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# **IMPACT ASSESSMENT OF ACIAR-FUNDED PROJECTS ON GRAIN-MARKET REFORM IN CHINA**

**ACIAR Projects ANREI/1992/028 and  
ADP/1997/021**

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June 2004*

The Australian Centre for International Agricultural Research (ACIAR) operates as part of Australia's international development cooperation program, with a mission to achieve more productive and sustainable agricultural systems, for the benefit of developing countries and Australia. It commissions collaborative research between Australian and developing country researchers in areas where Australia has special research competence. It also administers Australia's contribution to the International Agricultural Research Centres.

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## Foreword

ACIAR's impact assessment reports provide information on project impacts, which helps to guide future research activities. While the main focus of these commissioned reports is on measuring the dollar returns to agricultural research, emphasis is also given to analysing the impacts of projects on poverty reduction.

During the 1990s ACIAR supported two projects to study the economic consequences of alternative routes to policy reform that will lead to an integrated national grain market in China. The findings, which have been published in Chinese and English, will enable economists to predict with greater accuracy the effects of different market reforms on China's domestic economy, and their implications for world markets.

The projects focused on understanding the political economy of the Chinese domestic grain marketing system (mainly rice, wheat and maize). The system was characterised by a lack of competition, costly inefficiencies, and cycles of reform. It was a complicated marketing system with extensive government control over pricing, transportation and storage.

In 1999–2000 the project team surveyed 1000 households in five provinces and 20 counties. This provided a micro basis to support an aggregate analysis of grain flows among regions.

The outputs from the projects should help Australians better understand the long- and short-run implications of China's accession to WTO as well as China's inter-regional grain trade volumes and regional comparative advantage in various crops. This will help to identify opportunities for Australian agriculture in terms of future trade relations with China.

Project results have had a positive role in promoting a new round of grain marketing reform in China. At the final review of the project the Chinese project leader commented that results had been used in decision-making by high level administration in China.

This impact assessment was carried out to assess the benefits of economic research in grain market reform in China and attribute some share of these benefits to ACIAR's investment in this area of research. Simultaneously, given that economic evaluation procedures have been applied to economic policy research in only a limited number of studies, this impact assessment

was undertaken as a step towards advancing methods associated with assessing the impact of research in social sciences.

This report is number 26 in ACIAR's Impact Assessment Series and is also available for free download at <[www.aciar.gov.au](http://www.aciar.gov.au)>.

A handwritten signature in black ink, appearing to read 'Peter Core'.

Peter Core  
Director  
Australian Centre for International Agricultural Research

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## Details of projects evaluated

ACIAR project ANREI/1992/028	Emergence and integration of regional grain markets in China
Collaborating organisations	Department of Economics, University of Adelaide, Australia (UAdel); Australian National University; Department of Policy Reform and Law, Ministry of Agriculture, China (MOA)
Project leaders	Dr Christopher Findlay (UAdel); Professor Guo Shutian and Mr Luo Yousheng (MOA)
Duration of project	1 July 1993 – 30 June 1997
Total ACIAR funding	AUD642,623
Project objectives	To evaluate (1) the impacts of regional comparative advantage on the emerging grain market, (2) the patterns of growth in grain demand in urban China, (3) regional demand, supply and trading relationships by grain types, (4) the marketing institutions needed to integrate grain markets, and (5) government participation in regulating regional and national markets, and to develop a database for future use.
ACIAR project ADP/1997/021	Chinese grain market policy with special emphasis on the domestic grain trade
Collaborating organisations	University of Adelaide, Australia; Ministry of Agriculture, China; Nanjing Agricultural University, China
Project leaders	Dr Christopher Findlay (UAdel); Mr Du Ying and Mr Tang Renjian (MOA)
Duration of project	1 July 1999 – 30 April 2003
Total ACIAR funding	AUD538,666
Project objectives	The main aims were to assess the current transfers of grain between regions within China, to examine constraints on grain movements, and to evaluate policies that could affect transfers.

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## Summary

An assessment has been made of two projects (ANRE1/1992/028 and ADP/1997/021) funded by ACIAR dealing with economic research into grain-marketing policy in China. The focus of these projects has been on presenting theoretical and empirical arguments that China would benefit from efficiency gains if there were less intervention by the government in grain marketing. ACIAR has routinely conducted impact assessments of investments it has made in research leading to the development of new agricultural technologies. An objective of this impact assessment has been to assess how well economic-evaluation procedures can be applied to economic-policy research.

Every effort has been made to quantify the benefits and costs associated with the ACIAR-funded projects. Since 1994, real expenditure (2002 dollars) on these projects, including in-kind contributions from partners, has amounted to about A\$2.7m. In the late 1990s, the extent of intervention in grain marketing by the Chinese Government rose rather than fell. In quantifying benefits in this impact assessment, the contribution of the projects has been assumed to be a bringing forward of the time at which the Chinese Government returns to a process of policy reform that was evident until the late 1990s. The annual welfare gains to China from a return to this reform process may be in the order of 1500m yuan per year. This represents the difference in losses to China between the situation of the late 1990s when the welfare costs of intervention were about 0.5% of the value of grain production and the situation before that, when welfare costs had been about 0.2% of the value of grain production.

There are many sources of research and policy advice to the Chinese Government. If this body of economic research brings forward policy reform from the end of 2004 by between 3 and 6 months, the present value of benefits is estimated to be between A\$40.3m and A\$88.6m. Assuming that the cost of this total body of research is around A\$13.5m, net present value (NPV) for this body of research is in the range A\$27m–\$75m, and the benefit–cost ratio (BCR) is between 3:1 and 6.6:1. On their own, the ACIAR-funded projects are likely to advance the pace of reform less than the total body of economic research. If the ACIAR-funded projects alone bring forward policy reform from the end of 2004 by 1 month then the present value of the investment is A\$12.7m and, given that the cost of the ACIAR-funded research is approximately A\$2.7m, the NPV for the ACIAR-funded projects is A\$10m and the BCR is 4.7:1, which is a satisfactory return on funds invested.

Other scenarios examined include one where supply response was doubled (increasing the welfare costs of intervention) and one where the likelihood that the welfare cost of recent intervention was underestimated. If welfare costs were 3000m yuan rather than 1500m yuan, then the present value of benefits increases to between A\$81m and A\$179m. The corresponding NPV for economic research in advancing policy reform by from 3 to 6 months ranges from A\$68m to A\$166m, and the BCRs are 6.0 to 13.3:1. In the case of ACIAR advancing reform by even just one month, the NPV is A\$23m with a BCR of 9.5:1.

Allied with this uncertainty about the total welfare gains from grain market reform in China is uncertainty about the distributional impacts of so significant an institutional change. No attempt was made to conduct an empirical assessment of the winners and losers from grain market reform but a qualitative assessment was made in the course of interviewing academics and policy-makers about grain marketing in China.

There seems widespread consensus that consumers would gain, but views about the impact on producers were more varied. Most thought that producers of high-quality grains and those for whom the opportunity costs of producing grain under quota were high would be winners from grain reform. They would be able to produce crops for which they had a comparative advantage. Some argued that freeing producers from quota commitments would be a benefit to the large majority of producers, at least after some adjustment period. Those in the southeastern provinces, until recently required to produce grain, would shift to other, more profitable crops, to the eventual benefit of themselves and of producers in provinces with a comparative advantage in grain production.

The impact of market reform on poor farmers in grain-specialist areas is more uncertain. Farmers receiving a protected price for a fixed quota in isolated markets face potentially large losses if the government withdraws. There are two factors mitigating this impact. First, several studies have noted that the budgetary pressures associated with the 1998 policy have meant that the state marketing bureau has often sought to discount grain purchases in a variety of ways, and hence the losses from marketing reform may not be as severe as indicated by the thorough application of current procurement policies. Second, these producers may benefit as grain production in the southeastern provinces declines. Some argue that many poor farmers in grain-dependent areas would be worse off as a result of market reform, but this view was not widely shared.

State-owned grain-marketing enterprises are a significant component of the grain-marketing system in China. They have been a vehicle for the

implementation of government policy with respect to grain marketing. At times they have had the authority to be the monopoly purchaser of grain from farmers. They may still handle as much as 70% of grain in China, and they employ several million people across the country. They share with producers, private traders and consumers in welfare changes associated with government intervention to manage the prices and quantities of grain in China. The consensus is that this sector would lose as markets opened up to private traders. In implementing government policy and in pursuing entrepreneurial opportunities these state-owned enterprises have built up large debts, as noted above. Central and local governments would be better off under market reform were they not forced to prop up these enterprises.

### **Difficulties in identifying the contribution of the ACIAR-funded projects**

Three key factors have made an empirical benefit–cost analysis (BCA) difficult and highly qualified. First, there are no published estimates of the welfare costs to China from intervention in grain marketing. A highly aggregated, approximate calculation was made during this assessment. It is based on uncertain estimates of demand and supply elasticities and border protection rates.

Second, since the mid 1990s the level of government intervention in grain marketing in China has increased. Hence, those benefits of this project in the form of policy reform are yet to be fully realised. The future path of grain marketing reform in China is uncertain. Issues other than efficiency — such as food security, grain prices and the related potential for social unrest — are other key influences. However, most Chinese academics and policy-makers approached during this assessment suggested that some level of reform was likely to occur in the next few years. Already there is experimentation with ‘freer’ grain marketing in several provinces in the southeast of China, and this experiment is expected to be extended to other provinces soon. The approach taken here is to assume that, by the end of 2004, the extent of intervention in grain marketing will retreat to that evident in the mid 1990s and perhaps further, in response, in part, to the high cost of present policy. The contribution of recent economic-policy research, including the ACIAR-funded projects, is assumed to be that the mid 1990s level of intervention will be reached several months before the end of 2004. The assumptions that some reform would be achieved by the end of 2004, and that economic research might speed this up by some months, are subjective, but are in line with the policy experiments in southeastern provinces. Some may view an assumption that, without economic-policy research, the Chinese Government would revert to the

degree of market intervention evident in the mid 1990s, as being a conservative one (in the sense of understating benefits to economic research). It is also true that economic-policy research, including the ACIAR-funded projects, may contribute to the further reform of grain-marketing policy beyond mid 1990s levels in years after 2004. Policy reform often takes many years, but even small efficiency gains in a market as large as the Chinese grain market, yield significant welfare gains even if discounted because of long lags.

Third, there are many government and academic research institutions in China, sometimes supported with external funds, that conduct research to influence grain-marketing policy. There is no objective way of isolating the contribution of the ACIAR-funded projects to decisions about grain-marketing policy in China. Two, broad, hypothetical scenarios are examined in this study. First, an assessment is made of the average return to this total body of economic research and the ACIAR-funded projects are assumed to be at least as productive as the average based on a review of qualitative factors noted below. Expenditure by other institutions is unknown, but it is assumed to be five times the expenditure on the ACIAR projects. Benefit–cost ratios for this scenario range from 1:1 to 7:1 as reform is advanced by 1 to 6 months. The second hypothetical scenario assumes that the ACIAR-funded projects alone are responsible for speeding up the reform process by from 1 to 6 months with BCRs in the range 5:1–35:1. These benefit–cost estimates are based on potential benefits from hypothetical reform scenarios. Hence, while they cover the likely range of outcomes, there is no empirical support to allow choice between any of these scenarios.

In this assessment, economic-policy research is evaluated using an approach similar to that used in evaluating an agricultural extension project in which the benefits are recognised as a faster rate, and perhaps level, of adoption of a new technology. In both cases, the analyst must confront issues of attribution and of identifying a realistic technology adoption/policy reform scenario, including response lags. However, the causal links between a project and the outcomes sought seem far weaker in the case of policy research than in the case of traditional agricultural technologies, particularly in situations where there are many sources of policy research and advice. In the case of agricultural technologies, there is usually evidence that some farmers have found the technology profitable enough to warrant its adoption. This provides the analyst with some empirical basis for assumptions about the rate and extent of adoption. This is not the case for a single government policy-maker facing ever-changing economic and social conditions. Hence BCAs of

economic-policy research will often be more conjectural than those of agricultural technologies.

### **Other evidence of the success of the ACIAR-funded projects**

The difficulties encountered in the empirical assessment described above mean that a final assessment of the value of these projects to China and ACIAR should be based on a broader range of criteria than a highly qualified empirical estimate of the potential benefits from efficiency gains in grain marketing in China. This broader set of criteria relates to project-management processes, project outputs, extensions from the projects, and outcomes that are difficult to quantify, such as capacity-building. These other criteria are discussed in detail in the report and are briefly summarised here.

Key arguments for the success of the projects have been the strength of the Chinese partners and capacity-building within the Department of Policy Reform and Law in the Ministry of Agriculture (MOA). The Chinese project leaders for the latest project were Mr Du Ying and Mr Tang Renjian from the Ministry of Agriculture. Mr Du is now Director General, Department of Rural Economy, State Development Planning Commission and Mr Ying is Director General, Office of Economics and Finance, Leading Group of the Chinese Communist Party Central Committee. Both are regarded as being influential in grain-marketing policy. The capacity of the Department of Policy Reform and Law to analyse policy and to conduct household surveys has probably been enhanced as a result of the research partnership. Policy analysis in MOA based on household surveys conducted during the project is claimed to have been influential in recent grain-marketing policy experiments in a number of provinces in the southeast of China. These claims were difficult to verify but were not disputed by most of the people interviewed. Earlier reviews of the projects commissioned by ACIAR commented on these issues and concluded that the projects were likely to influence grain-marketing policy in China.

The communications record of both projects is impressive. Outputs included a large number of research papers, some presented at professional conferences and some published in scientific journals and books. One book about grain marketing in China has been published and another is to be published soon. Research papers are available on a website, and findings and events reported in a project newsletter. Several significant workshops were also held in conjunction with the projects. These outputs are detailed in the report.

Project partners have been able to build on the success of the projects. Professor Zhong Funing from Nanjing Agricultural University has published a further 19 papers related to the project, and has attracted further financial support of A\$54,000 from research funding institutions in China to continue his research into China's comparative advantage in agriculture. Dr Christopher Findlay, the Australian project leader, was invited by the World Bank to be part of a team reviewing the Bank's projects in China. His responsibility was the agricultural sector and he was able to apply some of the analysis from the ACIAR-funded projects to this review.

The projects' objective of measuring inter-regional grain flows within China was not met. Perhaps the continuing growth in the private grain-trading sector, despite a hostile policy regime in the late 1990s, made it difficult if not impossible to meet this objective because accurate statistics on private grain trading were unlikely to be available.

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## Acknowledgment

Many people have helped in the conduct of this impact assessment. The contributions of these people are acknowledged in section 6.1 of this report.





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## I Introduction

The objective of this impact assessment is to undertake an economic analysis of the ACIAR-funded projects ANRE1/1992/028 ‘Emergence and integration of regional grain markets in China’ and ADP/1997/021 ‘Chinese grain market policy with special emphasis on the domestic grain trade’. Since decollectivisation in the late 1970s, the Chinese Government has been experimenting with a variety of policy instruments, such as production quotas, acquisition, support prices and buffer stocks, to minimise the costs of intervention in grain production and marketing while maintaining food security, a long-standing concern. However, the costs of intervention, both financial and economic, have been high, while concerns about food security have diminished.

The first project was led by Dr Chris Findlay, then of the University of Adelaide and by Guo Shutian, then of the Department of Policy Reform and Law in the Ministry of Agriculture (MOA), China, and was conducted over the period 1993 to 1997. The objective of the project was ‘to analyse the origins and impacts of the development of an integrated national market for grain in China’.

No doubt hoping to build on project ANRE1/1992/028, and to fill gaps particularly with respect to regional comparative advantage and trade flows, Findlay and a team from the Department of Policy Reform and Law in the MOA, China and from Nanjing Agricultural University undertook project ADP/1997/021 from 1999 to 2003. The objectives of project ADP/1997/021 as extracted from the project’s second annual report included:

- measuring the current extent of inter-regional grain transfers within China
- explaining the directions of, and constraints to, those transfers
- and evaluating current policy proposals including those that reduce the impediments to inter-regional trade.

The methodological approach of the project is:

- to disaggregate China’s grain market, both in terms of types of grain (rice, wheat, maize) and major grain regions, in order to assess the impacts of integration of China’s grain markets on the types and

volumes of various grains transferred between regions within China and between those regions and world markets

- to complement the study of the movements of grains between regions of China with further study of the inter-regional movement of other foods
- to undertake an economic and political analysis of how the economic forces operating on the market system are translated into policy choices in general, and particularly in relation to inter-regional trade
- to combine the results of that political economy analysis with a series of econometric projects on farm production processes and on the degree of market integration within and between regions of China.

The process of grain-market reform in China has been influenced on the one hand by a range of internal and external research and policy institutions, of which the ACIAR-funded projects (AFPs) are only a small part, and on the other, by a range of issues such as food security, income distribution and World Trade Organization (WTO) issues, of which grain market efficiency is but one. Perhaps concerns about food security and potential social unrest have been paramount concerns.

