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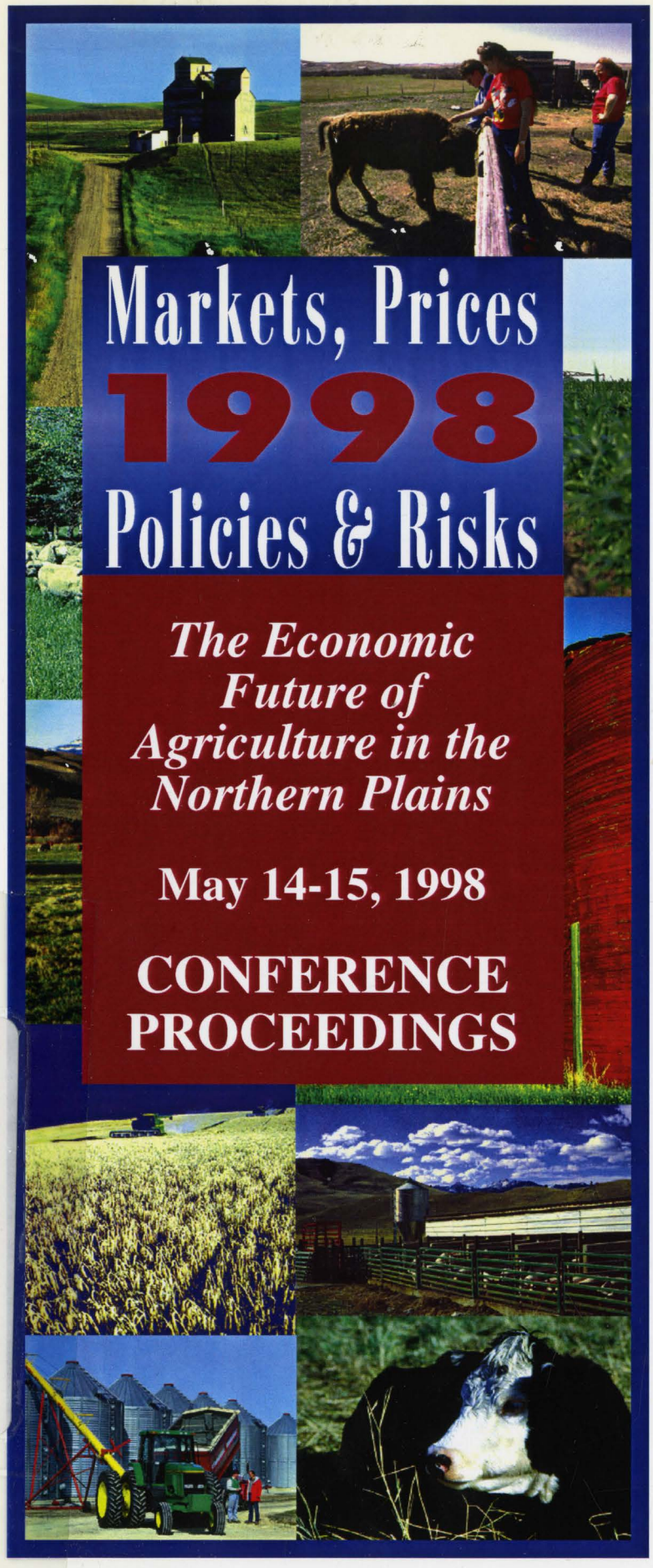

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Objective Analysis for Informed Decision Making

China and World Wheat Markets: Assessing Supply, Demand, and Trade in China

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The future role of China in world wheat markets is a compelling and important issue for producers in the Northern Plains. Some analysts have estimated that China will continue to demand large quantities of imported wheat (Rosegrant et al. 1995; Economic Research Service 1995). Others have forecast that China will gradually move to a position where domestic supply will meet the nation's demand for wheat (Rozelle and Huang 1997).

China's own economists also have conflicting views. Chinese Academy of Agricultural Sciences researchers have predicted that the nation will remain at least self-sufficient and could be a large exporter (Mei 1995). China's net imports of grain decreased steadily between 1989 and 1993. Moreover, despite large imports in 1994 and 1995, China has had an overall agricultural trade surplus with the United States during most of the 1990s. In contrast, other economists continue to argue that China will remain a large importer of grain, including wheat.

