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# THE CURRENT SITUATION AND PROSPECT OF CHINA'S PHOSPHATE FERTILIZER AND COMPOUND FERTILIZER MARKET

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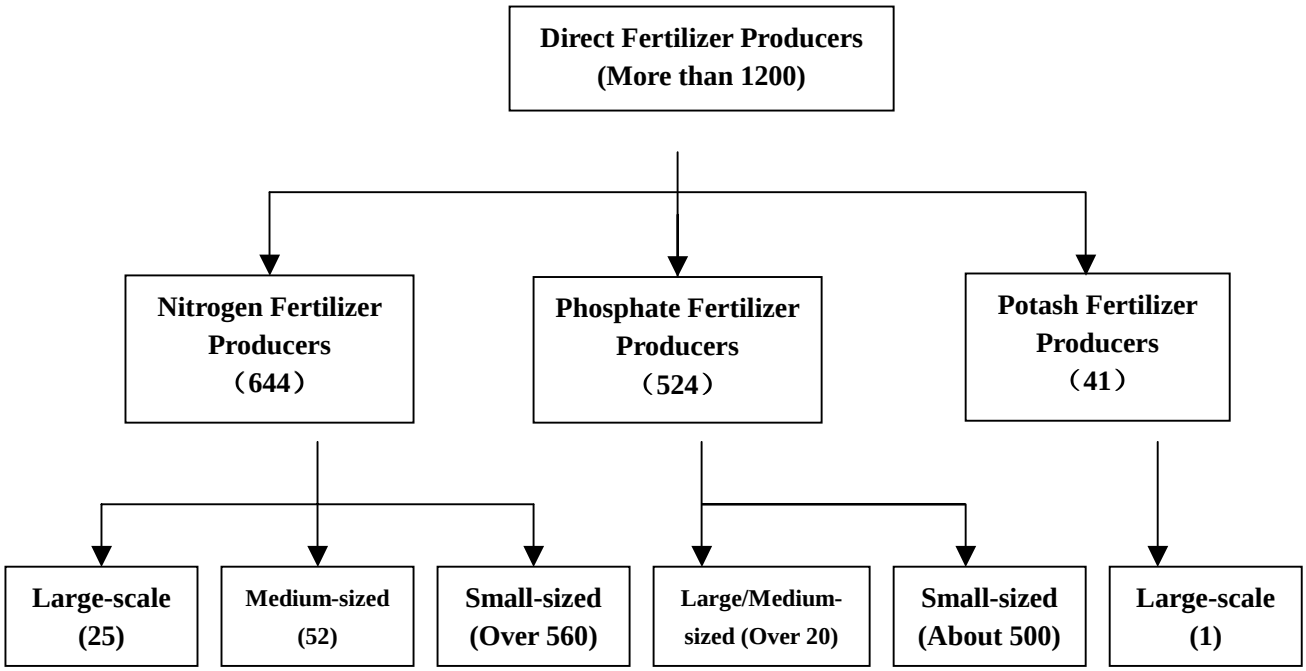
China's high-analysis phosphate and compound fertilizer industry developed very quickly in recent years. The production capacities developed fast ; output increased. Many new projects especially high-analysis NPK started. The proportion of the output of high-analysis phosphate and compound fertilizer in China's total phosphate and compound fertilizer output increased rapidly. This article gives some of our views toward China's phosphate and compound fertilizer production and market demand. What needs to be clarified is that the phosphate and compound fertilizer mentioned in this article mainly refers to MAP, DAP, TSP, NP and chemically produced NPK.

## The General Situation of China's Fertilizer Industry

After 50 years of development, the technology in China's fertilizer industry has reached a certain level. The product diversity has been improved. The structure has turned to be reasonable. The production capacity has much increased. By the end of 2001, there were around 1200 fertilizer enterprises in China, among which there were 644 nitrogen fertilizer enterprises, 524 phosphate fertilizer enterprises and 41 potash fertilizer enterprises. (See Figure 1).

**Figure 1 The Structure of China's Fertilizer Industry**



In 2001, China's fertilizer output reached 33.965 Mt, up 5.9% over 2000, among which the nitrogen fertilizer, the phosphate fertilizer and the potash fertilizer outputs reached 25.267 Mt, 7.394 Mt and 1.304 Mt, making up 74.39%, 21.77% and 3.84% of the total and increasing by 4.75%, 8.72% and 13.55% against 2000 respectively. (See Figure 2).

