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**China's Maize Production and Supply
From A Provincial Perspective**

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Abstract

China's maize production has experienced rapid growth during the period of on-going economic reforms. However, the magnitude of the growth has varied across regions. The bulk of the increased output has been generated from a few large producing provinces, whereas the increase in other provinces as a whole has been modest. During this period, the general situation of China's domestic maize supply has been dominated by the performance of the few large producing provinces, while China's role in the international maize market has been determined by even fewer of them. Given this fact, government policies in favour of production in these provinces are of significance for further increasing China's total maize output and stabilising the market supply.

1. Introduction

Maize is one of the most important grain crops in China. It accounts for nearly 1/5 of the country's total grain sown areas and a slightly larger proportion of the output. Since the economic reforms, begun in the late 1970s, China's maize production has experienced unprecedented development. Total output rose from 55.95 million tonnes in 1978 to 111.97 million tonnes in 1995, an average growth rate of 5.88 percent per year (SSB, 1996). This increase has been the foundation underlying the significant improvement in the people's food consumption during this period.¹

Despite the remarkable achievement, the pace of growth has been uneven over the years and the magnitude of the increase has varied across provinces. Taking the nation as a whole, the growth in the early 1980s was relatively slow. The momentum occurred in the second half of the decade. Between 1985 and 1990, the total output of maize increased by 51.56 percent, representing an increase of 32.94 million tonnes. This made China a maize exporter during the late 1980s and the first few years of the 1990s. Nevertheless, entering into the 1990s, the growth has slowed. In 1994, the output was only 2.46 million tonnes above the figure in 1990 (SSB, 1995). The slow increase in maize output versus the persistently rising demand for meat and dairy products created an imminent shortage of maize in China's domestic market. The government then imposed a ban on the exportation of maize in 1994.

Yet, China is a large country with great regional diversities. Referring to maize production, the spatial distribution is uneven and production is highly concentrated in the north and northeast regions. The output in other regions is generally small. During the reform period, the growth has also been uneven across regions. Some, in particular several large producing provinces, have had faster growth than many others.

¹ For example, between 1978 and 1992, the average consumption of meat increased from 8.86 kg/per capita to 22.58 kg/per capita and eggs from 1.97 kg/per capita to 7.78 kg/per capita (SSB, 1994).

Regional variations in China's maize production necessitates a regional approach in studying this sector. This paper adopts a provincial perspective to investigate the growth patterns of China's maize production during the reform period. Three major questions related to regional variations are raised and will be answered in the following analysis. These are: 1) which provinces have dominated the overall growth pattern of China's maize production? 2) to what extent have these provinces determined China's domestic maize supply? 3) which provinces have been the major providers to China's exported maize and why were the exports stopped completely? The answer to these questions will shed light on the mechanism of the growth of China's maize output during the reform period and help to draw some policy implications for the further development of maize production and stabilising the market supply in the future.

The study is organised as follows: section 2 overviews the spatial distribution of maize production and the growth of provincial output during the reform period. It identifies the key provinces which play important roles in national production. Section 3 investigates the growth patterns of maize production in the key provinces and elaborates the impact of their performance on the trend in national output. In Section 4, the role of the key provinces in China's domestic maize supply and international trade is examined. Some policy implications are also raised. Concluding remarks form the final section.

2. An Overview of Provincial Maize Production

The spatial distribution of maize production is uneven across regions. Table 1 shows that output is considerably large in Liaoning, Jilin, Heilongjiang, Shandong, Hebei, Henan and Sichuan provinces. Their output shares in total national output range between 6 and 14 percent, which are significantly larger than that in other provinces. These seven provinces together accounted for 70.38 percent of the country's total maize output. They are, therefore, the key provinces involved in China's maize production. In other provinces, the volume of output is either small or negligible.