China's wheat imports account for 10 to 15 percent of world wheat trade.

Previous studies of China's wheat supply, demand, and trade have ignored factors that determine production, consumption, and importing behavior. Here we examine the effects of China's income growth, urbanization, and market development on wheat demand, and the effects of technology, agricultural investment, environmental trends, and institutional innovations on China's wheat supply. We also explore the circumstances under which China might reestablish itself as self-sufficient in wheat and the kinds of structural transformations and policy decisions that might cause rising wheat deficits.

Annual Grain Production and Utilization in China

Total wheat production in China rose to 99 million metric tons (MMT) in the early 1990s, making China one of the largest producers of wheat in the world. China also produces more maize than any country except the United States. China uses over 95 percent of its wheat for direct food consumption and only 4 percent for feed.

The average resident in China consumes 85 kilograms of wheat per year. However, rural residents consume 90 kilograms per person on average whereas urban residents consume only 67 kilograms per person on average. South Korea is the only country in which per capita consumption is larger than in China (FAO 1997).

Unlike other East and Southeast Asian countries, China produces most of the wheat it consumes, relying on imports for only 10 percent of its wheat needs. In contrast, Japan and Korea import over 90 percent of their wheat needs (FAO 1997). However, China's wheat imports account for 10 to 15 percent of world wheat trade.

Sources of Demand Growth

Recent changes in the urban economy have made urban consumers almost entirely dependent on markets rather than the government for their food needs. Therefore, prices and income changes will largely determine future urban consumption. Urban income growth rates (see Table 2, column 1) in China are among the highest in the world and will sharply increase food demand. However, increased urban incomes are likely to have larger effects on the demand for livestock products and feed grains than on food grains.

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Because of only partially freed markets, lack of refrigeration, and the generally high costs of procuring food, food choices in rural China are limited. While rising per capita incomes (see Table 2, column 2) will push up demand, rural residents of China depend heavily on household production of food to meet their consumption needs (see Table 2, column 3).

Wheat consumption typically has risen as populations in Asia have shifted from rural to urban areas. This may not be the case in China as per capita wheat consumption in rural areas is so much larger than in urban areas. The urban population in China increased from 19 percent of total population in 1980 to 28 percent in 1992 (see Table 2, column 4). This migration pattern is expected to continue. Since rural demand currently exceeds urban demand, China's future migration is expected to dampen wheat consumption.

Sources of Supply Growth

One-time institutional changes contributed to the high growth in wheat production enjoyed by China's agricultural economy in the early 1980s (Lin 1992). But technology was important in the early reform period and was responsible for most of the growth in the agricultural economy in the late 1980s and early 1990s (Huang and Rozelle 1996). China's base of wheat technology grew rapidly during the pre-reform and reform periods. After importing rust-resistant, semi-dwarf wheat varieties from the international agricultural research system in the late 1960s, Chinese breeders incorporated these traits into its own varieties. By 1977, 40 percent of China's wheat areas were in semi-dwarf varieties, increasing to 70 percent by 1984. Today in China, dwarf varieties are dominant in wheat-producing areas. Investment in agricultural research is the key to maintaining strong supply growth.

Investment in agricultural infrastructure, especially irrigation (see Table 2, columns 5 and 6), also boosted China's agricultural growth in recent decades. Since the early 1950s, China has increased its irrigated area from 18 percent to 50 percent of cultivated area. However, annual irrigation investment has been stagnant since the late 1970s.

Environmental factors might also affect production. Brown projected a 20 percent drop in grain production between 1995 and 2030, arguing that environmental degradation will be a principal cause of the decline in grain

Table 2. Important Factors Affecting the Supply and Demand for Grain and Rice in China's Economy, 1958–1992

Year	(1) Urban Income per Capita	(2) Rural Income per Capita	(3) Market Development Index	(4) Ratio of Urban Population	(5) Agriculture Research Expenditure	(6) Irrigation Expenditure
1958	n.a.	n.a.	n.a.	16	165	3053
1965	n.a.	n.a.	n.a.	18	357	1314
1970	n.a.	n.a.	n.a.	17	401	3256
1975	229	101	21	18	700	4526
1980	372	167	31	19	791	3209
1985	490	298	42	24	1078	2016
1990	593	306	45	26	808	3006
1992	778	319	46	28	977	5527

Notes and Sources: (1) and (2) are from ZGTJNJ (1980–1993) and are measured in real 1985 yuan. (3) is from Huang and Rozelle (1995) and measures the proportion of food purchased by rural households in consumption markets. (4) is from UN. (5) and (6) are in real 1985 million yuan and are from SSTC. (7) and (8) are in real 1985 million yuan and are from MRWEP.

output (Brown 1994). However, he cites only anecdotal evidence. Government data show that erosion and salinization have increased since the 1970s. There is some evidence that these developments have had adverse effects on grains and other agricultural output (Huang and Rozelle 1994).