In general terms, both projects aimed to demonstrate the likely inefficiencies associated with government intervention in grain marketing in China using empirical measures of comparative advantage, market integration and household income (from project surveys) to support a traditional analytical framework related to free markets. The relative influence of new information provided by the projects about this issue on the process of grain market reform in China is unclear and needs to be addressed in an economic impact assessment. The challenge is to isolate the AFPs' contribution from these other influences on grain-market reform in China.

ACIAR makes investments in agricultural research in developing countries as part of Australia's development-assistance program. It has a strong tradition of empirical analysis of the impact of its activities, not only to strengthen its ability to meet accountability requirements to Australian taxpayers but also to assist in its internal processes of allocating and managing scarce research resources. These two projects were selected as part of the impact assessment process. They are the first ACIAR economic-policy projects to be evaluated. Previous evaluations have been of agricultural technology projects.

Many commentators remark on the difficulty of valuing social science research such as that under review here. Social science research is often an input to policy-making processes. There are manifold problems in attributing value to any particular piece of social science research where policy decisions are based on a wide variety of sources of information and other influences. Furthermore, there may be long lags between policy research and policy reform. Nevertheless, resources are devoted to social science research and it is important that these resources be used efficiently.

In very general terms, the efficiency gains from grain-market reform can be thought of as reducing the social costs (or deadweight loss) associated with a price wedge in the form of a tax or a subsidy caused by government intervention in the market. The size of the deadweight loss depends on the size of the price wedge and on demand and supply elasticities. A review of the literature suggests that there is little agreement on any of these parameters and hence there must be great uncertainty about the extent of welfare gains to be had from reform in grain marketing in China.

The deadweight losses reflect the efficiency costs of market intervention. However, market intervention also has distributional or equity consequences. While households in China that are net consumers of grains are likely to benefit from greater market integration, the impact on rural households that produce grain is unclear. Many are likely to benefit, particularly in the longer term as they become free to produce more-profitable crops, but some grain producers with few alternatives may be worse off. Those working in state-owned grain-marketing enterprises will be worse after the government withdraws. These issues are discussed further below.

While the extent of these efficiency costs does not appear to have been estimated by either the AFPs or other research institutions (with the possible exception of the Center for Chinese Agricultural Policy), the contribution of the AFPs can perhaps be viewed as contributing to a growing recognition amongst policy-makers that these losses may be large, and hence to bringing forward the time when market reform is undertaken to reduce them.

Ultimately, it did not prove either practical or sensible to focus solely on a financial analysis of the two AFPs — for two reasons. First, there are many institutions involved in providing policy analysis and development related to grain marketing in China. There are no objective ways of attributing shares of the benefits from policy reform between these institutions. Nor were any of the academics and policy-makers

interviewed in the course of the assessment willing to make a judgment about the contribution of the AFPs to the rate of reform. Hence, an important part of the assessment process, briefly described below, has been to review qualitative factors related to the potential impact of the projects; such as their linkages with key policy-makers in China, their outputs in terms of papers and seminars, and any evidence of capacity-building and subsequent recognition and financial support for research undertaken by the partners since completion of the projects.

The second reason the financial analysis was difficult was that, in recent years, the extent of government intervention in grain marketing has expanded rather than contracted, and hence the benefits from grain-policy research — at least in terms of efficiency gains — have yet to be fully realised. It is highly probable that economic research will have some influence on grain-policy reform processes in China, but this influence may extend over many years. The challenge here has been to develop more specific paths to reform that are likely to be followed over the next few years — to develop ‘with policy research’ and ‘without policy research’ scenarios in the terminology of technology evaluation. The scenarios developed were based on a return by the end of 2004 to a similar degree of intervention in grain marketing to that prevailing in the mid 1990s. This scenario was developed after reviewing trends in the efficiency costs of intervention since 1980 and, indirectly, from discussions with academics and policy-makers in China.

This impact assessment was pursued:

1. describing the outcomes of the AFPs
2. valuing the potential benefits from grain market reform in China
3. attempting to attribute some share of these potential benefits to the AFPs
4. drawing these elements together into a benefit–cost analysis of ACIAR’s investments.

The report proceeds as follows. Section 2 is a review of methodologies used in valuing economic research. Section 3 is a review of grain-market reform in China since the late 1980s. An attempt is made in Section 4 to estimate trends in social costs associated with grain-market intervention in China. Section 5 contains information about the objectives and outputs of the AFPs. In Section 6, views from academics and policy-makers in China about trends in grain market policy and about the role of the AFPs gained

as part of this impact assessment are presented. Section 7 contains the benefit–cost analysis involving an estimate of the gains to China from grain-market reform and some hypothetical scenarios about the speed of reform and the role of the AFPs. Conclusions are given in Section 8.

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## 2 Methodologies to evaluate the impact of the ACIAR-funded projects

There is a growing literature on the valuation of social science research. No attempt has been made to thoroughly review all this literature here but papers that have influenced the direction of this assessment include those by Ryan (1999), Gardner (1999), Schimmelpfennig and Norton (2003), and Lindner (1987). The International Food Policy Research Institute (IFPRI) and the Government of The Netherlands sponsored a workshop on ‘Impact assessment of policy oriented social science research’ in 2001 and some of these key papers were delivered at this workshop.

Two methodological approaches have been employed to date. The first, based on Bayesian decision theory (BDT), values the information provided by research as the change in expected payoffs from policy actions where the likelihood of their occurrence has been revised as a result of the research. The second, referred to as the economic surplus approach, generally values research as the welfare gains from a faster rate of policy reform. They are reviewed in Appendix 1.

Both approaches have been applied in traditional evaluations related to agricultural technologies. The use of economic surplus techniques to evaluate agricultural technologies dates back at least to the analysis by Griliches (1958) of the returns from new corn varieties and is extensively reviewed in Alston et al. (1995). A common approach to evaluating extension programs has been to view extension as advancing the pace of adoption of a new technology. Some technologies focus on providing new information to farmers about, say, soil fertility, and BDT techniques have been applied to such problems (Anderson et al. 1977; Singh et al. 2002).

A widely held view seems to be that evaluating social science research is more difficult than valuing new technologies from biological research, largely because of attribution problems. Sumner (1997), for one, points to the similarities between these two areas, and suggests that the attribution problems in valuing biological research are sometimes taken for granted.

However, it seems that cause and effect relationships are far less certain in the case of policy research than in a new production technology.

### **Implications for assessing the ACIAR-funded projects**

The economic surplus approach has been applied in this impact assessment, for two reasons. First, while trends in grain-marketing policy were discussed with Chinese academics and policy-development personnel from the Ministry of Agriculture, those who actually make grain-marketing policy in China were not able to be interviewed. This issue of access to policy-makers is a practical limitation on the use of the BDT approach, especially for relatively small projects. Perhaps this limitation can be eased by developing reasonable approaches to inferring how the relevant probabilities held by decision-makers change.

Second, grain-marketing policy in China is an area in which many institutions are competing, even if the eventual policy-makers are all domestic, and hence there is a problem of identifying the contribution of the AFPs. Unlike the economic surplus literature, there does not appear to have been a BDT application in which this issue of attribution has been worked through empirically and Schimmelpfennig and Norton (2003) were cautious about how successfully BDT could be applied. As will become clear below, this is not to say that the economic surplus approach has already developed objective procedures in such situations, but the issue has been addressed.

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## **3 Review of grain-market reform in China**

This section identifies some of the key institutions that influence grain-marketing policy in China, describes the pattern of grain-market reform since the 1980s, and reviews literature about the extent and rate of market integration in China. An understanding of the processes of grain-market reform in China is important in characterising the nature of market intervention and hence the estimation of welfare losses, and also in identifying the time path of market emergence and hence the ‘with-AFP’ and ‘without-AFP’ scenarios underlying the benefit–cost analysis that follows.

### 3.1 Trends in grain production in China

Trends since 1980 in the production, price and value of rice, wheat, maize and soybean, the four largest grain crops in China, are shown in Table 1 and Figures 1–3. These trends can be related to changes in intervention policy described in Section 3.3.

Figure 1 shows that, apart from more recent years, grain production in China has generally risen since 1980 — rice production by a third, while wheat and maize production has doubled.

Nominal grain prices (Figure 2) rose substantially in the mid 1990s, encouraging production, and have since drifted down to be about three times their level in 1980. These are nominal average prices rather than real prices for over-quota production, which may explain why the relationship between prices and production, while consistent with expectations, may not be as strong as would be expected.

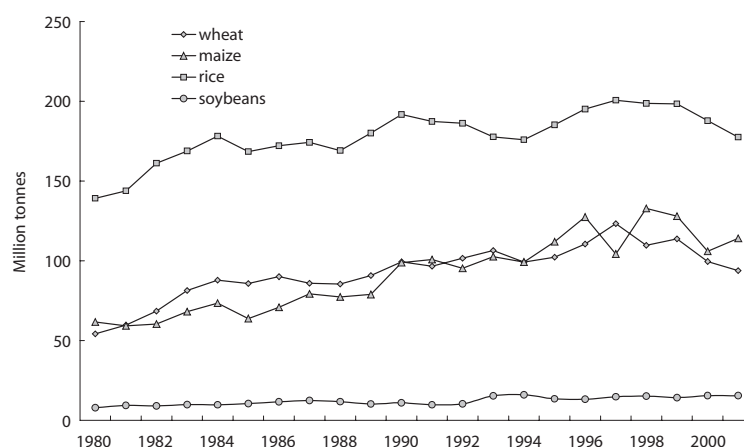
The real total value of production of the four grains (Figure 3) closely follows trends in nominal prices. The real value of production in 2001 was more than three times its value in 1980.

The decline in the value of production of these four grains from 1996 reflects declines in the real price of grain which may have arisen in part because of difficulties encountered in implementing government policy at this time. Production fell in the three years from 1999.

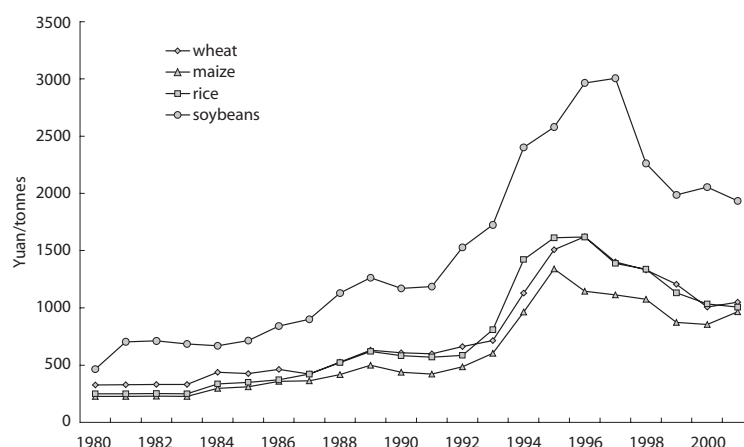
### 3.2 The agricultural policy-making process in China

Ultimately all policy, including grain-marketing policy, is decided by the now nine-member Politburo. The policy development process leading to this final decision-making body is carried out by the Central Leading Group for Rural Work, which is led by a vice premier in charge of agriculture and consists of ministers of agriculture, water resources, forestry, state development and reform commission, finance and commerce. These ministries have research groups including, for example, the Policy Research Office of the Central Party Committee, the Research Office of State Council, and policy-research departments in relevant ministries. There are also inputs from research institutions, such as the Development Research Centre of State Council, the Research Center for Rural Economy in the MOA, and the Chinese Academy of Social Sciences. Other independent research organisations and universities conduct research that influences policy evaluation and development by the MOA.

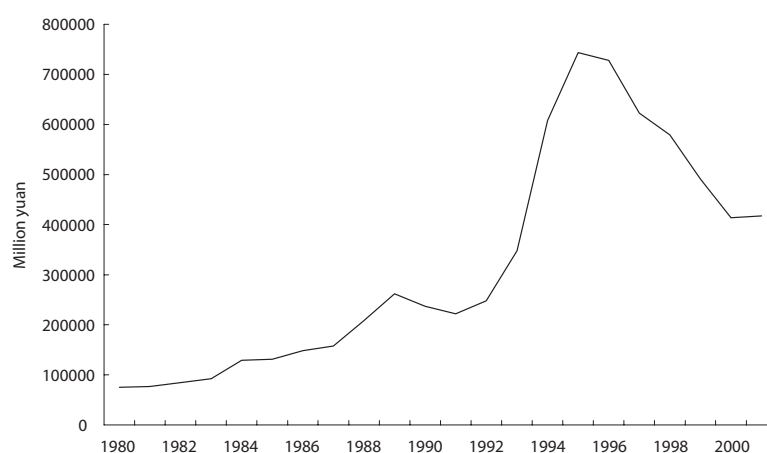




**Figure 1.** Grain production in China



**Figure 2.** Nominal grain prices for China



**Figure 3.** Real Value of Production of Rice, Wheat, Maize and Soybean in China

**Table I.** Price, quantity and value statistics on grains in China: 1980–2001

	Wheat			Maize			Soybean			Rice		
	Quantity (million t)	Price (yuan/t)	Value (million yuan)	Quantity (million t)	Price (yuan/con)	Value (million yuan)	Quantity (million t)	Price (yuan/t)	Value (million yuan)	Quantity (million t)	Price (yuan/t)	Value (million yuan)
1980	54	326	17,676	62	227	14,013	8	466	3,697	139	251	34,981
1981	60	328	19,574	59	228	13,475	9	705	6,574	144	250	35,960
1982	68	331	22,620	60	229	13,783	9	711	6,422	161	252	40,601
1983	81	330	26,891	68	228	15,578	10	685	6,684	169	251	42,351
1984	88	438	38,463	73	298	21,891	10	670	6,497	178	337	60,001
1985	86	427	36,673	64	311	19,824	11	715	7,510	169	350	58,999
1986	90	463	41,671	71	360	25,480	12	842	9,776	172	372	63,998
1987	86	421	36,165	79	364	28,844	12	900	11,223	174	421	73,364
1988	85	527	45,023	77	416	32,209	12	1,129	13,155	169	523	88,511
1989	91	631	57,263	79	500	39,448	10	1,263	12,916	180	619	111,573
1990	99	609	60,468	99	438	43,324	11	1,171	12,883	192	583	111,712
1991	97	599	57,904	101	421	42,449	10	1,187	11,522	187	571	106,940
1992	102	663	67,332	95	486	46,318	10	1,528	15,743	186	587	109,238
1993	106	715	76,069	103	604	61,992	15	1,725	26,409	178	809	143,725
1994	99	1,131	112,267	99	965	95,763	16	2,401	38,417	176	1,423	250,422
1995	102	1,509	154,243	112	1,340	150,088	14	2,580	34,838	185	1,611	298,438
1996	111	1,622	179,300	127	1,145	145,902	13	2,965	39,201	195	1,618	315,753
1997	123	1,402	172,873	104	1,113	116,141	15	3,006	44,268	201	1,389	278,744
1998	110	1,332	146,111	133	1,076	143,033	15	2,262	34,279	199	1,338	265,957
1999	114	1,207	137,475	128	873	111,870	14	1,986	28,299	198	1,132	224,649
2000	100	1,008	100,433	106	856	90,736	15	2,055	31,676	188	1,035	194,447
2001	94	1,050	98,585	114	967	110,300	15	1,935	29,821	178	1,006	178,610

Data supplied by Qiu Huangang from Center for Chinese Agricultural Policy

The AFPs are just two of many seeking to influence the rate and direction of grain-market reform in China. A listing of the groups involved in grain-market research, which is probably incomplete, would include: the Department of Policy and Law, Ministry of Agriculture; the Center for Chinese Agricultural Policy, Chinese Academy of Science; the Research Center for Rural Economy, Ministry of Agriculture; the College of Economics and Trade, Nanjing Agricultural University; the Institute of Agricultural Economics, Chinese Academy of Agricultural Sciences; and the College of Economics and Management, China Agricultural University. Empirical research, or at least policy development, may also be occurring in the Development Research Center of State Council, the Macroeconomic Research Institute of the State Planning Committee; the Chinese Center for Economics Research, Beijing University; the Center for Rural Research, the Institute of Economic Research and the Institute of Population Studies in the Chinese Academy of Social Sciences and other universities. One interviewee suggested that the empirical and theoretical research was undertaken in the academies and at the universities and that policy development occurred in institutions more closely linked to policy processes, including some of the centres and within ministries. Some of the grain-marketing research in these centres has in the past been funded by external institutions such as the World Bank, the Ford Foundation and ACIAR, and this external funding may have provided critical extra resources to conduct surveys and collect and analyse data.

The Policy and Law Department and the Research Center for Rural Economy within MOA were partners in the AFPs, as was the Nanjing Agricultural University. However, ACIAR has links, albeit indirect, with other parties in the policy streams, including the Central Leading Group for Rural Work.

