

## **Rice Production, Distribution, and Utilization in China\***

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### **Part I**

#### **I. China rice production**

Rice is the staple food in China. During the Ninth Five-Year Plan (1996-2000), the rice annual sown area was  $3.14 \times 10^7$  ha, the total output was  $1.98 \times 10^8$  t, accounted for 27.7% and 40.0% of the food crops, respectively. The average per unit area yield was 6 303 kg/ha. The area, per unit area yield, and total output are all on the first position in the food crops.

In the same period, the rice annual sown area and total output of the global were  $1.52 \times 10^8$  ha and  $5.87 \times 10^8$  t, the proportion of those of China's rice in the world's were 20.7 % and 33.7 %.

#### **1. China Rice Regions**

##### **1) Rice Ecological Regions**

The whole China's rice area can be divided into 6 regions, they are as follows:

##### **a. South China double-season rice region**

This region includes the whole of Taiwan and Hainan, the south of Fujian, Guangdong, Guangxi, and Yunnan. The plant system is multiple cropping systems, the double-season rice's area is about 73.5% of the total of this region's and the sown area of this region is about 15.0% of the whole country's. Varieties planted in this region are mainly indica.

##### **b. Center China single-double-season rice region**

The region includes Jiangsu, Shanghai, Zhejiang, Anhui, Jiangxi, Hunan, Hubei, and Sichuan provinces and the south of Sha'anxi and Henan provinces. Here co-existed

*\*Data involved the amount of consumption demand, trade, and yield in Part I and V are based on the rice grain, while those in Part II, III, and IV are based on the rice, which 1.00 t rice is equivalent to 1.43 t rice grain.*

double-season and single season cropping systems. The ratio of double-season / single-season is about 2:3. In the north of the Changjiang River, it is mainly single-season rice, while in the south, that is double-season. The sown area of this region is about 65.0% of the whole country's.

**c. West-south China Plateau single double-season rice region**

This region includes Guizhou, Tibet, and Qinghai, the north of Yunnan and Guangxi. This area is mainly single-season rice, additional, there is some mountain rice. Its sown area is about 8% of the whole country's.

**d. North China single-season rice region**

This region includes the whole of Beijing, Tianjin, and Shangdong, large part of Hebei and Henan provinces, and the north of Sha'anxi. The region is middle-early maturity in the north plain of North China, and middle-late maturity in Huanghuai plain-hills. The sown area is about 4.0% of the whole country's.

**e. East-north China early maturity single-season rice region**

This region includes Heilongjiang, Jinlin, and Liaoning, and east-north of Inner Mongolia Autonomous Region. This region is single season rice, and its area is about 5.0% of the whole country's. This is the highest latitude rice planting area.

**f. West-north China drying single-season rice region**

This region includes Xinjiang Uygur Autonomous Region, Ningxia Huizu Autonomous Region, and Gansu Province, and large part of Inner Mongolia Autonomous Region. Its climate is very dry. This area is one-cropping per annual, single-season rice, and the area is about 2.0% of the whole country's.

