

China's Regional Feedgrain Markets: Developments and Prospects

**Report for the Grains Research and
Development Corporation**

March 2003

Prepared by
Zhang-Yue Zhou and Wei-Ming Tian



The University of Sydney



Report for the Grains Research and Development Corporation

Prepared by Zhang-Yue Zhou and Wei-Ming Tian

With contributions from

Xi-An Liu

Xiao-Yun Liu

Fu Qin

Guang-Hua Wan

Ji-Min Wang

Yan-Rui Wu

Xian Xin

Jun Yang

Zhen-Hai Yang

Jin-Hui Yin

March 2003

ISBN 1 86487 552 6

© Jointly held by the Grains Research and Development Corporation, The University of Sydney and China Agricultural University

Printed in Australia by
The University of Sydney

Enquiries to:

Publications Officer

Grains Research and Development Corporation

Kingston, Canberra

ACT 2604 Australia

◆ Telephone (02) 6272 5525

◆ Fax (02) 6271 6430

Contents

Preface	i
Contributors	v
1. Introduction	
<i>Zhang-Yue Zhou and Wei-Ming Tian</i>	1
2. Studying China's feedgrain demand and supply: research methodological issues	
<i>Zhang-Yue Zhou, Wei-Ming Tian, Xi-An Liu and Guang-Hua Wan</i>	6
3. Developments in China's animal husbandry industry	
<i>Wei-Ming Tian</i>	30
4. Animal product consumption in China	
<i>Ji-Min Wang and Jun Yang</i>	47
5. China's feedgrains production and marketing	
<i>Xian Xin, Wei-Ming Tian and Zhang-Yue Zhou</i>	63
6. Developments and trends in household animal raising practice in China: a survey report	
<i>Zhang-Yue Zhou, Wei-Ming Tian and Xi-An Liu</i>	76
7. China's feed industry: developments and trends	
<i>Fu Qin and Jin-Hui Yin</i>	108
8. China's feedgrain: production, trade and its usage in the feed industry	
<i>Zhen-Hai Yang</i>	123
9. China's feedgrains demand and the international market	
<i>Wei-Ming Tian and Zhang-Yue Zhou</i>	131
10. Regional feedgrain demand and supply in China: possible scenarios after the WTO accession	
<i>Xian Xin, Guang-Hua Wan and Xiao-Yun Liu</i>	154
11. Feedgrain vs foodgrain	
<i>Yan-Rui Wu</i>	188
12. Conclusions and implications	
<i>Zhang-Yue Zhou and Wei-Ming Tian</i>	199
References	206
Appendixes	
A. July 2002 workshop program and participants	216
B. Statistical data.....	220

Preface

This report provides the Australian grains industry with an in-depth understanding of China's feedgrain markets at both the regional and national levels. It also provides useful information to other Australian industries whose businesses are related to the use of feedgrains and who have an interest in the Chinese market such as livestock, pulses and feed industries.

In recent years, China's demand for feedgrain has been increasingly recognised as an important issue and many believe that any future increase in total grain demand in China will be mainly caused by an increasing demand for feedgrains. On the other hand, it seems that, in the longer term, China will not be able to supply enough feedgrains with its domestic resources.

As a major grain exporter, it is essential for Australia to gain improved understanding of China's feedgrain market developments and prospects. It is for this important reason that GRDC supported this project (GRDC Project Number US282) to look into China's feedgrain issues.

This project was three years in duration (2000-2002) and was conducted collaboratively by researchers from the University of Sydney and China Agricultural University. Several researchers from other Australian and Chinese institutions also contributed to this project at the later stage.

In this project, the research team examined various feedgrain issues in China at great depth and from various angles. Findings highlighted in this project report will greatly facilitate Australia's understanding of China's feedgrains and other related markets. Among various other important issues, this report offers the reader with insights into: China's current animal product consumption and production development and trends; China's regional feedgrain production, consumption and trade patterns; household animal raising practices; China's feed industry development and its demand for feedgrains; China's future feedgrain supply and demand and regional-level feedgrain trade patterns; and the impact of international agricultural market reforms on China's demand for feedgrain imports. The report also addresses likely opportunities and challenges resulting from China's feedgrain market development to Australia's grains and other related industries.