### **3.3 Grain-market reform in China since the late 1980s**

Several project papers review grain-market policy in China. These include papers by Findlay and Chen (1999), Watson and Findlay (1999) and Zhong (n.d.). Most of the papers review policy until the 1998 policy changes and argue for continuing market reform. Wang (n.d.) reviews the experiments introduced in 2000 in Zhejiang, Jiangsu and Guangdong provinces. These were extended to several other provinces in 2001. He argues that this experiment ‘symbolises the beginning of the marketisation of China’s grain economy’.

Zhong (n.d.) pointed out that the state grain-marketing system was established in the 1950s partly because of concerns about food security

and the distribution of grain, and partly to allow economic surplus generated in agriculture to be used to promote development in other sectors of the economy.

Over the last two decades, grain-market policy in China has been marked by alternating periods of reform and retrenchment. The first period of reform, during which state control was relaxed, came between 1979 and 1992. This period started with the household responsibility system which referred to the responsibility of households to meet grain-production quotas. At the same time, grain-procurement prices were increased and private grain-trading emerged. Zhong (n.d.) noted that grain production increased at the rate of almost 5% per year between 1978 and 1984, and that rural incomes grew at an annual rate of almost 16% in real terms. The negative side of this was that budget expenditure on agriculture rose steeply.

In 1985, the mechanism by which the government acquired grain became less stringent. A consequence of the change noted by Zhong (n.d.) was that the price paid for over-quota grain was lower, and grain production soon fell. This resulted in a return to a compulsory 'state contract' until 1993. Zhong noted that 'Any step towards a more market-oriented direction depended on how comfortable the government felt with the actual and expected total supply, and how heavy was the budget burden to maintain the existing marketing system'.

Zhong (n.d.) noted that the government substantially increased retail prices for rationed grain in 1991 and 1992, to the extent that they differed little from market prices and many local authorities abolished grain ration entitlements. While these changes were expected to lead to substantial budget savings, costs of operating the state-owned grain enterprises also seemed to rise. Zhong argued that all subsequent changes in grain-marketing policy reflected a conflict between the government's concern about food security and its wish to operate the state grain-marketing system more cost-effectively.

By 1993, the domestic grain market was based on market operations, and inter-regional grain flows were increasing. Nonetheless, central and provincial governments still maintained a two-tier grain reserve system and farmers were still obliged to deliver a quota to state agencies although they were paid a market price. However, this was a time of both rapid inflation, reflected in high urban grain prices, and a fall in grain production. In 1994, there was a retrenchment from reform in the form of the 'governor's grain responsibility' program which imposed on provincial governors responsibility for grain production and supply in their provinces, and required central government approval for price increases.

Declining production and increasing urban grain prices led some such as Lester Brown (Brown 1995) to doubt China's food security. The government responded by doubling the price for quota grain between 1993 and 1996. Grain production responded to a greater extent than expected but, for a variety of reasons, listed by Zhong (n.d.), grain consumption did not increase in this period, which meant that by the end of 1996 the market price for above-quota grain fell sharply and the government stepped in to protect it. The state grain agencies were required to purchase both quota and non-quota grain at prices above market levels — the price at which they could sell grain — and stockpiles and debts began to accumulate. Inefficiencies related to widespread underemployment in these agencies added to their financial problems.

It was hoped that this high level of grain production would encourage a return to grain-market reform but the 'three policies and one reform' program put into effect in 1998 strengthened the monopoly powers of the state grain agencies. Both quota and over-quota grain were to be purchased at a protection price. The program also required that the agencies sell grain at a price high enough to cover procurement prices and their costs, hence eliminating pressure on the government's budget. It was hoped that grain could be sold at a price high enough to recoup the existing debts of the state grain agencies.

The reviews of policy undertaken as part of the project were complemented by surveys of the impact of grain-market policy on farm households. Zhou and Zhong (n.d.) reported results from a survey of 201 households in a county in Jiangsu Province during 1996–2000. Huang Yanxin (n.d.) reported a survey of 1000 households in five provinces for the 1999–2000 period. Both surveys found that the 1998 'three policies and one reform' package had been largely ineffective in achieving its goals.

One reason why the policy was ineffective was that the government could never ensure a complete monopoly. A private market continued, as farmers found it attractive to sell their over-quota grain to private traders, and hence the market price for grain between 1998 and 2000 never reached a level at which the state grain agencies could recover their operating costs and repay debts. Facing these difficulties, state grain agencies and provinces adopted policies that effectively circumvented the program. The agencies often downgraded the quality of grain to avoid paying the protection price and were reluctant to accept delivery of over-quota grain. Provinces cut quotas by as much as 24% according to Zhong (n.d.) and the central government announced that, from 1999, in some regions, spring wheat, red wheat, early Indica rice and maize were not subject to protection prices. Zhong pointed to the difficulty of attempting to act as a monopolist without controlling

supply. The program was a burden to local governments and did not increase farm prices to the extent expected.

In reviewing this program at the final ACIAR workshop (7.9.01), Du Ying (2000) argued that the ‘three policies and one reform’ program had been constrained by the financial burdens associated with it. Hence, significant quantities of grain were still handled through private grain traders at market prices. He noted that China had moved to a position where it was generally self-sufficient in grains. Of significance was acceptance of the view that farmers did respond to grain prices in their production decisions because it provided a strong rationale to break away from what Lu Feng (1996) referred to as the ‘half circle’ reform model where policy retrenchment occurs when grain supplies become short (final seminar report; see Appendix 2). Some speakers at the seminar suggested that in the past, policy-makers had responded to the short-term impacts of market reform before long-run impacts could be observed.

Zhong (n.d.) observed that, since 1997, grain production had remained high and farm prices low and he argued that this gave the government confidence that ‘food security will not be a problem in the foreseeable future’. In fact, in 2000, the government recognised a need for structural adjustment in agriculture towards higher-quality grains and the production of fruit and vegetables and animal products.

Despite the period of policy retrenchment since the mid 90s, there has continued to be a shift in grain production towards central and northern areas away from eastern coastal and western areas and increasing grain trade flows between these regions, which is consistent with the comparative advantage enjoyed by these regions. There has also been a continuing increase in the number of non-state grain-trading enterprises.

The total area growing grain fell in the three years 1999–2001. Grain stocks have remained high, but because of a high proportion of undesirable varieties in the stockpile and because stocks are concentrated in the production areas, there is some concern at how effectively they might be used to smooth out the availability of grains through time across production and consumption provinces. The costs of these grains stocks have been very high (Wang n.d.).

In 2001, the government again began experimenting with market reform in a small number of provinces including Zhejiang, Guangdong, Jiangsu, Shanghai, Hainan, Fujian, Beijing and Tianjin. According to Zhong (n.d.), grain marketing was to be completely free in these markets, with quotas and protection prices abolished and state grain agencies expected to

become true business enterprises. Wang's analysis of this latest experiment in reform focused on the provinces of Zhejiang, Guangdong and Jiangsu. There is little empirical analysis of this experiment in Wang's undated paper and while the contribution of the AFPs to the experiment is not clearly described it is thought to have been influential.

Wang (n.d.) argued that it was sensible to begin experiments in grain-market reform in the coastal provinces, partly because of the extent of market reform in other sectors in these provinces and also because these provinces no longer had a comparative advantage in grain production and, indeed, are grain-deficit provinces. They produce 25% and 10% of China's production of rice and wheat. In the three provinces, there are large numbers of grain-trading businesses. The government seems to have reserved the right to operate reserves to smooth out peaks and troughs in the market. Wang (n.d.) identified a number of other complementary measures designed to assist the market reform experiment. These included protection of farmland from non-agricultural development and a number of measures designed to allow the grain reserve system and state-owned grain market enterprises to function more efficiently.

The accession of China to the WTO also has implications for grain-market reform. Under WTO, countries have to reduce the extent to which industries receive price supports related to production levels. Support of this nature in the grains industries can come only at the expense of such support elsewhere in the economy. It seems likely that accession to WTO has provided some impetus for China to once again examine grain-market policy reform, although as Du (2000) has pointed out, the level of protection to agriculture in China under green box provisions is low relative to many developed economies. The agricultural implications of WTO accession for China are discussed in a project paper by Du Ying (2000). Most of those interviewed in the course of this impact assessment suggested that, while WTO accession was influential, domestic considerations are likely to be of more significance in determining the future course of grain-market reform in China. The impact of WTO accession is the subject of another, ongoing AFP (ADP/1998/128).

### **3.4 Evidence of the integration of grain markets in China**

As markets become more liberalised, trade flows and production patterns would be expected to change in ways consistent with principles of comparative advantage, and differences in grain prices between provinces would be expected to reflect mainly transport costs rather than trade



barriers. There is some dissension among China ‘experts’ about the impact of this period of policy reform and retrenchment on the degree of integration of grain markets in China. Evidence from research conducted by the AFPs and from other sources is briefly reviewed below.

Du Ying (2000) reported that, since the mid 1980s, regional grain flows had changed in accord with regional comparative advantage. In particular, grain was flowing from north to south, the volume of trade has been increasing and new patterns of inter-regional trade were emerging. Similar conclusions can be found in other project papers by Chen and Findlay (2001), Wang Zhonghai et al. (2001). However, there is an expectation that China does not have a comparative advantage in the production of at least some grains such as wheat and maize (Du Ying 2000; Carter et al. 1996; Zhang 2000) and hence that more grain will be imported, especially by coastal provinces and large cities as access to world markets is liberalised.

There were, however, some misgivings about these findings. While the domestic resource cost (DRC) methodology can be used to indicate comparative advantage in grain production at a province level, several speakers at the final seminar (Findlay 2001) noted the importance of using the true shadow prices for inputs such as land and water (rather than administered prices) and also that the cost of transport between provinces needs to be accounted for. In this more pessimistic vein, Carter and Lohmar (2002) using an index of regional specialisation suggested by Krugman (1991) found that the degree of regional specialisation showed little trend from 1981 to 1993, but during the period of policy retrenchment from 1994–1999 the index has drifted down from 54% in 1981 to 45.5% in 1999. Others to draw similar conclusions about unrealised opportunities to gain from comparative advantage include Du (2000), Young (2000) and Fang and Beghin (2001). Using the DRC approach, project team members, Zhong et al. (n.d.) found that China is likely to have ‘a strong comparative advantage in Japonica rice, sorghum, middle Indica rice, millet and late Indica rice production’ but that there remains ‘great potential to improve resource allocation and to increase grain production through restructuring of the grain sector’. Zhong and Xu (n.d.) in a project paper found that regional comparative advantage had yet to be fully exploited in China.

In addition to these studies analysing trends in comparative advantage and regional specialisation, members of the project team also conducted econometric analyses of price integration both between domestic markets and between domestic and international markets. Wu Laping (n.d.), for example, found in several papers that while there was evidence of integration in the long run, this was not the case in the short run and he



called for continued market reform. Du Yang (2001) reached similar conclusions. Wang Xiaolu (n.d.) argued that government intervention in grain markets had been too unresponsive to underlying trends to smooth out prices and production as intended, and that the way forward lay in a smaller role for government. Zhong and Zhu (n.d.) argued that a more integrated grain market would significantly lower the cost of meeting food-security reserves. They estimated that required storage capacity could be reduced from 320 million tonnes to 82 million tonnes and the average amount of grain stored reduced by more than 119 million tonnes if the markets were integrated at a national level, although market integration requires investment in transport infrastructure.

In contrast, several studies have argued that market integration has continued despite periods of policy retrenchment. In an analysis of the impact of WTO accession on agriculture in China, Huang et al. (2004) found evidence that agricultural markets throughout China were integrated. Park et al. (2002) attempted a more comprehensive analysis of the extent of development in grain markets in China. They argued that despite recurring periods of policy retrenchment, grain markets had continued to evolve, although at an uneven pace, because policy instruments to regulate prices, production and trade were becoming less effective and more expensive. A constraint to market development, particularly in southern China, is a lag in the development of transport infrastructure which may explain some of the increases in transactions costs.

Park et al. (2002) argued that tests of market integration based on the co-movement in prices in 'neighbouring' markets, which generally found a lack of integration, were unable to determine whether the lack of integration was due to failed arbitrage, autarky or trade flow switches. They defined autarky to be a situation where the price difference between markets is less than the transaction cost between the markets and failed arbitrage as where the price difference is greater than the transaction cost.

They used a data set on market prices for rice and maize collected by the National Market Administration Bureau from 180 sites in 28 provinces. This provided reports every 10 days for the period 1988 to 1995. They estimated a parity bounds model of inter-regional trade using maximum likelihood techniques. The observation period was split into four sub-periods; two approximating periods of policy liberalisation and two approximating periods of retrenchment. They examined how arbitrage and autarky rates and transactions costs (estimated from the data) varied over these sub-periods.

The empirical results of Park et al. (2002) provide mixed evidence about the extent of market development. It is certain that the rate of market development as measured by some of their three parameters slowed down in some of the periods of retrenchment. However, they went on to argue that, based on other knowledge about grain markets in China and infrastructure problems, markets had continued to grow as measured by the number of traders and the volume of trade, and that trade barriers were only one factor influencing the growth of integrated grain markets in China.

This uncertainty about the degree of integration in grain markets in China is also reflected in uncertainty about the degree of protection at the border afforded to grain industries, and hence about the impact on China of accession to the WTO. The level of border protection was analysed by Huang et al. (2004). They pointed to divergent views about the impact of the WTO on China. Carter and Li (1999) and Du Ying (2000) in a project paper, argued that accession to the WTO would have a significant impact on the structure of the grains industries in China. Other papers in this vein include those by Carter and Estrin (2001), Li et al. (1999) and Anderson and Peng (1998).

Huang and Chen (1999) used a multi-commodity econometric model of China's food demand, supply and trade, known as the China Agricultural Policy Simulation and Projection Model (CAPSiM), to empirically estimate the impact on the agricultural sector in China of trade liberalisation associated with accession to the WTO. They found that 'in general, China's agriculture would face great challenges and shocks from trade liberalization' and projected that land-intensive crops such as wheat and maize would contract within China and that, at least initially, imports of these commodities would rise, but that rice and horticulture and intensive animal products would expand and be exported. China's rate of self-sufficiency in grain production might decline to 90% by 2005 and in the order of 2 to 2.5 million personyears of labour might be released from agriculture. For the agricultural sector as a whole, the welfare gains from trade liberalisation were likely to be small, but within the sector there would be clear winners and losers.

In an attempt to inject more empirical evidence to the debate, Huang et al. (2004) used the same (but updated) data source as Park et al. (2002) to first measure border protection rates for a range of commodities as a measure of the distortion to be removed by WTO accession and then analysed how this 'border shock' would be transmitted throughout the country. They derived their estimates from surveys of around 100 grain-market participants in nine major trading centres (mostly port cities). Huang et al. (2003b) pointed to the difficulty of estimating net protection rates (NPRs –

the difference between domestic and world prices) as a single number for a range of crops, varying in quality, and sold in a host of markets throughout China all through the year. A lack of uniformity in methodology explains the variation in estimates of NPRs evident in the literature referred to above. This question of border protection is reviewed thoroughly here because the rate of border protection is later used as the basis for estimating the gains from grain-market reform.

Huang, Rozelle and Chang (2003) found that for a grain like wheat the effective level of protection varied widely depending in part on the quality of wheat. Hence, the level of protection for high-quality North American wheat might be as high as 50% but the market for such wheat was very small. The protection on medium-quality wheats (by international standards), accounting for about 15% of the market, was about 10%. The level of protection for lower-quality wheats accounting for about 60% of the market was around 8%. Huang, Rozelle and Chang (2003) estimated an aggregate set of NPRs by weighting the NPRs for particular grain qualities by their sown areas.

Huang, Rozelle and Chang (2003) estimated that, in October 2001, the average NPRs across China for wheat, rice, maize and soybeans were 12, -3, 32 and 15% but warned that there was great variation by locality and quality for these commodities. In contrast, they suggested that had NPRs been estimated in the usual way, the NPR for wheat would have been -21% and that for rice -48%, suggesting that these grains were being taxed rather than protected.

They found that while protection had sometimes been high up to the early 1980s, it has since fallen, to the extent that, around the turn of the century, protection for rice was negative, that for wheat and maize was around 30% and that for soybeans was less than 20% (Table 2). They went on to argue that rural exports had switched towards labour-intensive horticultural and animal products away from land-intensive grains as expected under comparative advantage. They did point out that in some cases China now relied on other non-traditional mechanisms for trade protection, such as its taxation system.

NPRs measure protection at the border. The impact on China's farmers of, say, the WTO, depends not only on the size of the price shock at the border but also on how the price shock flows through to markets far from the borders. Huang, Rozelle and Xie (2003), while pointing out that the transmission of such a price shock depends on whether there are other policy safeguards, on the extent to which households can change enterprise mix in response to relative prices changes and the nature of

transactions costs between markets, focused on analysing the latter — the level of integration between markets – revisiting the work of Park et al. (2002). They found that grain markets in China were integrated to some degree and hence that specialised grain growers, even in remote markets, will not be isolated from changes in market prices in coastal provinces.