**Figure 2 The Structure of China's Fertilizer Production in 2001**

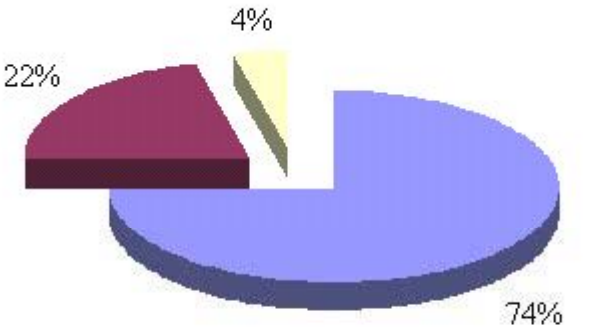
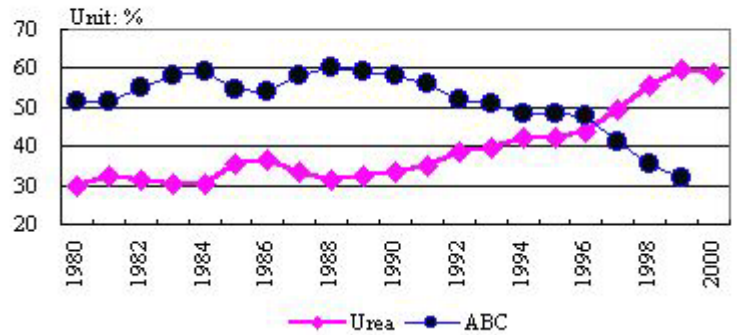



**Figure 3 Proportions of Urea and ABC Outputs in Total Nitrogen Fertilizer Output in China**




In 2001, on nitrogen fertilizer, the urea output reached 14.548 Mt, accounting for 58% of China's total nitrogen fertilizer output. The proportion of AN, AS and ammonium chloride outputs in China's total nitrogen fertilizer production remained stable.

However, facing intensive competition and further development of restructuring and product mix adjustment, some ABC producers will face bankruptcy. Therefore, the proportion of ABC output in total nitrogen fertilizer production has continued to decline year-on-year (see Figure 3).

Meanwhile, the production capacities and outputs of the high-analysis phosphate and compound fertilizers have been growing steadily in China. As a result, ammonia consumption has been increasing accordingly. For example, ammonia consumption for the production of DAP/MAP and chemically-produced compound fertilizers reached nearly 1.50 Mt, and accounted for 6% of the total ammonia output.

The nitrogen proportion of fertilizers in China is shown in Table 1 and Figure 4.

