these commodities (Table 3.7). Under the trade liberalisation scenario, cereal imports will rise from 3 million tonnes in 2001 to 41 million tonnes in 2010. Most of the imports are feed grain. Although exports (mainly rice) will also increase, net imports will reach 32 million tonnes in 2010, accounting for about 7% of domestic consumption. In other words, the self-sufficiency level of cereals will fall from 101% in 2001 to 93% by 2010, which would be 96% if China were not a member of the WTO in 2001–2010 (Table 3.7).

The self-sufficiency levels of other land-intensive crops such as oilseed and sugar crops, will fall even more than those of cereal crops. The imports of edible oils will account for 31% (100 minus 69%, Table 3.7) of domestic consumption under the trade liberalisation scenario in 2010, about 20% (89 minus 69%) higher than that under the baseline scenario. By 2010, China will also have to import nearly 30% of its sugar from the world market.

On the other hand, China can benefit substantially from trade liberalisation for rice and labour-intensive products such as vegetables, fruits, meats and fish. Self-sufficiency in rice will be improved by 4% with its WTO membership (107 minus 103%, Table 3.7). China can export 5–6% of its horticultural products to international markets, compared with the baseline of nearly zero net exports. Export expansion of meat and fish products will be even larger than in horticulture. In sum, while grain self-sufficiency levels will fall with trade liberalisation, food grain (excluding feed grain) and overall food self-sufficiency will rise. Trade liberalisation will facilitate China's agricultural diversification and transformation of China's agriculture from lower comparative advantage sectors to higher comparative advantage ones.

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Table 3.7 Self-sufficiency in China under the baseline and trade liberalisation scenarios in 2005 and 2010

Commodity	2001	2010	
		Baseline	WTO
Cereal crops	101	96	93
Rice	101	103	107
Wheat	100	97	96
Maize	105	90	80
Soybean	53	49	47
Oil crops	83	89	69
Sugar crops	89	80	71
Vegetables	101	100	105
Fruits	100	99	106

IMPACTS OF TRADE LIBERALISATION ON CHINA'S RURAL HOUSEHOLDS AND POVERTY

1. Characteristics of rural households

Because all rural households have access to land, farm sizes in China are small by international standards. For the nation as a whole, the average size of farm is 7.9 mu, or 0.53 hectare (15 mu = 1 ha). With farms so small, households in China have to intensively use their land resources. They use their land both to produce their own staple food and for cash crops for sales into the market. Sustainable increases in rural labour productivity and household income, however, will require more than income from the average farm in China. As a result, farm households need to find employment in the off-farm sector. In fact, this is what has been happening in rural China since the early 1980s (de Brauw et al. 2002). By 2003, the average farmer allocated 35.6% of their time to off-farm activities and earned 56% of the family's income from the non-agriculture sector. Most of the off-farm earnings were in the form of wages.

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There is significant regional variation in economic activities, sources of income and patterns of spending. Income levels in the eastern region are twice as high as those in the west. The average farmer in most of the west earned more from agriculture than other sources. Income variation among regions means too that the patterns of spending by farmers also differ. Poverty incidence is higher in western and central regions than in the east. Our analyses also indicate that the agricultural income of the poor depends more on the less-competitive commodities than does that of the richer groups. To show this, we divide household agricultural production into two groups: importable and exportable commodities. Prices for importable commodities will decline with trade liberalisation, while prices will rise for the exportable commodities (or their NPRs were negative in 2001; see previous section for detail). The results of this analysis are presented in Figure 3.2, which shows that, overall, as farmers move from the lower income categories into the higher ones, the shares of their importable commodity output in total production decline while exportable commodity production increases.

Production patterns that we have observed by income category for the nation (Figure 3.2) do not appear in each region. Careful analysis of production of different farmers by province reveals some key differences. For example, in Shanxi and Jilin, nearly all farmers (except the richest) produce more commodities in which China has lower comparative advantage, while farmers in all categories, poorer or richer, in Zhejiang Province produce commodities for which prices will rise with trade liberalisation. These results suggest that future trade liberalisation will disadvantage poorer farmers in the poor areas since it will invariably lead to lower prices for the products they are highly reliant on. On the other hand, all farmers may gain equally in many coastal and southern provinces with China's WTO membership.

2. Impacts on rural households by income group and region

In order to understand the impact of WTO accession and further trade liberalisation on household welfare, we report the results of our simulation analysis for three sets of households (Table 3.8). The three sets of households include those that are very poor (those that earn less than US$1/day, the designated international poverty line), those in the average income category, and those that are in the top decile of income in China. We also disaggregate the impact of trade liberalisation by reporting how much the households in each category are affected by liberalisation in the importable and exportable sectors. The welfare effects are simulated for both agricultural output value and food consumption expenditures.

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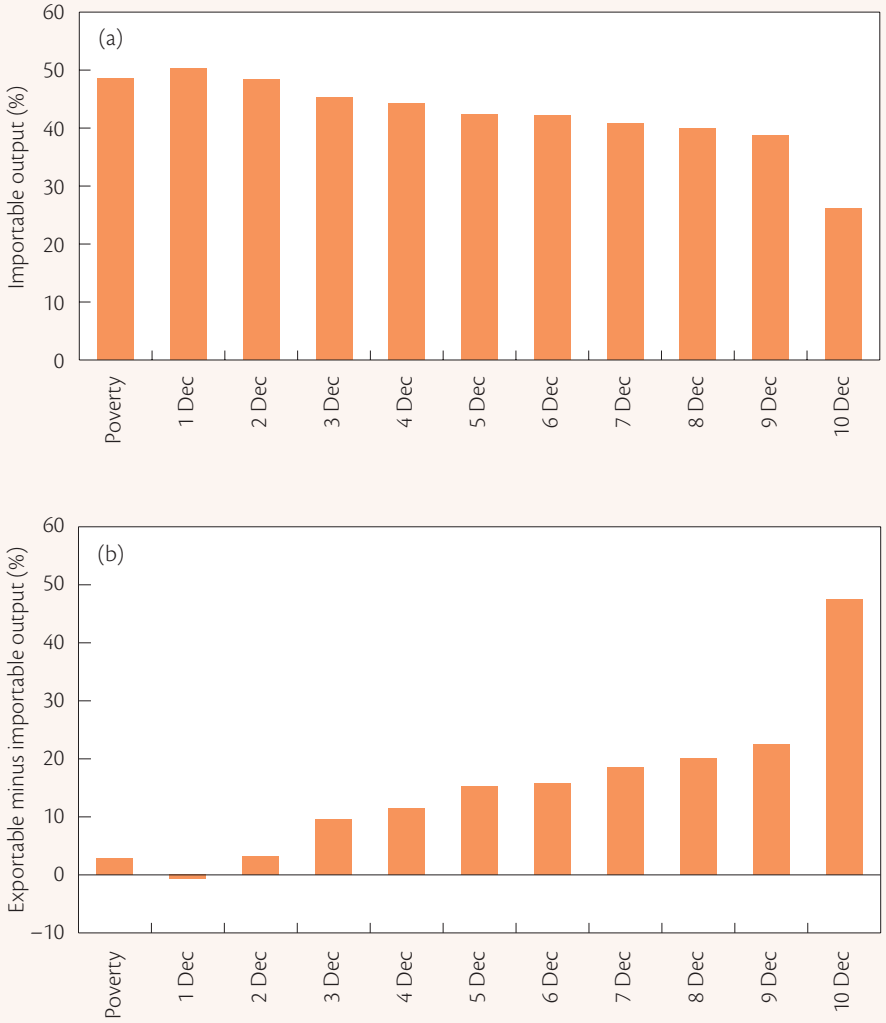

Figure 3.2 Agricultural production structure in China by income group (poverty to 10th decile) in 2003: (a) importable output; (b) exportable minus importable output.
Source: NSBC (2004).

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According to the analysis, if China implements its promises for the WTO agreement, the changes in domestic prices will affect both production and consumption of all rural households (Table 3.8). As discussed above, our simulation analysis predicts that, after five years for the average farm, agricultural output value will rise 2.8% (Table 3.8, row 4). During the same period, food expenditures will rise by 1.1% (Table 3.8, row 13), albeit a rate less than production output value increase. Aggregate food expenditures also rise as the results of overall food-price increase and changes in total food consumption. For importable commodities, falling prices increase their consumption. Reduction of expenditure on importable foods means that consumers gain from both increased consumption and decline in price. For exportable commodities consumers lose from rising prices.

Not all farm households, however, benefit equally from China's trade liberalisation. Our results show that in 2005 and 2010, the poorest farmers gain much less than the average and richer farmers. Agricultural output values for the poor will increase by 77 yuan per household in 2005, while they will be 191 yuan for the average farmer and 583 yuan for the top 10% richest farmers (Table 3.8, column 1). Even in the percentage changes, the rise in agricultural output values for the poor is less than those for the richer. On the other hand, food expenditure increases for all farmers, but in percentage terms the rates of rise are nearly identical in 2005 and fall from rich to poor in 2010 (albeit the difference is very small). Despite the gains from trade liberalisation for average farmers in each group at the national level, farmers in western and northern China are disadvantaged. Indeed the gains we estimated for China as a whole are due mainly to the positive effects that occurred in southern and coastal provinces. Agricultural output value per household will decline as much as 100–340 yuan (or 1–4.5% of output) in northwest and northeast China, while it will increase 100–500 yuan (1–8%) in southern China (Table 3.9). This is not surprising, as the production patterns differ significantly across regions. The provinces with positive effects from trade liberalisation are those that produce greater volumes of exportable than importable commodities (Table 3.9). At the national level, we show that average farmers, including the poor, will gain from trade liberalisation, but, this result does not hold for every province (Table 3.10). From Table 3.8 we see that, at the national aggregate levels, the overall impact is small. The main reason is that there are offsetting effects among provinces. But from Table 3.10, the impacts differ significantly across provinces even for farmers in the same income categories.

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Table 3.8 Impacts of China's World Trade Organization accession and further trade liberalisation on per household food expenditure by income category in China in 2005 and 2010, compared with the baseline scenario

	2005		2010	
	Change in value (yuan)	Percentage change (%)	Change in value (yuan)	Percentage change (%)
Agricultural output value				
Below the international poverty line[a]	77	1.7	221	4.4
Importable sector	−138	−6.3	−177	−7.2
Exportable sector	215	9.6	399	15.5
Average farmers	191	2.8	460	5.8
Importable sector	−198	−7.2	−264	−8.5
Exportable sector	389	9.3	723	15.1
Top 10% richest farmers	583	5.3	1205	9.3
Importable sector	−212	−7.5	−304	−9.3
Exportable sector	795	9.7	1509	15.6
Food consumption				
Below int'l poverty	25	0.9	76	2.4
Importable sector	−20	−2.3	−21	−2.2
Exportable sector	45	2.4	97	4.4
Average farmers	44	1.1	102	2.3
Importable sector	−16	−2.0	−17	−1.9
Exportable sector	61	1.9	119	3.3
Top 10% richest farmers	62	1.0	134	2.0
Importable sector	−13	−1.5	−12	−1.3
Exportable sector	75	1.4	146	2.6

[a] The international poverty line is defined as an income of US$1/day in purchasing power parity terms.