Not only does this report provide a vast array of rich information about China's feedgrain market to personnel of Australia's grains and other related industries, it also offers valuable discussion on sources of information and methodological issues to those who are involved in various market studies of China. An electronic database containing useful statistics has been included in this report for the convenience of those who wish to look further into the Chinese market. It contains statistics of total grains and grain crops that can be used as feed (by major crops), animals (by major animal types) and animal products (by major products) for 1980-2001 at the provincial level.

Without GRDC's funding support, this project would not have been conducted. We are most grateful to GRDC for its support to make this study possible.

Many organisations and individuals provided assistance to the accomplishment of this project. In particular we record our sincere appreciation to the following organisations and individuals.

Dr Mike Taverner, GRDC Program Consultant, has been most instrumental in the design and implementation of this project. Throughout this project, he has been very supportive and encouraging. We have benefited greatly from our interactions with him in various ways such as meetings, his sending us information relevant to the project and his help in organising the project workshop in July 2002.

Both of the chief collaborating institutions, the University of Sydney and China Agricultural University, provided enormous support to the conduct of this project. Over the past three years, while there were changes in the deanship of both of the Faculty of Rural Management (FRM) of the University of Sydney and the College of Economics and Management (CEM) at China Agricultural University, the support from the management has been continuous. We thank the following deans for their continued support: Emeritus Professor John Chudleigh, the Principal of the then Orange Agricultural College; Mr Ross Wilson, former Acting Dean of the FRM; Professor Kevin Parton, the current Dean of the FRM; Professor Xiangyong Tan, Vice President of China Agricultural University; Professor Xiurong He, former Dean of CEM; and Professor Fu Qin, the current Dean of CEM. Many staff and postgraduate students from both the institutions provided assistance to this project at various stages in various capacities. Among them we thank in particular Mrs Maureen MacKinney, Mrs Jo Porter, Mrs Jane Goodridge, Mr Hugh Haynes and Mr Roger Hopson for their various administrative and publicity assistance, Ms Li Wang, Mr Qingfang Guo, Mr Huayong Teng, Ms Liqing Zhang, Ms Lan Li, Ms Ying Gao for conducting the surveys, data collection and entry.

Comments and suggestions received at the July 2002 project workshop were most valuable to refine our research findings and we thank all the participants for their inputs and assistance. In particular, we owe a great deal to those discussants at the workshop who spared their valuable time to examine our draft reports. The discussants are: Dr John Brennan, Principal Research Scientist, NSW Agriculture; Mr Tim Kelf, Regional Manager, South Asia, Meat and Livestock Australia; Ms Belinda Howe, International Market Analyst, Australian Wheat Board; Dr Ray Trewin, Program Manager, Australian Centre for International Agricultural Research; Dr Ray King, Principal Research Scientist, Victorian Institute of Animal Science; Professor Ron Duncan, Director, National Centre for Development Studies, Australian National University; Dr Jammie Penm, Manager, Commodity Forecasting Support Unit, ABARE; and Mr Vince O'Donnell, Senior Program Manager, ABARE.

We benefited enormously from discussions with a number of individuals on the implications of China's feedgrains market developments for Australia, and in particular, with Dr John Brennan, Principal Research Scientist, NSW Agriculture; Dr Mike

Taverner, GRDC Program Consultant; Emeritus Professor John Chudleigh, the University of Sydney; and Dr Jock Fletcher, the University of Sydney.

Professor Gordon MacAulay of the Department of Agricultural Economics of the University of Sydney conducted a spatial equilibrium modelling workshop to the research team. His skills and expertise helped greatly the research team to carry out simulation exercises for this project.

We also record our gratitude to all members in the research team for their willingness and cooperation to work on this project. We are most fortunate for having such a wonderful and capable research team.

Last but not the least, we thank Ms Marjorie Wilson for editing many pages of our draft reports. Her skills and patience in bringing this report to the current stage are greatly appreciated.