While their research findings were generally in accord with the trends identified by Huang, Rozelle and Xie (2003), Tian et al. (2002) have suggested that traditional means of computing net protection rates as the difference between a border and a market price overstate the degree of protection afforded Chinese farmers because of the high level of agricultural products that are consumed on the farm rather than marketed.

**Table 2.** Changes in nominal rates of protection over time of China's major agricultural commodities, 1978 to 2000<sup>a</sup>

	Nominal rates of protection (%)			
	Rice	Wheat	Maize	Soybean
1978–79	10	89	92	40
1980–84	9	58	46	44
1985–89	–4	52	37	39
1990–94	–7	30	12	26
1995–97	–1	19	20	19
1998–00	–6	26	32	49
1998	–6	22	40	37
1999	–9	30	33	67
2000	–2	26	23	44
2001	–3	12	32	15

<sup>a</sup> Nominal rates of protection (NPRs) measured as difference (in percentage terms) between average border price and average domestic wholesale (market) price.

Source: Huang et al. (2004).

### 3.5 Measures of the welfare gains from grain-market reform in China

The importance to an impact assessment of the AFPs on grain-market reform of being able to estimate the potential benefits from grain market reform has already been noted. The only paper known to the author that attempts to value grain-market policy reform is that by de Brauw et al. (2000). They compared the gains from decollectivisation under the household responsibility system from 1975 to 1984 with the gains from market liberalisation from 1985 to 1995. They conducted an econometric analysis of the returns to land and labour at a provincial level for 13

provinces in northern China for the period 1975 to 1995. They found that the gains from market liberalisation, at around 1% per year of the return to labour and land, were modest compared with the returns to decollectivisation. They qualified this conclusion by pointing to some methodological issues but, more importantly, argued that the gains from market liberalisation are slower to eventuate, that the process of market liberalisation was incomplete and that they had not attempted to estimate the benefits from grain market liberalisation to others in the community.

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## **4 Potential welfare gains from grain-market reform**

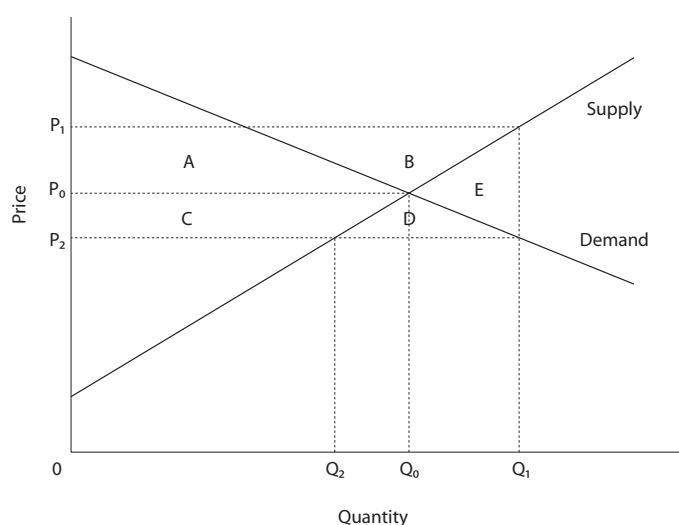
### **4.1 Characterising intervention in grain markets**

As already noted, there do not appear to have been any empirical studies to estimate the potential gains from grain-market reform in China. While the resources available to conduct this impact assessment do not permit a thorough empirical analysis, it is necessary to make an approximate estimate of the potential gains from grain-market reform. In the first instance, this requires a crude characterisation of the grain policy in China at a national level, ignoring the regional differences that most commentators point to.

It is assumed that, at least for wheat, maize and soybean, the government has generally intervened in these markets to provide price support to growers, but has also required producers to meet production quotas. This intervention in the domestic market has been made possible by border protection measures.

Attention has been confined to estimating the total social costs or deadweight losses of market intervention. Several combinations of policies can be used to arrive at the observed price and quantity outcomes (as discussed in Alston and James (2002)), but because at this stage there is less concern about apportioning gains and losses to consumers, producers and taxpayers, there is no attempt to represent the actual policies used for any commodity, just the final outcomes. One drawback of this approach is that, as discussed in Alston and James (2002), the marginal excess burden of taxation to finance market intervention will vary depending on the extent to which the policy combination relies on taxation.

Following Alston and James (2002) closely, the impact of removing a grain subsidy of say,  $\tau$  (% of final price) is to reduce the price to farmers from  $P_1$  to  $P_0$  in Figure 4 with an accompanying fall in domestic production from  $Q_1$  to  $Q_0$ . Producer surplus falls by the area  $A + B$ . Consumer surplus (if grain under interventions had been sold at price  $P_2$  to avoid stockpiles) falls by area  $C + D$ . The gain to government is the area  $A + B + C + D + E$ , and hence the deadweight loss, the net welfare gain to China, is the area  $E$ .



**Figure 4.** Welfare effects of a quota and a subsidy

The extent of the deadweight loss for the removal of a subsidy can be estimated using linear approximations of supply and demand from the following formula adapted from Alston and James (2002):

$$DWL = \frac{1}{2} P_1 Q_1 \tau^2 \left( \frac{\epsilon \eta}{\epsilon + \eta} \right)$$

where  $\tau P_1$  is the reduction in farm price,  $\epsilon$  is the supply elasticity, and  $\eta$  is the absolute value of the demand elasticity at equilibrium. The social gain from the policy increases with the size of the industry ( $PQ$ ), and the size of the price wedge associated with that change. Hence, the deadweight loss can vary with production and price, irrespective of the price wedge.

In the case of rice, the results of the empirical work of Huang, Rozelle and Chang (2003) suggest that, at times, the price farmers received for rice has been below the border price, at say  $P_2$  in Figure 4, and that this has been maintained by restrictions on exports. Farmers have also been required to supply  $Q_1$  to the marketing authorities. The impact of removing this set of policies (or a set of policies delivering the same result) is that consumers

would lose the area  $C + D$  but producers would gain surplus amounting to  $C + D + E$ , where  $D + E$  is the amount by which the cost of producing production from  $Q_2$  to  $Q_1$  exceeds the price received. The net gain to the community from removing this combination of policies is again area  $E$ , which is estimated using Equation 1.

## 4.2 Parameterising the model of welfare gains from grain market reform

Potential welfare gains from grain market reform can be estimated by parameterising Equation 1. The size of the potential welfare gains are largely driven by the extent of the price wedge,  $\tau$ , and the value of the industry at the initial 'equilibrium',  $P_1Q_1$ . Huang (assisted by Qui Huanguang) provided data on price and production data (Table 1) since 1980. Attention is focused on the four crops for which Huang, Rozelle and Chang (2003) provided estimates of protection rates — rice, wheat, maize and soybean. Huang and Chen (1999) noted that rice, wheat and maize account for more than 80% of total grain production in China.

Arguably the most critical choice in this assessment has been to use the estimates by Huang, Rozelle and Chang (2003) of nominal protection rates as a measure of the price wedge,  $\tau$ , and of the impact of government intervention. The uncertainties attached to the measurement of this parameter, which have resulted in wide divergences in its value, were noted earlier. Border protection measures are required to support domestic market intervention. However, nominal protection rates, measured as the difference between prices in world and local markets, pick up more than just the impact of government intervention. They may reflect other causes of inefficiency related to transport for example.

In the financial analysis that follows, the focus is on the change in the price wedge under two scenarios about the extent of government intervention and on the change in deadweight loss (rather than the absolute value of the deadweight loss). Assuming that over short periods these other influences picked up by the NPRs are constant, this differencing procedure makes the use of changes in NPRs a more reliable proxy for the change in the price wedge.

The other parameters are the elasticities of supply and demand in these industries. The study by Huang and Chen (1999) using the CAPSiM model to assess the effects of trade liberalisation on agriculture in China is the basis of the estimates of supply and demand elasticities used in this impact assessment. The model was estimated as a system for 12 crop and 7



livestock products and 5 inputs including research and irrigation stocks. From the report accessed it is unclear how many years of data were used to estimate the model.

The crop response was estimated as a two-stage process with areas and yield response components in double log form. These elasticities, for 1996, as well as demand elasticities for urban and rural consumers, are presented in Table 3. Supply elasticities were derived by adding the area and yield elasticities. Presumably as a result of more recent work, J. Huang (pers. comm.) has suggested a slightly larger set of elasticities, also presented in Table 3, and these will be used in the baseline estimates of welfare changes below. In general, they are consistent with preconceptions that supply is likely to be more elastic than demand, and elasticities are likely to be larger in absolute terms for the smaller crops.

Expectations about how grain producers in China respond to price changes may have been a key policy driver in China, perhaps reflecting concern about rural poverty and food security. It is certainly influential in assessments of the costs of market intervention. If supply elasticities are double those used here (Table 3), then, as explained more fully below, the estimate of the average annual cost of increased market intervention since 1998 increases by one third to about 2000 m yuan. As noted later, benefit–cost ratios also go up by about one third under this scenario. Two interesting dimensions to this issue of supply response are first, de Brauw et al. (2000) found some evidence that grain supply has become more responsive to price as markets have been liberalised, and second, economic policy research may have contributed to a view amongst policy makers that farmers were more responsive to price signals than previously thought and this may advance the pace of reform.

**Table 3.** Crop supply and demand elasticities

	Elasticities from CAPSiM					Huang's suggested elasticities	
	Area response	Yield response	Supply elasticity	Rural demand elasticity	Urban demand elasticity	Supply elasticities	Demand elasticities
Rice	0.18	0.10	0.28	−0.29	−0.20	0.45	−0.25
Wheat	0.25	0.14	0.39	−0.28	−0.25	0.45	−0.30
Maize	0.26	0.14	0.40	−0.25	−0.28	0.60	−0.25
Soybean	0.26	0.07	0.33	−0.30	−0.25	0.55	−0.30



### 4.3 Trends in the welfare costs of intervention in grain markets

Trends in the welfare costs of intervention in grain markets were of interest for two reasons. The first, already mentioned, was to provide an empirical estimate of the welfare cost of intervention in the benefit–cost analysis that follows. The second, and related reason, was to help define the ‘with’ and ‘without’ scenarios in the analysis of the AFPs, by reviewing trends in welfare costs as policy has evolved since 1980. The uncertainty attached to the raw estimates of welfare costs used in this assessment suggests that it would be unwise to base the analysis on a couple of recent years.

The net protection rates provided by Huang, Rozelle and Chang (2003) were averages over 3- and 4-year periods since 1980.<sup>1</sup> The average was simply assigned to each year over which it was calculated. The estimates in Table 2 suggest that, in general, nominal protection rates declined until the 1998–2000 period. This is generally consistent with the review of policy above, although the key policy changes that resulted in marked rises in domestic prices occurred in the mid-1990s. To gain further insights into the general trend in protection, an average nominal protection rate across the four grains was derived by weighting the individual protection rates by their shares in the total value of production of the four grains. This average series is presented in Table 4. This series declined at a rate of about 9.5% per year until 1998.

An estimate was made of the deadweight losses for each of the four grains for each year since 1980, using the one set of elasticity estimates (Huang’s preferred set), the estimates of NPRs from Table 2, and Equation 1. Using these parameters, the social cost to China of intervention in the grain market in 2001 may have been in the order of 12.9m yuan, 127.8m yuan, 996.6m yuan and 65.1m yuan in the rice, wheat, maize and soybean industries, or 1202.4m yuan in total. The large social costs associated with the maize industry are driven by the much larger difference between the domestic and border price for maize — 32% — as compared with the other grains. Since these grains are likely to be substitutes in both production and consumption, estimates of the welfare changes for individual grains are likely to be unreliable and, from here on, attention is therefore focused on the total welfare change.

As already noted above, not all these social costs can be captured by the government simply withdrawing from grain marketing. The lack of transport infrastructure in particular has been mentioned as a continuing source of inefficiency.

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<sup>1</sup> The estimates for 1978–79 were not included because price and production data for these years were not available.

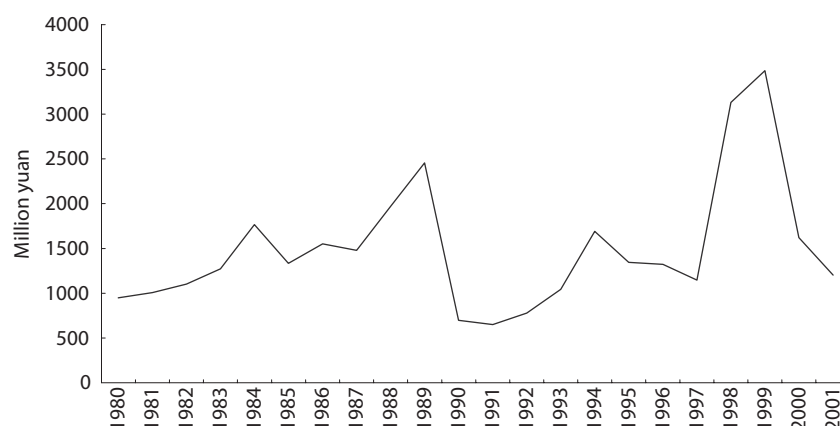
**Table 4.** Trends in the costs of China's Intervention in grain markets

	Average NPR <sup>a</sup>	Real DWL <sup>b</sup> (million yuan)	Real value of production	DWL/value of production
1980	0.31	948	75,044	0.013
1981	0.31	1,008	76,857	0.013
1982	0.31	1,102	84,420	0.013
1983	0.32	1,273	92,594	0.014
1984	0.32	1,767	129,243	0.014
1985	0.22	1,335	131,304	0.010
1986	0.23	1,552	148,334	0.010
1987	0.21	1,479	157,610	0.009
1988	0.21	1,970	208,536	0.009
1989	0.20	2,456	261,797	0.009
1990	0.08	698	236,771	0.003
1991	0.08	650	222,071	0.003
1992	0.09	780	247,863	0.003
1993	0.09	1,043	347,637	0.003
1994	0.08	1,691	608,270	0.003
1995	0.10	1,347	743,243	0.002
1996	0.10	1,325	728,064	0.002
1997	0.10	1,148	622,347	0.002
1998	0.15	3,131	578,855	0.005
1999	0.15	3,486	490,832	0.007
2000	0.13	1,622	420,685	0.004
2001	0.11	1,202	417,317	0.003

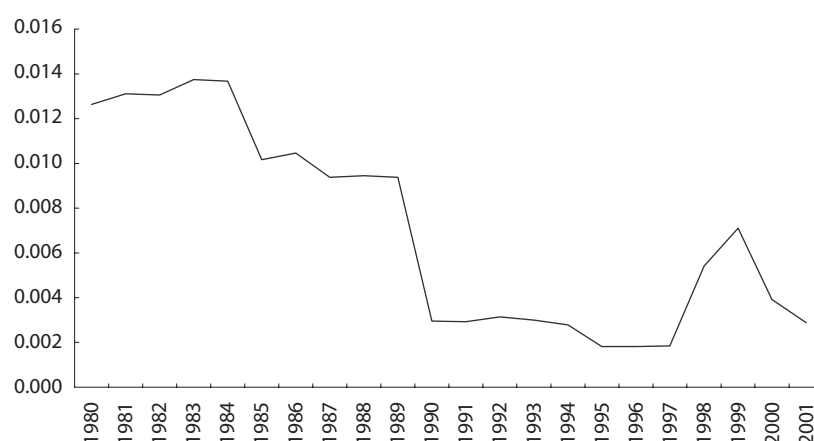
<sup>a</sup> Net protection rate<sup>b</sup> Deadweight loss

The 1980–2001 series of total real deadweight losses can be found in Table 4 and Figure 5. There is little apparent trend in this series. This is perhaps not unexpected because the estimate of deadweight loss depends on the value of production, which varies from year to year independently of policy. It also depends on the nominal rate of protection, the price wedge, which also has an exogenous element in it, in the form of world market prices.

In an attempt to ‘smooth out’ this series, the estimate of total deadweight loss was expressed as a ratio of the total value of production of the four grains (Table 4 and Figure 6). This relative series gives a clearer picture of the trend in protection of the four grains in China since 1980. From 1984 to 1998 the level of protection fell steadily (at a rate of about 14% per year) but has since risen. These trends are consistent with the review of grain-marketing policy presented earlier.



**Figure 5.** Total real deadweight losses from intervention in the markets for four grains in China



**Figure 6.** Ratio of total deadweight loss to the total value of production of four grains in China

During much of the 1990s, the deadweight losses from market intervention were around 0.2–0.3% of the value of production of the four grains. However, in the late 1990s this percentage increased to a peak of 0.7%, presumably reflecting the policy retrenchment that occurred in the last half of that decade.

The trend in this ratio of welfare costs to the value of production suggests that an approximation of the cost of policy retrenchment over the years 1998 to 2001 may be the difference between the actual deadweight losses in these years (estimated using Equation 1), the column in Table 5 headed ‘Real deadweight loss’, and the deadweight losses where protection rates were maintained such that deadweight losses remained at 0.2% of the value of

production of the four grains over this period — the column in Table 5 headed ‘Real deadweight loss at 0.2% of the total value of production’.<sup>2</sup> The average difference in deadweight losses over the four years was 1484 m yuan and is the basis for defining the hypothetical ‘with policy research’ and ‘without policy research’ in the financial analysis below.