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Because trade impacts are commodity-specific, and because farmers in different income groups in different provinces grow different sets of commodities, there are sharp regional and income-class-specific impacts (Table 3.10). This also means that they affect equity. While nearly all farmers in many provinces in the east and south will benefit from trade policy, liberalisation will hurt producers in the west and north primarily because those regions are the largest producers of maize, wheat, cotton, edible oil, sugar and soybean, the sets of commodities that are most hurt by trade liberalisation.

Interestingly, not all of the poor will gain or lose income with trade liberalisation. Our analyses show that the poor in the rich areas (again in the south and east) gain from trade liberalisation, while the poor in the poor area (west and north) are hurt (Table 3.10). Therefore, trade liberalisation may contribute to poverty alleviation in some parts of China, but it may worsen income distribution in other parts of the nation. Another important finding is that the poor will gain (or lose) less than the rich for each sector because, despite having farms that are of a similar size, their land produces less than that of the richer producers. It could be that lower production is due to inferior land and climate resources. It could also be that poorer producers have access to fewer inputs. If so, the clear policy implications are that the government needs to provide ways for farmers to access better technology, water control and credit.

The impacts of trade liberalisation on food consumption by income group in the selected provinces are shown in Table 3.11. Several observations can be made from these results. First, the effect on rural residents as producers is typically larger than the effect on them as consumers. Production shifts (both positive and negative) are larger than shifts in expenditures because, while the rural resident as producer enjoys (suffers) all of the gain (loss) from the price rise (fall), the rural resident as consumer is affected only marginally since much of the output is sold to consumers in the city. Second, the difference in consumption effects among income groups within the same province (Table 3.11) is much less than those of production impacts (Table 3.10). Finally, our analysis also shows that the trade effects on commodity type are more important than the region of the country in terms of expenditure impacts (Table 3.11). In other words, when examining our results by province, we find that there are only slight differences among provinces. Evidently, because markets are fairly well integrated, all consumers in China consume a basket of goods that is fairly similar, but production baskets differ greatly. The farm households in the north and west of the country obviously produce a commodity mix that will be hurt more by trade liberalisation.

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Table 3.9 Agricultural production structure, importable and exportable shares (%), by province in China in 2001

	Agricultural sector			Crop sub-sector		
	Importable	Exportable	Net exportable	Rice	Horticulture	Importable
Tibet	88	12	–75	0	1	99
Xinjiang	72	28	–44	2	9	90
Gansu	67	33	–35	0	3	97
Inner Mongolia	66	34	–31	2	3	96
Heilongjiang	65	35	–30	12	3	86
Hebei	63	37	–27	1	4	95
Jilin	60	40	–20	14	4	82
Shanxi	57	43	–13	0	6	94
Henan	56	44	–13	4	5	91
Qinghai	56	44	–12	0	2	98
Ningxia	53	47	–7	7	8	86
Shandong	53	47	–6	0	18	81
Shaanxi	48	52	3	2	7	91
Anhui	41	59	18	29	8	63
Liaoning	40	60	19	14	8	78
Tianjin	39	61	23	0	1	99
Beijing	31	69	37	1	13	87
Hubei	31	69	37	38	7	55
Yunnan	30	70	40	25	9	66
Jiangsu	28	72	45	33	11	56
Guizhou	27	73	45	23	12	65
Chongqing	24	76	51	30	21	49
Sichuan	24	76	51	25	14	61
Guangxi	23	77	54	51	9	40
Jiangxi	10	90	79	77	8	15
Hunan	10	90	79	70	9	21
Hainan	10	90	80	62	14	24

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Table 3.9 (cont'd) Agricultural production structure, importable and exportable shares (%), by province in China in 2001

	Agricultural sector			Crop sub-sector		
	Importable	Exportable	Net exportable	Rice	Horticulture	Importable
Shanghai	9	91	81	56	17	27
Guangdong	8	92	85	64	21	15
Zhejiang	4	96	91	34	58	8
Fujian	3	97	93	70	14	16
National	40	60	19	18	8	74

Source: Computed by the authors, based on the rural household income and expenditure survey conducted by the National Statistical Bureau of China (NSBC 2004).

Table 3.10 Impacts of China's World Trade Organization accession and further trade liberalisation on per household agricultural output value by income category in selected provinces in 2005 and 2010, compared with the baseline scenario

	2005		2010	
	Change in value (yuan)	Percentage change (%)	Change in value (yuan)	Percentage change (%)
Zhejiang				
Below the international poverty line[a]	157	6.8	309	11.4
Average farmers	397	7.6	752	12.5
Top 10% richest farmers	951	8.2	1786	13.5
Guangdong				
Below the international poverty line	163	4.4	323	7.7
Average farmers	684	7.6	1348	12.8
Top 10% richest farmers	2936	11.0	5799	17.9
Jilin				
Below the international poverty line	−77	−1.3	61	0.9
Average farmers	−128	−1.2	105	0.9
Top 10% richest farmers	370	1.8	1165	5.0

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Table 3.10. (cont'd) Impacts of China's World Trade Organization accession and further trade liberalisation on per household agricultural output value by income category in selected provinces in 2005 and 2010, compared with the baseline scenario

	2005		2010	
	Change in value (yuan)	Percentage change (%)	Change in value (yuan)	Percentage change (%)
Jiangxi				
Below the international poverty line	187	4.7	368	8.3
Average farmers	278	4.5	549	8.0
Top 10% richest farmers	476	4.9	913	8.2
Henan				
Below the international poverty line	−7	−0.2	77	1.7
Average farmers	80	1.2	296	3.8
Top 10% richest farmers	818	5.8	1685	10.5
Sichuan				
Below the international poverty line	164	3.8	355	7.2
Average farmers	389	5.9	789	10.6
Top 10% richest farmers	683	7.5	1339	12.7
Ningxia				
Below the international poverty line	42	1.0	166	3.4
Average farmers	−3	0.0	88	0.9
Top 10% richest farmers	−119	−0.7	−238	−1.1
Shaanxi				
Below the international poverty line	27	0.7	123	2.9
Average farmers	101	2.0	280	4.8
Top 10% richest farmers	297	3.5	664	6.7
Guizhou				
Below the international poverty line	138	3.4	317	6.9
Average farmers	270	5.0	565	9.2
Top 10% richest farmers	471	6.8	941	12.0

[a] The international poverty line is defined as an income of US$1/day in purchasing power parity terms.

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Table 3.11 Impacts of China's World Trade Organization and further trade liberalisation on per household food expenditure by income category in selected provinces in 2005 and 2010, compared with the baseline scenario

	2005		2010	
	Change in value (yuan)	Percentage change (%)	Change in value (yuan)	Percentage change (%)
Zhejiang				
Below the international poverty line[a]	65	1.4	133	2.5
Average farmers	88	1.4	170	2.3
Top 10% richest farmers	105	1.1	200	1.8
Guangdong				
Below the international poverty line	67	1.2	141	2.3
Average farmers	123	1.5	243	2.7
Top 10% richest farmers	151	1.4	283	2.4
Jilin				
Below the international poverty line	46	1.5	97	2.8
Average farmers	41	1.3	88	2.6
Top 10% richest farmers	34	0.9	79	2.2
Jiangxi				
Below the international poverty line	32	1.0	70	1.9
Average farmers	47	0.9	98	1.9
Top 10% richest farmers	50	1.0	99	1.8
Henan				
Below the international poverty line	–1	0.0	18	0.7
Average farmers	13	0.4	43	1.3
Top 10% richest farmers	70	1.3	149	2.6
Sichuan				
Below the international poverty line	50	1.4	106	2.7
Average farmers	65	1.6	129	2.9
Top 10% richest farmers	68	1.4	130	2.6

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Table 3.11 (cont'd) Impacts of China's World Trade Organization and further trade liberalisation on per household food expenditure by income category in selected provinces in 2005 and 2010, compared with the baseline scenario

	2005		2010	
	Change in value (yuan)	Percentage change (%)	Change in value (yuan)	Percentage change (%)
Ningxia				
Below the international poverty line	7	0.2	49	1.4
Average farmers	24	0.7	91	2.4
Top 10% richest farmers	38	1.0	149	3.7
Shaanxi				
Below the international poverty line	−5	−0.3	11	0.4
Average farmers	−1	−0.1	17	0.6
Top 10% richest farmers	2	0.1	22	0.7
Guizhou				
Below the international poverty line	42	1.3	95	2.7
Average farmers	56	1.6	115	3.1
Top 10% richest farmers	64	1.6	126	2.9

[a] The international poverty line is defined as an income of US$1/day in purchasing power parity terms.

CONCLUDING REMARKS AND POLICY IMPLICATIONS

China's trade liberalisation has progressed smoothly since the late 1980s. Through nearly 20 years of external reform, China's foreign-trade regime has gradually changed from a highly centralised, planned and import-substitution regime to a more decentralised, market-oriented and export-promotion regime.

Although the effects of China's WTO accession and trade liberalisation on the rural economy from other subsectors may be equally large or even larger in the future, this study's focus on the agriculture sector showed that there will be effects and that the net effects will be positive for average farmers in China. Our findings on the

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NPRs show that, for some agricultural commodities, WTO accession will lead to a fall in prices and a rise in imports. Edible oils, sugar, maize and cotton may be most affected. There are also commodities in which China has considerable comparative advantage—e.g. japonica rice, meats, and horticulture products—and, hence, WTO accession could provide benefits to those engaged in these activities. The prospect of increased imports of feed grains (e.g. maize and soybeans) at lower prices means that livestock producers could become even more competitive.

Our study also shows that as some prices rise and others fall, trade liberalisation is encouraging farmers to adjust their agricultural production structure towards products for which they have a higher comparative advantage. In response to overall food-price rise, consumers reduce their consumption. However, with the increased incomes that accompany the shift of farmers to more-profitable agricultural products, most of the farming sector likely will be better off (although we do not measure the indirect rise in consumption due to the income effects of higher agricultural profits). We demonstrate that, although the absolute effects of trade liberalisation will not be very large, policy makers should be concerned about poverty and equity effects. We show this through several findings. First, although farmers at the national level will, on average, benefit from trade liberalisation, it does not hold for all provinces. Farmers in many less-developed provinces in the west and north will not gain from trade liberalisation. The main reason is that farmers in the east and south produce more of the products for which China has a comparative advantage. Indeed, the net impacts on agricultural production of average farmers in several western and northern provinces are negative.

Second, while for the nation as a whole the poor will benefit, not all of the poor in each region will gain from trade liberalisation. We find that the poor in many provinces in the west and north will lose in agricultural production (income).

Third, in nearly all provinces where there are gains, the richer will gain more than the poor. The main reason for the advantage of rich farmers in the same province is that the rich farmers produce higher yields for the same commodity and more output (e.g. more horticulture, meats and fish). As a consequence of equity issues, policy makers need to take one of two actions. First, they need to try to encourage farmers in poorer, inland areas to shift their production (where appropriate) to more-competitive crops. Second, officials may also need to take other, non-trade actions to increase the livelihood of farmers in these areas. In many areas, farmers

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do not have profitable opportunities in any farming activity. In such areas, rural education, better communications and other policies that facilitate their shift into the non-farm sector may be the most beneficial approach.