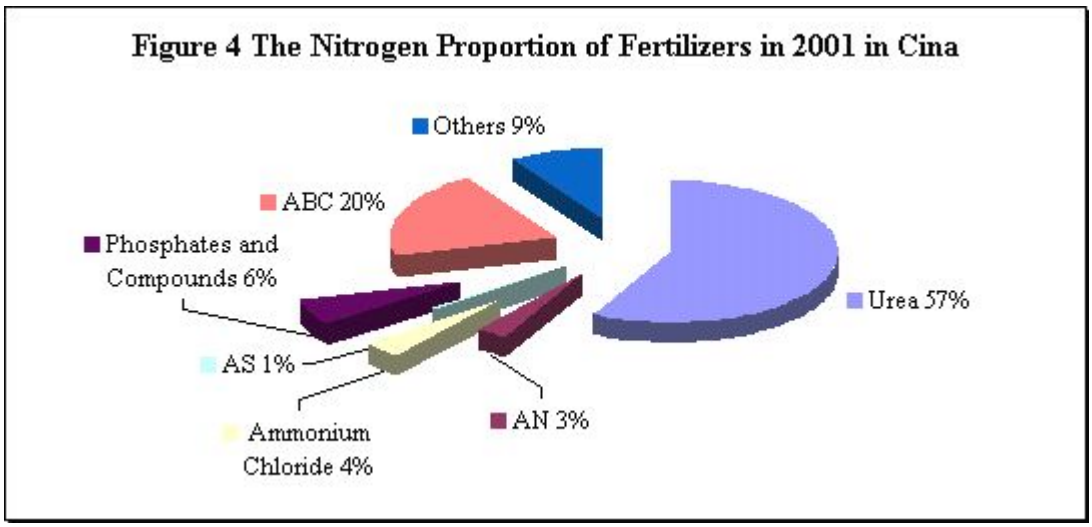


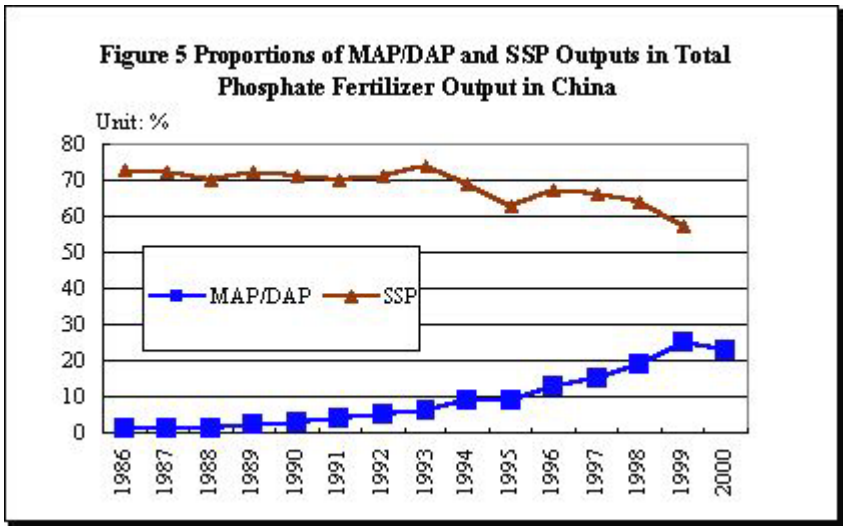

**Table 1 The Nitrogen Proportion of Fertilizers in 2001 in China**

| | Nitrogen (1000t) | Proportion (%) |
|---|---|---|
| **Nitrogen in Fertilizers** | 25267 | 100 |
| Urea | 14548 | 57.76 |
| AN | 800 | 3.17 |
| Ammonium Chloride | 925 | 3.66 |
| AS | 136.5 | 0.54 |
| ABC | 5100 | 20.18 |
| Phosphates and Compounds | 1456.4 | 5.76 |
| DAP | 383.4 | 1.52 |
| MAP | 219 | 0.87 |
| NPK | 630 | 2.49 |
| NP | 224 | 0.89 |
| Others | 2300 | 9.10 |

In 2001, Chinese phosphate fertilizer output was 7.394 Mt, among which the high-analysis phosphate and compound fertilizers output was 2.958 Mt, up 11.92% over 2000 and accounting for 40% of Chinese total phosphate fertilizer production ; the low-analysis phosphate fertilizers output was 4.436 Mt, accounting for 60%.

There are 109 enterprises that produce high-analysis phosphate and compound fertilizers in China, among which 47 enterprises are producing MAP only, 8 enterprises producing DAP only, 4 enterprises producing TSP only, 15 enterprises producing NPK only ; and the remaining 35 enterprises are able to produce both MAP/DAP and NPK.

The outputs of DAP, MAP and NPK increased by 39.29%, 12.49% and 20.19% over 2000, respectively. (See Figures 5-6 and Table 2).