In terms of Figure 4, the ‘Real deadweight loss’ column is an estimate of the area E, the gains from a total elimination of market intervention measured from point M, the existing price and quantity combination. The deadweight losses constrained to 0.2% of the value of production are an approximation of a triangle (in Figure 4) similar to E (and contained within E, with a vertex at the intersection of demand and supply) but with a smaller price wedge (although these losses were not estimated using Equation 1). The difference in these two triangles is a parallelogram within area E.

It was noted above that area E may pick up sources of market inefficiency other than government intervention. If these other sources of inefficiency remained constant over the period between 1998 and 2001, then the average difference in deadweight losses of 1484m yuan is an estimate of the annual costs of policy retrenchment over this period.

**Table 5.** Welfare costs of two market intervention scenarios

	DWL <sup>a</sup> as a percentage of TVP <sup>b</sup>	Real DWL (million yuan)	Real DWL at 0.2% TVP (million yuan)	Difference in DWL (million yuan)
1998	0.5	3,131	1,068	2,064
1999	0.7	3,486	905	2,581
2000	0.4	1,621	763	859
2001	0.3	1,202	770	433
Average difference in DWL				1,484

<sup>a</sup> Deadweight loss

<sup>b</sup> Total value of production

#### 4.4 Qualifying this approach to estimating potential welfare gains

There are a number of reasons confidence intervals around these estimates of potential welfare gains are likely to be wide. First, they are based on a model of a national market. Many commentators, including Huang et al. (2003b), have pointed out that there is great variation across China in all

<sup>2</sup> Not requiring the use of Equation 1.

dimensions of this issue, which in practical terms means that the parameters in Equation 1 will vary across the country. Resources permitting, an alternative approach would have been to disaggregate Figure 4 and Equation 1 to a model of spatially linked markets in key areas of grain production and consumption.

Another major area of uncertainty pointed to by Huang et al. (2003b) is that there seems little agreement about the extent of border protection for the grain industries examined. This issue was reviewed earlier.

A similar level of uncertainty surrounds the estimates of demand and supply elasticities used above. If supply elasticities are double those used here (Table 3), then the estimate of the average annul cost of increased market intervention since 1998 increases by one third, to about 2000m yuan. As will be noted later, BCRs also go up by about one-third under this scenario.

Two interesting dimensions to this issue of supply response are first that de Brauw et al. (2000) found some evidence that grain supply has become more responsive to price as markets have been liberalised, and second, as noted above, economic-policy research may have contributed to a view amongst policy-makers that farmers were more responsive to price signals than previously thought and this may advance the pace of reform.

The four grain industries have been modelled as being independent of each other, whereas in reality there is likely to be some degree of joint production in these industries. Similarly, these grains are likely to be substitutes in consumption to some degree. Of greater significance is the fact that the opportunity for farmers to move from grains with production quotas to other more profitable crops has not been explicitly modelled. Consumers are also likely to gain from such a shift in resources. Huang et al. (2003a) noted that quite large shifts between enterprises may occur in response to trade liberalisation. The approach used here may therefore result in a significant underestimate of the costs of the greater intervention in recent years.

As noted by Huang et al. (2003b), another reason for the lack of integration between prices for grains across China is related to infrastructure issues such as transport. Hence, the approach used here may bias the estimate of the potential gains from market reform if the costs imposed by transport infrastructure are severe and have changed significantly during the late 1990s.

There are thus a number of potential sources of bias in estimating the welfare costs associated with greater market intervention since 1998. Largely because the opportunity for farmers constrained by production quotas to move to more profitable crops was not explicitly modelled, the likelihood is that welfare costs of about 1500m yuan understate the true costs of recent intervention. In the financial analysis that follows, a scenario in which these costs are doubled to 3000m yuan was examined.

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## 5 The ACIAR-funded grain market reform projects

The AFPs are just two of many such projects seeking to influence the rate and direction of grain-market reform in China. A list of the groups involved in grain-market research was provided in Section 3.2.

It has not been possible to quantitatively attribute shares in the potential gains from policy reform between these manifold sources of policy research and development. However, an attempt was made, by reviewing project reports and interviewing those knowledgeable about grain-marketing policy in China, including past reviewers of the projects, to qualitatively assess whether the AFPs made a positive contribution to the larger body of economic research into grain-marketing policy in China. This has been done by briefly noting the outputs of the projects and then identifying the means by which the projects may have been influential.

### 5.1 Project outputs

Important outputs were surveys of 1000 households for the years 1999–2001 and the development of a database for these surveys and those from 1994–96 from the earlier project. These surveys provided information on the production and marketing of grain by rural households which was used to assess the effectiveness of existing policy.

Both projects have impressive publications records (see Appendix 2). From project ANRE1/1992/028, about 70 research articles and conference papers were prepared, some of which appeared in Findlay and Watson (1998). As part of the project, a conference was held at the East West Center in Hawaii in 1995 deliberations at which are likely to have influenced the direction of economic research about grain marketing in China.

From project ADP/1997/021, there was a series of 29 research reports, describing the research findings of the projects. Some of these papers were delivered at professional conferences and a selection of 15 of them will appear in a collection of readings entitled 'China's domestic grain marketing reform and integration', edited by Findlay and Chen and to be published by Asia Pacific Press in 2004. Professor Zhong Funing from Nanjing Agricultural University is an author on a further 19 papers arising from the project and published in journals or books.

Research findings from the project were reported in an electronic newsletter which was issued five times between February 2000 and September 2001, and were also communicated at a series of workshops held May 2000, and in June and September 2001. The workshops were attended by key policy-makers and grain-marketing policy experts as well as project team members. Project members organised two sessions at the 45<sup>th</sup> annual conference of the Australian Agricultural and Resource Economics Society in Adelaide in January 2001. A Chinese delegation visited Australia in November 2000 and Chinese team members visited at various times in the course of the project.

## **5.2 Other activities emerging from projects**

Since completion of project ADP/1997/021, team members have engaged in other activities that have arisen, in part, from the success of these AFPs. Professor Zhong Funing, for example, has been successful in obtaining funding amounting to about A\$54,000 from the National Science Fund, the Ministry of Education, and the US–China Academy Exchange Program, for three projects to continue his empirical research into China's comparative advantage in agriculture. Professor Findlay was invited by the World Bank to be part of a team reviewing the Bank's projects in China. His responsibility was the agricultural sector and he was able to apply some of the analysis from the AFPs to this review.

## **5.3 Project findings**

The findings of many of the research papers were discussed in the review of grain marketing above. This section briefly summarises findings related to key project objectives. In general, the research supports the initial premise that government intervention in grain marketing in China has been costly and ineffective, and that government's objectives with respect to integrated, efficient and stable grain markets across the country can best be met by continued market reform.

With respect to inter-regional trade, the project found that regional grain trade has been increasing in a direction consistent with regional comparative advantage. With respect to regional comparative advantage, the project found that there was still scope to restructure the regional pattern of production in response to market pressures and that some regions, because of their resource endowments, would emerge as being competitive in the production of particular crops. With respect to market integration, the project found that, while markets were integrated in the long run, government intervention has meant that price transmission in the short run between markets has been slow, and domestic prices have diverged in both directions from world prices. With respect to grain-marketing policy and farmers' behaviour, the project found that attempts to acquire grain at support prices have not been successful. Hence, the private sector role in grain trading has continued to grow even in periods of policy retrenchment. A key message from the project was that farm production decisions were responsive to grain prices. With respect to the experiments in grain marketing begun in 2001 in Zhejiang Province, it was argued from project results that market development had accelerated, and that grain trade and production was altering in directions suggested by comparative advantage. With respect to grain-market fluctuations and government intervention, research from the project suggested that government intervention had not contributed to smoothing out variation in grain prices and outputs, and that grain market reform should therefore continue.

## 5.4 Project influence

The path and extent to which the research outputs of the projects influenced policymakers in China is unclear and is an important issue to be investigated in this impact assessment. The project team suggested in its second annual report that:

...the above research findings have directly and indirectly produced significant benefits which have been delivered through project seminars, conferences and publications. Academic researchers, policy makers and government officials through these activities have had opportunities to discuss and consider the implications of China's ongoing grain marketing reform.

Empirical and definitive evidence to support the claim of the project team is difficult, if not impossible, to assemble. The project was conducted at a time when, as often as not, policy retrenchment rather than reform was occurring. In addition, the ACIAR-funded team was only one of a number



of domestic and international research and policy institutions recommending market reform.

Nevertheless, both project reviews (commissioned by ACIAR) were highly complimentary of the projects. The review team for ANRE1/1992/028 found that:

...this project has been an outstanding success in terms of its achievements. For the sums of money involved, there can be few other projects which have not only produced so much high quality tangible output, but also made important contributions to research capacity building in both China and Australia, and at the same time helped lay the foundations for possible policy changes which potentially could generate huge gains from trade for China, for Australia, and for the rest of the world.

In reviewing ADP/1997/021, Carter and Cai (2001) concluded that, while the project had not delivered a proposed matrix of regional grain flows, 'it is not an exaggeration to suggest that this project may very well influence government grain policy in China'. This influence on future policy has been achieved through research into the integration of provincial grain markets; analyses of trade flows and barriers between provinces; analyses of comparative advantage by province; and more-qualitative work explaining the outcomes of existing market policies and potential policy reforms backed up by the 1000-household survey data demonstrating the impact of these policies on households.

This research is likely to have had a positive impact on policy-making because of the strong links between the research staff engaged in the project from Australia, the Ministry of Agriculture and Nanjing Agricultural University and key policy-makers within the MOA who regularly attended project workshops and seminars held in China and Australia. The Chinese project leaders from the Ministry of Agriculture for the latest project were Mr Du Ying and Mr Tang Renjian. These men are now Director General, Department of Rural Economy, State Development Planning Commission and Director General, Office of Economics and Finance, Leading Group of the Chinese Communist Party Central Committee, and are regarded as being influential in grain-marketing policy. Policy analysis in the MOA based on household surveys conducted during the project is claimed to have been influential in recent grain-marketing policy experiments in a number of provinces in the southeast of China. The advantage to the projects of such influential partners in China was remarked on, not only by project reviewers, but also by academics and policy-makers in China.

Carter and Fang (2001) also argued that the projects made important contributions to capacity-building within the MOA and at Nanjing Agricultural University which may expedite the process of market reform. I have not attempted to value this capacity-building in the course of this impact assessment.

As described below, an important component of this impact assessment has been to interview research and policy staff associated with grain marketing in China to gain at least a qualitative assessment of the influence of this AFP.

### **5.5 ADP/1998/128—achieving food security in China: implications of likely WTO accession**

ACIAR is also funding a joint project led by Professor Ron Duncan, formerly of the Asia Pacific School of Economics and Management, ANU and Professor Justin Lin, Director of the China Center for Economic Research at Beijing University which has an objective of examining the impact on income distribution in China of agricultural policies that may be adopted following China's accession to the WTO. The analysis is to be conducted using a general equilibrium model of the Chinese economy and the general equilibrium global trade model (GTAP). The project is scheduled to run from July 2000 to December 2004. Research papers and a project newsletter can be found at [http://apseg.anu.edu.au/policy/ch\\_98128.php](http://apseg.anu.edu.au/policy/ch_98128.php).

Project ADP/1998/128 is not covered by this impact assessment.

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## **6 Views on grain reform and the ACIAR-funded projects**

An important source of information about trends in grain-marketing reform and the contribution of the AFPs to grain-market reform was a series of interviews with people involved in research and policy-making in grain marketing in China. The purpose of the interviews was to increase understanding of grain-marketing policy in China; to gain an appreciation of the research effort associated with grain-marketing policy in China; to attempt to assess the contribution of the AFPs relative to other sources of research-based policy advice; and, more narrowly, to gain some information about key parameters used in the analysis to follow, such as

the rate at which the AFPs advanced the adoption of reform, the extent of price wedges associated with government intervention in grain markets, and the responsiveness of producers and consumers to price changes.

## 6.1 Interviews

Following Ryan (1999), a structured questionnaire was developed (see Appendix 3). Given time constraints, every effort was made to adapt the interview to capture the expertise of the person being interviewed, and so the questionnaire was used more as a guide than as a strict protocol. From the review of the approaches described above for valuing policy research, it should be clear that formal sampling techniques and statistical analyses of responses are not possible or appropriate in surveying these people.

The sample was small, many interviewees had some connection with the projects (as project partners, for example) and the interviews were usually attended by Beijing-based ACIAR staff. Nevertheless, the interviews were important in shaping views about the significance of the AFPs and their strengths and weaknesses, and more generally about the practical difficulties in evaluating social science research in an environment where there are many research institutions which cooperate as often as they compete in the research and policy-making process. Of course the other confounding factor was the ability to interpret accurately the views expressed. Language was sometimes a barrier, even when an interpreter was used. In most cases, the interviews lasted for about two hours

The names of potential candidates to interview were suggested by the Australian project team and by other people with a knowledge of grain-marketing policy in China. The objective was to interview a sample of policy-makers and research personnel in China, some of whom were part of the project and some of whom were not. Arrangements for the interviews were coordinated by the staff in the ACIAR office in Beijing, including Mr Chris Brittenden, Ms Lydia Li and Mr Wang Guanglin, who also provided interpretation services where necessary. A list of the people interviewed follows below. These interviews were conducted mostly in China in the period 13–26 September 2003.

Unfortunately, some key people were unavailable for interview. It was hoped that Mr Du Ying, Director General, Department of Rural Economy, State Development and Planning Commission and Mr Tang Renjian Director General, Office of Economics and Finance, Leading Group of the Chinese Communist Party Central Committee, both of whom had been part of the project team while they were members of the Department of

Policy and Law in the Ministry of Agriculture, would be interviewed. A strength consistently identified throughout the interviews was that the projects had Du and Tang as partners, and that they had been moved to positions even more influential in the policy-making process. The unavailability of these two key people highlights one of the real difficulties in evaluations of policy research that are based on eliciting the views of policy-makers.

The following people were interviewed:

Professor Tian Weiming, College of Economics and Management, China Agricultural University

Dr Huang Yanxin, Chief, Division of Structural Reform Policy, Department of Policy and Law, MOA

Dr Wang Zhonghai, Division of Structural Reform Policy, Department of Policy and Law, MOA

Professor Huang Jikun, Director of the Center for Chinese Agricultural Policy, Chinese Academy of Science

Professor Lui Fengyan, Deputy Director General of the Institute of Agricultural Economics, Chinese Academy of Agricultural Sciences

Professor Zhang Lubiao, Deputy Director General of the Institute of Agricultural Economics, Chinese Academy of Agricultural Sciences

Professor Li Xiande, Institute of Agricultural Economics, Chinese Academy of Agricultural Sciences

Associate Professor Wu Jingxue, Director, Institute of Agricultural Economics, Chinese Academy of Agricultural Sciences

Mr Andrew Watson, Representative, The Ford Foundation

Dr Zhang Zhaoxin, Deputy Division Director, Research Center for Rural Economy, MOA

Mr Wu Wen, Deputy Division Director, Research Center for Rural Economy, MOA

Professor Zhong Funing, Dean, College of Economics and Trade, Nanjing Agricultural University

Professor Zhou Shudong, Director of the Agricultural Economics Department, College of Economics and Trade, Nanjing Agricultural University

Professor Chu Baojin, Director of the Department of Finance, College of Economics and Trade, Nanjing Agricultural University

Associate Professor Zhu Jing, College of Economics and Trade, Nanjing Agricultural University

Professor Cai Fang, Director, Institute of Population and Labor Economics, Chinese Academy of Social Sciences.

Largely because of the risk of misrepresenting the views of individuals, the general impressions and knowledge gained from these interviews are reported, rather than the views attributable to particular people. Some of these general observations were also influenced by discussions with others outside this formal interview process. They included Dr Jim Ryan; Professors Scott Rozelle and Colin Carter from the University of California at Davis; Dr Zhanghue Zhou, University of Sydney, Orange; Dr Shenggen Fan, IFPRI; and staff at the Australian Embassy in Beijing. While in Nanjing, much assistance was given at the local government level from Dr Qu Weimin, Vice Director of Agricultural and Forest Bureau of the Nanjing Municipal Government and Mr Zheng Lizhi, Vice Chief, Nanjing Jianye District People's Government. Professor Chris Findlay and Dr Chunlai Chen, both of whom worked on the projects, were also generous with their time and advice. Data on grain prices and quantities reported in Table 1 were assembled by Qiu Huanguang from Center for Chinese Agricultural Policy.

## 6.2 Views on grain-market reform

Views on the future of grain market reform were varied. Some regarded further liberalisation as inevitable and some agreed that reform would continue but pointed to a number of practical issues to be solved in the near future. These practical issues included: the management of the debt of the state grain-marketing enterprises, which has increased significantly to very high levels as a result of high rates of grain procurement since 1998; the disposal of grain in the stockpile, some of which has been there for more than 5 years and is therefore of dubious quality; and the high level of overmanning within the State Grain Bureau.