During the period observed, the magnitude of the growth differed significantly among provinces. However, it is noted that there is a high level of consistency

between the increase in provincial output and the spatial distribution of maize production. In the provinces where the output is larger, the increase is also greater. Conversely, the increase is modest in the provinces where the output is small. The seven key producing provinces together contributed 73.23 percent of the nation's total increase. This figure is larger than their share in the total output, implying a faster growth in these provinces. The rest of provinces as a whole has made a little contribution to the growth of national output. As a result, China's maize production has tended to further concentrate to the key provinces.

It is worth pointing out that the concentration of maize production in the key provinces is closely related to their regional comparative advantage. According to the author's previous study of regional productivity in China's grain production, maize production in these key provinces tends to be more efficient in terms of resource utilisation due partly to the favourable natural conditions and specialised production (Yang, 1994). For this reason, it may be argued that the further concentration of maize production in the key provinces would have been conducive to improving the overall efficiency of China's maize production. This shift, however, may also reflect farmers' increasing concern with production efficiency in their decision-making.

**Table 1 Maize Production and Output Increase by Provinces
1978/80-1992/94***

Areas	Output Share in total		Increase 92/94	Share in	
	1992/94	national output %		78/80- increase	total national %
National	100620		41383		
Beijing	1438	1.43	732	1.77	
Tianjin	789	0.78	351	0.85	
Hebei	9018	8.96	2993	7.23	
Shanxi	2891	2.87	138	0.33	
Neimenggu**	4390	4.36	3302	7.98	
Liaoning	8822	8.77	2538	6.13	
Jilin	14399	14.31	8994	21.73	
Heilongjiang	10625	10.56	4880	11.79	
Shanghai	56	0.06	5	0.01	
Jiangsu	2298	2.28	1034	2.50	
Zhejiang	132	0.13	-101	-0.24	
Anhui	1919	1.91	1512	3.65	
Fujian	44	0.04	44	0.11	
Jiangxi	70	0.07	59	0.14	
Shandong	12790	12.71	5565	13.45	
Henan	8676	8.62	3741	9.04	
Hubei	1223	1.22	226	0.55	
Hunan	295	0.29	60	0.14	
Guangdong	185	0.18	122	0.29	
Guangxi	1289	1.28	247	0.60	
Sichuan	6486	6.45	1596	3.86	
Guizhou	2072	2.06	195	0.47	
Yunnan	2933	2.91	529	1.28	
Shaanxi	3750	3.73	901	2.18	
Gansu	1440	1.43	505	1.22	
Ningxia	431	0.43	359	0.87	
Xinjiang	2162	2.15	860	2.08	

* Maize production in Hainan, Xizang and Qinghai is negligible. These provinces are ignored in this study.

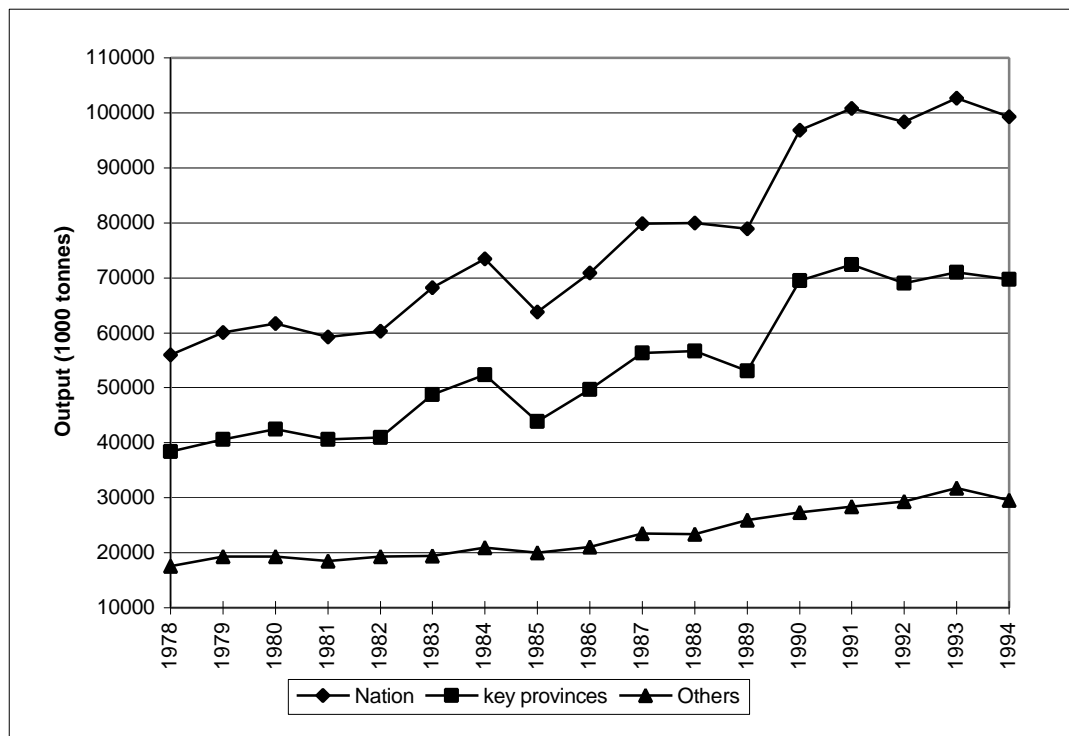
** The increase in Neimenggu is overstated due to changes in administrative territory in 1980.