Zhang-Yue Zhou (The University of Sydney)
Wei-Ming Tian (China Agricultural University)

Contributors

Dr Xi-An Liu, Research Associate, Asian Agribusiness Research Centre, The University of Sydney, Orange, NSW 2800 Australia. Email: xliu@orange.usyd.edu.au

Associate Professor Xiao-Yun Liu, Centre for Integrated Agricultural Development, China Agricultural University, Beijing 100094, China.

Professor Fu Qin, Dean, College of Economics and Management, China Agricultural University, Beijing 100094, China. Email: qinfuggn@vip.sina.com

Professor Wei-Ming Tian, Director of the Institute of Agricultural Economics, College of Economics and Management, China Agricultural University, Beijing 100094, China. Email: tianwm@sino.com

Dr Guang-Hua Wan, Senior Lecturer, Department of Agricultural Economics, The University of Sydney, Sydney NSW 2006 Australia. Email: g.wan@agec.usyd.edu.au

Professor Ji-Min Wang, Director of the Division of Animal Husbandry Economy, Institute of Agricultural Economics, the Chinese Academy of Agricultural Sciences, Beijing 100081, China. Email: jiminwang@btamail.net.cn

Dr Yan-Rui Wu, Senior Lecturer, Department of Economics, the University of Western Australia, Perth WA 6007, Australia. Email: ywu@ecel.uwa.edu.au

Professor Xian Xin, Deputy Dean, College of Economics and Management, China Agricultural University, Beijing 100094, China. Email: xinxian@public.cau.edu.cn

Mr Jun Yang, postgraduate student, Institute of Agricultural Economics, the Chinese Academy of Agricultural Sciences, Beijing 100081, China.

Mr Zhen-Hai Yang, Director, Feed Division, Ministry of Agriculture, Beijing 100026, China. Email: yang_zhenhai@sohu.com

Mr Jin-Hui Yin, Lecturer, College of Economics and Management, China Agricultural University, Beijing 100094, China.

Dr Zhang-Yue Zhou, Director, Asian Agribusiness Research Centre, The University of Sydney, Orange, NSW 2800 Australia. Email: zzhou@orange.usyd.edu.au

Chapter 1

Introduction

Zhang-Yue Zhou and Wei-Ming Tian

It is increasingly recognised that feedgrain demand in China will become the major component of China's total grain demand in the future. Any future increase in total grain demand in China will be mainly caused by an increasing demand for feedgrains (Garnaut and Ma 1992, p. 71; RGCFS 1993, p. 26; Findlay 1998, p. 32; Tian and Chudleigh 1999). On the other hand, it seems that, in the longer term, China will not be able to supply enough feedgrains with its domestic resources (Crompton and Phillips 1993; Crook and Colby 1996; Tian and Chudleigh 1999).

There is also a significant regional imbalance in the supply of and demand for feedgrains in China. While north-east China has a huge surplus, the relatively wealthier south-east China in contrast has a major deficit. Large quantities of feedgrains are currently shipped from north-east to south China. The market-oriented policy reforms after WTO accession may lead to notable changes in the feedgrains and livestock production and trade patterns. That is, feedgrain-surplus north-east regions may increase livestock production or may export feedgrains to the international market (e.g., Korea and Japan), while feedgrain-deficit south-east regions may import more feedgrains from the international market.

It is thus interesting, and indeed important, to examine China's feedgrain issues not only at the national aggregate level but at the regional level as well. Unfortunately, while studies on China's feedgrains market at the regional level are scarce in general, studies of this kind with particular reference to drawing implications for Australia's grains industry are virtually non-existent at present. The discussion which is available in studies on China's grain economy carried out by institutions of Australian origin is preliminary and aggregate in nature. For example, Garnaut and Ma (1992), while anticipating "feed grain demand is likely to account for most of the growth in China's future aggregate demand for grain", offered no details of the feedgrain markets in China at the regional level. Discussion on feedgrain in Findlay (1998) is also limited and aggregate.

Given the increasing importance of the feedgrain market and the regional disparities in China, a study of the market at the regional level is crucial to the formation of future grain production and trade strategies for Australia, a major grain exporter. It is for this important reason that this project was conducted to provide the Australian grains industries with insights into the developments and prospects in the Chinese feedgrains market.