There was, however, a group who foresaw an ongoing role for government in grain marketing. This group were concerned about food security and social unrest caused both by food insecurity and by income problems for farmers. It perhaps also included those in the State Grain Bureau concerned about withdrawal by the government. These issues have been longstanding concerns of the Chinese Government. People in this group

called for increased economic research into the impact of changes in marketing policy, because they claim the distributional impacts are larger than accepted by the pro-reform group. They seem particularly concerned about farm incomes after deregulation and the risk of relying on imports when, in their view, China is unlikely to be a price taker on world markets. While they were critical of recent intervention by the government that has resulted in large stockpiles and debt for the state-owned enterprises, it was not possible to discern from them an alternative system of government intervention.

### **6.3 Distributional consequences of market reform**

The complete withdrawal of the government from grain marketing would be a major institutional change. It is therefore understandable that there is uncertainty about the form of the grain-production sector in China after deregulation and the extent to which there might be a need to import grain. No doubt any process of structural change will take several years. This uncertainty about the impact of grain-market reform was reflected in doubt about who would be the winners and losers from such reform, and whether China would benefit in aggregate. There was widespread consensus that consumers would gain, but views about the impact on producers were more varied.

Most thought that producers of high-quality grains and those for whom the opportunity costs of producing grain under quota were high, would be winners from grain reform. They would be able to produce crops in which they had a comparative advantage. Some argued that freeing producers from quota commitments would be a benefit to the large majority of producers, at least after some adjustment period. Those in the southeastern provinces, until recently forced to produce grain, would shift to other, more-profitable crops, to the eventual benefit of themselves and of producers in provinces with a comparative advantage in grain production.

The impact of market reform on poor farmers in grain specialist areas is uncertain, as illustrated in the discussion in Huang, Rozelle and Chang (2003) about the impact on poor farmers of accession to WTO. Farmers receiving a protected price for a fixed quota in isolated markets face potentially large losses if the government withdraws. There are two factors mitigating this impact. First, several papers have noted that the budgetary pressures associated with the 1998 policy have meant that often the state marketing bureau has sought to discount grain purchases in a variety of ways and hence the losses from marketing reform may not be as severe as indicated by the thorough application of current procurement policies.

Second, these producers may benefit as grain production in the southeastern provinces declines. While some argue that many poor farmers in grain-dependent areas would be worse off as a result of market reform, this view was not widely shared.

State-owned grain-marketing enterprises are a significant component of the grain-marketing system in China. They have been a vehicle for the implementation of government policy on grain marketing. At times they have had the authority to be the monopoly purchaser of grain from farmers. They may still handle as much as 70% of grain in China, and they employ several million people across the country. No attempt to fully understand how they operate was made, but it is clear that these enterprises have an incentive and capacity to pursue their own interests, and hence they share with producers, private traders and consumers in welfare changes associated with government intervention to manage the prices and quantities of grain in China. Some have argued that because these enterprises pursue their own interests and because of the financial constraints they operate under, farm incomes have not been supported to the extent indicated by government policy with respect to protection prices and marketing quotas. The consensus is that this sector would lose as markets opened up to private traders. In implementing government policy and in pursuing entrepreneurial opportunities, these state-owned enterprises have built up large debts, as noted above. Central and local governments would likely be better off under market reform were they not expected to support these enterprises. One of the people interviewed noted that the cost associated with closing state-owned enterprises was not a problem unique the agricultural sector but that the agricultural sector could, at least potentially, compensate the state-owned grain sector because of efficiency gains elsewhere in the sector. Any attempt to model grain marketing in China would need to explicitly consider this sector.

The uncertainty about the impact on agriculture of China's accession to the WTO has already been discussed. In view of this uncertainty, it is perhaps not surprising that, in general, those interviewed did not regard WTO accession as being the key factor driving grain-marketing policy in China. Some pointed out that, since accession to the WTO, world grain prices have exceeded grain prices in China and that the large stockpile of grain in China gives some scope to manipulate domestic supply should the world price fall.

The consensus seems to be that the present government will press on with grain-market reform, particularly if a process for dealing with the three practical issues identified above, related to the operations of the state grain-marketing enterprises, can be devised. This process of reform might



take several years. The consensus now seems to be that stability in grain markets in China can be achieved through international trade. However, the government would intervene in the unlikely event of highly volatile prices and shortage of grain causing social unrest within China.

## **6.4 The contribution of economic research and the ACIAR-funded projects**

A second set of questions was related to gaining a better understanding of the role of empirical research in general in the development of grain-market policy in China before focusing on the contribution of the AFPs.

It is difficult to judge how effective the extensive body of empirical and analytical research and policy development into grain-marketing policy has been. As noted in Section 3.2, many research institutions have contributed. The history of the 1990s has been a cycle of reform and retrenchment, as already noted. Most of those interviewed, however, seemed confident that the latest round in the reform process begun in southeastern provinces in 2001 would spread, though the process might yet take several years, and that empirical research had advanced this process. Some argued that, in view of the long history of government involvement in grain marketing in China, reform would not occur unless it could be presented in a sound analytical and empirical framework. It would seem that those institutions with close links to key policy-makers have been successful in using their analytical and empirical skills to demonstrate the ineffectiveness of recent grain-marketing policy, the opportunities for efficiency gains and that food security could be handled in other ways. The influence of those more independent of the policy-making process, such as universities, was less direct.

In summary, many institutions have been involved in funding and undertaking research and policy development with respect to grain marketing in China. Generally, this body of research has queried the effectiveness of policy in recent years and been an advocate for further market reform, although researchers at one institution (at least) see a continuing but unspecified role for government.

Turning to the contribution of the AFPs, their strength, already noted, was that their partners in China included people who have become very influential policy-makers: Mr Du Ying and Mr Tang Renjian, who led the project while in the Policy and Law Department of MOA, with Professor Zhong Funing from Nanjing Agricultural University. This strength was recognised by those who were not partners to the project.



The most common weakness identified by those outside the project was a lack of contact or communication on the part of the project partners. While few outside the project were able to recall papers from the project that they had found useful or even read, it is not clear how the performance of the project in this respect could have been markedly improved. Research papers were accessible on the web, a project newsletter was widely circulated and there were regular seminars. Perhaps versions of papers in Chinese would have been more accessible, and a summary document of key findings or papers from the project would have been welcome. Other concerns were the unavailability of the household survey databases to those outside the project team. Some project members and reviewers were concerned about coordination between the three project partners, but specific problems were not apparent.

One of the claims for the project noted by its reviewers was the building of capacity within institutions in China, particularly the MOA. It is not clear how capacity-building can be measured and valued, and hence little time was spent investigating this issue. As part of the project, MOA staff were trained on survey techniques, and assistance was presumably provided in preparing policy briefs. Little time was spent at the MOA and it was not possible to assess the extent of capacity-building. It was noted that the household survey program has not continued, but this may be more a reflection on the MOA's financial capacity rather than its scientific capacity in this area. As already noted, Professor Zhong Funning has been able to attract further funding to extend his analysis of efficiency in Chinese agriculture and this may be regarded as evidence of enhanced capacity at Nanjing Agricultural University attributable to the AFPs.

A more-general criticism related to the contribution of external researchers to policy reform in China. Some argued that the resources used by these external research people could be better employed in key research academies in China. In relation to the AFPs more specifically, some argued that the project had worked with Chinese partners in the MOA who had policy-development skills rather than research skills and had concentrated on explaining the theory behind market reform, already well-trodden ground. They were concerned at the lack of empirical research on the impact of grain-market reform but seemed unaware of the empirical research undertaken as part of the project. This argument about the contribution of external researchers prompted careful examination of what the Australian connection brought to the ongoing process of grain-marketing research and policy development in China.

The key reason advanced by many interviewees for believing that the AFPs may have been influential in grain market reform was that important

policy-makers were either partners to the projects and/or attended project workshops and seminars. The question remains as to why these key policy-makers aligned themselves with Australian researchers rather than with other institutions inside and outside China. As already noted, neither Mr Du Ying nor Mr Tang Renjian were able to be interviewed to ask this question directly. However, from the comments of project members and interviewees it would seem that the Australian and Nanjing Agricultural University researchers brought to the project empirical and analytical skills that complemented the policy-development skills and connection to the policy-making process existing in the Policy and Law Department of the MOA. Furthermore, the independence of the Australian researchers may have allowed them to stimulate, more easily than their Chinese partners, a debate about alternative grain-marketing policies, and to conduct empirical research to identify the failings of existing grain-marketing policies. Much of the empirical research in the project seemed to be designed to show that present policy was unsuccessful. The household survey work conducted by the Ministry of Agriculture and the comparative advantage work from the Nanjing Agricultural University fall into this category.

The original intention of the interviews was to go as far as asking by how much did the AFPs advance the speed of reform in grain marketing. Those interviewed early in the process were unwilling to make an estimate of this. It quickly became apparent that the AFPs were one of many interrelated sources of policy advice, and those interviewed were uncomfortable about making attributions between institutions, even though they viewed the AFPs favourably. From the empirical work discussed below, it is apparent that, because of the large potential gains from grain market reform in China and the small investment by ACIAR and its partners, the break-even time of policy advance is measured in days rather than months or years — a time scale difficult to discern in such a gross approach as attempted here.

Ryan (1999), in his study of rice policy in Vietnam, was successful in answering the question about the rate at which policy reform has been adopted. Perhaps his success in this area can be explained by the fact that IFPRI was supporting the main source of policy advice in close cooperation with the key policy-maker, the Ministry of Agriculture and Rural Development and that, as a result of its recommendations, policy reform was actually implemented. The situation with respect to grain market reform in China was more similar to the multi-agency multilateral trade problems addressed by Schimmelpfennig and Norton (2003) who concluded that issues of attribution remained unresolved for these types of problems.

With the benefit of hindsight, a more defensible approach would be to avoid the attribution question by focusing on the impact of the whole body of knowledge generated by all the institutions involved in research and policy-making with respect to grain marketing and on the resources they employed collectively; i.e. conducting a benefit–cost analysis of the investment by all agencies into marketing policy. From a qualitative review of the AFPs, one could argue that the rate of return to the ACIAR investment was likely to have been at least as good as the average rate of return earned by total investment made by the group of institutions. The drawback of this approach is that it does not allow a judgment to be made, except qualitatively, about the performance of the AFPs relative to the other institutions, although perhaps this may not be a significant issue for ACIAR. The main practical difficulty is that information would be required from all institutions about their investments over time in grain-market research and policy development.

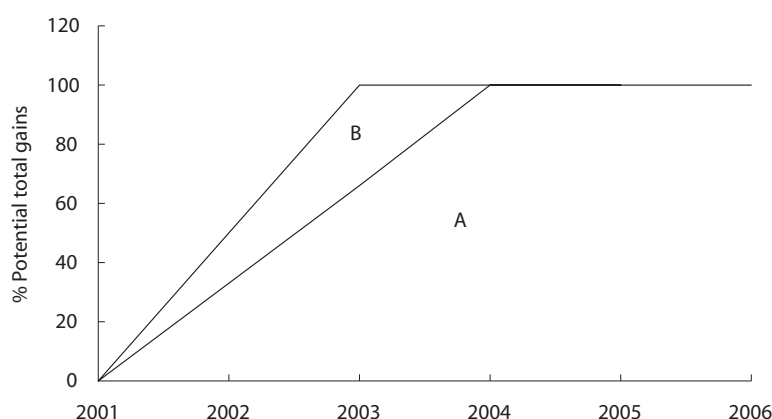
This approach is also based on the presumption that those interviewed would be more comfortable assessing the rate at which policy change has been advanced for the total research effort than for the research effort of, say, the AFPs. This is still a difficult question for most people, given its hypothetical contingent nature. As noted above, in future work of this nature, it may be worth consulting with those experienced in contingent valuation surveys to devise a set of questions more likely to succeed.

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## 7 Benefit–cost analysis of economic research in grain-market reform in China

The adoption of policy reform is modelled in the same way as the adoption of technology is normally modelled — as a gradual process taking a number of years. This is illustrated in Figure 7, where the y-axis denotes the percentage of the total costs of policy retrenchment, 1484 m yuan, that is recovered by a process of policy reform from 2001 onwards. However, an alternative approach would be to model the adoption of policy reform as an instantaneous shock to the system, where the uncertainty lies in which year the shock occurs. Discussion of this issue in the literature appears to be non-existent. The process was modelled as a gradual one because Chinese policy in the past appears to have evolved, although clearly there have been years of major shocks, and because it takes time for producers, marketers and consumers to respond to policy change. The benefits from economic

research into policy reform, including the AFPs, can be viewed as area B in Figure 7, which arises because the process of policy reform is completed, in this scenario, by the end of 2003 rather than the end of 2004.



**Figure 7.** Time path of gains from market reform

## 7.1 The ‘with’ and ‘without economic policy research’ scenarios

A key step in BCA is to define the ‘with economic policy research’ and ‘without economic policy research’ scenarios (which define the area B). Earlier, the cost of policy retrenchment in recent years was estimated to be almost 1500 m yuan per year, which is the difference between the actual deadweight losses incurred from 1998 to 2001 and the losses that would have occurred had the earlier trajectory of marketing reform continued such that the ratio of welfare losses to the value of production of the four grains stayed at around 0.2%.

The strong impression gained in discussion with experts in grain-marketing policy in China was that the current level of government intervention could not continue, largely because of the costs associated with acquiring and maintaining stockpiles of grain. It also seems to be the case that the government is more confident that a lesser degree of government intervention will not threaten food security. Finally, as already noted, the government has already embarked on a process of market liberalisation in provinces in the southeast of the country and this experiment is likely to be expanded to other provinces in coming years. There seem to be reasonable grounds to expect that the ‘half circle’ reform process is coming to an end.

Hence, an appropriate ‘without economic policy research’ scenario would seem to me to be one where, by the end of 2004, the year when the impact of WTO accession is greatest, the government will have withdrawn from grain-market intervention to the extent that the ratio of welfare costs to the value of production is back to its trajectory of 0.2%. The 0.2% level of support recognises the widespread view that the government is likely to continue enter grain markets in a limited way to maintain a minimal grain stockpile. Under this scenario, reform is motivated by the high cost of present policies, the lessons from past changes in policy, and perhaps by the influence of economic policy research in the early 1990s and before.

An alternative ‘without’ scenario may have been to assume that, without the ongoing economic-policy research, the level of protection in the late 1990s may have exceeded the actual rates used here. No evidence to suggest that this scenario is any more likely than the conservative approach taken here was found.

The ‘with economic policy research’ scenario and the contribution of the AFPs is much more difficult to define. In the BCA to follow, the impact of this body of policy economics is modelled as speeding up the process of grain-market reform recognising the influence that current economic policy research is likely to have on the reform process. The difficulties of quantifying this influence have already been discussed, but at least some of the academics and public servants interviewed in China had clear links to key policy-makers, had published in international scientific journals and were successful in attracting external and internal funding. In their view, policy-makers were responsive to sound analytical and empirical economic research. However, it was not possible to get any strong impression as to the time by which the process might be advanced and several scenarios were examined.

A key issue in defining the ‘without’ scenario is identifying the contribution of the AFPs.

## **7.2 Attributing welfare gains to the ACIAR-funded projects**

Most of the people interviewed in China complimented the AFPs. As already noted, they pointed to the close links with key policy-makers and the value of the household surveys in providing empirical evidence of the ineffectiveness of some existing policy instruments. The projects’ reviewers suggested that the projects were likely to be influential.

However, none of those interviewed were prepared to put a figure on the length of time by which the AFPs might have accelerated the policy reform process. Nor did any of those interviewed volunteer that these projects were critical to the reform process.

No doubt we can and do assess subjectively whether or not projects like those under review are likely to have been influential. Perhaps as we gain experience in evaluating the impact of economic research, through ‘reasoned discourse’ (to use the terminology of Randall (1993)) some agreement will be reached as to what constitutes good practice in making these subjective assessments.

However, it is more difficult to see developing an objective way of quantitatively isolating the contribution of particular projects such as the AFPs. Good practice at present would seem to be to attempt to measure the returns to the total body of research and to assume that those components judged to have been influential have earned at least this average rate of return.

The contribution of the AFPs is examined under two scenarios. The first is that the projects were indistinguishable from the body of economic research into grain-marketing policy reform and hence earned the same rate of return as the group. As will be seen below, the weak link in this approach is that an estimate of the expenditure is available on this research for only the AFPs and not for total expenditure on this research by the whole group.

The second approach has been to assess the rate of return to the AFPs if the length of the reform process were shortened by one or more months.