The impact on agriculture, however, is only part of the story. Although we do not analyse the non-farm impacts, trade liberalisation is expected to also affect the access of households to non-farm employment and the wages they earn for being in the off-farm market. In general, China will gain a great deal from trade liberalisation. Rising exports of manufactured goods will need much rural labour. In a country like China, raising the demand for off-farm labour is probably the most important thing that can happen in the economy. The nation needs to keep promoting policies that facilitate investment and allow rural households to move to these jobs without constraints.

REFERENCES

Anderson, K., Huang, J. and Ianchovichina, E. 2004. Will China's WTO accession worsen farm household income? China Economic Review, 15, 443–456.

Carter, C.A. and Estrin, A. 2001. China's trade integration and impacts on factor markets. Davis, University of California, mimeo.

de Brauw, A., Huang, J., Rozelle, S., Zhang, L. and Zhang, Y. 2002. China's rural labor markets. The China Business Review, March–April, 2–8.

Hertel, T.W., ed. 1997. Global trade analysis: modeling and applications. Cambridge University Press.

Huang, J. and Chen, C. 1999. Effects of trade liberalization on agriculture in China: commodity and local agricultural studies. Bogor, Indonesia, United Nations ESCAP CGPRT Centre.

Huang, J. and Li, N. 2003. China's agricultural policy analysis and simulation model—CAPSiM. Journal of Nanjing Agricultural University, 3(2), 30–41.

Huang, J., Li, N. and Rozelle, S. 2003. Trade reform, household effects and poverty in rural China. American Journal of Agricultural Economics, 85, 1292–1298.

Huang, J., Rozelle, S. and Chang, M. 2004. Tracking distortions in agriculture: China and its accession to the World Trade Organization. The World Bank Economic Review, 18, 59–84.

Huang, J., Rozelle, S., Pray, C. and Wang, Q. 2002. Plant biotechnology in China. Science, 295, 674–677.

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Edited by: Bernard H. Sonntag, Jikun Huang, Scott Rozelle and John H. Skerritt
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Ianchovichina, E. and Martin, W. 2004. Economic impacts of China's accession to the WTO. In: Bhattasali, D., Li, S. and Martin, W., ed., China and the WTO: accession, policy reform, and poverty reduction strategies. Washington, DC, World Bank and Oxford University Press.

Lardy, N. 2001. Integrating China in the global economy. Washington, DC, Brookings Institution.

Li, S., Zhai, F. and Wang, Z. 1999. The global and domestic impact of China joining the World Trade Organization, a project report. China, Development Research Center, State Council.

Martin, W. 2002. Implication of reform and WTO accession for China's agricultural policies. Economies in Transition, 9, 717–742.

MOFTEC (Ministry of Foreign Trade and Economic Cooperation) 2002. Foreign trade and economic yearbook of China. Beijing, China Statistical Press.

NSBC (National Statistical Bureau of China) 2003a. Statistical yearbook of China. Beijing, China Statistical Press.

— 2003b. China rural household survey yearbook. Beijing, China Statistical Press.

— 2004. Rural income and expenditure survey. Beijing, China, Statistical Press.

Rozelle, S. 1996. Stagnation without equity: changing patterns of income and inequality in China's post-reform rural economy. The China Journal 35, 63–96.

van Tongeren, F. and Huang, J. 2004. China's food economy in the early 21st century. The Hague, Netherlands, Agricultural Economics Research Institute (LEI), Report # 6.04.04.

Wang, Z. 2003. WTO accession, the greater China free-trade area, and economic integration across the Taiwan Strait. China Economic Review, 14, 316–349.

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CHAPTER 4

PARTNERSHIPS WITH FARMER ORGANISATIONS

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4.1 BUILDING PARTNERSHIPS WITH FARMER ASSOCIATIONS

CCICED ARD Task Force members

In a modern society that is dominated by markets and where most assets and information are in the hands of private individuals and enterprises, the government needs partners to engage in the development process. It is important at this point that China encourages the establishment of truly independent non-state organisations, including those that will act as information networks, business-support groups, and providers of technical and marketing systems. Cooperatives played major roles during the rapid growth periods in all European and North American nations. In Japan, Korea and Taiwan, the development of the rural economy was guided by cooperatives and farmer associations (FAs). In a number of developed countries, as the government reduces its commitment to rural extension, FAs are taking over information dissemination and service provision.

THE ABSENCE OF FARMER ASSOCIATIONS: LEGACY OF THE PAST

Farmer associations have a relatively low profile in China and little is known about them.[1] In the mid 1990s it was estimated that there were more than 100,000 farmer associations in China. The Ministry of Agriculture claimed that, during the 1990s, up to 5% or more of all farmers belonged to associations. Because the source of these numbers is unclear, those familiar with rural China often cast doubt on the figures. Field workers during the 1990s rarely encountered such associations. Retrospective information from a recent community-level, national representative survey in 2003 confirms that, even by as late as 1995, only a small number of villages and a smaller number of farmers participated in FAs.

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The conditions in rural China have changed markedly in recent years and there is now an increasing need for institutional change. Almost certainly the poor record in establishing FAs during the 1980s and 1990s was due to China's unique legacy of planning, an environment characterised by poorly developed markets and the lack of a legal and institutional support framework. In the past, government agencies were responsible for delivering and financing inputs and technology, and for procuring and marketing output. Markets and price signals were weak. The demand for agricultural products was dominated by the need to purchase the basic commodity; there was almost no emphasis on quality or value-added services. In the old environment there was little need for FAs to aid farmers in accessing technology and inputs, or for marketing their products.

Since the mid 1990s, the situation has changed. The legacy of planning had been fading for some time but this process accelerated in the first half of the 1990s. Markets started to become the dominant source of technology and inputs, and the demand for higher quality, safer and fresher food products from farmers began to grow rapidly. Despite the sharply increased need for organisations such as FAs in the new market-driven environment, there has been little on-the-ground response outside a few notable experimental areas. The slow emergence of FAs is not surprising, given the absence of many of the basic conditions that facilitated the emergence of FAs elsewhere in the world.

NEW URGENCY, NEW EFFORTS

China's government has begun to take steps to promote FAs in recent years, following a change in attitude. While in the past FAs were viewed with ambivalence, or even as a threat, they are now embraced. The beginning of a new phase of FAs is best marked by the revision of the Agricultural Law in 2002. The new version provides the fundamental legal basis for the development of FAs in China. Article 14

[1] In this chapter and the others we are careful to draw a distinction among those entities that are called farmer associations or farmer professional associations inside China. In particular, in the chapter on farmer professional associations (FPAs) by Shen et al. we enumerate all of those entities in China that call themselves FPAs and then categorise them into those that are functional and those that are formal and those that are both or neither (that is, nominal-only FPAs).

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of Chapter 2 stipulates that 'farmers and farmer production and marketing organizations may establish various kinds of agricultural commodity sector associations, to provide services to members in production, marketing, information, technology and training, to bring into play the functions of coordination and self-control, to submit applications for support in agricultural trade related issues, and to protect the interest of members and the sector'.

In a document of the Communist Party of China (CPC) and the State Council for guiding agricultural and rural work in 2003, the important roles of FAs and other cooperative organisations are also recognised. Finally, and perhaps most importantly, in the 2004 No. 1 Document of the CPC and the State Council, the prominent role of FAs has been promulgated as well as more concrete measures designed to promote their development. The document states, 'The development of various kinds of agricultural professional cooperative organizations … should be encouraged. The formulation of the law for farmer professional cooperative organizations should be advanced … To accommodate the new development situation of world agricultural trade, the establishment of sector or commodity associations for major export products including poultry, vegetable and fruits should be accelerated'.

A recent nationwide survey by economists in China confirms the recent surge in FA activity. FAs do exist in China, but they are still in an early stage of development. From less than 1% in the mid 1990s, it is now estimated that about 7% of villages in China have functioning FAs. Around 2–3% of China's households participate in some type of FA. Although the level of participation is low, in recent years their emergence is accelerating.

The expansion of FAs is not spread evenly across China. FAs appear in greater numbers in richer villages, but surprisingly there are also substantial numbers in poorer areas. While the relative wealth of the area is not correlated with the formation of FAs, the distance from a major economic centre is strongly correlated. Where villages are further away from major economic centres, FA activity falls rapidly. This suggests that, if households in more remote areas are going to start FAs, they will require substantially more help than in the past. Finally, most of the associations are in areas where there are more higher-value crops, such as fruits and vegetables, and non-cropping activities such as livestock production.

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REMAINING CONSTRAINTS

There are still shortcomings that are restricting the development of FAs and constraining their spread to new communities. Above all, there are legal constraints. Despite the new laws and higher policy status, today FAs have no legal status. Members are unable to sign contracts as an organisation. They cannot take out loans or act as a guarantor. In the vast majority of cases studied by two separate Ministry of Agriculture and Peking University research teams, the lack of legal status has been identified as the most severe constraint to the expansion of FA activity.

The other pressing need is to find the right group, agency or institution to act as a catalyst to promote FAs. While it is almost universally known that although cooperation and collective action among farmers will lead to rising welfare for the entire group, it often is difficult to overcome group dynamics and to achieve cooperative behaviour. In such cases, the input of an outsider (or a champion/leader from the group) is needed to get the group going and to mentor it, especially in its early years. However, though it is necessary to have a catalytic agent, it is difficult to establish the right balance between encouragement and domination. Farmers need to be encouraged and, indeed, sometimes pushed into such organisations but, to be successful, FAs need to be voluntary. In other countries, various agencies have taken responsibility for promoting and managing cooperative movements. In the US, the agricultural university system has a network of cooperative extension agents. In Japan, there is a special ministry-level cooperative commission. In Europe, the cooperative movement is quite mature and local cooperatives are bound together by informal networks of upper-level, pan-national cooperative associations. In China there is now really no single group that has responsibility for promoting and fostering the nation's FA movement.

The record in China shows that such a service (government or not) is needed, but that it is difficult to find the right balance. According to a survey by economists, the actions of local governments often dampen the enthusiasm of farmers. In many places, the government has put in place regulations for registration and the establishment of charters—when these rules are followed the FAs become *formally established*. In other areas, the emergence of less-formal FAs has been allowed or encouraged. In many cases, even without being formally established, farmers cooperate in their input purchasing and marketing activities, in organisations that are called functioning FAs. Research shows that there is some overlap between

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formal and functioning FAs, but most non-functioning ones are actually formal ones. In contrast, most informal FAs function well. This indicates that strict regulations may retard FA growth. As is the case in a number of developed countries, the best-practice legislation is less prescriptive and more enabling. It also suggests that, in some areas, fewer detailed rules may not harm the growth of the FA movement.

On the other hand, the government clearly has an important influence on the emergence of FAs. Government involvement in promoting FAs within a locality is the single-most important factor that explains why FAs exist in some communities, but not in others. Such a finding suggests that China may consider adopting a system like that used in other countries, in which government employees are hired with the explicit job to be an advocate for FAs. Such an official would be rewarded for rapid expansion of FAs, as long as they developed in a way that was pro-farmer and positively affected rural welfare.