China's Wheat Economy in 2000 and 2020

This section presents forecasts of future developments in China's wheat markets based on an economic simulation model developed by the authors. Our analysis indicates that per capita wheat consumption in China may have crested in the mid-1990s. Starting from a 1995 baseline of 85 kilograms, per capita wheat consumption is projected to remain constant over the first fifteen years of the twenty-five-year forecast period. Per capita wheat consumption declines to 82 kilograms in 2020 (see Table 3, row 1). Total wheat demand continues to increase through 2020 mainly because of population growth. Aggregate wheat consumption is projected to reach 138 MMT by 2020 (see Table 4, column 7). Wheat consumption rises about the same percentage as for rice but increases by much less than coarse grain consumption. Total grain consumption is projected to increase by more than 50 percent (Huang and Rozelle 1997). Wheat's share of total grain utilization will fall from about 30 percent to just over 20 percent.

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Projections of wheat production in China indicate that wheat output will increase more slowly than wheat consumption in the 1990s (see Table 4, columns 1 to 3). In the year 2000 domestic wheat output is predicted to reach 110 MMT, only about 10 percent more than the early 1990s (99 MMT). However, the gap between wheat output and consumption is expected to narrow after 2000 (see Table 4, columns 4 to 9). The increase in production is largely a result of the resumption of investment in agricultural research.

Table 3. Projected Annual per Capita Wheat Food Consumption under Alternative Income Growth Scenarios in China, 1996–2020.

Alternative Scenario	Per Capita Wheat Food Consumption (kg)			
	1995	2000	2010	2020
Baseline				
National Average	85	85	85	82
Rural	92	94	96	97
Urban	67	68	69	68
Low Income Growth				
National Average	85	84	83	80
Rural	92	93	95	95
Urban	67	68	68	67
High Income Growth				
National Average	85	86	86	83
Rural	92	95	98	98
Urban	67	69	69	68

Note: Base year is 1995.
Source: Authors' estimates.

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The predicted annual growth rates for production and consumption in the late 1990s imply a rising deficit in wheat. Wheat consumption rises at about 1.60 percent per year, 1.28 percent from population increases and 0.32 percent from rising per capita wheat consumption, while wheat production grows at only 1.30 percent per year. Wheat imports rise somewhat in the late 1990s but fall back to their current levels by 2010 and approach zero in 2020 (see Table 4, row 1, columns 6 and 9).

Alternative Projections

The sensitivity of the results to changes in the underlying forces driving the supply and demand balances is evaluated by altering baseline growth rates for variables including income, population, and investment in technology (see Table 4). Lower population growth rates would reduce wheat demand by only 8 MMT (from 138 MMT to 130 MMT) in 2020 compared to the baseline with wheat imports completely disappearing (see Table 4, row 2). Higher population growth rates would lead to increased imports of about 15 MMT in 2000 and imports would remain positive through 2020 (see Table 4, row 3). Income growth, investment rates, price and market liberalization simulations are similar to the population growth rate simulations (see Table 4, rows 4 through 7). Since expenditure elasticities for wheat are low, import demand for wheat rises but does not explode with rapid income growth. This outlook for wheat stands in stark contrast to the scenario for aggregate grain import demand, which varies sharply with the assumed income growth rate because the income elasticity of demand for livestock and the indirect demand for grain are much higher.

Table 4. Projections of Wheat Production, Demand, and Net Imports (million metric tons) under Various Scenarios with Respect to Population, Income, Technology and Price Policies, 2000–2020.