Source: Data for 1978-1990 are from USDA, *ERS*. Data for 1991-1994 are from SSB, *ZTN*.

3. The Performance of Maize Production in the Key Provinces

Since the key provinces account for a large proportion of the country's total output and growth, their performance is expected to have a strong impact on the trend in national maize production. This can be seen clearly from Figure 1, where the trend exhibited in national output is perfectly consistent with the trend in the seven key provinces as a whole. In contrast, the output in the rest of provinces increased slowly. Their performance had little effect on the national trend.

Figure 1 Trends in Maize Output, 1978-1994



Source: Same as Table 1.

Owing to the important role of the key provinces, the following analysis decomposes them and examines their individual roles in the national output and supply during the reform period.

Although the growth in the key provinces as a whole was quite impressive, a decomposed observation reveals that variations were significant among them. Table 2 shows that the growth in Jilin was particularly remarkable, 166 percent above the base

year. In Heilongjiang, Shandong and Henan, the increase was also substantial. The large increase in these four provinces contributed greatly to the growth of total national output. In contrast, the growth in Liaoning, Hebei and Sichuan was relatively slow. In Sichuan, only 33 percent was recorded. As a result, the output share of the four fast growing key provinces in the “big seven” was enhanced from 59.45 percent in 1978 to 67.17 percent in 1994.

Table 2 Changes in Maize Output in the Key Provinces, 1978-1994

Year	(1000 tonnes)						
	Hebei	Liaoning	Jilin	Heilongjiang	Shandong	Henan	Sichuan
1978	5165	6030	5810	6225	6120	4690	4385
1979	6280	6285	5335	5810	7300	4785	4875
1980	6630	6535	5070	5200	8255	5330	5410
1981	6475	5820	5275	4415	7940	4805	5940
1982	7250	5580	5895	3280	8480	4365	6125
1983	6905	7370	9410	4635	8220	6300	5890
1984	6400	7155	11040	6420	9935	5230	6250
1985	6789	4481	7931	4118	9377	5373	5780
1986	6862	6073	10164	6320	10165	4370	5785
1987	7162	6715	12316	6461	11702	6770	5211
1988	7352	6910	12210	6838	11494	6002	5825
1989	7733	4848	9815	5888	10333	8096	6320
1990	8292	7982	15296	10083	11109	9605	7150
1991	9061	8223	15014	10978	13838	8491	6793
1992	8343	8645	14736	11331	11508	8066	6445
1993	9651	9597	13446	9566	13023	9470	6219
1994	10653	6519	14394	11464	13453	7543	5726
Changes 1978/80-1992/94							
Volume	2993	2538	8994	4880	5565	3741	1596
%	50	40	166	85	77	76	33

Source: Same as Table 1.