Finally, research has found that lack of resources—both financial and information—in the hands of FA leaders constrains their growth. The success of the influential FA movement in East Asian economies is often attributed to the fact that there was a great deal of motivation for members to participate in and contribute to the leadership of the local FA. The association had the support of the government and was the recipient of investment funds from budgetary authorities and financial support from the banking system. Many government rural-development initiatives have worked through FAs and, due to the high level of participation of farmers, even the poorest and most land-constrained households could benefit.

POLICY OPTIONS

Although the impetus to meet and act as a group must originate from the farmers themselves, the Chinese Government can create an environment in which FAs can thrive.

First, leaders need to develop laws and regulations that promote and protect FAs. The legal status of groups needs to be clear. FAs need to have the ability to enter into contracts and take loans. FAs need the authority to be able to act for the members of their group, as well as to be subject to well-designed regulations that protect the membership from the leadership, including the way in which the leadership is selected and monitored. There is now a working group that is pushing for a new law by 2006. The law should include clear and unambiguous language giving FAs full

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legal status. Efforts are needed to ensure that the law is well-written in other dimensions and immediately implemented. When it is final, there should be no expense or effort spared in promoting and implementing the law.

Second, the experience of FAs in other countries has shown that even when a favourable legal and regulatory framework exists, an independent catalyst is also often needed to get FAs started, growing and performing better. While China has a number of FA-promoting agencies, these institutions are controlled by the government. Alternative models should be sought to create catalysts that are first and foremost responsive to the needs of farmers and FAs. The main role of such an advocacy organisation is to facilitate the creation of FAs and provide information that allows its members to promote the interests of the association—usually the FAs that survive are those that provide economic gain to farmers as a result of their involvement.

Third, new measures should be enacted immediately to provide more technical and financial support to FAs. Technical support from government is needed for sound development of FAs and good functioning of those associations. The technical support can be in the form of: training members, leaders and staff of the associations in establishing an efficient and democratic internal management system; technical services provision by public agricultural extension systems/units to members of farmer associations; and a marketing information service from governmental organisations. It is also possible to offer financial and economic support. Care, however, is needed to ensure that the incentives for establishing FAs are not so great that fake FAs appear solely to take advantage of the benefits.

Fourth, there is a great deal of accumulated experience and knowledge about FAs in many other countries. China should take advantage of this experience and expertise to further its own development and utilisation of this valuable tool. Many countries and their FAs are willing to share their knowledge and experience with China.

Fifth, although having FAs provide credit services before rural financial reform may not be a viable alternative, in the long run this may be one of the most effective ways for FAs to grow. In many countries and regions (e.g. Japan, Canada and Taiwan), FA activities often revolved around credit provision. In many areas of China, access to credit may relieve major constraints to production and investment activities.

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4.2 PRODUCER ASSOCIATIONS: THE INTERNATIONAL EXPERIENCE

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Producer associations are a common feature in market economies. Found throughout the world, they initially emerged in the late 1800s in northern Europe, North America and Australia/New Zealand to address problems faced by farmers in the market economy that was then developing. Known as small-group voluntary organisations, grassroots organisations, local organisations and institutions, and collective organisations, producer associations have a wide variation in size and in the forms and activities they undertake. Among other things, producer associations provide goods and services to their farmer members (often through formal business structures such as cooperatives), lobby government, set standards, fund research, administer programs and manage local resources (e.g. water).

Producer associations play a critical role in a market economy. They are a mechanism by which market and government failure are addressed, and they allow adaptation to changing economic and social conditions. The success of producer associations depends on the existence of a formal legal framework within which they can be structured, the development support they receive, their organisational independence—which effectively means they have the freedom to succeed and to fail based on the decisions they make, proper internal property rights and benefit structures, and effective governance and management.

The purpose of this paper is to examine the historical and international experience associated with producer associations. Although examples of producer associations can be found from around the world, the examples will primarily be taken

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from North America and northern Europe. The next section of the paper provides a definition of a producer association. That is followed by an examination of the economic and social reasons for producer associations. The focus of examination is on the role of market and government failure, as well as the nature of different types of goods and services, in creating the conditions necessary for the formation of producer associations. With these conditions as background, the section also provides a number of examples of producer associations that have been formed and links their formation to the underlying factors discussed in the previous section. The paper then goes on to argue that the formation of producer associations is not automatic, but rather involves a complex mix of players and factors. The examination of the conditions required for the successful formation of producer associations is the focus of the next section of the paper, and is followed by an examination of the challenges facing producer associations. A short summary concludes the paper.

WHAT IS A PRODUCER ASSOCIATION?

Producer associations comprise many different forms of organisations. Their key feature is that they are a form of collective action—they involve a group of producers/farmers coming together to form an organisation that in turn provides goods or services to the producer-members. Examples of producer associations include agricultural cooperatives formed to supply inputs to their members or to market their members' output, informal groups of farmers that provide credit to their members or that meet to discuss the latest agricultural technology or environmental problems, and organisations formed by producers to fund research and development or to administer government programs. What is not included in this paper is any discussion of national sectoral associations that are formed by government and charged with implementing one or more elements of agricultural policy.

Producer associations are typically formed under legislation that provides them with the legal power to enter into contracts and to borrow money. They are typically self-governed, with the members of the association providing the leadership for the organisation. While day-to-day management of the association is often left with employees, the producer-members typically set the policy direction for the association, usually through an elected board of directors.

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REASONS FOR PRODUCER ASSOCIATIONS

The development of producer associations is closely associated with the formation of market economies. Market economies arise hand-in-hand with a growing demand by the members of the economy for a wider set of goods and services and for a greater freedom in the social and economic activities that are undertaken. These developments create the conditions necessary for the formation of producer associations. On the economic front, market economies often give rise to either market or government failure; simply put, for-profit firms and governments are often unable to provide the full range of goods and services desired or required by the population. In addition, a number of the goods and services demanded are often supplied most efficiently through producer associations. On the non-economic front, market economies may also create social conditions/factors that serve as the backdrop for the formation of producer associations.

Market failure

Market economies do not always work efficiently and the outcomes are not always beneficial to all groups. The failure of the market economy to effectively meet the needs of the people participating in the economy stems from potential problems that two of its key institutions—for-profit firms and governments—have in supplying goods and services.

Under the conditions of a perfectly competitive economy, for-profit firms are expected to be able to supply goods and services at the lowest cost possible. The conditions of a perfectly competitive economy, however, do not always exist. In particular, the firms participating in a market are often not price takers and freedom of entry and exit does not exist. In such situations, markets are said to be monopolistic or oligopolistic. One outcome of this market structure is that products are sold for more than the marginal cost of producing them. For agricultural producers, the result is what is termed market failure—higher than competitive prices for their inputs and lower than competitive prices for their outputs.

This form of market failure is often cited as a key reason for the formation of agricultural cooperatives, which are one form of producer association. For instance, the agricultural structure that emerged in northern Europe, North America and Australia/New Zealand in the late 1800s was one of relatively small, family-owned

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enterprises producing raw agricultural products, and relatively large companies that handled and processed this raw product. The consequence of this imbalance in scale economies was the creation of oligopolistic firms that farmers believed did not price their goods and services competitively.

To provide more competitive prices, farmers formed cooperatives that invested in these handling and processing activities. With ownership and control of these activities, farmers were in a position to price the processing and handling services more competitively (Cook 1995; Hansmann 1996). Indeed, agricultural cooperatives have often been billed as the 'competitive yardstick' (Cotterill 1984; Torgerson et al. 1998).

Many examples exist of agricultural cooperatives that were formed to address problems of non-competitive pricing. They include dairy cooperatives, grain handling co-ops, vegetable and fruit marketing co-ops, and input (e.g. fuel, fertiliser, feed) supply co-ops. While agricultural producers often used co-ops to overcome problems of non-competitive pricing, their response was not always to take ownership and control of the processing or handling facilities. For example, bargaining associations—another form of producer association—have been used in a number of countries to provide a group of producers with greater control over the pricing and marketing of their output (Hueth and Marcoul 2003; Hendrikse and Bijman 2005).

Other forms of market failure can also arise in market economies; the ones that are of interest are the lack of provision of goods and services, and informational asymmetries.

Consider first the lack of provision of goods and services. For-profit firms, by their very nature, require a certain expected rate of return before they will undertake an investment. In situations where the size of the market is limited and firms are required to make substantial investments to provide a good or service, the earnings from the sale of the good or service may not be sufficient to cover the cost of the investment or, if the investment cost can be covered, to earn a rate of return that is better than what can be earned elsewhere. In such situations, the outcome is that the good or service in question will not be supplied.

Despite the fact that it may not be profitable to provide this good/service, the consumers of the good/service may nevertheless find it desirable to have it provided—the utility they earn from having it supplied is greater than the cost associated with its provision. When this set of conditions occurs, a market failure is said to exist. Fulton and Ketilson (1992) provide a number of examples from communi-

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ties in rural Saskatchewan where this market failure has been addressed through local community-owned cooperatives that provide retail (e.g. groceries and farm supplies) and financial services to the members of the community. The formation of the rural electrical and telephone cooperatives in many parts of the USA during the 1940s is also an example of an association of rural residents attaining a good that would otherwise not have been provided.

As with oligopolistic pricing, the source of the informational asymmetry market failure lies in the fact that the conditions for a perfectly competitive market do not always exist. An important condition for a perfectly competitive economy is that all participants in the market have the same information. In practice, however, some parties will have information that other parties do not—in short, informational asymmetries are said to exist. As Akerlof (1970) showed in his markets for lemons paper, an asymmetry in the information held by the buyer and the seller can lead to a lack of trade between these two parties, even when trade would be beneficial to both.

Numerous examples exist in agriculture of informational asymmetries between producers and the firms with which they deal. Producers, for instance, will know whether they are a good credit risk or whether the quality of their output is high. The firms with which these producers deal may not have this information, however, particularly if the cost of obtaining it is large. Faced with this lack of information—or a high cost of obtaining it—firms may simply decide not to participate in particular markets. For instance, if processing firms are uncertain as to the quality of the product supplied by producers, they will be reluctant to make an investment in a market where product quality is critical. Similarly, faced with a lack of knowledge of the credit worthiness of rural residents, financial institutions may simply decide not to provide credit to rural residents. The result is a market failure—even though trade would be potentially beneficial, it does not take place.

Producer associations provide a potential solution to this market failure. As a collective organisation made up of producers, a producer association may be able to obtain the information more cheaply than can for-profit firms. For instance, members of the association may have knowledge of other members' credit worthiness, knowledge that outside financial firms would not have. Or a producer association may be more effective at providing guarantees of product quality—perhaps because its costs of ensuring compliance are lower. If the producer association is able to reduce these informational asymmetries, it may be able to allow trade to occur when it otherwise would not.