**2) Rice main product region**

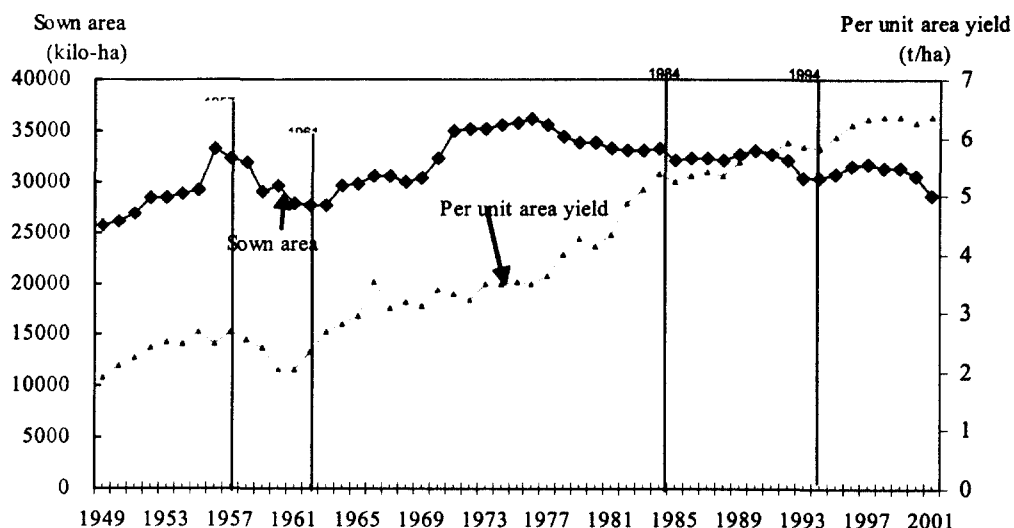
China main rice product provinces are Hunan, Jiangsu, Sichuan, Hubei, Jiangxi, Anhui, and Zhejiang in the Changjiang Middle-Low region, Guangdong and Guangxi in South China, and Heilongjiang in East-north China. Yields of the above 10 provinces are all over 10 million ton, and the total output of them was  $1.47 \times 10^8$  t in 2000, accounted for 78.3% of the whole country's rice output.

Among them, Hunan Province has the highest output and the largest growing area. In 2000, its rice output was  $2.39 \times 10^7$  t, 12.7% of the whole country's, and it was equal to

the total rice output of the Thailand, the sixth rice product country on the world, and the sum of the Phillipines' and Japan's, the 8<sup>th</sup> and 9<sup>th</sup> rice product countries.

## 2. China rice production & development phases

During 1949-1997, rice-growing area had increased by 23.6%, from the original  $2.57 \times 10^7$  ha to  $3.18 \times 10^7$  ha. Per unit area yield of rice had been raised by 234.3%, from 1.89 t/ha to 6.32 t/ha. Meanwhile, the total output had risen from  $4.86 \times 10^8$  t to  $2.00 \times 10^8$  t, increased by 312.7%. In this period, the contribution to the total output by expanding growing area and enhancing per unit area yield were 16.5% and 83.5%, respectively. During 1997-2001, the rice sown area and the total output decreased by an average annual rate of 2.6% and 2.5%, respectively due to China's crops planting structure adjustment. In the whole process of rice production, six stages are involved (see figure):



**Diagram of the development in China rice production.**

### **The first (1949-1957)----- Slow increasing stage**

In this phase, the rice sown area, per unit area yield, and total output all presented stable increasing. Rice sown area increased from  $2.57 \times 10^7$  ha to  $3.32 \times 10^7$  ha, per unit area yield from 1.89 t/ha to 2.69 t/ha, and the total output from  $4.86 \times 10^7$  t to

$8.68 \times 10^7$  t, the average annual increasing rates were 2.9%, 4.5%, and 7.5 %, respectively.

**The second (1958-1961)-----Quick falling stage**

In this stage, China rice development returned to the original level of 12 years ago, the rice sown area, per unit area yield, and the total output decreased annually by 5.0%, 6.6%, and 11.3%, respectively.

**The third (1961-1984)-----Quick increasing stage**

This is a vigorous period of China rice development, the increasing rate was relatively high, and it played an important role in China's food production. There were two main reasons for the quick development: one was the using of modern varieties with different maturities and dwarf characters from the mid-1960s to early-1970s; the other was the utilization of rice heterosis from the early-1970s to early-1980s. In the whole period, the annual increasing rates for sown area, per unit area yield, and total output were 1.0%, 4.3%, and 5.4%, respectively.