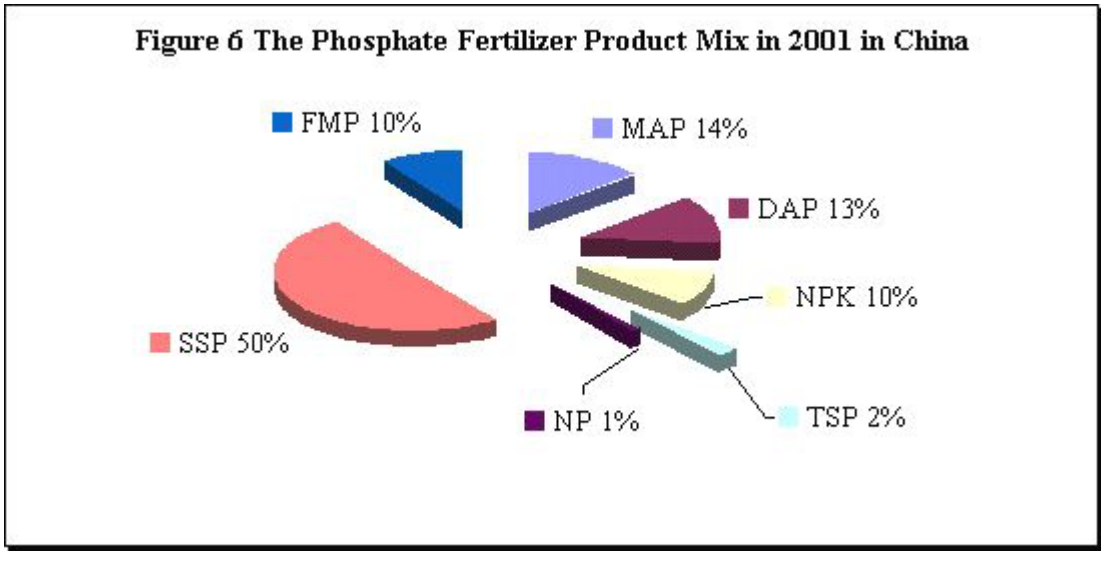



**Table 2 Phosphate Fertilizer Production in 1999-2001 in China**

Unit : metric tonnes, $P_2O_5$

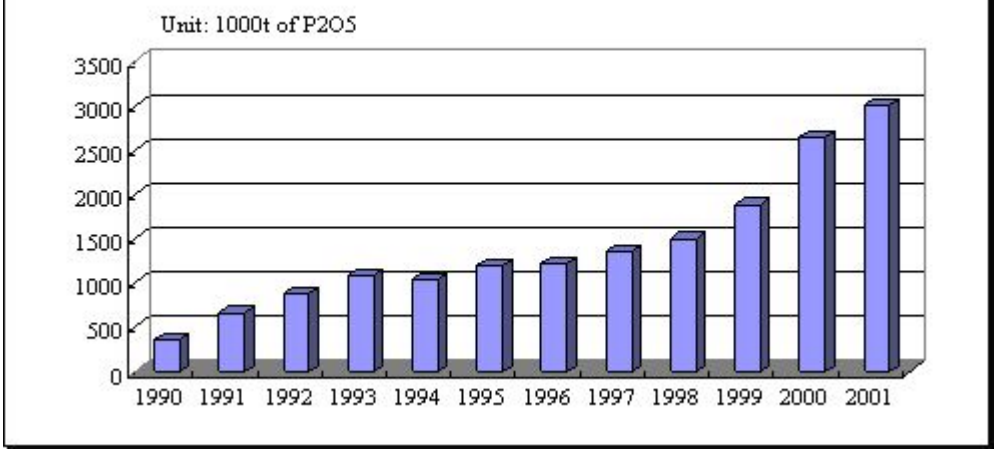
| Product | 2001 | | 2000 | | 1999 | |
|---|---|---|---|---|---|---|
| | Production | % | Production | % | Production | % |
| Phosphate Fertilizer | 7,394,402 | 100 | 6,634,410 | 100 | 6,553,174 | 100 |
| MAP | 1,004,886 | 13.59 | 788,651 | 11.89 | 867,038 | 13.23 |
| DAP | 976,413 | 13.20 | 690,957 | 10.41 | 449,684 | 6.86 |
| NPK | 706,778 | 9.56 | 273,079 | 4.12 | 273,079 | 4.17 |
| TSP | 177,454 | 2.40 | 188,878 | 2.85 | 260,958 | 3.98 |
| NP | 99,456 | 1.35 | 95,109 | 1.43 | 125,991 | 1.92 |
| SSP | 3,727,052 | 50.40 | 3,644,737 | 54.9 | 3,734,385 | 56.99 |
| FMP | 702,363 | 9.50 | 637,417 | 9.61 | 827,717 | 12.63 |

## Current Situation and Prospect of China's High-analysis Phosphate and Compound Fertilizer Market

### 1．Production capacity increased quickly but the percentage of utilization of capacity was not high.

In recent years, the fertilizer consumption pattern changed. Phosphate fertilizer consumption rose in China, which led to the rapid development of high-analysis phosphate and compound fertilizer industry. By the end of 2001, the production capacity of chemically-produced phosphate and compound fertilizer reached 17.30 Mt. The proportion of the production capacity of high-analysis phosphate and compound fertilizer in total phosphate fertilizer capacity went up to 48% from 10% ten years ago.

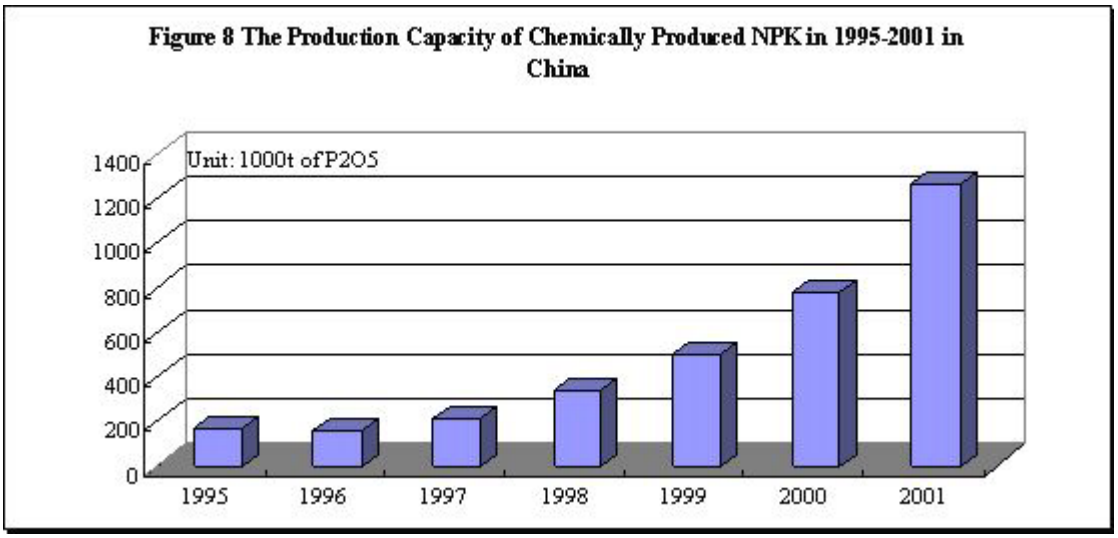
**Figure 7 The Production Capacity of MAP/DAP in 1990-2001 in China**



The increases of MAP/DAP and NPK capacities contributed largely to the increase of Chinese phosphate and compound fertilizer capacity. Most of NPK is based on SOP and is produced by the facilities renovated from MAP facilities.