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Many examples exist of producer associations that have been formed to address problems of information asymmetry. Among the most common examples are alternative organisations for the provision of rural credit. [For a history of credit unions in Saskatchewan, Canada, see Clements (1965).] Credit unions that provide loans and take deposits can be found in virtually every part of the world; micro-credit schemes that rely on small groups to decide upon loans and to monitor repayment are also increasingly popular in developing countries. One of the keys to the formation and success of these credit organisations has been their ability to efficiently determine an individual's credit worthiness and create incentives for loan repayment.

In addition to fostering price competition, a number of agricultural cooperatives and bargaining associations may have been formed as a way of dealing with informational asymmetries. Hueth and Marcoul (2003) suggest that one of the reasons for the formation of bargaining associations in the US is that they have been able to share production information with processors that would otherwise be costly to obtain, while Hendrikse and Bijman (2005) argue that bargaining associations have developed recently in the Dutch fruit and vegetable industry as a way of more efficiently negotiating contract terms. Henriksen and Hviid (2003) outline how dairy co-ops emerged as the dominant organisational form in the Danish dairy industry in the late 1880s because of their ability to effectively monitor the quality of the milk delivered to the dairy processing plant.

Government failure

Governments are an extremely important part of a market economy. In addition to providing the basic legal and judicial framework (e.g. property rights, court system) for a market economy, governments provide a host of regulations, as well as many goods and services, to their citizens. Governments, however, do not always supply these regulations and goods/services effectively, in large part because of the complexity of the economy and because the required information is unavailable or costly to obtain. Complexity and informational problems result in inefficient policies and programs, myopic regulations, institutional rigidities, political constraints, incorrect objectives and corruption (Lipsey et al. 1988).

Producer associations can often address these government failures, in large part for the same reasons that they are able to address the market failures described above. For instance, by taking on the provision of certain services that might otherwise

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have been provided by government, producer associations may be less likely to be influenced by other objectives and thus more likely to provide the service effectively. Similarly, producer associations may have informational advantages that governments do not have, with the result that services can be provided more efficiently.

Examples of producer associations that were formed in response to government failures can be found in a number of different areas. Producer-funded research programs (e.g. pulse and canola research in Canada) have in part been formed because the producer associations that operate them have been able to more quickly respond to the changing needs of the industry than have government research agencies. These research associations were also formed because producers of these commodities believed that government was unwilling to fund research to the extent that they believed was desirable.

Producer rural-resident associations have been formed to provide local services and infrastructure that are often provided by one of more levels of government. In the US, rural electrical and telephone co-ops were formed during the 1940s to supply electricity and telephone to rural areas (as discussed above, the formation of these co-ops was in response to a market failure—for-profit firms were generally unwilling to supply these services because they could earn a greater rate of return in the more-populated urban areas). In more recent years, local associations have been formed to provide education, health and social services, and waste-disposal services to rural areas in many parts of the US—see Sanderson and Fulton (2003) for examples. These cooperatives and associations can typically provide services that are tailored to the needs of their members, and thus represent a mechanism to deal with the informational asymmetries that often make government provision costly.

Nature of goods and services

The manner in which goods and services are provided can be linked to their characteristics. For instance, it is argued that the government most effectively supplies public goods, while for-profit firms most effectively supply private goods, and groups or associations most effectively supply what are known as common-pool goods. To understand the role played by producer associations in supplying common-pool goods, it is necessary to examine how goods and services can be characterised and how this characterisation influences the manner in which they are most effectively supplied.

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Goods and services have been characterised along three dimensions: rivalry; excludability; and voice. A good or service is said to be rival if its use by one person means that others cannot use it, while a non-rival good is one that can be used by everyone. Shoes and haircuts are examples of rival goods, while scientific ideas, the music and lyrics to a song, and national defence are non-rival goods. Excludability refers to the degree to which one person can exclude others, either technically or legally, from using a good. Goods that can be stored or locked away have a high degree of excludability, while goods or services available in the public sphere (e.g. clean air) are non-excludable. Voice refers to the degree to which the good supplied depends on the specific needs of the people consuming the good and the degree to which these needs are difficult or costly to determine.

Governments are generally the most effective at providing public goods and services—those that are non-rival and non-excludable and have low voice. The classic examples of public goods include national defence and basic scientific research. The non-excludability of these goods and services means that for-profit firms will have difficulty appropriating the benefits that consumers receive from their consumption, while the non-rival nature of the goods means that it is most efficient if they are supplied by only one economic player. The low degree of voice associated with these goods means that informational asymmetries are unlikely to substantially affect the nature of the good or service that is provided. As a consequence, public goods are most effectively supplied by public agencies.

Private goods and services—those with a high degree of rivalry and excludability and a low degree of voice—are generally most effectively supplied by for-profit businesses. The rivalry and excludability of these goods and services mean that for-profit firms are able to capture a portion of the consumer benefit, while the low degree of voice means that specific knowledge of particular groups—which may be difficult or costly for a firm to acquire—is not required to supply the good or service.

The third category of goods and services—common-pool goods—is characterised by a high degree of voice, and some degree of non-rivalry and non-excludability. The presence of some degree of non-rivalry and non-excludability means that for-profit firms often find it difficult to profitably supply these goods; the high degree of voice and the associated informational asymmetries also often makes these goods costly

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to provide. While governments could supply these goods, this provision may not be effective because of informational asymmetries. An association of the people that consume this common-pool good, however, is often able to supply it.

To effectively supply this good, the group must meet a number of challenges associated with the good's common-pool nature. The group must, at least partially, overcome the free-rider problems associated with limited excludability and rivalry. These free-rider problems include the challenge of raising capital to provide the good and the need for mechanisms to limit those individuals that have access to the good or service. The group must also find a way of tailoring the good or service to the specific needs of the membership, as well as finding rules and regulations that ensure the costs and benefits of the association are distributed in such a manner that the members continue to see a benefit from participating in the association.

A number of the examples of producer associations listed above can be viewed as instances where a group of agricultural producers or rural residents joined together to provide common-pool goods. Rural infrastructure (e.g. electricity and telephone networks) and agricultural research can be considered common-pool goods. They have some degree of non-rivalry, since their use by one person does not generally preclude their use by others. As a consequence, it is more efficient if these goods are supplied only once, since doing so ensures their least-cost provision. While rural infrastructure is largely excludable and could be easily provided by for-profit firms, the incentive for them to provide this good and the associated services may not exist (thus giving rise to a market failure). While governments can supply this good, they too may not have the incentive to provide it at the most desirable level. An association of rural residents, however, often does have the appropriate incentives to supply the good.

In the case of agricultural research, the lack of excludability that is often associated with new seed varieties, for instance, may make it difficult for for-profit firms to profitably undertake the research. While government could undertake the research—and indeed often has—see Alston et al. (1995) for details on the role of government in funding agricultural R&D—it may not have the incentives or the information to undertake the appropriate amount and type of research. In particular, producers of a specific commodity may find it advantageous to be able to fund and to direct research on their crop, particularly if government funds for agricultural research are limited and if producers possess specific knowledge of where the research should be going (i.e. the degree of voice is high).

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Of course, the producer association still faces the problem that the research is non-rival and that free-rider problems will emerge in getting producers to fund the research. In Canada, this problem has been overcome by providing the producer association with legislative power to levy a check-off on sales of the commodity in question. This levy power, however, is granted to associations only if they can demonstrate that a significant portion of the producers (e.g. more than two-thirds) support a check-off.

Social factors

Market economies also give rise to social conditions/factors that can lead to the formation of producer associations. The economic and political forces at work in a market economy rarely provide similar benefits and opportunities to everyone. For instance, certain geographic regions often find themselves disadvantaged relative to other regions; in many cases, the hardship suffered by a region is linked to its reliance on economic sectors that decline as a market economy develops. Agriculture is a good case in point. Agricultural products typically have both low price and income elasticities. As a consequence, productivity increases—which result from a substitution of capital for labour and which have been particularly prevalent in agriculture—result in falling agricultural prices and lower employment over time. For regions that are highly dependent upon agriculture, the fall in labour demand resulting from productivity increases has typically been greater than the increase in aggregate output in the region. Thus, high agricultural productivity has had a negative impact on employment opportunities in agriculture-dependent areas.

Historically, agricultural producers have also believed they lacked economic and political power. This perception stems in part from the outcome of the forces described above, in part from producers' need to deal with oligopolistic businesses when they purchase their inputs and sell their outputs, and in part from the geographic isolation often associated with agriculture. The perceived isolation and hardship not only gave agricultural producers something to react to and protest against, but also provided them with a sense of identity.

Numerous examples exist of producers forming associations to reduce the economic hardships associated with agriculture and the geographic region where they are located. In a number of instances, the formation of producer associations was

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associated with social and/or political movements that sprang up to deal with the perceived lack of economic and political power enjoyed by a region or sector. The formation of producer associations was often aided by the sense of identity that had been created among producers.

The overall role of producer associations

As an alternative form of organisational structure to government and for-profit firms, producer associations have been formed to overcome failures in either the government or the market to provide the entire range of goods and services demanded by agricultural producers. As well, producer associations are much better suited than either private firms or government to providing common-pool goods. Thus, producer associations have to be seen as an important and integral component of a well-functioning market economy.

Further in this vein, producer associations can also play an important check-valve function in market economies. As outlined above, they are a mechanism by which greater competition can be introduced into oligopolistic or monopolistic markets. As well, in the instances when they were formed to redress a perceived lack of economic and political power, producer associations have usually been important in better integrating their members into the economy, often by rebalancing power or in removing the sense of isolation that initially led to their formation.

THE FORMATION OF PRODUCER ASSOCIATIONS

As discussed in the previous section, producer associations emerge because a group sees a benefit from acting together; producer associations are thus a form of collective action. As a form of collective action, however, producer associations suffer from collective-action problems—see Olson (1971) for a discussion of such problems. Because the benefits accrue to everyone, free-rider problems emerge—while each individual sees a benefit from having the good or service supplied, each individual would prefer that the others incur the cost of providing the good or service. The free-rider problem is particularly important at the time of formation of associations. If the free-rider problem is not solved, the good or service may not be provided or supplied.

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Associations face other problems at the time of their formation. While the potential members of an association may understand that a problem exists, they may not understand the options available in terms of dealing with the problem. Even after the formation of an association is identified as the preferred method of dealing with the problem, a clear understanding of precisely what the association will do may not be present. As well, membership in the association is often diverse, with the result that compromises need to be worked out, and policies and rules developed that allow the different members to benefit from the association. Finally, trust and commitment may be lacking among the membership, and these are elements that are critical for the formation of effective associations (Ostrom 1990; Ostrom et al. 1993).

As a consequence of these problems, associations are rarely formed solely on their own accord. While associations clearly form from the initiative of what is usually a core group of initial members, the actions of this group are frequently not enough. In addition, the association often requires development assistance from what are known as external development agents (Stefanson 1999). The next section outlines the nature of the development assistance that is typically provided to associations. [For more detail on the ideas presented in the section, see Harris et al. (1998).]