**The forth (1985-1994)----- Stagnating stage**

This stage could be divided into 3 processes: the first was 1984-1988, the sown area and total output decreased with an annual rate of 0.9%-1.0%, per unit area yield stagnated at 5.35 t/ha; the second was 1989-1992, per unit area yield and total output increased with annual rates of 0.2% and 1.2%, respectively, while the sown area decreased continuously; the third was 1992-1994, the sown area, per unit area yield, and the total output decreased  $1.28 \times 10^6$  ha, 0.09 t/ha, and  $7.67 \times 10^5$  t, respectively, the annual decreasing rates were 3.0%, 0.7%, and 4.4%, respectively. So, the whole phase presented the process of decreasing—increasing---decreasing.

**The fifth (1995—1997) -----Resume increasing stage**

In this stage, China rice production resumed increasing, the annual increasing rates for sown area and the total output were 1.7% and 4.5%, respectively. The total output was more than  $2.00 \times 10^8$  t in 1997, the highest record in history.

**The sixth (1998-- )-----Structure adjusting stage**

With the adjustment of China's crops planting structure, rice sown area decreased by a big margin in recent years, the annual decreasing rate for sown area was 2.6%, for

total output was 2.5%, only the per unit area yield kept the annual increasing rate of 0.12% due to the sci-tech improvements.

**Table 1. Year of another ton of per unit area yield and years demanded.**

Year	Per unit area yield (t/ha)	Year demanded
1949	1.89	
1950	2.11	1
1966	3.53	16
1979	4.25	13
1983	5.09	4
1995	6.02	12
1998	6.37	3

**Table 2. Year of another ten million ton of the total output in China's rice production.**

Year	Sown area ( $\times 10^7$ ha)	Per unit area yield (t/ha)	Total output ( $\times 10^7$ t)	Year	Sown area ( $\times 10^7$ ha)	Per unit area yield (t/ha)	Total output ( $\times 10^7$ t)
1949	2.57	1.89	4.86	1979	3.39	4.25	14.38
1951	2.69	2.24	6.09	1982	3.31	4.88	16.12
1953	2.83	2.51	7.13	1984	3.32	5.37	17.83
1956	3.33	2.48	8.25	1988	3.20	5.36	17.12
1966	3.05	3.53	9.54	1990	3.31	5.81	19.18
1970	3.22	3.40	10.96	1997	3.18	6.32	20.07
1971	3.49	3.30	11.52	2000	3.05	6.24	19.04
1973	3.51	3.47	12.17	2001	2.86	6.35	18.15
1978	3.44	3.98	13.69				

**Summary:**

- a. The largest sown area was  $3.62 \times 10^7$  ha in 1976, accounted for 30.0% of the total food crops'; the total output was  $1.29 \times 10^8$  t in the year, accounted for 43.9% of the total food crops'.
- b. The largest proportion of rice output in food crops' was 49.6% in 1981. The total rice output was  $1.44 \times 10^8$  t in that year.
- c. The largest rice output was in 1997, with a total of  $2.01 \times 10^8$  t, accounted for 40.6% of the total food output.

### 3. China rice production status.

#### 1) Changes of sown area of rice and food crops

Since the mid-late period of 90s, the 20<sup>th</sup> century, China has stepped into the agricultural structure adjusting stage. The food crops' sown area decreased accompanying with the increase of economics' (Table 3).

**Table 3. Sown area and total output of rice and food crops during 1997-2000.**

Year	Rice		Food crops		Proportion (%)	
	Sown area	Yield	Sown area	Yield	Sown area	Yield
	( $\times 10^7$ ha)	( $\times 10^8$ t)	( $\times 10^8$ ha)	( $\times 10^8$ t)	(%)	(%)
1997	3.18	2.01	1.13	4.94	28.1	40.6
1998	3.12	1.99	1.14	5.12	27.4	38.8
1999	3.13	1.99	1.13	5.08	27.7	39.0
2000	3.00	1.88	1.09	4.62	27.6	40.7

#### 2) Changes of rice sown area and yields for early, middle, and late rice

During 1997-2000, the sown area of early, middle, and late rice changed. For early rice, the sown area decreased from  $8.16 \times 10^6$  ha to  $6.67 \times 10^6$  ha, the decreasing rate was 18.3%; for middle rice, that was from  $1.47 \times 10^7$  ha to  $1.56 \times 10^7$  ha, the increasing rate was 6.2%; for late rice, that was from  $8.59 \times 10^6$  ha to  $7.57 \times 10^6$  ha, the decreasing rate was 15.4% (Table 4).