### **7.3 Expenditure on economic research related to grain-marketing policy in China**

The expenditure on ACIAR-funded projects ANRE1/1992/028 and ADP/1997/021 was gathered from ACIAR financial statements. These statements contain information about total expenditure by ACIAR and the amounts spent by the partner research organisations in both Australia and China. The statements also contain an estimate of the in-kind contributions of the Australian and Chinese research partners. The records come in two forms. The project contracts contain projected expenditure and estimates of the in-kind contribution. There are also financial statements for actual expenditures. Because the difference between actual and projected expenditure, at least in total, is small, a combination of these statements has been used. Expenditure information relevant to this assessment is presented in Table 6.

Both projects were subject to an external review. In Table 6 an allowance of A\$7000 has been made in 1997 for ANRE1/1992/028 and in 2001 for ADP/1997/021 for these reviews. This estimate was based on the known expenditure of one US reviewer in the latter project review.

In nominal terms, ACIAR invested almost A\$680,000 on ANRE1/1992/028 and A\$545,000 on ADP/1997/021. About 80% of ACIAR funds for ANRE1/1992/028 were spent in Australia. The share for ADP/1997/021 was about 70%. Nominal expenditures were first expressed in 2002 dollars using the Australian GDP deflator and then either compounded forward or discounted back to 2002 at a rate of 5%. In real 2002 dollars, total expenditure, including in-kind contributions, was A\$1,754,000 on ANRE1/1992/028 and A\$945,000 on ADP/1997/021. It seems highly likely that the in-kind contributions from research partners is understated for ADP/1997/021. From the project contract, Nanjing Agricultural University did not claim an in-kind contribution. In this analysis, the in-kind costs of ADP/1997/021 were doubled and expenditure on the two projects in 2002 dollars was A\$2.7m.

**Table 6.** ACIAR and In-kind Costs for Projects ANRE1/1992/028 and ADP/1997/021

	Nominal A\$			Real A\$2002
	ACIAR expenditure	In-kind contributions	Total	Total compounded forward at 5%
Project ANRE1/1992/028:				
1994	204,210	138,600	342,810	591,960
1995	206,491	138,600	345,091	561,124
1996	214,547	133,600	348,147	526,667
1997	52,361	0	52,361	74,293
Total	677,609			1,754,044
Project ADP/1997/021:				
2000	245,673	74,500	320,173	378,468
2001	245,693	74,500	320,193	344,608
2002	47,300	0	47,300	47,300
2003	7,000	0	7,000	6,472
2004	32,474	0	32,474	27,788
Total	578,140			804,636

Information about expenditure by the various other economic research institutions in China that have sought to influence the rate of policy reform in grain marketing was not readily available. As noted above, several institutions have interests in this area, and it was therefore assumed in one



of the scenarios below that the level of expenditure on economic research related to grain policy reform has been five times that by the AFPs or A\$13.5m (2002 dollars) in total.

## 7.4 Benefit–cost results

Recall that, for the purposes of this impact assessment, the benefits of policy reform are assumed to be a return to a grain-marketing regime where the welfare costs of government intervention are about 0.2% of the total value of production in China of rice, wheat, maize and soybean, from an average of about 0.5% between 1998 and 2001. A return to this policy trajectory was estimated to be worth almost 1500m yuan per year. The Chinese Government appears to be heading in this direction already, and in the analysis it is assumed that, by the end of 2004, welfare costs will again be about 0.2% of the value of production. The impact of economic research (including the AFPs) has been assumed to be a shortening of the time by which this target is achieved. Note again that it is assumed that the reform process is gradual, much like the adoption of new technology, and that economic research brings forward the time by which the process is complete. An alternative approach likely to lead to larger BCRs would be to assume that economic research results in the reform process beginning earlier than otherwise.

From Table 7, under the base scenario, the present value of benefits is A\$88.6m, A\$40.3m and A\$12.7m when reform is advanced by 6, 3 and 1 month, respectively. The NPVs range from A\$85.9m, where reform is completed 6 months earlier and the only costs considered are ACIAR's, to –A\$0.8m where the costs are assumed to be A\$13.5m and reform is advanced by only a month. The corresponding BCRs are 32.8:1 and 0.9:1, respectively. These benefit–cost results are slightly lower if the reform process extends to the end of 2005 rather than 2004.

There are two scenarios worthy of closer consideration. Focusing first on the total body of economic research, if the process of reform is advanced by between 3 and 6 months before the end of 2004, a reasonable prospect in view of the current 'experiment' in the southeastern provinces, the present value of benefits from a return to the pre-1998 reform trajectory (i.e. not a complete elimination of government intervention) is estimated to be between A\$40.3m and A\$88.6m. Assuming that the cost of this total body of research is around A\$13.5m, the NPV ranges from A\$26.8m to A\$75.1m and the BCR is between 3:1 and 6.6:1.



**Table 7.** Some benefit–cost scenarios.

	Time by which policy reform process is reduced		
	6 months	3 months	1 month
<b>Base scenario (1500 m yuan costs):</b>			
Present value of benefits A\$(2002)m	88.6	40.3	12.7
Net present value (NPV) A\$(2002)m for expenditure by:			
ACIAR projects (actual)			
A\$(2002) 2.7m	85.9	37.6	10.0
All research institutions (estimate)			
A\$(2002) 13.5m	75.1	26.8	–0.8
Benefit–cost ratios (BCRs) for expenditure by:			
ACIAR projects (actual)			
A\$(2002) 2.7m	32.8	14.9	4.7
All research institutions (estimate)			
A\$(2002) 13.5m	6.6	3.0	0.9
<b>Elastic supply scenario (2000 m yuan costs):</b>			
Present value of benefits A\$(2002)m	117.5	53.4	16.8
NPV A\$(2002)m for expenditure by:			
ACIAR projects (actual)			
A\$(2002) 2.7m	114.8	50.7	14.1
All research institutions (estimate)			
A\$(2002) 13.5m	104.0	39.9	3.3
BCRs for expenditure by:			
ACIAR projects (actual)			
A\$(2002) 2.7m	43.5	19.8	6.2
All research institutions (estimate)			
A\$(2002) 13.5m	8.7	4.0	1.2
<b>Larger welfare costs scenario (3000 m yuan costs):</b>			
Present value of benefits A\$(2002)m	179.1	81.4	25.6
NPV A\$(2002)m for expenditure by:			
ACIAR projects (actual)			
A\$(2002) 2.7m	176.4	78.7	22.9
All research institutions (estimate)			
A\$(2002) 13.5m	165.6	67.9	12.1
BCRs for expenditure by:			
ACIAR projects (actual)			
A\$(2002) 2.7m	66.4	30.2	9.5
All research institutions (estimate)			
A\$(2002) 13.5m	13.3	6.0	1.9

If the contribution of the AFPs has been to advance the process by a month, again a reasonable prospect given the role attributed to the Department of Policy and Law in the MOA in the southeastern provinces ‘experiment’, then the present value of the investment is A\$12.7m and, given the cost of the ACIAR-funded research is approximately A\$2.7m, the NPV for the AFPs is A\$10m and the BCR from these projects is in the order of 4.7:1.

This BCA is based on an estimate that the average cost of the higher level of government intervention since 1997 has been about 1500 m yuan. There is great uncertainty about this estimate. Two further scenarios were assessed and reported in Table 7. In one scenario, supply elasticities were doubled, increasing the annual cost to about 2000m yuan. In this case, the present value of benefits for economic research in total in advancing policy reform by from 3 to 6 months is estimated to be between A\$53.4m and A\$117.5m. The corresponding NPVs are in the range A\$39.9m–A\$104m and the BCRs range from 4.0:1 to 8.7:1. For ACIAR advancing reform by one month, the present value of benefits is A\$16.8m, the NPV is A\$14.1m and the BCR is 6.2:1.

The choice of static, single-industry national market models, and errors in the parameter values used for net protection rates and supply and demand response, mean that an estimate of the costs of greater intervention is biased. Largely because the opportunity for farmers to move from grains with production quotas to other more profitable crops has not be explicitly modelled, it is more likely that intervention costs have been underestimated. If welfare costs were 3000 m yuan rather than 1500 m yuan, then the present value of economic research in total in advancing policy reform by from 3 to 6 months is between A\$81.4m and A\$179.1m and the NPV ranges from A\$67.9m to A\$165.6m and the BCRs are 6.0:1 to 13.3:1. For ACIAR advancing reform by one month, the present value is A\$25.6m, the NPV A\$22.9m and the BCR 9.5:1.

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## 8 Conclusions

An assessment has been made of two projects (ANRE1/1992/028 and ADP/1997/021) funded by ACIAR dealing with economic research into grain-marketing policy in China. The focus of these projects has been on presenting theoretical and empirical arguments that China would benefit from efficiency gains if there was less intervention by the government in grain marketing. ACIAR has routinely conducted impact assessments of investments it has made in research leading to the development of new

agricultural technologies. An objective of this impact assessment has been to determine how well economic evaluation procedures can be applied to economic policy research.

Every effort has been made to quantify the benefits and costs associated with the AFPs. Since 1994, real expenditure (2002 dollars) on these projects, including in-kind contributions from partners, has amounted to about A\$2.7m. In the late 1990s, the extent of intervention in grain marketing by Chinese government increased rather than decreased. In quantifying benefits in this impact assessment, the contribution of the projects has been assumed to be bringing forward in the time by which the Chinese Government returns to a process of policy reform that was evident until the late 1990s. The annual welfare gains to China from a return to this reform process may be in the order of 1500 m yuan. This represents the difference in losses to China between the situation of the late 1990s, when the welfare costs of intervention were about 0.5% of the value of grain production and the situation before that, when welfare costs had been about 0.2% of the value of grain production.

If the total body of economic policy research in recent years brings forward policy reform from the end of 2004 by between 3 and 6 months, then the present value of benefits for this body of research is estimated to be between A\$40.3m and A\$88.6m, the NPV ranges from A\$26.8m to A\$75.1m and the BCR is between 3:1 to 6.6:1. If the contribution of the AFPs in isolation has been to advance the process by a month, again a reasonable prospect given the role attributed to the Department of Policy and Law in MOA in the southeastern provinces 'experiment', then the present value of the investment is A\$12.7m, the NPV for the AFPs is A\$10m and the BCR from these projects is in the order of 4.7:1. Note the hypothetical nature of these scenarios.

This empirical analysis is highly qualified, not the least because important potential impacts of the projects could not be quantified and because policy reform in China has yet to occur. These qualifications and the qualitative outcomes of the projects are discussed in detail in the body of the report.

Other scenarios examined included one where supply response was doubled (increasing the welfare costs of intervention) and one where the likelihood that the welfare cost of recent intervention was underestimated. If welfare costs were 3000 m yuan rather than 1500 m yuan, then the present value of economic research in total in advancing policy reform by from 3 to 6 months is between A\$81.4m and A\$179.1m, the NPV ranges from A\$67.9m to A\$165.6m and the BCRs are 6.0 to 13.3. For ACIAR

advancing reform by one month, the present value is A\$25.6m, the NPV A\$22.9m and the BCR 9.5:1.

Three key factors have made an empirical BCA of these projects difficult. First, there are no published estimates of the welfare costs to China from intervention in grain marketing. Second, since the mid 1990s the level of government intervention in grain marketing in China has increased. Hence, the benefits of this project in the form of policy reform are yet to be fully realised. Third, there are many government and academic research institutions in China, sometimes supported with external funds, which conduct research to influence grain-marketing policy in China. There is no objective way of isolating the contribution of the AFPs to decisions about grain-marketing policy in China.

The difficulties encountered in empirically assessing the contribution of these ACIAR-funded projects in economic policy research mean that a final assessment of the value of these projects to China and ACIAR should be based on a broader range of criteria than a highly qualified empirical estimate of the potential benefits from efficiency gains in grain marketing in China. This broader set of criteria relates to project-management processes, project outputs, extensions from the projects and outcomes that are difficult to quantify, such as capacity-building. Key arguments for the success of the projects have been the strength of the Chinese partners and capacity-building within the Department of Policy Reform and Law in the Ministry of Agriculture. The communications record of both projects appears impressive. However, the projects' objective of measuring inter-regional grain flows within China was not met.

A final point of discussion concerns the feasibility of evaluating economic policy research. In this assessment, economic policy research has been evaluated using an approach similar to that used in evaluating an agricultural extension project, where the benefits are recognised as a faster rate and perhaps higher level of adoption of a new technology. In both cases, the analyst must confront issues of attribution and of identifying a realistic technology adoption/ policy-reform scenario, including response lags. However, the causal links between a project and the outcomes sought seem far weaker in the case of policy research than in the case of traditional agricultural technologies, particularly in situations where there are many sources of policy research and advice. In the case of agricultural technologies, there is usually evidence that some farmers have found the technology profitable enough to warrant its adoption. This provides the analyst with some empirical basis for assumptions about the rate and extent of adoption. This is not the case for a single government policy-maker facing ever-changing economic and social conditions. Hence, benefit–cost

analyses of economic policy research will often be more conjectural than those of agricultural technologies. Perhaps, as has been the case for the evaluation of technologies, analysts will become more experienced in developing the reasonable ‘with’ and ‘without’ policy scenarios that are the key to sensible benefit–cost analyses.

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## Appendix I. Methodologies to evaluate social science research

### *Review of approaches based on Bayesian decision theory*

Policy-makers have to take actions (choose between policies) where the consequences depend on which state of nature emerges from a set of states. The Bayesian approach to valuing agricultural economics research is based on the view that the value of such research is in reducing the uncertainty about the likelihood that any of the possible states of nature will occur and, hence, about the consequences of alternative policies. Agricultural economics research is valuable if it changes the prior probabilities held by decision-makers about these states in such a way that their policy choice is altered in a welfare-enhancing way. To apply the Bayesian decision theory (BDT) framework, information is required about the efficiency gains from alternative policies under a range of states of nature, the prior probabilities held by policy-makers about the states of nature, and the chances that agricultural economics research delivers information accurate enough to allow the derivation of posterior probabilities that differ from prior probabilities. Gardner (1999) points out that these are the three parameters that drive the value of agricultural economics research in this policy context.

Papers by Gardner (1999) by Schimmelpfennig and Norton (2003) are two prominent examples in the literature of the application of BDT. Schimmelpfennig and Norton applied BDT in three case studies of agricultural economics research conducted within the Economics Research Service of the USDA, partly to identify the conditions under which BDT is an appropriate methodology. While the mechanics of deriving posterior probabilities and applying these to estimates of the efficiency changes under alternative actions and states of nature are amply described in these papers (with a spreadsheet model presented in Schimmelpfennig and Norton), there are some issues in defining the states of nature and eliciting probabilities that are less settled.

A key component in applying the BDT approach is to elicit from policy-makers prior probabilities and the likelihood that agricultural economics research information is accurate. Schimmelpfennig and Norton (2003) discussed this issue at some length, particularly the issue of the trade-off between sample size and the need to give most weight to those, perhaps

few, people who actually made the decision. They concluded that ‘one must be willing to accept subjective probabilities from a very small number of individuals, which leaves one uneasy even if the interviewers are knowledgeable and confident’. Uncertainty about the value of agricultural economics research increases significantly if the few policy-makers hold divergent views about the key probabilities. They noted that the policy context described in the survey process was likely to influence survey responses (a ‘framing’ effect).

Another issue discussed in part by Schimmelpfennig and Norton (2003) was that raised by multiple sources of agricultural economics research and multiple constituencies in the policy-making process. In a couple of their examples, the USDA was basing policy decisions largely on agricultural economics research conducted by its Economic Research Service. As distinct from this largely in-house policy-making, they considered an example concerning multilateral trade negotiations where the countries involved received advice from a variety of sources of agricultural economics research and were each likely to weight differently the distributional consequences of various alternative policies. The procedure for applying BDT in this latter example is much less clear. At the very least, the problem of attribution between several sources of policy advice arises. This problem of multiple sources of analysis applies to grain marketing in China.

An important issue that neither Gardner (1999) nor Schimmelpfennig and Norton (2003) discussed in any detail is how to define the problem to which BDT is to be applied or, more specifically, how to define the uncertain ‘states of nature’ that will determine the outcomes from the policy alternatives. The possibilities range from quite specific states, such as whether or not export demand for a commodity is elastic (Gardner), to far more generic states such as whether or not a particular policy action, such as advertising (Gardner) or a food safety program (Schimmelpfennig and Norton), was profitable.

## **Review of economic surplus approach**

There are some important differences between the papers of Ryan (1999) and Schimmelpfennig and Norton (2003). Ryan is particularly interested in the attribution question — the role of IFPRI research in the change in rice-marketing policy in Vietnam, for example. Vietnam had embarked on a process of policy reform. He estimated the gross benefits from rice-market reform using a trade model developed by IFPRI. He did not use a Bayesian approach based on how research provided information to change

perceptions of the outcomes from policy change, but concentrated on assessing how much more quickly rice market reform occurred as a result of IFPRI research. The empirical purpose of the survey was to estimate this change in the time taken to introduce to policy change. Hence, it seems legitimate for Ryan to solicit views from a range of stakeholders, some of whom may not have actually participated in the policy decision but who were informed observers.