Development assistance

Much of the organisational assistance that has been provided to producer associations is in the form of support for external agents—individuals who assist with the formation of an association but are not directly associated with it (for instance, as a member). At the most basic level, external agents help to offset the organisational problems outlined above. Recall that these problems are often peculiar to associations; e.g. the cost of organising meetings, of getting agreement on the idea of forming the association, and of deciding on the activities that the association might undertake. External agents can reduce these costs by identifying commonalities among the members and by assisting members to understand the interdependencies that exist between them. They often assist in legitimising the use of an association to meet the problem the members are facing, they facilitate discussion among the members, and they push the members to understand the economic situation they are facing. Legitimisation is important because often the association model does not fit with what people have learned in school, from the media, and from their dealings with others. Understanding member commonalities and the economic environment

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is important because the better the members comprehend the benefits that might result from collective ownership of an investment, the more likely they will be to make the investment.

Once a common purpose is defined, external agents also identify appropriate leaders for the group, assist in the identification of potential members, locate resources for business plans and industry analyses, and help to ensure that the association proceeds only if the outlook is reasonably favourable. To that end, external agents can improve communication among participants, collect and disseminate information, evaluate existing resources, and contribute skills and experience about alternative institutional arrangements and in developing governance structures. While the external agents must have a good understanding of the emerging association, they must remain outside it. Unless the external agents are able to remain outside, they run the risk of imposing their ideas and beliefs on the association and depriving the members of control. Both of these are serious problems for an association. A clear sense of ownership is one of the ways of ensuring member commitment, and the imposition of ideas and beliefs by outsiders usually results in the association not responding appropriately to the problems it is facing.

An important role of the external agent is to build trust and cooperation among the members of an association in an incremental and sequential manner (Ostrom 1990). Rather than occurring within a single step, the process of forming associations often involves a series of small steps—with low initial costs—that progressively build upon one another.

As discussed above, the provision of common-pool goods requires that producer associations develop mechanisms by which the costs and benefits are distributed in a fashion that maintains member commitment to the organisation. External agents can assist and encourage groups to develop rules that are well-tailored to local conditions by providing a low-cost mechanism for modifying these rules and by clearing up inevitable ambiguities about their application. In addition, a system of monitoring behaviour and enforcing graduated penalties is often needed to ensure that collective-action commitments are kept in the long run. External agents can act as monitors and enforcers of rules. However, it is important to stress that, as such, external agents must remain answerable to the members for the process to remain self-governed—while the agents can assist in enforcing the rules and penalties, these must be defined by the members themselves (Ostrom 1990).

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Examples of development assistance

Many examples exist where development assistance was critical in the formation of producer associations. The development agents that participated in the formation of these associations come from a wide variety of backgrounds and include people from other associations, university extension agents, government extension personnel, and local business and religious leaders. The cases provided below are linked to examples outlined in the previous section.

In Saskatchewan, retail cooperatives and credit unions were created during the 1930s and 1940s with the assistance of Saskatchewan Wheat Pool field agents. These agents not only helped organise the co-ops, but also often provided the initial office space for the new organisations. Before this, the Saskatchewan Wheat Pool was itself a result of the efforts of outside individuals, including Aaron Sapiro, the California lawyer who was closely connected with the formation of many of the marketing co-ops in various parts of the US and particularly California. The wheat pools were also promoted by farm leaders, pre-existing farm organisations and politicians (Fairbairn 1984).

The importance of cooperative development assistance can also be seen in examples from the US. In the 1930s and 1940s, the United States Department of Agriculture provided considerable support to develop rural electric and telephone co-ops. This active support for co-op development continues today; rural utility cooperatives and associations of existing cooperatives in North Dakota and Minnesota, for instance, played and, continue to play, a very important role in developing 'new generation co-ops' (NGCs). [Stefanson (1999) examines the role of development agents in the formation of NGCs.]

Other factors in association formation and success

There are a number of additional factors that affect the likelihood of association formation and success. Generally speaking, the more homogeneous are the members of the association, the more likely is the association to form. The greater is member heterogeneity in characteristics such as size of operation or type of production activity undertaken, the more difficult it is to find policies and pricing rules that allow all members to benefit. At the same time, complete homogeneity of membership is not advantageous. To be successful, producer associations require a diversity of perspectives and approaches in order to be able to effectively understand and deal with the challenges and issues that they will face. This diversity will not be forthcoming if all members are similar.

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While diversity of views is important, it is also critical that a significant portion of the membership has a common identity or world view. Successful producer associations often build on existing identities and/or encourage the development of new identities. [Akerlof and Kranton (2000) examine the role of identity in economics.] For instance, a number of producer associations have been built on the idea that agricultural producers lack economic power; this was the case in the formation of the large agricultural marketing co-ops—see Torgerson et al. (1998). In other cases, associations have been built on the notion that the members of the association are dynamic, forward-looking and leaders in their agricultural sector. This was the case with the producer associations in Canada that fund research and development, and with the NGCs in the US (Harris et al. 1996; Fulton 2000).

As discussed above, healthy producer associations require well-defined benefit structures, as well as effective monitoring of the actions of the members and the management. These elements are critical for associations because they determine the incentives that the members and management face, which in turn affects the stability of the organisation and its ability to meet its members' needs. Members must be provided with the incentive not only to participate in their association, but also to participate in the appropriate fashion. For instance, members of a marketing association must have the incentive to use their association to market their products and to produce the type and quality of product required for the market that their association is serving. The policy and rules that are chosen for the organisation, the pricing schemes that are implemented, and the monitoring and enforcement that are undertaken will create the incentives for the membership to behave appropriately. As was noted above, it is critical that the membership determines and selects the benefit structure and oversees the monitoring in the association. Member commitment and trust can be developed and maintained only if members feel that they have ownership of their organisation.

The need for members to have ownership and control of their organisation is a critical requirement for successful producer associations and is closely linked to whether the association has been created and is operated on the basis of a bottom-up approach or a top-down approach. In the bottom-up approach, the members have ownership and control—they finance the organisation, select the managers, and determine the benefit and monitoring structure. Although they are often assisted in these activities by external agents (see discussion above), the members make the critical policy decisions, including whether there is in fact a need for the organisation.

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An important part of this ownership and control is that the members are responsible if the organisation should fail—they are the ones who will be faced with a loss of equity and/or the loss of service provision.

Under a top-down approach, the association is effectively owned and controlled by some other party or parties. Often this other party is the government (local, provincial/state or national), although it could be another association or a for-profit firm. In addition to reducing member commitment, the top-down approach may result in a lack of information about local needs and may be unable to develop a suitable membership identity.

Evidence strongly suggests that producer associations formed with a top-down approach tend to be unsuccessful. In North America and northern Europe, virtually all producer associations are formed on the basis of a bottom-up approach; elsewhere in the world, however, the top-down approach has often been used. For instance, most of the agricultural co-ops formed in Africa and India during the 1960s and 1970s were formed using a top-down approach. While the governments of the day understood that co-ops could be an effective element in their development strategy for the reasons cited in the previous section, they were unwilling to let the co-ops be formed by the producers on the basis of their needs and requirements. Although governments have invested millions of dollars in these enterprises, they have not been successful.

While producer ownership and control are critical for producer associations, government support may also be required. As will be discussed below, a formal legal framework for producer associations is one type of support that government can provide. In addition, some types of producer associations will require specific legislation in order for them to operate effectively. For instance, producer-funded and directed research organisations must be able to raise their research money through something like a producer check-off. As was discussed earlier, this power should be granted to an association only if it can demonstrate that a substantial majority of its members are supportive of such power being granted. As well, once the check-off is in place, it is critical that the association be allowed to make the research-funding decisions, since it is the members' funds that are being spent.

The external environment in which producer associations are formed is also important to their success. The presence of a legal framework that allows for the establishment of producer associations is critical. This framework is important for

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a number of reasons. First, a formal legal structure provides the associations with the ability to enter into contracts and to borrow money. This formal legal status is critical if producer associations are to carry out the functions described earlier in the paper.

Second, by determining the basic organisational features of producer associations (e.g. the composition of the board of directors, the types of benefit structures that are allowed and not allowed), the legal framework can ensure that agricultural producers are provided with ownership and control. Whether or not the members then use these basic organisational features effectively is their decision.

Third, the presence of a legal framework also provides legitimacy to producer associations as bona-fide organisations. One of the fundamental institutions in an economy and a society is the legal system. The legal system typically reacts to and reflects the changing needs and values of society, rather than acting as an architect of these values. As a result, the law serves a function similar to that of an engineer or plumber. Once a plan or policy objective is identified, the legal system assists in putting the plan into place. Thus, the presence of a legal framework for producer associations is a sign that a country has understood the need for producers to work together to address problems they are facing and is willing to provide them with a mechanism and a structure for them to work together.

Although producer associations may be provided with a basic level of legitimacy by a national or provincial government, numerous groups may still oppose their formation and operation. As was outlined in the previous section, producer associations are often formed because of market and government failures. As a consequence, the formation of producer associations may often be viewed as a threat. For-profit firms or government personnel/agencies may not wish to see additional competition or to see economic power shift in favour of producers. As a result, the power and incentive structure in the larger community may impose roadblocks and additional costs on the formation of producer associations.

Different power and incentive structures in different communities are one reason why producer associations that are successful in one community may not be successful in others. Many other reasons exist for this lack of success, since organisations depend on a complex set of economic and social factors—e.g. the social and economic background of the membership, the world view of the membership, and the presence and/or nature of an external development agent. While many

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examples do exist of organisational models being successfully transplanted from one community or country to another, there are also many examples where the transplant has not been successful.

The question is often raised as to whether producer associations should be formed from scratch or whether existing organisations should be restructured and reformed. The reform of existing organisations may provide access to existing infrastructure and employees, thus reducing the cost of forming the association. However, the reform of existing organisations does not come without costs. Vested interests and existing mindsets can often make the reform very difficult; moreover, reform may not engender the required sense of ownership and control among the membership that is needed to create a successful organisation. As a result, the creation of a new organisation may often be a less costly way of forming an association. The creation of new organisations may also be important in another respect. If successful, new organisations are often used as models by producers in other locations who are looking for a way of overcoming similar problems.

CHALLENGES FOR PRODUCER ASSOCIATIONS

Once established, producer associations face a range of challenges. Most of these have to do with the benefit and monitoring structure that is in place in the association. In short, associations face a number of what can be termed internal property-right issues: the free-rider problem; the horizon problem; and control and agency problems—for a discussion of these property-rights problems, see Vitaliano (1983), Cook (1985), Bonin and Jones (1993) and Hansmann (1996).

The free-rider problem exists because of the collective nature of the association and was described earlier in the paper. As a result of free-rider problems, associations may have trouble raising capital. They may also have trouble with members overusing facilities or making/requesting deliveries at inopportune times. The horizon problem emerges because the benefits that the members can obtain from the organisation are limited to the time that producers are actually members. As a consequence, producers near retirement may be unwilling to make any major long-term investment in their association, since they will not see the benefits of this investment (Cook 1995; Rey and Tirole 2001).

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Control and agency problems arise because of the manner in which producer associations are governed. A widely dispersed ownership, especially in large associations, provides individual members with limited incentives to monitor the performance of the managers of their association. The result is the well-known agency problem—managers may have the ability to direct the association into activities that are beneficial to them rather than the members. This ability is enhanced because managers also have access to information that the members lack, which gives them additional power (Cook 1995).