**Table 4. Sown area and total output of early, middle, and late rice during 1997-2000.**

Year	Earlyrice				Middlerice				Laternice			
	Sown area	Increasing rate(%)	Yield ( $\times 10^7$ )	Increasing rate(%)	Sown area	Increasing rate(%)	Yield ( $\times 10^8$ )	Increasing rate(%)	Sown area	Increasing rate(%)	Yield ( $\times 10^7$ )	Increasing rate(%)
	( $\times 10^6$ )				( $\times 10^7$ )				( $\times 10^6$ )			
1997	8.16	-1.5	4.58	+4.1	1.47	+4.5	1.05	+5.7	8.59	-1.6	4.99	-3.5
1998	7.81	-4.3	4.05	-11.5	1.50	+2.1	1.10	+4.3	8.43	-5.7	4.86	-2.6
1999	7.57	-3.1	4.10	+1.1	1.53	+2.3	1.10	-0.15	8.41	-0.4	4.81	-1.05
2000	6.67	-11.1	3.75	-8.4	1.56	+1.7	1.10	-0.3	7.57	-10.0	4.13	-14.1

### **3) Changes of rice regions during 1997-2000**

During 1997-2000, changes of rice regions had the following characteristics:

The first was the sown area of Center China rice region decreased, mainly in the Changjiang Delta Region and East-south Coastal Region, especially in Zhejiang, Hubei, and Gungdong provinces. The second was the sown area of East-north single cropping rice region and West-south single cropping rice region increased quickly, mainly in Helongjiang, Jilin, Guizhou, and Yunnan provinces.

## **Part II**

### **II. China Rice Consumption**

#### **1. Rice uses**

In China, rice usually has the following uses:

- 1) edible rice (provision).
- 2) feed: including be used in feed process and in poultry farm, etc.
- 3) industry processing: be used as materials in food processing and medical industries, etc.
- 4) seed
- 5) storage and turnover rice: be used to adjust the balance in food offering and selling.
- 6) export

#### **2. Consumption amount and proportion of different uses**

The total rice consumption was  $1.35 \times 10^8$  t in 1998,  $1.36 \times 10^8$  t both in 1999 and 2000, and  $1.38 \times 10^8$  t in 2001. It was more than self-sufficient in grain in 1998 and 1999, while in 2000 and 2001, the insufficiency were  $4.00 \times 10^6$  t and  $1.00 \times 10^7$  t, respectively, but the insufficiency was enough to be balanced by the former storages. In general, China rice's supplying was more than its demanding. Take 2001 as an example; the rice consumption amount and proportion were as follows:

- 1) **Rice used as provision** The edible consumption was  $1.18 \times 10^8$  t, accounted for 85.2% of the total output.

2) **Rice used as feed** The amount required was about  $1.20 \times 10^7$  t, about 5.8% of the total output.

3) **Rice used in industry** The amount was  $3.00 \times 10^6$  t, about 1.3% of the total output. Rice plays an important role in food industry and has large potential in making food products, such as in making monosodium glutamate, yellow rice, ground rice, rice cake, and beer etc.

4) **Rice used in export** The export amount was about 1.5%-2.0% of the total rice consumption. In recent years, it was  $1.86 \times 10^6$  t, 1.2% of the total rice output.

5) **Rice used as seed** The amount required was  $1.56 \times 10^6$  t, accounted for 1.2% of the total output.

In general, with the population's increasing, the proportion of provision will have a little increase; rice used as feed and in industry will increase relatively fast; while rice used as seed and in consumption will keep stable.

### 3. By-product utilization

1) **Grain shell** It could be used as culture medium such as produce mushroom or to make fast food box.

2) **Broken rice** It could be utilized to making ground rice, New Year cake, maltose, and starch products.