During the period of 1991 to 2001, MAP/DAP capacity rose at an average annual increase rate of 17.7%. The MAP/DAP capacity increased to 3.04 Mt in 2001 (see Figure 7) and the production capacity of chemically-produced NPK reached 1.26 Mt, growing at an average annual rate of 35.5% (see Figure 8).

**Figure 8 The Production Capacity of Chemically Produced NPK in 1995-2001 in China**




The production capacity of high-analysis phosphate and compound fertilizers increased notably in the past two years. The production capacity of MAP/DAP rose by 80% and that of chemically-produced NPK rose by 54%. The main additional production capacities are listed in Table 3.

**Table 3 Main Additional Production Capacities of high-analysis Phosphate and Compound Fertilizers in the past two years in China**

| Province | Enterprises | Additional Capacity（1000t of product） | Product |
|---|---|---|---|
| Hebei | Sino-Arab Chemical Fertilizers Co Ltd | 700 | NPK |
| Jiangsu | Jiangsu Ruihe Fertilizer Co Ltd | 40 | MAP |
| Anhui | Xuanzhou Sulfuric Acid Plant | 40 | MAP |
| | Hefei Sifang Phosphate and Compound Fertilizer Co Ltd | 20 | MAP |
| | Anhui Liuguo Chemical Industry Stock Co Ltd | 240 | DAP |
| Shandong | Laizhou Jinxing Chemical Co Ltd | 100 | SOP-NPK |
| | Qingdao Changhua Group | 100 | SOP-NPK |
| | Tianli Biochemical Industry Co Ltd | 100 | SOP-NPK |
| | Zibo Bofeng Compound Plant | 100 | SOP-NPK |
| | Anqiu Aobao Chemical Co Ltd | 100 | SOP-NPK |
| Hubei | Hubei Xiangyun Chemical Holding Co | 80 | MAP |
| | Xiangfan Inorganic Chemical Plant General | 30 | MAP |
| Chongqing | Qijiang Fertilizer Plant General | 20 | MAP |
| | Fuling Chemical Holding Co Ltd | 20 | MAP |
| | Win-win Group Nanchuan Weifeng Chemical Plant General | 40 | MAP |
| Sichuan | Sichuan Shihua Holding Co Ltd | 50 | MAP |
| | Sichuan Hongda Holding Co Ltd Shihua Co | 60 | MAP |
| | Sichuan Longmang Phosphate Product Holding Co | 20 | MAP |
| | Sichuan Shifang Yingfeng Industry Co Ltd | 50 | MAP |
| | | 20 | SOP-NPK |
| | Sichuan Sulfuric Acid Plant | 60 | MAP |
| | Jinhe Phosphate Mine Chemical Plant | 30 | MAP |
| | Gongxian Zhongzheng Chemical Industry Co Ltd | 20 | MAP |
| Guizhou | Guizhou Xiyang Fertilizer Industry Co Ltd | 40 | SOP-NPK |
| Yunnan | Yunnan Phosphate Fertilizer Plant | 30 | MAP |
| | | 50 | TSP |
| | Jianglin Group Holding Co Ltd | 20 | MAP |
| | Yunnan Tree-Circle Sinochem Cargill Fertilizer Co | 600 | DAP |

The proportion of capacity utilization is not high, although the capacity of phosphate and compound fertilizers increased rapidly in China. The production of chemically-produced phosphate and compound fertilizers only accounted for 56.3% of its total capacity (see Table 4).

It is important to note that some facilities with a total capacity of 900,000t of MAP stopped running in 2001 because of fund shortage, among which some facilities have stopped production for many years due to external factors and cannot resume production any more, some are facing bankruptcy or being merged or rented by other enterprises due to market and financial reasons in recent years but they are able to resume production. In addition, there is still a capacity of around 370,000t of NPK unused in China. Besides, the TSP production in Hubei Jingxiang Chemical Group Co Ltd still has not reached its full capacity of 560,000t up to now. Therefore, if deducting these unused capacities, the proportion of the production of high-analysis phosphate and compound fertilizers over total capacity would be around 63%.