Over the years observed, the growth pattern in the individual provinces was uneven. Figure 2 gives visual views of the trends in the four fast growing provinces and the three slow growing provinces. It is noted that the most volatile output appeared in the provinces where the scale of production is large and where the output grew fast. In Jilin, Heilongjiang and Shandong, China’s largest maize producing provinces, the fluctuation was quite sharp. In contrast, the fluctuation in Sichuan and Hebei, the slow growing provinces, was relatively modest.

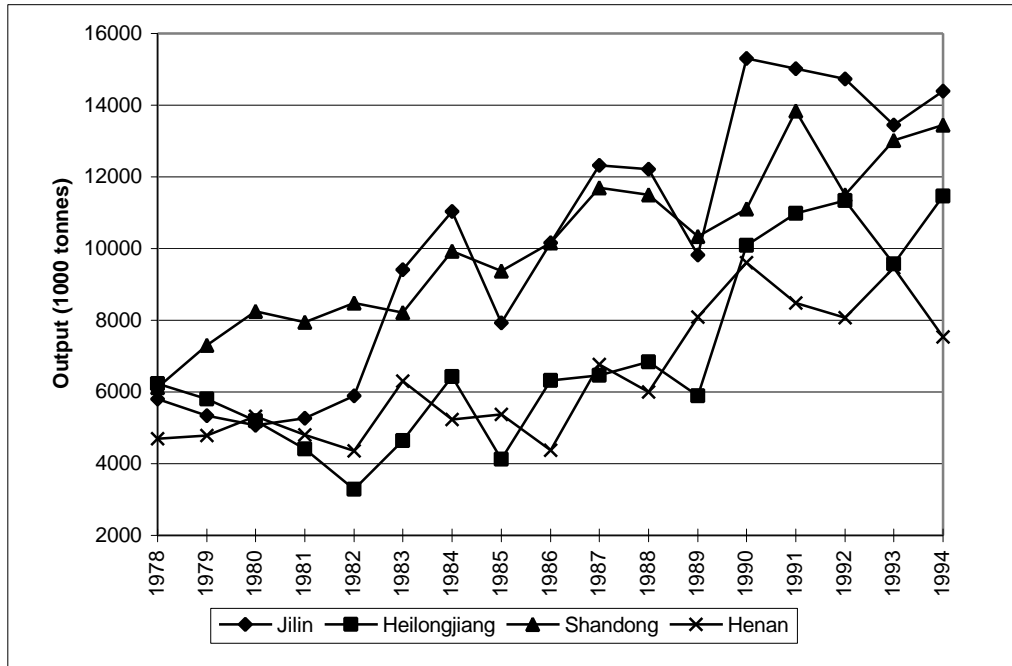
Another notable feature shown in Figure 2 is that the fluctuations in Jilin, Liaoning, Heilongjiang, Shandong and Henan had a similar pattern before 1990. In these provinces, the peak output appeared in 1984, 1987-1988 and 1990. In 1982, 1985 and 1989, output was generally at the bottom of the trough. The similar trend in these provinces would have amplified the degree of fluctuations in total output, causing an instability of maize supply at the national level.

The picture exhibited in Figure 2 reveals that during the reform period, the growth pattern of China's maize production has been shaped primarily by fewer largest producing provinces. These provinces have not only been substantial in determining the level of total national output, but also the major sources of fluctuations in this output.