3) **Bran and middlings** Bran food developed in China had rice bran protein and rice bran fiber, etc.

## Part III

### III China rice trade

#### 1. China rice trade

From 1979 to 2001, China rice was all net-export except for 1989, 1995, and 1996.

And now, the rice export amount is about  $2.0 \times 10^6$  t and import is  $2.0 \times 10^5$  t (Table 5).



**Table 5. China rice import and export during 1996-2002**

Year	Export ( $\times 10^5$ t)	Import ( $\times 10^5$ t)	Net-export ( $\times 10^5$ t)	Net-import ( $\times 10^5$ t)
1996	2.64	7.61		4.97
1997	9.38	3.26	6.11	
1998	37.45	2.44	35.01	
1999	27.03	1.68	25.35	
2000	29.48	2.38	27.09	
2001	18.60	2.00	16.60	
Jan–May 2002	5.00	0.63	4.37	

**Table 6. The five top countries of importing China rice during 1999-2002.**

1999		2000		Jan–May 2001		Jan–May 2002	
Country	Export amount ( $\times 10^5$ t)	Country	Export amount ( $\times 10^5$ t)	Country	Export amount ( $\times 10^5$ t)	Country	Export amount ( $\times 10^5$ t)
Indonesia	7.34	The Ivory Coast	8.99	The Ivory Coast	4.00	The Ivory Coast	1.73
The Ivory Coast	4.21	Indonesia	5.41	Cuba	0.74	Japan	0.71
Cuba	2.27	Cuba	2.25	Iraq	0.61	Cuba	0.63
The Phillipines	1.79	Russia	2.14	Japan	0.58	Russia	0.59
Russia	1.61	Iraq	1.69	Russia	0.26	Nigeria	0.32

From the table 6, we could conclude that:

- a. In the 20<sup>th</sup> century, Indonesia, the Ivory Coast, Cuba, and Russia used to be the China rice exporting countries. In the 21<sup>st</sup> century, the Ivory Coast becomes the

main exporting country, accounted for one-third of the total export, and the amount to Indonesia decrease rapidly.

- b. There was a big portion of rice exporting to Africa in China rice trade. In 2000, the exporting amount was  $1.18 \times 10^6$  t, accounted for 39.9% of the total.
- c. The rice import amount of neighboring countries in East-south Asia is increasing. For example, Japan imported 22.0% more in the first 5 months of 2002 than that in the same period of 2001. But there was a fluctuation in south Asia.

## **2.China rice product trade after entering WTO**

During Jan to May 2002, China imported rice  $6.28 \times 10^4$  t, the importing amount and value were both 98.0% of the total rice products importing. In the meantime, China exported rice  $5.00 \times 10^4$  t, which was 98.5% of the total rice product, its exporting value was 94.3% of the total. (Table 7)

### **1) Countries composition of China's rice import in 2002**

The rice importing in the first 5 months of 2002 were mainly from Thailand, Taiwan, Laos, Burma, and Hongkong. Among them, Thailand and Taiwan were the main regions, accounted for 91.4% and 8.0% of the total, respectively (Table 8).

**Table 7. China rice product trade during Jan to May 2002.**

Item	Year	Importing amount (t)	Importing value (× 10 <sup>4</sup> \$)	Exporting amount (t)	Exporting value (× 10 <sup>4</sup> \$)	Net-exporting value (× 10 <sup>4</sup> \$)
	Jan –May					
	2001	109 832	4 639	709 904	12 151	7 512
Rice production	Jan—May					
	2002	63 972	1 988	504 989	9 983	7 995
	Increasing rate(%)	-42	-57	-29	-18	6
	Jan –May					
	2001	176	9	1 948	180	171
Rice grain	Jan—May					
	2002	43	2	3 047	331	329
	Increasing rate(%)	-76	-76	56	84	93
	Jan –May					
	2001	101 680	4 363	703 747	11 814	7 451
Rice	Jan—May					
	2002	62 786	1 948	497 400	9 484	7 536
	Increasing rate(%)	-38	-55	-29	-20	1
	Jan –May					
	2001	7 976	266	4 209	157	-109
Rice flour	Jan—May					
	2002	1 143	38	4 542	168	130
	Increasing rate(%)	-86	-86	8	7	-219