**Table 4 Production and Capacity of Chemically Produced Phosphate and Compound Fertilizers in 2001 in China**

Unit : 1000t of product

| | MAP | DAP | NPK | TSP | NP | Total |
|---|---|---|---|---|---|---|
| Capacity | 3630 | 2760 | 8510 | 1450 | 1050 | 17400 |
| Production | 2193 | 2134 | 4204 | 396 | 863 | 9790 |
| Proportion of the production in capacity（%） | 60.4 | 77.3 | 49.4 | 27.3 | 82.2 | 56.3 |

## 1．The potential is great in China’s phosphate and compound fertilizer market

The forecast on phosphate and compound fertilizer needs in China can be made on the basis of both the practical consumption for several previous years and its consumption by main crops. However, because China lacks a nationwide and systematic follow-up on the fertilizer consumption by main crops, the difference is big between the relative statistic data of phosphate fertilizer consumption and the apparent consumption of phosphate fertilizer in China. It is not scientific to use them in evaluating China’s phosphate market potential. Therefore, we use relative specialist’s research achievements in the agricultural sector to calculate market potential.

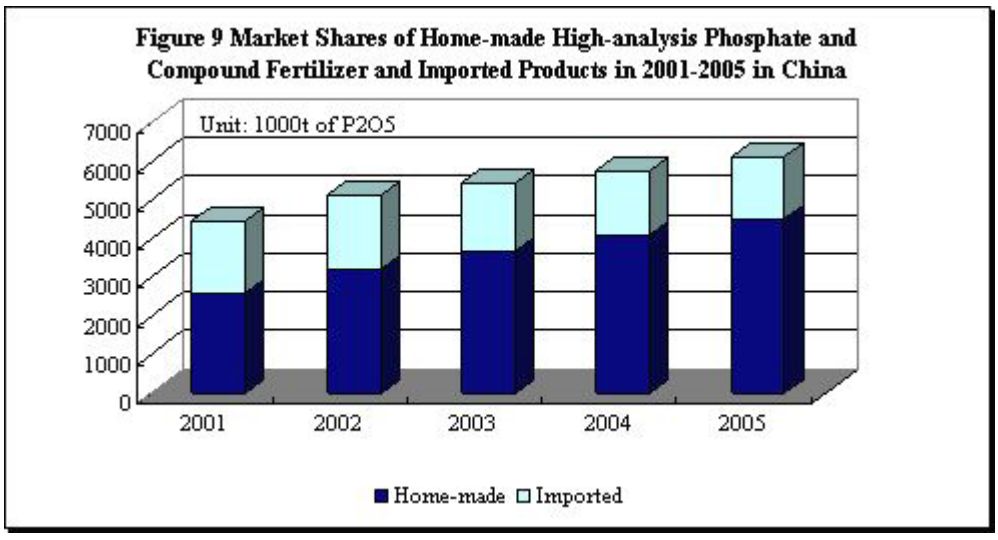
At present, Chinese plowland is still in serious shortage of phosphorus. According to related research in 2000, the equilibrium nutrient can get guarantee only when the fast effective phosphorus (FEP for short) content reaches 20mg/kg in the plowland. We can see from Table 5 that the FEP content in 83.6% of Chinese plowland is lower than that standard. According to the calculation made by Chinese specialists in the agricultural sector, 2.30 Mt of $P_2O_5$ should be added into the plowland annually regardless of losses and uptake of phosphorus in plowland in order to ensure that China’s 129.2 million hectares of plowland meet the standard within the next ten years. Meanwhile, the FEP content in plowland will show a downward movement in the future. In order to maintain the current FEP content of 12.9mg/kg, close to 2.53 Mt of $P_2O_5$ should be added into the soil annually regardless of phosphorus uptake by crops that needs to be compensated with 8.49 Mt of $P_2O_5$ annually (more crops, more uptake of phosphorus).

Based on the calculation above, it is projected that at least 13.32 Mt of $P_2O_5$ will be needed in 2005 in China.

**Table 5 Phosphate Fertilizer Demand in Raising FEP Content in Plowland, 2000-2010 in China**

| FEP content (mg/kg) | Sample number | Proportion (%) | Average FEP content (mg/kg) | Plowland area (million hectares) | Demand（%P2O5）（1000t） |
|---|---|---|---|---|---|
| >40 | 46 | 3.37 | 55.16 | 4.35 | 0 |
| 25~40 | 86 | 6.30 | 31.74 | 8.14 | 0 |
| 20~25 | 92 | 6.74 | 22.79 | 8.71 | 0 |
| 15~20 | 172 | 12.60 | 17.79 | 16.28 | 892 |
| 10~15 | 319 | 23.37 | 12.51 | 30.19 | 4562 |
| 5~10 | 427 | 31.28 | 7.32 | 40.41 | 10377 |
| <5 | 223 | 16.34 | 3.18 | 21.11 | 7188 |
| Total | 1365 | 100 | 12.93 | 129.2 | 23020 |

Analyzing China's current phosphoric resources, we find around 3.00 Mt of $P_2O_5$ that are returned to soil in forms of organic fertilizers annually. In 2005, assuming that China's phosphate fertilizer demand is 13.30 Mt $P_2O_5$, then the amount of $P_2O_5$ to be provided by chemical fertilizers will be 10.30 Mt ; if the proportion of phosphate and compound fertilizer production in total phosphate fertilizer production is estimated at 60%, then $P_2O_5$ provided by phosphate and compound fertilizers will be 6.18 Mt ; the import volume of phosphate fertilizer will be around 1.64 Mt $P_2O_5$ ; the home-made high-analysis phosphate and compound fertilizer supply in the domestic market will be around 4.54 Mt $P_2O_5$, taking up 90% of the total high-analysis phosphate and compound fertilizer output. Meanwhile, 500,000 t of phosphate and compound fertilizers will likely be exported to abroad, making up 10% of the total output. In the domestic market, the home-made high-analysis phosphate and compound fertilizers accounted for 73.5% of the total while the imported products make up 26.5%.



