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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 3.14×10^7ha, the total output was 1.98×10^8t, accounted for 27.7% and 40.0% of the food crops, respectively. The average per unit area yield was 6303kg/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 1.52×10^8ha and 5.87×10^8t, 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 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 doubleseason. 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

* *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.*

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 2.39×10^7t, 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 Phillipine's and Japan's, the 8th and 9th rice product countries.

2. China rice production & development phases

During 1949-1997, rice-growing area had increased by 23.6%, from the original 2.57×10^7ha to 3.18×10^7ha. Per unit area yield of rice had been raised by 234.3%, from 1.89t/ha to 6.32t/ha. Meanwhile, the total output had risen from 4.86×10^8t to 2.00×10^8t, 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):

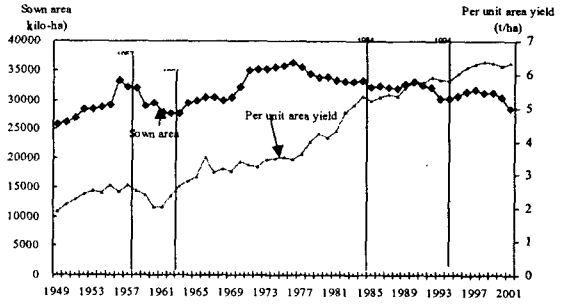

Diagram of the development in China rice production.

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 2.57×10^7ha to 3.32×10^7ha, per unit area yield from 1.89 t/ha to 2.69 t/ha, and the total output from 4.86×10^7t to 8.68×10^7t, 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 $\times10^6$ha, 0.09t/ha, and 7.67×10^5t, 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 (19951997) -------Resume increasing stage

In this stage, Chin'a 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 2.00×10^8t 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

Summary:

a. The largest sown area was 3.62×10^7ha in 1976, accounted for 30.0% of the total food crop's; the total output was 1.29×10^8t in the year, accounted

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				

for 43.9% of the total food crop's.

b. The largest proportion of rice output in food crop's was 49.6% in 1981. The total rice output was 1.44×10^8t in that year.

c. The largest rice output was in 1997, with a total of 2.01×10^8t, 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 20th century, China has stepped into the agricultural structure adjusting stage. The food crop's sown area decreased accompanying with the increase of economic's (Table 3).

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 8.16×10^6ha to 6.67×10^6ha, the decreasing rate was 18.3%; for middle rice, that was from 1.47×10^7ha to 1.56×10^7ha, the increasing rate was 6.2%; for late rice, that was from 8.59×10^6ha to 7.57×10^6ha, the decreasing rate was 15.4% (Table 4).

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

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

Year	Rice		Food crops		Proportion(%)	
	Sown area ($\times 10^7$ha)	Yield ($\times 10^8$t)	Sown area ($\times 10^8$ha)	Yield ($\times 10^8$t)	Sown area (%)	Yield (%)
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

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

Year	Early rice				Middle rice				Late rice			
	Sown area ($\times 10^6$)	Increasing rate (%)	Yield ($\times 10^7$)	Increasing rate (%)	Sown area ($\times 10^7$)	Increasing rate (%)	Yield ($\times 10^8$t)	Increasing rate (%)	Sown area ($\times 10^6$)	Increasing rate (%)	Yield ($\times 10^7$t)	Increasing rate (%)
1997	8.16	-1.5	4.58	+4.1	1.47	+4.5	1.05	+5.7	8.95	-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

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 1.35×10^8t in 1998, 1.36×10^8t both in 1999 and 2000, and 1.38×10^8t in 2001. It was more than self-sufficient in grain in 1998 and 1999, while in 2000 and 2001, the insufficiency were 4.00×10^6t and 1.00×10^7t, 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 1.18×10^8t, accounted for 85.2% of the total output.
2) Rice used as feed The amount required was about 1.20×10^7t, about 5.8% of the total output. such as in making monosodium glutamate, yellow rice, ground rice, rice cake, and beer etc.
3) Rice used in industry The amount was 3.00×10^6t, about 1.3% of the total output. Rice plays an important role in food industry and has large potential in making food products,
4) Rice used in export The export amount was about 1.5%-2.0% of the total rice consumption. In recent years, it was 1.86×10^6t, 1.2% of the total rice output.
5) Rice used as seed The amount required was 1.56×10^6t, 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 2.0×10^6t and import is 2.0×10^5t (Table 5).

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

Year	Export ($\times10^5$t)	Import ($\times10^5$t)	Net-export ($\times10^5$t)	Net-import ($\times10^5$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	
JanMay 2002	5.00	0.63	4.37	

From the table 6, we could conclude that:

a. In the 20th century, Indonesia, the Ivory Coast, Cuba, and Russia used to be the China rice exporting countries. In the 21st 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 1.18×10^6t, 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.