**Table 8. The five top countries (regions) imported during Jan to May 2002.**

Country (Region)	Importing amount (t)	Importing value ( $\times 10^4$ \$)	Position	Importing portion (%)
<b>Total</b>	<b>62 786.2</b>	<b>1 947.7</b>	—	<b>100.00%</b>
Thailand	57 414.7	1 876.7	1	91.44%
Taiwan	5 000.0	60.0	2	7.96%
Laos	200.0	5.8	3	0.32%
Burma	150.0	4.5	4	0.24%
Hongkong	21.5	0.6	5	0.03%

**2) Country composition of China's rice export in 2002.****Table 9. The ten top countries of China's rice export during Jan to May 2002.**

Country	Exporting amount ( $\times 10^3$ t)	Exporting value ( $\times 10^6$ \$)	Position	Exporting portion (%)
<b>Total</b>	<b>497.40</b>	<b>94.83</b>	—	<b>100.0%</b>
The Ivory Coast	172.74	24.12	1	34.7%
Japan	70.74	21.21	2	14.2%
Cuba	63.30	10.90	3	12.7%
Russia	58.70	13.16	4	11.8%
Nigeria	32.04	4.39	5	6.4%
Libya	31.50	6.94	6	6.3%
PRK	14.00	2.84	7	2.81%
Malaysia	13.32	2.25	8	2.7%
Madagascar	11.60	1.57	9	2.3%
Bulgaria	7.00	1.50	10	1.4%

Among the ten top countries of China rice export, one was more than  $1.0 \times 10^5$  t, five were  $3.0 - 10.0 \times 10^4$  t, and three were  $1.0 - 3.0 \times 10^4$  t, and the other one was less than  $1.0 \times 10^4$  t. The Ivory Coast, Japan, Cuba, and Russia were the main exporting countries, accounted for 73.5% of the total of China's rice export (Table 9).

## **Part IV**

### **IV. Effects of entering WTO on China rice production and trade**

#### **1. The effects of entering WTO on rice production are limited**

There are some effects of entering WTO on China's food production, but that is little for rice, because it had the following characteristics:

##### **Strong product ability and high self-sufficient rate**

In recent years, the demand of rice for provisions is about  $1.19 \times 10^8$  t. Although the total yield decreased due to the agricultural structure-adjustment and natural disaster, the total output is still more than  $1.26 \times 10^8$  t, that's more than self-sufficient in grain.

##### **Little international trade volume**

The total volume of rice trade in the world is  $2.2-2.5 \times 10^7$  t, accounted for about 4.0% of the total global rice output, while that is 17.0% and 12.0% for wheat and maize, respectively. So, the effect of the foreign rice market on the domestic will not be very strong.

##### **Low rate of quota/total output**

In 2002, the rice importing quota is  $2.66 \times 10^6$  t, which is only 2.2% of the total consumption of the year. In 2004, the quota will be  $5.30 \times 10^6$  t, accounted for 4.4% of the total rice consumption. The rate is even within the annual fluctuation of China rice output. So, the import quota will not affect thoroughly on rice production.

#### **2. There are pressures of entering WTO on China rice production and trade**

There are three pressures in China's rice production and trade.

**The first is poor quality** Compared with the sell well rice in the international market, China rice's quality is poor. Thailand rice, especially for Thailand fragrant rice, is good in quality, slim in grain shape, low in chalkiness, middle in amylose content, middle-gel consistence, and fragrant in smell. It is very suitable to South China, Hongkong, and Macow people's taste. More than 90.0% of imported rice is from Thailand, and it's mainly sold to Guangdong, Hainan, Fujian, and Shanghai provinces and municipality. USA, the second exporting country, its good quality rice had high milled-rice rate, low chalkiness, and good grain shape, its amylose content is 18.0%-20.0%. The rice is suitable to East China, South China, and North China peoples' taste. The potential is large though only several hundreds ton are imported now. Moreover, japonica rice from Australia also has potential market.