	2000			2010			2020		
Alternative Scenario	Demand	Pro-duction	Net Imports	Demand	Pro-duction	Net Imports	Demand	Pro-duction	Net Imports
Baseline	123	110	13	132	122	10	138	137	1
Low population growth	121	110	11	128	122	6	130	137	-6
High population growth	125	110	15	136	122	4	144	137	7
Low income growth	122	110	12	130	122	8	137	137	0
High income growth	124	110	14	134	122	3	140	137	3
Low investment rate	123	108	15	132	118	14	138	129	8
High investment rate	123	111	12	132	126	6	138	144	-6
Protection of domestic production[a]	123	111	12	130	123	7	135	139	-4
Liberalizing wheat market[b]	125	110	15	135	120	15	143	134	8

[a]Real wheat prices will keep level with 1995 over projection period.
[b]Real wheat prices will decline (with a growth rate of -1%) more than the world trend (with a growth rate of -0.5%) in order to bring China's domestic wheat market prices close to the world prices.
Source: Authors' estimates.

Continuing high levels of grain imports in China can be expected only if there is a continued decline in the growth of agricultural investment and if the government does not respond with countervailing policy measures as import levels rise. Agricultural research and irrigation investments have recovered in recent years. In recent months, as grain prices have risen in response to tightening grain supplies, government policy makers have responded with promises of greater investments in agriculture (Mei 1995). Most of the investments have been targeted at irrigation, but improvements in the operations of research institutes have also been announced. If China's government maintains current investment levels in wheat research, wheat imports under the most likely demand scenario will slowly fall.

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Several factors may mitigate the decline in wheat import demand. The insensitivity of projected imports to price policy depends on low estimated output price response elasticities and the implicit assumption that current production patterns will continue in the future. Shifts in these assumptions could lead to sharp changes in predicted supply, demand, and imports. China's fairly restrictive policy environment and the subsistence nature of its households may account for the estimated low response of output and demand to prices. If the decision-making environment in China evolves as the rest of the economy develops, farmer production and demand responses may vary more with prices in the future. If production were to rise more sharply and demand were to fall more rapidly in the future when China's leaders implemented pricing policies, wheat imports would be even lower than those currently projected. Likewise, if the nation's leaders opened the agricultural economy and wheat prices continued to decline as they have throughout the past century, the nation's imports of wheat could be significantly larger than currently projected.

Currently the intense rice-wheat and wheat-maize rotations in most of China's wheat-producing areas require large quantities of labor and may not be conducive to mechanized planting and harvesting. As wages increase, pressures will rise to search for labor-saving cropping patterns. With higher projected demand for feed grains, farmers in some areas may abandon two-season rotations and choose to produce single-season maize. If the demand for wheat does not change, the concomitant need for wheat imports would increase. These projections are based on prevailing technologies and cropping patterns. Any fundamental change in the way that wheat farmers cultivate their land may have sharp impacts on future wheat production, consumption, and imports.

Conclusions

China is not very likely to import increasingly larger volumes of wheat in the near future. In fact, the most likely scenario is that China's wheat imports will fall by 2020. China could very well become self-sufficient in wheat within 25 years. However, there are scenarios under which China would continue to demand large volumes of wheat, especially if the

structure of cropping patterns change drastically or if the government is unable or unwilling to create its own new technologies to increase the wheat supply. Importing new wheat production technologies from other parts of the world provides China a viable alternative to developing its own. Taking all factors into consideration, it does seem unlikely that China will become a much bigger wheat importer in the coming decades.

The most significant difference between our predictions and the predictions of others is in the nature of the demand for wheat. Others forecast rising per capita wheat consumption over time. Our view is that the unique structure of wheat demand in China, one in which rural residents consume more wheat per capita than urban residents, will take the pressure off of domestic demand as China's population continues the gradual shift from rural to urban. As the projected migration occurs, rural residents migrating to urban areas are likely to adopt the demand behavior of other urban residents, and wheat demand will shift down sharply.

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In this paper we have attempted to unravel some of the mysteries of China's wheat economy. China is unlikely to either empty the world grain markets or become a major grain exporter. China will be an important player in world grain markets as an importer in the coming decades. Its long-term importance is most likely to be in world feed markets. Over the next five to ten years China will continue to retain its current position as the world's leading wheat importer. However, China's reliance on world wheat markets may gradually fall in the long run. Grain producers in exporting countries, especially those dealing with wheat and maize, will undoubtedly be those more affected by these developments. They need to have a keen appreciation of the implications of China's evolving role in world grain markets.

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