The latitude that managers have to direct the activities of the association can lead to attempts by members to steer the association to positions that will benefit them personally. The ability and likelihood of this sort of rent-seeking activity is likely to be greater, the greater is the heterogeneity of the association (Banerjee et al. 2001). The need to ensure member-support means managers must constantly work to build consensus, an activity that is often costly—particularly when members have highly diverse interests. Capital constraints and the horizon problem also make management more difficult (Cook 1994).

These property-rights problems are likely to become more severe over time (Cook 1995). At the time of their formation, association membership is typically reasonably homogenous, in large part because it is likely that groups with a highly heterogeneous membership will be unsuccessful at forming associations. In addition, there is likely to be a fairly strong sense of identity among the members; most will have a similar world view as to the problems they are facing and how the association can be used to address those problems.

Over time the membership of an association changes. New members replace old members as retirements occur; also, existing members make changes to their own operations and to their world view. As a consequence, member heterogeneity increases, and makes it more difficult to keep all the members satisfied that the association is providing them with a benefit. The shift in membership also makes the existing set of policies, pricing schemes and monitoring systems less than ideal at producing the most desirable behaviour from the members; in addition, since the association is no longer as effective and may be operating on the basis of what is perceived to be a different world view, member commitment is reduced.

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This change in the membership is typically accompanied by changes in the structure and activities of the association. As associations grow and develop, they usually rely more and more on hired management for their administration; in addition, the scope of the activities of the association often increases. As a consequence, there is a greater likelihood of agency and control problems emerging. As well, increased member heterogeneity results in greater opportunity for rent-seeking that can lead to loss of efficiency and reduced member commitment.

The external environment in which the association is operating is also subject to change. While some form of consensus among the members may have existed when the association was first formed, this consensus may be difficult to maintain when the association is faced with adapting itself to a new economic environment. In addition, the structure of the association may have to be changed in order for it to operate effectively in the new environment. [Fulton (2000) discusses how the contract structure of NGCs better fits agriculture's new economic environment.] The result is that, over time, associations typically become more difficult to manage. Property-rights problems become more acute, and it becomes more difficult to find policies and programs that will appeal to all members. Member commitment to the organisation may also diminish. Nevertheless, many producer associations are long-lived and have successfully adapted themselves to their changing internal and external environments. A good example is the cooperative retailing system in western Canada, which has shown substantial growth and increased profitability for much of the past 20 years (Fairbairn 2004).

Part of the reason for the success of associations over the years can be linked to the efforts made to constantly educate the elected and corporate officials. For instance, compulsory board training is a feature of most large cooperatives in Canada and the United States. This training is carried out both in-house and through the expertise of the various educational and training centres that have been developed over the years. Some of the training and education is carried out in universities and in associations or federations of cooperatives; many of the large commercial cooperatives also conduct their own in-house training (Hammond Ketilson and Fairbairn 1994).

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CONCLUDING REMARKS

Producer associations are an important part of agriculture in a market economy. Since neither the market nor the government is capable of effectively and efficiently providing all the goods and services desired by agricultural producers and rural residents, producer associations—which, when properly structured have strengths that for-profit firms and governments do not have—have often been formed to provide goods and services. Producer associations are also an important means by which the market economy regulates itself and adaptation occurs. They help correct the inefficiencies, excesses and rigidities that often occur and they can assist in rebalancing power in the economy.

The successful formation of producer associations requires a formal legal structure, independence—associations must be allowed to fail and to succeed, assistance by third-party agents that allow the members to take effective ownership and control of their organisation, and clearly established property rights and rules for sharing benefits. Over time, associations succeed or fail based on their ability to solve internal property-rights problems and to successfully adapt to changing conditions in the external environment. The ability of associations to react to these challenges is linked to the governance and management structures they have in place and to the efforts they make to constantly educate their members and staff.

REFERENCES

Akerlof, G.A. 1970. The market for 'lemons': quality uncertainty and the market mechanism. Quarterly Journal of Economics, 84, 488–500.

Akerlof, G.A. and Kranton, R.E. 2000. Economics and identity. Quarterly Journal of Economics, CXV, 715–753.

Alston, J.M., Norton, G.W. and Pardey, P.G. 1995. Science under scarcity: principles and practice of agricultural research evaluation and priority setting. Ithaca, NY, Cornell University Press.

Banerjee, A., Mookherjee, D. et al. 2001. Inequality, control rights, and rent seeking: sugar cooperatives in Maharashtra. Journal of Political Economy, 109, 138–190.

Bonin, J.P., Jones, D.C. et al. 1993. Theoretical and empirical studies of producer cooperatives: will ever the twain meet? Journal of Economic Literature, 31, 1290–1320.

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Clements, M. 1965. By their bootstraps: a history of the credit union movement in Saskatchewan. Toronto, Clarke, Irwin and Company Limited.

Cook, M. 1994. The role of management behavior in agricultural cooperatives. Journal of Agricultural Cooperation, 9, 42–58.

— 1995. The future of U.S. agricultural cooperatives: a neo-institutional approach. American Journal of Agricultural Economics, 77, 1153–1159.

Cotterill, R.W. 1984. The competitive yardstick school of cooperative thought. American cooperation. Washington, DC, American Institute of Cooperation, 41–54.

Fairbairn, B. 2004. Living the dream: membership and marketing in the co-operative retailing system. Saskatoon, Centre for the Study of Co-operatives.

Fairbairn, G.L. 1984. From prairie roots: the remarkable story of Saskatchewan wheat pool. Saskatoon, Western Producer Prairie Books.

Fulton, M. 2000. Traditional versus new generation cooperatives. In: Walzer, N. and Merrett, C., ed., A cooperative approach to local economic development. Greenwood Publishing Group.

Fulton, M.E. and Hammond Ketilson, L. 1992. The role of cooperatives in communities: examples from Saskatchewan. Journal of Agricultural Cooperation, 7, 15–42.

Hammond Ketilson, L. and Fairbairn, B. 1994. Education and training in North America, co-operative. In: Dülfer, E., ed., International handbook of cooperative organizations. Gottigen, Vandenhoeck and Ruprecht.

Hansmann, H. 1996. The ownership of enterprise. Cambridge, Mass., Harvard University Press.

Harris, A., Fulton, M.E., Stefanson, B. and Lysyshyn, D. 1998. Working together: the role of external agents in the development of agriculture-based industries. University of Saskatchewan, Saskatoon, Centre for the Study of Co-operatives and the Department of Agricultural Economics.

Harris, A., Stefanson, B. and Fulton, M.E. 1996. New generation cooperatives and cooperative theory. Journal of Co-operatives, 11, 15–28.

Hendrikse, G. and Bijman, J. 2005. On the emergence of new growers' associations; self-selection versus countervailing power. European Review of Agricultural Economics, Special Issue: Contracting in Agriculture, in press.

Henriksen, I. and Hviid, M. 2003. Governance in a contractual perspective. A historical case. Paper presented at the European Research Conference (EURESCO) on vertical markets and cooperative hierarchies: the role of cooperatives in the international agri-food industry. Bad Herrenalb, Germany, 12–16 June 2003; <http://www.flec.kvl.dk/kok/coop03/>.

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Edited by: Bernard H. Sonntag, Jikun Huang, Scott Rozelle and John H. Skerritt
ACIAR Monograph No. 116 (Printed version published in 2005)

Hueth, B. and Marcoul, P. 2003. An essay on cooperative bargaining in U.S. agricultural markets. Journal of Agricultural & Food Industrial Organization, 1(1), Article 10.

Lipsey, R.G., Purvis, D.D. and Steiner, P.O. 1988. Economics, 6th ed. Harper and Row.

Olson, M. 1971. The logic of collective action: public goods and the theory of groups. Cambridge, Harvard University Press, Harvard Economic Studies.

Ostrom, E. 1990. Governing the commons: the evolution of institutions for collective action. New York, Cambridge University Press.

Ostrom, E., Schroeder, L., and Wynne, S. 1993. Institutional incentives and sustainable development: infrastructure policies in perspective. Colorado, Westview Press, Inc.

Rey, P. and Tirole, J. 2001. Financing and access in cooperatives. Working Paper. L'Institut d'Economie Industrielle, University of Toulouse, Toulouse, France. <http://www.idei.asso.fr/Commun/Articles/Tirole/Financing-Access.pdf>.

Sanderson, K. and Fulton, M. 2003. Producer adaptation to the new agriculture: application of the co-operative model to changes in market specifications, regulation and service access. Report prepared for the Canadian Co-operative Association and Le Conseil Canadien de la Coopération, February. University of Saskatchewan, Centre for the Study of Co-operatives.

Stefanson, B. 1999. Adult educators in co-operative development: agents of change. Unpublished MSc thesis, University of Saskatchewan.

Torgerson, R.E., Reynolds, B. and Gray, T.W. 1998. Evolution of cooperative thought, theory and purpose. Journal of Cooperatives, 13, 1–20.

Vitaliano, P. 1983. Cooperative enterprise: alternative conceptual basis for analysing a complex institution. American Journal of Agricultural Economics, 65, 1078–1083.

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4.3 FARMER PROFESSIONAL ASSOCIATIONS IN RURAL CHINA:

STATE DOMINATED OR NEW STATE–SOCIETY PARTNERSHIPS?

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Two decades of economic reform have changed the economic landscape of China. Per-capita grain output has reached developed-country levels; many farmers have shifted into higher-value crops, making decisions increasingly on market-oriented principles; the research system has helped push up productivity by almost double the rate of population growth; and the nation has by far the most sophisticated agricultural biotechnology program in the developing world—indeed many of its breakthroughs are of global importance (Huang et al. 2002). Rising food exports demonstrate that China's farmers are now able to compete in international markets. More than 40% of rural residents have off-farm employment; and about 100 million of them have moved to urban areas for employment (de Brauw et al. 2002). Rural incomes have risen

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dramatically and hundreds of millions of people have escaped poverty during this time (World Bank 2001). Growth in agriculture, non-farm employment and rural industry, and the transformation of domestic and international markets, have changed the face of rural China and are playing key roles in the nation's modernisation.

While the new landscape should fill leaders with optimism, there are still great challenges ahead. With the transition from planning in the rural economy mostly complete, China's main challenge has shifted to one of development (Nyberg and Rozelle 1999). In China's new environment, the main measure of success will be the extent to which the rural economy can become an integral part of the nation's push towards modernisation. For China to successfully modernise, the nation's economy will have to experience a fundamental transformation—from rural to urban and from agriculture to industry and services. Also, the government needs to play a role when markets fail (Mo 1995).

To effect such a transformation, one of the main challenges is a shift in the role of the state and development of new partnerships with citizen groups to carry out efficient and equitable growth (World Bank 2003). Although the government has moved out of the direct provision of many goods and services, it needs to redirect efforts to providing public goods, overcoming market failure and providing useful services that the private sector is unlikely to find profitable. To achieve these changes, the main task of leaders is to comprehensively redefine the role of government and make explicit to various levels of governments, bureaus and individual leaders what they should and should not be doing. Also, as the government gets out of direct production, it will be in a better position to create, implement and coordinate policies that involve conflicting goals. Mistakes have been made in this area in the past, such as poverty-alleviation projects to raise livestock (goats, sheep) in unsuitable areas that have resulted in serious environmental damage. Some sub-national governments have taken drastic but effective measures to manage natural resources while still helping the poor, but others need better guidance.