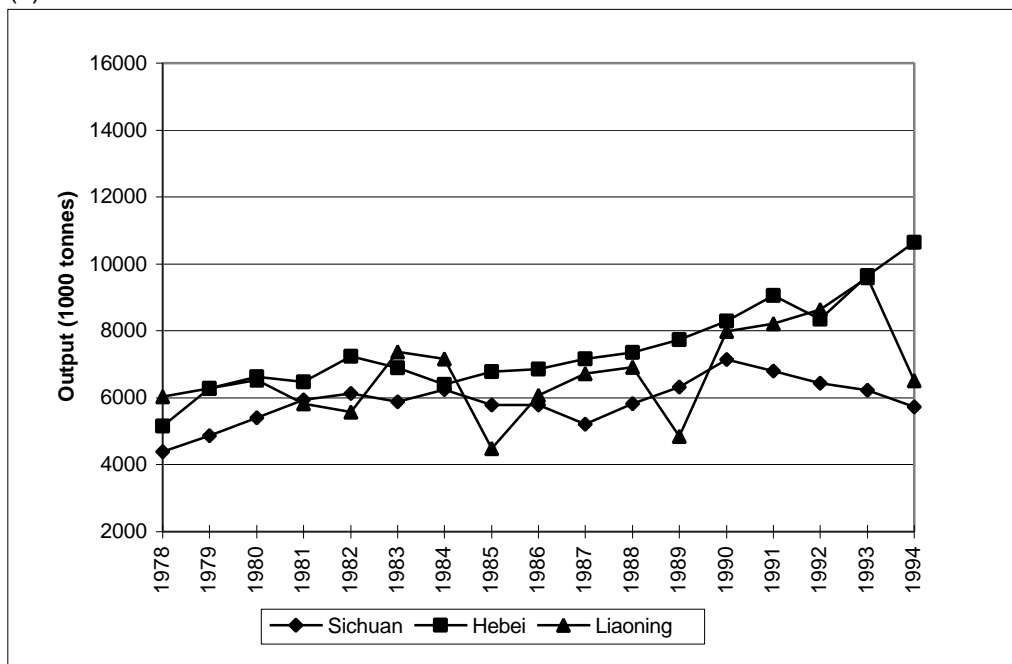
The fluctuations in maize output are partly the result of the instability of the weather. A point that needs to be emphasised here is that the spatial concentration of maize production may have made the weather effect more influential on total national output. This is because weather fluctuations tend to have similar trends in provinces adjacent. Partly for this reason, over the years, maize output has been more volatile in comparison with wheat and rice at the national level (Yang Hong, 1995a). As the latter two crops are widely spread over the country, unfavourable weather in one area would only have a small effect on their national outputs.

Figure 2 Trends in Maize Output in the Key Provinces, 1978-1994

(a)



(b)



Source: Table 2.

Apart from the effect of weather variability, the intensified fluctuations in the larger producing provinces are also likely to be related to farmers' active response to the market situation, in particular prices. As these provinces have a relatively higher

commercial rate, the potential for adjusting production is also greater. Farmers are expected to be more responsive to price changes, leading to a fluctuation in output. The situation would be different in the provinces where the market surplus is small. Maize production is mainly for self-consumption. Price changes would have little impact on farmers' maize production. In these provinces, therefore, output is likely to be more stable. This would have been the reason for the smooth trend in output for the non-key provinces as a whole shown in Figure 1.

Entering into the 1990s, while the fluctuations remain, the growth pattern in the key provinces has tended to diversify. This feature is likely to be associated with the acceleration of market reforms and the decentralisation of administrative control in the early 1990s. Provincial governments have been entrusted with ever larger autonomous power. This enabled them to adjust maize production based on their own interests, resulting in diversified trends in maize production among these provinces.

4. The Key Provinces in China's Domestic Maize Supply and International Trade

4.1 The Key Provinces in the Domestic Supply

Under the current double-track system, maize, like many other staple grain crops, is delivered through two channels: the state procurement system and market trade.² With China's progressive transition from a centrally planned economy to a "socialist-market economy", the quantity of state procurement has been declining, and delivery through the market channel increasing. However, for individual provinces, the progress in this transition has been uneven and their role in the state procurement scheme also varied.