Based on the increase rates of apparent consumption of high-analysis phosphate and compound fertilizers in the period of 1997 to 2001, the development of new projects, market factors and WTO entry impacts, the apparent consumption of Chinese high-analysis phosphate and compound fertilizer in 2005 is projected as shown in Table 6.

**Table 6 Forecast on Supply and Demand for Phosphate and Compound Fertilizers within 5 Years in China**

Unit : 1000t of $P_2O_5$

| | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|
| **Production** | | | | | |
| NP | 99 | 105 | 105 | 105 | 105 |
| DAP | 976 | 1152 | 1359 | 1452 | 1635 |
| MAP | 1005 | 1173 | 1369 | 1450 | 1615 |
| NPK (Chemical) | 707 | 968 | 1017 | 1291 | 1405 |
| TSP | 177 | 177 | 217 | 227 | 237 |
| **Total** | **2964** | **3575** | **4067** | **4525** | **4997** |
| **Imports** | | | | | |
| NP | 3.5 | 12 | 13 | 13 | 14 |
| DAP | 1514 | 1610 | 1510 | 1410 | 1410 |
| MAP | 7.6 | 9 | 15 | 15 | 15 |
| NPK (Chemical) | 339 | 300 | 225 | 225 | 200 |
| TSP | 0 | 0 | 0 | 0 | 0 |
| **Total** | **1864** | **1931** | **1763** | **1663** | **1639** |
| **Exports** | | | | | |
| NP | 0.6 | 0.4 | 0.4 | 0.5 | 0.5 |
| DAP | 208 | 207 | 230 | 276 | 299 |
| MAP | 48 | 32 | 45 | 45 | 45 |
| NPK (Chemical) | 17 | 23 | 30 | 38 | 45 |
| TSP/SSP | 99 | 110 | 88 | 88 | 110 |
| **Total** | **372.6** | **372.4** | **393.4** | **447.5** | **499.5** |
| **Apparent Consumption** | | | | | |
| NP | 101.9 | 116.6 | 117.6 | 117.5 | 118.5 |
| DAP | 2282 | 2555 | 2639 | 2586 | 2746 |
| MAP | 964.6 | 1150 | 1339 | 1420 | 1585 |
| NPK（Chemical） | 1029 | 1245 | 1212 | 1478 | 1560 |
| TSP/SSP | 78 | 67 | 129 | 139 | 127 |
| **Total** | **4455.4** | **5133.6** | **5436.6** | **5740.5** | **6136.5** |

*Note ： Figures in 2001 are practical values. Those in 2002-2005 are forecast.*

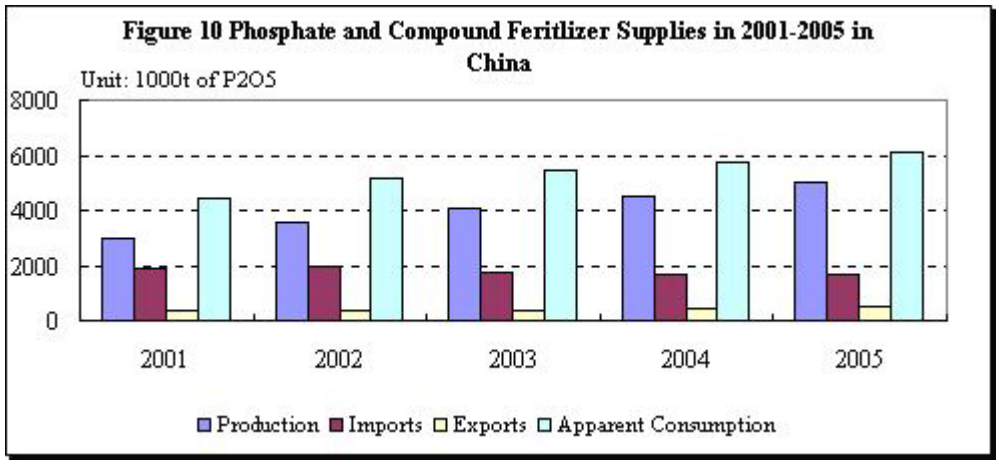



**Table 7 Apparent Consumption of Phosphate and Compound Fertilizers in 1997-2001**

Unit : 1000t of $P_2O_5$

| Year | NP | DAP | MAP | NPK (Chemical) | TSP | Total |
|---|---|---|---|---|---|---|
| 1997 | 89 | 2480 | 580 | 582 | 61 | 3792 |
| 1998 | 106 | 2921 | 750 | 624 | 82 | 4483 |
| 1999 | 127 | 2601 | 863 | 702 | 131 | 4424 |
| 2000 | 106 | 2097 | 747 | 835 | 66 | 3851 |
| 2001 | 102 | 2282 | 965 | 1029 | 78 | 4456 |