1. Objectives of the project

The broad objectives of this project are to:

- Assess China's current feedgrain demand and supply situations and the potential of feedgrain production at the regional level;
- Predict China's regional feedgrain trade patterns under various policy scenarios;
- Examine the impacts of different policy options on feedgrain trade within China and internationally; and
- Draw trade implications for Australia's grains industry.

2. Research methodology

There exist a reasonable number of studies dealing with China's feedgrain demand and supply issues. However, few have seriously dealt with the subject matter at the regional level. Many earlier studies have also tended to base their analysis on the observed trends of supply and demand situations in the 1980s, or make reference to non-mainland Chinese communities' meat consumption requirements in their projection work. The use of such parameters is problematic. That is, seriously biased projections on feedgrain demand or supply (either upward or downward) may be obtained. The examination of existing studies, which is detailed in Chapter 2, has confirmed that there are vast discrepancies between China's feedgrain demand and supply projections. Not only are the discrepancies between some of the projections large, some of them are also too far from the realised actual observations.

Projections are meant to guide future policy initiatives and market activities. Needless to say, the accuracy of such projections is of utmost importance. Carefully devised research framework is needed to study China's feedgrain demand and supply issues. The broad research framework for this project has the following distinct features:

- It takes regional characteristics into consideration,
- It uses field surveys to verify feedgrain supply and demand situations and data quality,
- It estimates China's feedgrain demand and supply at both the regional and national levels with the most up-to-date and verified data, and
- It carries out simulation exercises to identify the impacts of different policy options, particularly China's WTO accession, on feedgrain trade within China and internationally.

China is a vast and diverse country. It is, therefore, essential to take regional characteristics into consideration when studying China's feedgrain demand. For the purpose of this study, China is divided into five regions.¹

¹ Chongqin, Shanghai, Tianjin, and Beijing are municipalities. They are not major production centres of animal products. They largely rely on import of meat from other regions and demand for feedgrains is less significant. Nonetheless, each of them has been placed in a region according to their geographical location.

- South-east China, feedgrain deficit region, including Zhejiang, Fujian, Guangdong, and Shanghai.
- South-west China, largely self-sufficient at present but deficit is expected, including Guangxi, Guizhou, Yunnan, Sichuan, Tibet, and Chongqing.
- Central China, largely feedgrain self-sufficient region, including Hebei, Shanxi, Henan, Shandong, Anhui, Jiangsu, Jiangxi, Hubei, Hunan, Tianjin and Beijing.
- North-east China, feedgrain surplus region, including Heilongjiang, Jilin, Liaoning, and east of Inner Mongolia.
- North-west China, largely self-sufficient and relatively isolated, including Shanxi, west Inner Mongolia, Qinghai, Ningxia, Gansu, Xinjiang.

A field survey was carried out in each of the first four regions. No survey was carried out in the north-west region for, in addition to research resource limitations, this region is less significant in terms of feedgrain demand and it predominantly features grass-fed animal husbandry. The provinces chosen for the surveys are: Jilin for North-east China, Henan for Central China, Zhejiang for South-east China, and Sichuan for South-west China. In each survey area (county), three sub-areas were chosen according to local economic development level (economically developed, medium-developed and less-developed) with about 100 rural households interviewed in each of the sub areas. Altogether, about 1100 households were surveyed in the four chosen provinces.

In addition to some econometric analyses, simulation exercises were conducted to examine the impacts of different policy options for feedgrains trade within China and internationally. A non-linear Feedgrain Spatial Equilibrium Model (FSEM) was developed to simulate inter-regional feedgrain supply, demand and trade flows. The GTAP (Global Trade Analysis Project) program was used to evaluate the impacts of different policy environments on China's feedgrain trade internationally.

The necessary data were acquired through government departments and official publications. Some of them were collected or verified through surveys.

3. Outline of the report

This report is composed of twelve chapters. Apart from this introductory and the concluding chapters, each of the other ten chapters deals with a particular aspect that is related to China's feedgrain issues. While these ten chapters are interrelated, they are also largely self-contained and can be read without having to follow a particular order.