**The second is high price** Since the latter half of 2000, the rice price in domestic market had gone up, while that in international market had fallen down. Rice price in the domestic was higher than that in international market (Table 10).

**Table 10. Comparison of rice prices in domestic and international markets. (RMB Yuan /t)\*.**

Time	International price(I)	Domestic price (D)	Higher(%) (D-I)/I×100 %
Jan 2000	1734	1579	-7.3
Nov 2000	1347	1468	9.0
Jan 2001	1350	1528	13.2
Nov 2001	1285	1546	20.0
Jun 2002	1550	1800	16.1

\*The international price is the free on board (FOB) of 25% Bangkok broken rice and has been converted into RMB. The domestic price is the average of 36 cities' of late-indica standard I rice.

**The third is from the foodstuff circulating system** The agreement on Sino-USA

defined that half of the import quota will distribute to non-state trade enterprises, and during the three-year transitional period, China will be permitted foreign enterprises to participate the food retail. The entering of foreign high quality rice and advanced retail system will lash China food market. Non-state enterprises have the power to engage in foreign trade, which will break the state-enterprises monopolization, and influence the current foodstuff circulating system. Additional, the state monopoly for purchase and retail for sale and trade system of domestic being disjointed foreign should also be reformed.

## **Part V**

### **V Development strategy of China rice**

#### **1. Keep the rice stable development**

According to the government plan, the China's population will be controlled within  $1.33 \times 10^9$  in 2005 and  $1.40 \times 10^9$  in 2015. Based on the food demand of 400 kg/person, the total food demand amount will be  $5.30 \times 10^8$  t and  $5.60 \times 10^8$  t in 2005 and 2015, respectively. The rice portion is 40.0% in the food output, so, the rice expected demand is  $2.13\text{-}2.24 \times 10^8$  t, i.e. increased by 11.9% and 17.6% in 2005 and 2015, respectively on the base of 2000's. To meet the target, we should stabilize the sown area and improve the per unit area yield.

The rice sown area was  $3.07 \times 10^7$  ha in 2000, and we should strive to stabilize the area of  $3.00 \times 10^7$  ha in the future. Enhancing rice total output mainly depend on per unit area yield's. On the base of 6 240 kg/ha in 2000, the per unit area yield should be enhanced to 6 645 kg/ha and 7 455 kg/ha in 2005 and 2015, increased by 6.5% and 19.5%, respectively.

#### **2. Adjust rice planting structure**

With the improving of people's living level, more high quality rice is needed. So, qualities for edible and other uses should be improved simultaneously to make

rice varieties specialization and qualification. Table 11 shows the expected demands of different uses rice. Results show that the provision will have a little increase, while rice used as feed, in industry, and in export will increase, and rice used as seeds will almost keep unchanged.

**Table 11. Expected demands of rice in 2005 and 2015 ( $\times 10^8$  t).**

Demand	2000	2005	2015
Provision	1.72	1.73	1.76
Feed	0.12	0.13	0.18
Industry	0.08	0.10	0.16
Seed	0.02	0.02	0.02
Export	0.035	0.05	0.12
Consumption	0.095	0.10	0.10
Total	2.07	2.13	2.34

Based on the characteristics of regional resources, market conditions, and comparison advantages among regions, deep and wide agricultural structure adjustment are in progress. Beginning with the superiority product, superiority regions and bands are being developed to improve agricultural product competitive ability and to form reasonable agricultural region division. As to rice, product bases for commercial edible rice are mainly in Liaoning, Jilin, and Heilongjiang provinces, East-north China and Hunan, Hubei, Jiangxi, and Anhui provinces, south of China. Bases for rice used as feed and in industry are mainly in Hunan, Hubei, and Jiangxi provinces. For exporting rice, its japonica bases are mainly in Liaoning, Jilin, Helongjiang, and Tianjin, and its indica bases are mainly in Jiangxi, Hubei, and Hunan provinces.