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

1999		2000		JanMay 2001		JanMay 2002	
Country	Export amount ($\times10^5$t)	Country	Export amount ($\times10^5$t)	Country	Export amount ($\times10^5$t)	Country	Export amount ($\times10^5$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

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

Item	Year	Importing amount (t)	Importing value ($\times 10^4$$)	Exporting amount (t)	Exporting value ($\times 10^4$$)	Net-exporting value ($\times 10^4$$)
Rice production	Jan May 2001	109832	4639	709904	12151	7512
	JanMay 2002	63972	1988	504989	9983	7995
	Increasing rate(%)	-42	-57	-29	-18	6
Rice grain	Jan May 2001	176	9	1 948	180	171
	JanMay 2002	43	2	3 047	331	329
	Increasing rate(%)	-76	-76	56	84	93
Rice	Jan May 2001	101680	4363	703747	11814	7451
	JanMay 2002	62786	1948	497400	9484	7536
	Increasing rate(%)	-38	-55	-29	-20	1
Rice flour	Jan May 2001	7976	266	4209	157	-109
	JanMay 2002	1143	38	4542	168	130
	Increasing rate(%)	-86	-86	8	7	-219

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

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 (%)
Total	62786.2	1947.7		100.00%
Thailand	57414.7	1876.7	1	91.44%
Taiwan	5000.0	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%

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).

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 (%)
Total	497.40	94.83		100.0%
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 1.0×10^5t, five were $3.0\text{-}10.0\times10^4$t, and three were $1.0\text{-}3.0\times10^4$t, and the other one was less than 1.0×10^4t. 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 1.19×10^8t. Although the total yield decreased due to the agricultural structure-adjustment and natural disaster, the total output is still more than 1.26×10^8t, that's more than self-sufficient in grain.

• Little international trade volume

The total volume of rice trade in the world is $2.2\text{-}2.5\times10^7$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 2.66×10^6t, which is only 2.2% of the total consumption of the year. In 2004, the quota will be 5.30×10^6t, 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 people's 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)/I100 %
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 citie's 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 1.33×10^9 in 2005 and 1.40×10^9 in 2015. Based on the food demand of 400 kg/person, the total food demand amount will be 5.30×10^8t and 5.60×10^8t in 2005 and 2015, respectively. The rice portion is 40.0% in the food output, so, the rice expected demand is 2.13-2.24$\times10^8$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 3.07×10^7ha in 2000, and we should strive to stabilize the area of 3.00×10^7ha in the future. Enhancing rice total output mainly depend on per unit area yield's. On the base of 6240 kg/ha in 2000, the per unit area yield should be enhanced to 6645 kg/ha and 7455 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 qualitification. 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

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

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

export will increase, and rice used as seeds will almost keep unchanged.

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 highefficiency 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 150000-225000 RMB Yuan/ha, the rice yield can reach 7500 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, highoutput & 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 genomy 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 farmer's 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.

중국의 쌀 생산, 유통 및 이용 현황

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요 약

쌀은 중국에서 중요한 식량작물로 제9차 5개년 계획(1966-2000년) 동안 재배면적 31.4백만 ha이며 생산량은 단위 ha당 6,303kg으로 198백만톤에 이르며 이는 재배면적으로는 식량작물의 27.7%, 그리고 생산량으로는 전체식량작물의 40%를 각각 점하고 있다. 이러한 재배면적과 생산량은 각각 세계전체 면적과 생산량의 20.7%와 33.7%를 차지하는 많은 량이다. 중국의 남부지역은 전지역의 73.5%가 이모작으로 재배되며 주품종은 Indica이다. 중국의 중부 지역은 이모작과 일모작의 재배형태가 2:3으로 공존하고 있으며 양쯔강 이북은 주로 일모작의 형태이다. 중국의 쌀 재배면적은 1960년대 이후 점차 증가하다가 1980년대 후반부터 정체되었다가 최근 90년대 말에 이르러서는 재배면적의 감소가 가속화되고 있으나 단보당 생산량은 꾸준히 증가하고 있다. 2001년 중국의 쌀 소비량은 138백만톤으로 이의 85.2%는 식량용으로, 5.8%는사료용으로, 1.3%는 가공용, 1.5-2.0%는 수출용으로 그리고 1.2%는 종자용으로 소비되었다.

WTO체제에 들어서도 중국의 쌀 생산에는 크게 영향을 받지않을 것으로 여겨지는데 그 이유로는 충분한 생산능력과 자급률, 쌀의 낮은(4%) 국제교역 비율, 총생산량에 대한 낮은 쿼터비율 등을 들 수 있다. 그러나 WTO체제 가입에 따른 압력 또한 존재하는 것이 사실인데 그것은 낮은 품질, 국제가격보다 높은 국내가격 등을 들 수 있다.

향후 중국 쌀의 발전적 전략들로는 쌀의 안정적 발전을 지속하는 일, 쌀 재배구조 조정과 함께 높은 미질을 가지는 품종육종, 기계화를 비롯한 경작기술의 발달, 쌀과 부산물 가공기술의 개발연구, 특정 기능을 함유하는 유전공학적 기술의 적용, 토지와 도시화 그리고 식량순환에 시스템의 개혁 등 과학기술을 고양하는 일 등을 들 수 있다.