In a modern society that is dominated by markets and where assets and information are mostly in the hands of private individuals and enterprises, the government needs partners to carry out its tasks (Trewin 2003). It is important at this point of its development for China to encourage truly independent non-state organisations, including organisations that will act as information networks, business-support groups, marketing systems and credit cooperatives. Drawing on the experience of

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Japan, Korea and Taiwan, the rural economy in China is in need of active and strong farmer professional associations (FPAs) to help the rural population carry out a number of production and consumption-oriented activities needed for rapid growth.

Although the role of FPAs is beginning to be discussed again in academic and policy-making circles, such institutions are still relatively low profile and little is known about them. It has been stated that there are more than 100,000 farmer associations in China (World Bank 2003). The Ministry of Agriculture (MOA) claims that the current associations include 4–5% of all farmers (Zhou 2003). The validity of these numbers, however, is unclear, and they need to be treated with caution, since the structure of most associations is still ill-defined and there are no standards on which reports from FPAs are based.

To overcome the dearth of information on so important a part of China's future development process, this paper reports the results of a survey designed to provide a picture of the current status of FPAs in China. As our first objective, we establish a baseline of the size of the FPA movement in China, its rate of growth and the scope of the activities. Second, we identify when, where and what FPAs are emerging, examining our data by province, by income category and by several other indicators. Finally, we seek to find what factors are inducing the emergence of FPAs.

DATA

At the heart of our analysis is our data-set. We use a unique set of data on the institutions and development investments in rural China that we collected in 2003. The authors and several Chinese and foreign collaborators designed the sampling procedure and final survey instrument, with the village as the unit of analysis. The field-work team, made up of the authors and 30 graduate students and research fellows from Chinese and North American educational institutions, chose the sample and implemented the survey in 6 provinces and 36 counties in an almost nationally representative sample. The sample provinces were each randomly selected from China's major agro-ecological zones.[1]

The sample villages were selected by a process that the survey teams implemented uniformly in each of the sample provinces. Six counties were selected from each province, two from each tercile of a list of counties arranged in descending order of gross value of industrial output (GVIO). GVIO was used on the basis of the conclusion

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of Rozelle (1996) that it is one of the best predictors of standard of living and development potential and is often more reliable than net rural per capita income. Within each county, we also chose six townships, following the same procedure as the county selection. When our enumerator teams visited each of the 216 townships (6 provinces by 6 counties by 6 townships) officials asked each village to send two representatives (typically the village leader and accountant) to a meeting in the township. On average, enumerators surveyed 11 villages in each township. The number of villages per township ranged from 2 to 29.[2]

After answering questions about the economic, political and demographic conditions of their villages in 1997 and 2003, the respondents answered a set of 25 questions about the activities of FPAs that were operating in or around their villages. The questionnaire was designed to elicit information about the size of the association, its coverage, its main functions, its charter, registration rules and internal organisation. The survey also included a section that attempted to understand how the actions of government agencies affected the start-up of the associations.

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1 The sample villages come from six representative provinces. Jiangsu represents the eastern coastal areas (Jiangsu, Shandong; Shanghai, Zhejiang, Fujian and Guangdong); Sichuan represents the southwestern provinces (Sichuan, Guizhou and Yunnan) plus Guangxi; Shaanxi represents the provinces on the Loess Plateau (Shaanxi and Shanxi) and neighbouring Inner Mongolia; Gansu represents the rest of the provinces in the northwest (Gansu, Ningxia; Qinghai and Xinjiang); Hebei represents the north and central provinces (Hebei; Henan; Anhui; Hubei; Jiangxi; and Hunan); and Jilin represents the northeastern provinces (Jilin, Liaoning and Heilongjiang). While we recognise that we have deviated from the standard definition of China's agro-ecological zones, the realities of survey work justified our compromises. Pretests in Guangdong demonstrated that data collection was extraordinarily expensive and the attrition rate high. One of our funding agencies demanded that we choose at least two provinces in the northwest. Our budget did not allow us to add another central province (e.g. Hunan or Hubei) to the sample.

2 On average, the attrition rate was only 6%. In no case, did we leave a township until at least 80% of the villages had been enumerated. In order to examine if the villages that were not enumerated (due to attrition) were systematically different from those that participated, we collected a set of variables about no-show villages from the township and ran a probit regression with the dependent variable represented as an indicator variable where the variable equalled one if the village did not come and zero otherwise. There were no variables that were significant. If a township had more than 25 villages, we randomly selected 25 of them. This affected fewer than five townships.

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FARMER PROFESSIONAL ASSOCIATIONS IN CHINA

To meet our first objective, we examine the number of villages that report any sort of FPA, regardless of its characteristics. We then use this information to identify those FPAs that have met a number of criteria (e.g. having a certification or being officially chartered) that are thought to typically define a *formal association*. We also identify those FPAs that have characteristics (e.g. they are not registered as a commercial entity at the Market Administration Bureau, or they are associations in which government officials do not have decision-making authority) that make them appear to be a *functional association*. In most of the report, we will examine the nature of FPAs according to these definitions.

When leaders from the 2459 sample villages were asked the *unqualified* question, 'Are any farmers in your village currently participating in an FPA?' only a small fraction of the respondents responded affirmatively. According to our data, 251 villages reported that their farmers participated in some form of FPA. Since some villages had farmers in more than one FPA (2 villages reported activity in 4 FPAs; 3 villages reported activity in 3 FPAs; 23 villages reported activity in 2 FPAs), our surveyors enumerated 290 FPAs in the sample villages.

Although the sample size was relatively small (only 0.35% of China's villages), with a number of assumptions, the randomness of our sample allows us to make an estimate of total FPA activity in China. If it is assumed that all villages have equal probability of being observed and are of equal size, our survey finds that 10.21% (250/2459) of China's sample villages have FPAs (not shown in Table 4.1). When we account for the probability of observing each of our villages according to their population proportion (that is weighting our descriptive statistics by the sizes of the population of township, county and region of each observation), our survey finds that 10.21% of China's villages have FPAs (Table 4.1, column 1, row 1). Using the weighted statistics (*as we do in the rest of the report*) and extrapolating from our sample to the rest of China, we estimate that about 75,000 villages at least nominally have FPAs (row 2). Moreover, on average, 28.5% of the households in each village are part of the village's FPA. Hence, our data suggest that about 2.91% of China's farm households, or about 6.93 million households, nominally have an association with a FPA (Table 4.1, column 1, rows 3 and 4). These numbers of unqualified FPAs are surprisingly close to the figures of the Ministry of Agriculture, which has reported

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Table 4.1 National point estimates of villages and farm households that participate in farmer professional associations (FPAs) in China, 2003

		Total FPAs[a]	Formal FPAs[a]	Functional FPAs[a]
National point estimates of number of villages with FPAs[b]	%	10.21	7.49	7.50
	Number of villages (thousands)[c]	75	55	55
National point estimates of number of farm households that participate in FPAs[b]	%	2.91	1.76	2.08
	Number of households (millions)[d]	6.93	4.19	4.95

[a] Total FPAs includes all reported FPAs, without any qualifications. Formal FPAs is a term that designates FPAs in villages that meet three of the four criteria, including being registered, being chartered, having formal membership requirements and/or charging annual fees. Functional FPAs is a term that designates FPAs in villages that meet three criteria, including *not* being registered as a commercial entity in the Marketing Administration Bureau, *not* being mainly set up to run a commercial business and *not* being dominated by a government official in the making of major decisions.

[b] Regional weights are calculated for six regions in China that are estimated on the basis of estimates from the six sample provinces. Jiangsu represents the eastern coastal areas (Jiangsu, Shandong; Shanghai, Zhejiang, Fujian and Guangdong); Sichuan represents the southwestern provinces (Sichuan, Guizhou and Yunnan) plus Guangxi; Shaanxi represents the provinces on the Loess Plateau (Shaanxi and Shanxi) and neighbouring Inner Mongolia; Gansu represents the rest of the provinces in the northwest (Gansu, Ningxia; Qinghai and Xinjiang); Hebei represents the north and central provinces (Hebei; Henan; Anhui; Hubei; Jiangxi; and Hunan); and Jilin represents the northeastern provinces (Jilin, Liaoning and Heilongjiang). While we recognise that we have deviated from the standard definition of China's ago-ecological zones, the realities of survey work justified our compromises. The regional population weight is the population of the region (the sum of the population of all of the provinces in the region) divided by the sum of the populations of all of the region

[c] Number of villages estimated by multiplying the estimated proportion of villages with FPAs (row 1) times the number of villages in rural China (737,000—China National Statistical Bureau (2001)).

[d] Number of households estimated by multiplying the estimated proportion of households that participate in FPAs (row 3) times the number of households in rural China (238.1 million—China National Statistical Bureau (2001)).

Source: authors' survey

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that about 100,000 villages had FPAs, and include 4–5% of China's households. In short, although only a small fraction of China's villages have FPAs, the absolute number of FPAs in China is large.

When more carefully categorising the reported FPAs—into those that follow more *formal* rules (without regard to how they function), those that *function* according to standard definitions of associations (as opposed to commercial units or government programs), and those that are only nominally FPAs (or those that are merely FPAs in name)—we produce what we believe are more-informative estimates of FPA activity in China. In the survey, we included two sets of questions designed to understand how FPAs operate. The first set measured the formality of FPAs. Specifically, we asked: (a) if the FPA was formally registered (and where); (b) if the FPA had a written charter; (c) if there was a process by which individuals established their formal membership; and (d) if participants were required to pay dues or an annual membership fee. Although somewhat ad hoc, we decided to designate those associations that had two or more of these characteristics as *formal FPAs*.

Using our information on FPA formality, we find that most, but not all, FPAs follow internationally established procedures and can be counted as formal FPAs (Table 4.2). For example, 74% of FPAs formally register with one of several government bureaus (Table 4.2, row 1). Slightly more (82%) have written charters, which typically are documents that specify the rules and regulations governing FPA activities (Table 4.2, row 3). Just under three-quarters (72%—although not exactly the same FPAs) have procedures in which they admit formal members (Table 4.2, row 2). In these villages, members must fill-out an application, and membership is not automatically conveyed on them merely because they are in the village. Finally, some FPAs, though a much lower proportion (14%), have annual membership-fee requirements that oblige active members to pay dues to the FPA. By examining the presence or absence of the formality characteristics in the sample FPAs, we find that 2% have none of the four formality characteristics and 15% of reported FPAs have only one or none (Table 4.2, rows 5 and 6). The rest, or 84% of FPAs (33 + 41 + 10), meet at least two of the formality criteria and are counted as formal FPAs.[3] According to the formality criteria, in total there were 233 FPAs, which would imply that 7.49%

[3] Note that, throughout the paper, rounding means that percentages in many cases do not add up to 100.

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