**Table 8 Estimated Figures for Chinese Phosphate Fertilizer Demand and Supply in 2005**

Unit : 1000t of $P_2O_5$

| | |
|---|---|
| Demand for raising FEP content in soil | 2302 |
| Demand for keeping reasonable FEP content in soil | 2530 |
| Demand for complementing crops' uptake | 8490 |
| **Total demand** | 13300 |
| Supply from organic fertilizers | 3000 |
| Supply from chemical fertilizers | 10300 |
| Supply from phosphate and compound fertilizers, of which : | 6180 |
| Supply from home-made phosphates and compounds | 4540 |
| Supply from imported phosphates and compounds | 1640 |

## Conclusion

### 1. The production capacity of high-analysis phosphate and compound fertilizers will continue to increase in the next 5-10 years in China.

Because a lot of phosphate and compound fertilizer projects are under construction recently in China, it is forecasted that Chinese production capacity of phosphate and compound fertilizers will rise very fast before 2005, which can be reflected from the rapid development of capacity expansion and new projects in Yunnan, Guizhou and Hubei provinces, the main sources of domestic phosphate rock. By the end of 2010, only Yunnan province is scheduled to add an additional capacity of 2.20 Mt $P_2O_5$ of phosphate and compound fertilizers or 2.80 Mt if the market is bullish.

2002 is the first year for China's WTO entry. The impact of imported fertilizers on China's domestic market after the change from former import license to import tariff quota for fertilizer import administration is not clear at present. Therefore, the proportion of phosphate and compound fertilizer output over capacity is expected to remain at around 60% though the production capacity increases much. Besides, the increases of phosphate and compound fertilizer output and its capacity in phosphate rock origins including Yunnan, Guizhou and Hubei provinces will lead to an increase of phosphate rock consumption in these areas. As a result, the volume of phosphate rock exported to other areas will decline, which will result in a drop of the proportion of phosphate and compound fertilizer production capacity utilization in coastal areas.

**Table 9 Fertilizer Import Quota after China's WTO Entry**

Unit : 1m tonnes of product

| | Starting Quota | Annual Increase Rate | Five Years Later |
|---|---|---|---|
| Urea | 1.3 | 20% | 3.3 |
| DAP | 5.4 | 5% | 6.9 |
| NPK | 2.7 | 5% | 3.5 |
| Total | 9.4 | 7.8% | 13.7 |

### 2. The current phosphate and compound fertilizer supply cannot meet the requirement from China's agricultural sector.

China needs at least 6.18 Mt $P_2O_5$ of high-analysis phosphate and compound fertilizers in 2005. The current phosphate and compound fertilizer production capacity can only meet 47% of that total requirement. There is still a large room for the development of high-analysis phosphate and compound fertilizer industry. China will raise not only the capacity but also the production of high-analysis phosphate and compound fertilizers. China still needs to import high-analysis phosphate and compound fertilizers for a long period of time.

The main destination for home-made phosphate and compound fertilizers is the domestic market although there exist opportunities for Chinese product export. Therefore, the development of China's phosphate and compound fertilizer industry will still focus on domestic market and the competitiveness of the products.

Chinese high-analysis phosphate and compound fertilizers are facing fierce competition from both imported products and home-made SSP and FMP. Chinese farmer is accustomed to using SSP and FMP in many areas. SSP and FMP can supplement the calcium, magnesium and sulphur for crops, which is its advantage over high-analysis phosphate and compound fertilizers. The SSP export of Yunnan and Guizhou provinces is still prosperous today. Therefore, it is predicted that the production capacity of SSP will remain at the present level in the coming 5-10 years. Meanwhile, because its physical feature, FMP is not easy to use ; FMP output will see a drop of about 200,000-300,000 tonnes $P_2O_5$.

**Table 10 SSP and FMP Outputs in 1995-2001 in China**

Unit : 1000 tonnes of $P_2O_5$

| | **1995** | **1996** | **1997** | **1998** | **1999** | **2000** | **2001** |
|---|---|---|---|---|---|---|---|
| SSP | 4050 | 3850 | 4180 | 4260 | 3730 | 3640 | 3730 |
| FMP | 1210 | 810 | 920 | 820 | 830 | 640 | 700 |