Table 3 shows the quantity and the share of the key provinces in the state maize procurement. The lack of historical data prevents an examination of the situation in the early years. The data after 1987 show that for the key provinces as a whole, the share in

² The market trade here refers to all non-state transfers, including sales to private traders, to processing enterprises and at free markets.

state procurement increased.³ In 1992, the seven provinces together accounted for 74.24 percent of the state total procurement, indicating an important role of these provinces in national maize supply.⁴

Table 3 The State Maize Procurement in the Key Provinces

Areas	(1000 tonnes)					
	1987		1990		1992	
	Purchase	%*	Purchase	%	Purchase	%
National	32042		31204		27035	
Hebei	3052	9.52	2801	8.98	3002	11.10
Liaoning	4775	14.90	4746	15.21	4354	16.11
Jilin	7614	23.76	8456	27.10	7327	27.10
Heilongjiang	1916	5.98	2718	8.71	2247	8.31
Shandong	2481	7.74	1719	5.51	1280	4.73
Henan	2224	6.94	1935	6.20	1186	4.39
Sichuan	1192	3.72	742	2.38	673	2.49
Sum	23254	72.57	23117	74.08	20069	74.23

* Share of the provincial procurement in total national total procurement.

Source: Editorial Committee of Almanac of China's Commerce, ZSN, 1988, 1991 and 1993.

Looking at the figures for individual provinces, however, it is found that the variations are quite substantial. In 1992, the share in Jilin accounted for 27.10 percent of total state procurement, much larger than its share in national output of 14.31 percent. In Hebei and Liaoning, the share was also large compared with their share in total output. Taking into consideration the generally low state purchase price, the large share of the state procurement in these provinces means a heavy state levy imposed on them. It is also noted that the share tended to increase in Heilongjiang, Jilin, Liaoning and Hebei. In other provinces the share declined. The increasing share in some provinces in contrast with the decreasing share in others suggests that the state procurement has become more reliant upon even fewer provinces.

The data for the volume delivered through the non-state channels are not available from the official statistics. This is mainly because of the difficulty in recording the

³ It is noted that the quantity of the state procurement tended to decline. This is associated with the general reduction of the state purchase initiated from the government's intention to gradually retreat from the direct control over the grain marketing.

⁴ The state procurement provides the bulk of the maize consumed by urban population and industries. Maize transferred through state channels is particularly important in balancing the

amount sold by farmers to private traders and at free markets. According to a household survey conducted jointly by the Chinese Economies Research Centre at the University of Adelaide in Australia (CERC) and the Ministry of Agriculture in China (MoA), maize sold through the non-state channels has accounted for more than half of the total marketed surplus. In Jilin, it is about 55 percent and in Shandong, the figure is as high as 77 percent (CERC) and MoA, 1994 and 1995). These figures indicate that the large producing provinces have sold a large, if not larger proportion of marketed maize through the non-state channels as they have contributed to the state procurement quota.

4.2 The Key Provinces in China's International Trade

In the history of the People's Republic, China has been a maize net importer for most years. The exception was during the period of the late 1980s and the early 1990s, when China turned itself into a maize exporter. This role remained until 1994, when the government banned maize exports completely. Some people were puzzled by this one-shut performance and wondered whether China really had a maize surplus at the time when it exported maize. To understand this performance, it is useful to investigate the role of the key provinces in China's international trade.

Table 4 shows the quantity of China's international maize trade and the exports in selected provinces. Before 1983, China was a net importer, though the quantity varied from year to year. In 1984 for the first time its exports exceeded the imports. The net exports jumped to 6.246 million tonnes in 1985 compared to less than one million tonnes in the preceding year. In 1991, another big jump was recorded and in the succeeding years, the exports further increased.

Table 4 Maize International Trade in China and the Volumes of Net Exports in Selected Provinces, 1978-1992*

Year	Total imports	Total exports	Trade balance	(1000 tonnes)			
				Exports in Jilin	%	Exports in Hebei	%
1978	794						
1979	2792						

nationwide supply, given the fact that China lacks a nationwide market for grain transactions. The state's role is even more important in long distance transfers among regions.

1980	1696						
1981	748	141	-607	17			
1982	1612	68	-1544	20			
1983	1986	61	-1925	54	88.52		
1984	46	917	871	562	61.29		
1985	91	6337	6246	2058	32.48		
1986	683	5706	5023	2827	49.54		
1987	1572	3847	2275	2103	54.67		
1988	196	3522	3326	2052	58.26		
1989	102	3497	3395	2409	68.89	245	7.01
1990	314	2887	2573	1860	64.43	253	8.76
1991	37	7487	7450	-	-	-	-
1992	1	10435	10434	-	-	-	-
1993	0	11100	11100	-	-	-	-
1994	1	-	-	-	-	-	-

* A blank refers to an amount that is negligible or zero and a “-” refers to the figure not available.