In the next chapter, we deal with some research methodological issues related to the study of China's feedgrain demand and supply. We first highlight when and how feedgrain became a topical issue in China and the nature of this issue. We then review feedgrain demand and supply situations in the past and evaluate existing projections about China's future feedgrain demand and supply. Discrepancies between projections are explained and problems and difficulties in studying China's feedgrain issues are discussed. Finally, we point out the areas to which research priority should be given in order to achieve better research findings.

Demand for feedgrains is a derived demand. The more animal products to be produced, *ceteris paribus*, the more feedgrains will be demanded. Hence, an understanding of animal product production and consumption is essential for understanding China's demand for feedgrain. Chapter 3 provides an overview about the livestock industry development in the past and its likely future prospects. Chapter 4 examines, based on household survey data, the current level of animal product consumption by the Chinese in both rural and urban areas. This chapter also estimates a set of income elasticities of demand for several major animal products for both rural and urban residents.

In Chapter 5, we turn our attention to the current status of China's feedgrain production and marketing. Firstly, the patterns of China's feedgrain production are highlighted. This is followed by a discussion of feedgrain marketing arrangements, both domestically and internationally. This chapter also deals with the prospects of China's future feedgrain production potential and the likely changes in its feedgrain marketing arrangements following China's joining the WTO.

Some 95% of China's livestock products are produced by rural households. An improved understanding of household animal raising practices is thus most valuable to understand China's current and future feedgrain demand and supply. In Chapter 6, we report findings from rural household surveys we conducted in several regions in China. Issues covered include animal raising scale, feed composition, sources of feed, feeding efficiency, producers' responses to input and output prices and their intention towards future animal production.

Feedgrains are either used on farm (directly fed to animals or processed and mixed with other feed items) or used as a major ingredient to produce industrial processed feed. It is estimated that some 25% of total feedgrains are used in the feed industry to produce compound feed or condensed feed. Hence, it is also important to look into China's feed industry. Chapter 7 highlights major aspects of China's feed industry and discusses its development prospects. Chapter 8 provides further information on feedgrain use in China's feed industry. It also draws attention to the changed grain supply structure and future feedgrain demand in a developed coastal province, Guangdong province, and feedgrain demand and usage by a leading Chinese feed company, the Hope Group.

Having examined broad issues concerning China's feedgrain production and consumption and factors affecting them, in Chapter 9, we examine China's feedgrain demand and supply in the context of the world market, taking into consideration the possible impacts of China's WTO membership and the new round of WTO negotiations. In this chapter, how the world feedgrain market will evolve is simulated under a number of scenarios. Some major simulated scenarios include: China's fulfillment of its WTO commitment; all regions cut their import tariff rates; all developed economies remove their export subsidies on agricultural products completely; all developed economies remove their domestic support to agricultural products completely; and all regions carry out a comprehensive reform package consisting of all three aspects, *i.e.*, tariff cuts, removal of export subsidies and removal of domestic support.

For policy initiatives and marketing activities, China's regional feedgrain demand and supply and trade flows are of great importance. However, no such information has become available yet. In Chapter 10, we construct such a regional feedgrain demand and supply balance sheet. Based on this balance sheet, we simulate what the effect would be if regional trade barriers were removed (given that China is now a member of the WTO and is obliged to remove internal trade barriers) and identify trade flows between regions. With this new balance sheet (where free trade is assumed) as the base scenario, we further simulate the effects on regional feedgrain demand, supply, price, and trade flows under the following scenarios: technological improvements in feedgrain production; technological improvements in animal raising; increase in income; increase in animal product export; and imposition of regional trade restrictions (i.e., if free trade was not allowed). Based on the simulation framework, we also present the 2010 scenarios of China's feedgrain demand, supply, trade flows and imports.

In relation to findings in the earlier chapters, Chapter 11 looks at China's feedgrain issues from various different angles. In particular, it sheds light on relationships between feedgrain requirement and foodgrain consumption in China. It also examines the impact of economic growth and demographic changes on demand for feedgrains. The findings are used to draw implications for China's future foodgrain consumption and for international grain trade.

In Chapter 12, the last chapter, we summarise major findings from this project and draw implications for Australia's grains industry and other related industries.