In north rice region, the commercial rice bases are mainly in Liaoning, Jilin, and Helongjiang provinces, which provided the edible japonica for Beijing, Tianjin, Shanghai, Jiangsu, and Zhejiang municipalities and provinces and exporting japonica.



In south rice region, Guangxi, Sichuan, and Yunnan are almost self-sufficient; Jiangsu is changing to self-sufficient; Shanghai, Zhejiang, Fujian, Guangdong, and Hainan provinces should depend on the allocation; Guizhou and Chongqing are also need partial allocation. So, the edible rice mainly depends on the middle-late rice from Hunan, Jiangxi, and Anhui province, rice used in industry and as feed are mainly early or middle-rice produced by Hunan, Hubei, and Jiangxi provinces, and the exporting rice are from Jiangxi, Hubei, and Hunan provinces.

### **3. Strengthen rice sci-tech improvement**

#### **1) Enhance rice breeding to make varieties high-quality, specialization, diversity**

Using biological, radical, and traditional techniques to screen special rice combinations for different uses (such as middle-late indica and japonica for edible, early indica and partial middle indica for feed, and glutinous rice for making-wine), especially to improve the hybrid rice quality.

In the meantime, we should breed super-hybrid rice with higher per unit area yield to improve rice comprehensive product ability. As super –hybrid rice used to be planted as middle rice or single-season late rice and mainly used as provision, rice varieties (combinations) with good quality and more than 10% yield potential need to be screened, and integrated with a series of cultivation techniques to obtain a unit yield of 12.0 t /ha in 6.67 ha area and 9.0-10.5 t/ha in a large area.

#### **2) Study on rice farming system and rice mechanism, intensive, and model cultivation techniques to develop high–efficiency agriculture**

Studying on new farming system, which not only can improve rice yield and quality, but also can adapt to rotation and inter-planting with economic crops and develop aquaculture in paddy field. For example, planting vegetables in winter-spring and single late rice in summer-autumn, the income can reach 150 000-225 000 RMB Yuan/ha, the rice yield can reach 7 500 kg/ha. Raising fishes and ducks in paddy not only can increase income, but also can improve the ecological condition.

Studying on saving-cost techniques, such as whole-course mechanism product technique, high–output & low-input intensive, model cultivation techniques, and

biological diversity- utilization techniques, etc.

### **3) Study on rice grain and by-product deep-processing techniques**

Study and develop different kinds of concerted rice, add rice, nutrient complete rice, convenient rice products, and rice-drink, etc. Through rice deep-development, produce improved amylose, resistant amylose, micro-hole amylose, new-fat substitute, and low-sensitive protein etc; develop rice bran and grain hull to produce food and chemical product.

### **4) Study on elite germplasm and functional genomics of rice important traits**

Identify important yield traits, quality traits, photosynthetic characteristics, and root morphology traits, etc. Based on the gene mapping constructed, analyze genetic diversity by using DNA molecular marker to obtain genetic information of rice important functional genes and further to clone some of them.

## **4. Advance rural management-system reform**

**Reform land system** Make the proprietary rights of the collective land, the usufruct rights of the contract land, and the operation rights of the rent land separate. Gather the rent land to able rice farmers to enlarge rice scale and to enhance rice farmer's economic benefits.

**Reform food circulating system** Improve food market system and price forming system, resolve the contradiction between agricultural product structure and market supply-demand structure, enlarge the government's storage and turnover amount and strengthen the country's resistant ability to food risk.

**Strengthen rice industrialization management** Popularize different kinds of cooperated economic organizations, such as rice farmers' mutual aid community and cooperation between rice farmers and enterprises. Support leading rice process enterprises. Encourage industrial or commercial enterprises to engage in rice producing, processing, selling, and exporting. Harmonize rice production, industrial process, and trade.