Source: The national figures for 1978-1991 are from Editorial Board of the Almanac of China’s Foreign Economic Relations and Trade, *ZDJMN*, 1984, 1988-1995. The figures for 1992 - 1994 are from SSB, *ZTN*, 1994 and 1995. The data for Jilin are from SSB, *JSJTN*, 1988-1991. The data for Hebei are from SSB, *HSJTN*, 1990 and 1991.

Where were the sources of China’s exported maize? The answer is shown clearly in Table 4. Much of China’s exported maize came from Jilin. In some years, its volume accounted for more than 60 percent of the total exports. Another major exporting province was Hebei, where the share was around 8 percent of the total volume of exports. The data for exports in other provinces are not available. However, since the above two provinces contributed to a major part of China’s maize exports, the quantity exported by other provinces would be small.

It has been reported that during the period when China exported maize, many southern provinces experienced a shortage in feed grain. In some areas, farmers had to use rice to feed their animals (MoA, 1990). A question may be raised here is why China exported maize when there was a shortage in its domestic market. In part this would have been China’s lack of transport facilities and the low level of market integration. The spatially concentrated production requires maize to be transferred from surplus regions to deficit regions. However, because national transport facilities are generally overloaded, interregional maize transfers are often constrained (Huang, Qizheng, 1995). Many previous studies have pointed out that the lack of transport facilities has been a barrier to

the further development of maize production in the key provinces (MoA, 1990, Deng Yiming, et al, 1992).

In addition to the transport problems, some administrative barriers have also impeded interregional maize trade. In many areas, regional blockades are set up by local governments to protect their own interests, either political or economic. As market transaction is suppressed by regional blockades, all sorts of other administrative measures are used in dealing with maize regional transfers. This has, in turn, further constrained the development of market integration.

For maize surplus provinces, there were also incentives to export maize because of the higher prices in the international market (Cheng and Wu, 1994). Over the years, the state has imposed larger quotas on these provinces. The low state purchase price means a greater profit loss for them. Meanwhile, compared with the international market price, the domestic market price is relatively low. The surplus provinces, therefore, have a strong intention to sell their maize in the international market and did so when they were allowed in the late 1980s and the early 1990s. The supply shortage in the domestic market has become imminent in recent years, the government then imposed a ban over the exports in the few surplus provinces and forced them to turn back to the domestic market.

5. Concluding Remarks and Policy Implications

This study investigated the growth patterns of maize production in different provinces during the period of reforms. The analysis focused on the provinces which play important roles in national maize production.

The study found that there is a high level of consistency between the spatial distribution of maize production and the growth of regional output. Maize production is highly concentrated in a few provinces, leaving production in most other provinces to be only of local significance. During the reform period, the bulk of the increased output has been from the few large producing provinces. Their role in national maize production has been further strengthened.

Intensified fluctuations were a notable feature of national maize output. It is found that they are mainly sourced from several larger producing provinces. Production there is more volatile. The common trend in the fluctuations in these provinces has amplified the degree of volatility of maize output and supply at the national level.

An insight into the sources of China's exported maize reveals the important role of a few provinces in determining the volume of total exports. It is argued that China's ability to export maize does not mean a surplus in its domestic market. The lack of transport facilities and the underdevelopment of the nationwide market have constrained inter-regional transfers. These, together with the relatively low domestic prices, have created strong intention for the few surplus provinces to export maize to the international market.

The spatial concentration of maize production and the decisive role of the few larger producing provinces in national output and supply have some implications for policy makers. If the government intends to stabilise and further increase maize output, it should stipulate appropriate policies to promote production in these key provinces. These policies include the removal of regional barriers on maize transfers and to facilitate the development of market integration and infrastructure construction.

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