Ryan (1999) interviewed 35 people 'who were either partners in the research endeavour or stakeholders in the outcomes'. Policy-makers interviewed were concentrated in the Ministry of Agriculture and Rural Development and the Ministry of Planning and Investment, but there were none from the ministries of Trade or Finance. Ryan does not explicitly discuss whether he was successful in interviewing the key policy-makers, nor does he explicitly discuss how he weighted the responses from these 35 people. His conclusion was that the IFPRI work had been a major, though not sole influence, on decisions by the Government of Vietnam to relax export quotas on rice. Only a few of those who were interviewed were prepared to make a judgment about the time by which IFPRI research hastened policy change. The estimates ranged from 6 months to more than 2 years. Ryan analysed two scenarios; for one and two years.

The results of the IFPRI modelling work suggested that there were large efficiency gains to be had with little risk to food security and with few among the poor (largely the urban poor) being made worse off. The benefits from policy change stabilised at about A\$80m per year from 1999. If IFPRI hastened policy change by only 1 year, the NPV of its contribution was A\$45m giving a BCR of 56:1. If IFPRI hastened policy change by two years, the NPV rose to A\$91m and the BCR to 114:1.

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## Appendix 2. Project papers

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This volume contains the following papers:

Watson, A. and Findlay, C., Introduction

Watson, A. and Findlay, C., Food and profit: the political economy and grain market reform in China

Tang, R., Grain purchases and sales in China: the evolution from plan to market

Guo Shutian, The relationship between grain prices and inflation

Wu, H. and Findlay, C. Grain demand

Watson, A., The logic of market reform: the development of wholesale grain markets in china

Cheng Enjiang, Supply of funds for grain purchases in China since the middle 1980s

Yang Hong, Self-sufficiency and regional specialization

Johnson, D. Gale and Song Guoqing, Inflation and the real price of grain in China

Crook, F. W., The impact of China's grain reserve system on import demand

Carter, C., Institutional reform and agricultural productivity growth in China

Findlay, C., Watson, A., Cheng Enjiang and Wu, H.X. The implications of grain market reform for China's international grain trade: an overview

## Project ADP/I1997/021

The following research papers are in the Working Paper Series on Chinese Grain Market Policy with Special Emphasis on the Domestic Grain Trade (ACIAR Project ADP/1997/021), Asia Pacific School of Economics and Government, The Australian National University, Canberra. Available online at <[http://apseg.anu.edu.au/research/ADP/1997/021\\_papers.php](http://apseg.anu.edu.au/research/ADP/1997/021_papers.php)>.

1. Regional comparative advantage in China's main grain crops  
*Funing Zhong, Zhigang Xu and Longbo Fu*  
College of Economics and Trade, Nanjing Agricultural University
2. The application and extension of Jiangsu agricultural policy analysis model  
*Shudong Zhou*  
College of Economics and Trade, Nanjing Agricultural University
3. Implication of grain policy on agricultural restructuring in China  
*Jing Zhu and Funing Zhong*  
College of Economics and Trade, Nanjing Agricultural University
- 4.\* Food Price differences and market integration in China  
*Wu Laping*  
College of Economics & Management, China Agricultural University
5. China's new grain marketing policy  
*Huang Yanxin*  
Department of Policy and Law of the Ministry of Agriculture of China
6. A review of China's grain marketing system reform  
*Christopher Findlay and Chen Chunlai*  
The Australian National University and Adelaide University

- 7.\* Grain marketing system reform: a case study of a major paddy production county in southern China  
*Zhang Hongyu and Liu Jianwen*  
Department of Policy and Law of the Ministry of Agriculture of China
8. An investigation of grain production and marketing in Jilin and Heilongjiang provinces  
*Wang Zhonghai*  
Department of Policy and Law of the Ministry of Agriculture of China
- 9.\* Patterns of domestic grain flows and regional comparative advantage in grain production in China  
*Chen Chunlai and Christopher Findlay*  
Adelaide University and The Australian National University
10. An alternative approach to measure regional comparative advantage in China's grain sector  
*Zhong Funing and Xu Zhigang*  
College of Economics and Trade, Nanjing Agricultural University
- 11.\* Impact of market integration on China's food security  
*Funing Zhong and Jing Zhu*  
College of Economics and Trade, Nanjing Agricultural University
- 12.\* China's agricultural restructuring and system reform under its accession to the WTO  
*Du Ying*  
Department of Policy and Law of the Ministry of Agriculture of China
- 13.\* The basic situation of regional grain trade in China  
*Wang Zhonghai, Chen Chunlai, Huang Shouhong, Ding Shengjun, Qu Baoxiang and Li Chenggui*  
Department of Policy and Law of the Ministry of Agriculture of China  
State Grain Reserve Bureau, Chinese Academy of Social Sciences
- 14.\* The political economy of the Chinese grain marketing system  
*Funing Zhong*  
College of Economics and Trade, Nanjing Agricultural University
15. Integration of major agricultural product markets of China  
*Wu Laping*  
College of Economics & Management, China Agricultural University
- 16.\* Grain market fluctuations and government intervention in China  
*Wang Xiaolu*  
The Australian National University
17. The social economic and environmental impacts of trade liberalization on agriculture — taking Jiangsu Province as an example  
*Shudong Zhou*  
College of Economics and Trade, Nanjing Agricultural University
18. China's current grain marketing system and its impact on farm household behaviour  
*Zhou Yingheng and Zhong Funing*  
College of Economics and Trade, Nanjing Agricultural University

- 19.\* China's grain marketing reform: a case study from the pilot experiment in Zhejiang, Jiangsu and Guangdong provinces  
*Wang Dewen*  
Department of Policy and Law of the Ministry of Agriculture of China
- 20.\* Levels and determinants of agricultural market integration: the impacts of policies on marketisation  
*Du Yang*  
Chinese Academy of Social Sciences
- 21.\* Grain market integration and marketing margin in China  
*Wu Laping*  
College of Economics and Management, China Agricultural University
22. Comparison of world and domestic grain market prices  
*Wu Laping*  
College of Economics and Management, China Agricultural University
- 23.\* State grain marketing policy and farmer behaviour  
*Huang Yanxin*  
Department of Policy and Law of the Ministry of Agriculture of China
- 24.\* Regional comparative advantage in grain production in China  
*Zhong Funing and Xu Zhigang*  
College of Economics and Trade, Nanjing Agricultural University
25. The policy effects and the realising conditions of the new round grain marketing reform  
*Wang Dewen*  
Department of Policy and Law of the Ministry of Agriculture of China
- 26.\* Evaluation on China's regional grain trade policy  
*Wang Zhonghai and Chen Chunlai*  
Department of Policy and Law of the Ministry of Agriculture of China  
The Australian National University
27. China's grain marketing reform, regional grain trade and farmers' behaviour  
*Du Ying*  
Department of Policy and Law of the Ministry of Agriculture of China
28. Challenges facing China's grain marketing reform  
*Christopher Findlay*  
The Australian National University
- 29.\* China's domestic grain marketing reform since 1980s  
*Chen Chunlai and Christopher Findlay*,  
The Australian National University

Note: The papers marked with an asterisk have been collected into a book *China's domestic grain marketing reform and integration*, edited by C. Findlay and C. Chunlai, published by Asia Pacific Press in 2004.

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38. Miao Qi and Zhong Funing 2001. Jingji Quanqiu hua yu Woguo Xinde Liangshi Anquan Celue [Economic globalisation and China's new food security strategy]. Jilin Nongye Daxue Xuebao [Journal of Jilin Agricultural University], 2.
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41. Zhong Funing, Xu Zhigang and Fu Longbo 2001. An alternative approach to measure regional comparative advantage in China's grain sector. In: *The integrated land and water resources management in the coast areas, China*, China Environmental Press, Beijing.
  42. Fang Cheng, Francis Tuan and Funing Zhong 2002. How might China protect its agricultural sector? In: *China's food and agriculture: issues for the 21<sup>st</sup> century*. USDA/ERS Agriculture Information Bulletin 775.
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## Appendix 3. Questionnaire

Questionnaire used in interviews with research and policy-makers in China concerning grain marketing reform and the influence of the ACIAR-funded projects.

Name: .....

Position and responsibilities: .....

Organisation and address: .....

Telephone: .....

Email: .....

Date and time: .....

In preparing to do this project I have read several reviews of grain marketing policy in China. Many of these papers point to some periods when the private sector has been allowed to take an important role in grain marketing and some periods when the government has strengthened its role in grain marketing.

- Do you share the view that since the 1980s there have been periods in which the roles of the State and of private grain traders have moved back and forth?
- Why do you think there have been these changes in direction about the roles of the private and government sectors?
- How important has the issue of food security been?
- Why do you think government intervention in grain marketing has been less successful than hoped for?
- Is China now growing grain in regions that are best suited for grain production?
- To what extent are grain markets in china now integrated in that for example the price for wheat moves to a similar extent and direction across China?

- Has the role of private grain traders continued to grow?
- In your view which sectors of the community will benefit from the government withdrawing from grain marketing and which sectors will lose out?
- Why?
- In your view what is the probability that a private grain marketing system will provide net benefits to the Chinese people?
- In your view how important are infrastructure problems such as road and rail networks as constraints to China being able to gain all the benefits from more integrated markets. If the total potential gains from integrated markets were of the order of 300 million yuan have you any feel for the percentage of these gains that could arise from market reform as compared to the gains from a more efficient transport system?
- I am aware of the experiments since about 2000 in grain marketing in the provinces of Zhejiang, Jiangsu, Guangdong, and in 2001 in Shanghai, Hainan, Fujian, Beijing and Tianjin provinces. Have these experiments been successful? From here do you think that the role of the private sector will continue to grow and that large scale government intervention in the future is unlikely?
- What do you think is the probability that these experiments will be successful and lead to the general withdrawal of the government from grain marketing?
- How soon before these experiments are extended across all of China?
- Is it a requirement of WTO that China withdraws from grain marketing or would this have happened anyway?
- Has WTO brought forward the time that the government has withdrawn from grain marketing
- There are a number of organisations in government departments and universities, some funded by external organisations like ACIAR or the World Bank who conduct research and analysis of grain marketing issues. How important is research and analysis in policy making in the grains industries or are decisions largely made on

political grounds? In your experience how does the government make these decisions about its role in grain marketing?

- In your view who have been the important sources of research and analysis with respect to grain marketing policy in China?

The next set of questions focuses on the ACIAR-funded projects:

- Do you know any of the Australian or Chinese research people who worked on the ACIAR-funded projects?
- Can you recall a research paper you read or a seminar you attended that resulted from the ACIAR-funded projects?
- Can you recall any findings from this research paper or seminar that you found striking?
- Have you used any findings from the ACIAR-funded projects in a policy context?
- If yes could you indicate how?
- Have you used any findings from the ACIAR-funded projects in a research context?
  - ▶ If yes could you indicate how?
  - ▶ Have you cited ACIAR-funded project findings
- Have you used any findings from the ACIAR-funded projects in a teaching context?
  - ▶ If yes could you indicate how?
- How could the adoption or acceptance of the ACIAR-funded results been improved?
- What other research institutions or people do you think have made important contributions to grain market policy in China?
  - ▶ examples
- How would you rate the influence of the ACIAR-funded work relative to these other sources?

- What are the strengths and weaknesses of these other sources in information relative to ACIAR?
- Do you think the ACIAR-funded projects have bought forward the time at which the State withdraws from active participation in grain marketing?
- If yes by how many months – 3, 6, 12 months?
- Can you suggest anyone I should talk to who is critical of the ACIAR-funded projects specifically or of the grain market reform process in general?
- Do you have any other comments which may help me in my evaluation of the ACIAR-funded projects?

Some questions for economists about parameter values used above?

- I have assumed protection rates for wheat, rice, maize and soybeans of 12, –3, 32 and 15% based on the research by Huang et al. Are these rates of protection reasonable in a relative sense?
  - ▶ in an absolute sense?
- I have assumed that the supply of grain in China is more elastic than the demand for grain. Reasonable or not?
- I have assumed smaller crops are more elastic in demand and supply than the larger crops. Reasonable or not?
- Where would I find the most recent estimates of demand and supply elasticities?

## IMPACT ASSESSMENT SERIES

No.	Author(s) and year of publication	Title	ACIAR project numbers
1	Centre for International Economics (1998)	Control of Newcastle disease in village chickens	8334, 8717 and 93/222
2	George, P.S. (1998)	Increased efficiency of straw utilisation by cattle and buffalo	8203, 8601 and 8817
3	Centre for International Economics (1998)	Establishment of a protected area in Vanuatu	9020
4	Watson, A.S. (1998)	Raw wool production and marketing in China	8811
5	Collins, D.J. and Collins, B.A. (1998)	Fruit fly in Malaysia and Thailand 1985–1993	8343 and 8919
6	Ryan, J.G. (1998)	Pigeon pea improvement	8201 and 8567
7	Centre for International Economics (1998)	Reducing fish losses due to epizootic ulcerative syndrome — an ex ante evaluation	9130
8	McKenney, D.W. (1998)	Australian tree species selection in China	8457 and 8848
9	ACIL Consulting (1998)	Sulfur test KCL–40 and growth of the Australian canola industry	8328 and 8804
10	AACM International (1998)	Conservation tillage and controlled traffic	9209
11	Chudleigh, P. (1998)	Post-harvest R&D concerning tropical fruits	8356 and 8844
12	Waterhouse, D., Dillon, B. and Vincent, D. (1999)	Biological control of the banana skipper in Papua New Guinea	8802-C
13	Chudleigh, P. (1999)	Breeding and quality analysis of rapeseed	CSI/1984/069 and CSI/1988/039
14	McLeod, R., Isvilanonda, S. and Wattanutchariya, S. (1999)	Improved drying of high moisture grains	PHT/1983/008, PHT/1986/008 and PHT/1990/008
15	Chudleigh, P. (1999)	Use and management of grain protectants in China and Australia	PHT/1990/035
16	McLeod, R. (2001)	Control of footrot in small ruminants of Nepal	AS2/1991/017 and AS2/1996/021
17	Tisdell, C. and Wilson, C. (2001)	Breeding and feeding pigs in Australia and Vietnam	AS2/1994/023
18	Vincent, D. and Quirke, D. (2002)	Controlling <i>Phalaris minor</i> in the Indian rice–wheat belt	CSI/1996/013
19	Pearce, D. (2002)	Measuring the poverty impact of ACIAR projects—a broad framework	
20	Warner, R. and Bauer, M. (2002)	<i>Mama Lus Frut</i> scheme: an assessment of poverty reduction	ASEM/1999/084
21	McLeod, R. (2003)	Improved methods in diagnosis, epidemiology, and information management of foot-and-mouth disease in Southeast Asia	ASI/1983/067, ASI/1988/035, ASI/1992/004 and ASI/1994/038
22	Bauer, M., Pearce, D. and Vincent, D. (2003)	Saving a staple crop: impact of biological control of the banana skipper on poverty reduction in Papua New Guinea	CS2/1988/002-C

## IMPACT ASSESSMENT SERIES

23	McLeod, R. (2003)	Improved methods for the diagnosis and control of bluetongue in small ruminants in Asia and the epidemiology and control of bovine ephemeral fever in China	ASI/1984/055, AS2/1990/011 and AS2/1993/001
24	Palis, F.G., Sumalde, Z.M. and Hossain, M. (2004)	Assessment of the rodent control projects in Vietnam funded by ACIAR and AUSAID: adoption and impact	ASI/1998/036
25	Brennan, J.P. and Quade, K.J. (2004)	Genetics of and breeding for rust resistance in wheat in India and Pakistan	CSI/1983/037 and CSI/1988/014

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1	Doeleman, J.A. (1990a)	Biological control of salvinia	8340
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3	Fleming, E. (1991)	Improving the feed value of straw fed to cattle and buffalo	8203 and 8601
4	Doeleman, J.A. (1990b)	Benefits and costs of entomopathogenic nematodes: two biological control applications in China	8451 and 8929
5	Chudleigh, P.D. (1991a)	Tick-borne disease control in cattle	8321
6	Chudleigh, P.D. (1991b)	Breeding and quality analysis of canola (rapeseed)	8469 and 8839
7	Johnston, J. and Cummings, R. (1991)	Control of Newcastle disease in village chickens with oral V4 vaccine	8334 and 8717
8	Ryland, G.J. (1991)	Long term storage of grain under plastic covers	8307
9	Chudleigh, P.D. (1991c)	Integrated use of insecticides in grain storage in the humid tropics	8309, 8609 and 8311
10	Chamala, S., Karan, V., Raman, K.V. and Gadewar, A.U. (1991)	An evaluation of the use and impact of the ACIAR book <i>Nutritional disorders of grain sorghum</i>	8207
11	Tisdell, C. (1991)	Culture of giant clams for food and for restocking tropical reefs	8332 and 8733
12	McKenney, D.W., Davis, J.S., Turnbull, J.W. and Searle, S.D. (1991)	The impact of Australian tree species research in China	8457 and 8848
	Menz, K.M. (1991)	Overview of Economic Assessments 1–12	