

A Review of Potash Application and Prospects of Potash Requirements in China

By Xie Jian-chang

A growing population is forcing China's agriculture to produce more food and fiber. Such production can only be sustained by combining the use of manures with high, balanced applications of inorganic fertilizers. Fertilizer use efficiency on grain crops has declined because there has been a shift in use from grain to high value cash crops. Also, nitrogen (N) and phosphorus (P) use efficiency has declined because of lack of use of potassium (K). The only way to remedy K deficiency is to increase K importation quickly.

China has made great progress in its agricultural productivity. Grain production increased to nearly 450 million tonnes in 1994 from 113 million tonnes in 1949. Cotton production increased roughly 10 times in the same period. Table 1 shows significant increases in grain production for four time periods beginning in 1949 and some of those reasons for the increases.



Lack of potash (on left) reduces cotton yield and efficiency of N and P.

Fertilizer played an important role in these achievements. Data indicate fertilizer contributed 32 percent to food production growth, compared to 28 percent for irrigation, 17 percent for new varieties, 13 percent for mechanization, and 10 percent for other factors.

Comparing population with grain production before and after 1984 indicates that grain production increases were much greater than population growth during the 35 years preceding 1984, while the rate of growth in population outstripped that of grain production since 1984. Demand for agricultural products will continue to increase because of increasing population.

Sustained growth in grain production is dependent on the effective use of research and the resulting technologies. Rational increase in fertilizer use is still a very important measure that can be taken.

Stable high grain yields cannot be maintained when the country's agriculture depends only on mass cycling of organic materials, even when it is augmented with small amounts of inorganic fertilizer. Combining high but balanced inorganic fertilizer rates with organic manure has proven very successful. It should be practiced.

Comparing fertilizer consumption with grain production demonstrates a fertilizer efficiency decline in recent years. There are several reasons:

- Possibly one-fifth of all fertilizer is applied to non-grain crops.
- Poor irrigation management.
- Increase in low analysis fertilizer use, etc.

An important reason is the current imbalance in the use of N, P and K. Potash use is far too low to meet demands of high grain production. This negatively affects N and P fertilizer use efficiency and, consequently, the opportunity for meeting the yield goals set by the government of China. Undoubtedly, if balanced fertilization is practiced extensively, great increases in food and fiber production would result. While potash consumption has been constantly growing, the rate of increase is still too slow.

Ten years ago, Jiangsu was considered a province with moderate K deficiency problems. Today, K deficiency has spread to nearly 70 percent of the total cultivated land. From this, it is not difficult to deduce that China's national K-deficient area is much larger than the 23 percent estimated a decade ago.

In 1994, the N:P₂O₅:K₂O ratio in China was 1:0.31:0.13, which is considerably imbalanced when compared to the average ratio of 1:0.56:0.49 for developed countries (Table 2). More has to be done to reach true balanced fertilization with respect to K. To achieve and maintain a proper and economic nutrient balance, demand for K₂O in the years 2000, 2005 and 2010 should be 6.1, 9.2 and 12.4 million tonnes, respectively. Most of this potash will have to be imported. Phosphate consumption will stabilize at around 12 to 13 million tonnes over this decade (Table 3).

Table 1. Development of grain production in China.

Duration	Increased production, million tonnes/year	Unit yield increase, percent	Main reason(s)
1949-1958 (9 years)	2.57	59.5	Expansion of cultivation area; organic manure; and improved varieties
1958-1978 (20 years)	1.40	54.1	Expansion of irrigation area; increase in use of fertilizers
1978-1984 (6 years)	4.56	42.8	Policy; high increase in use of fertilizers; short straw and hybrid varieties
1984-1993 (9 years)	1.45	14.6	Great increase in the use of fertilizers (81%)

Table 2. Ratio of N, P and K fertilizers in some large fertilizer consuming countries.

Country	N:P ₂ O ₅ :K ₂ O Ratio
USA	1:0.37:0.45
Former Soviet Union	1:0.89:0.58
India	1:0.40:0.17
France	1:0.54:0.74
Developed countries	1:0.56:0.49
Developing countries	1:0.38:0.17
World	1:0.47:0.32

Source: Xie, 1994.

Table 3. Expected demand for fertilizer in China in Year 2000-2010.¹

Year	Total	10 ⁶ tonnes			N:P ₂ O ₅ :K ₂ O
		N	P ₂ O ₅	K ₂ O	
2000	42.6	24.3	12.2	6.1	1:0.50:0.25
2005	48.6	26.3	13.1	9.2	1:0.50:0.35
2010	53.6	27.5	13.7	12.4	1:0.50:0.45

¹Calculated based on the annual increase rate of 1.57 x 10⁶ tonnes for the years 1994-2000, 1.2 x 10⁶ tonnes for the years 2000-2005 and 1.0 x 10⁶ tonnes for the years 2005-2010.

Since the potash supply in China is limited, a rational distribution scheme is necessary. Southern China should receive the bulk of imported potash, particularly for cash and fruit crops. However, demand is growing in northern China because high crop yields (15 t/ha) are removing large quantities of K annually. In northern regions, locally produced potash sources should be exhausted before imported potash is used. The national 'vegetable basket' program must also be a target since vegetables require large quantities of K for high yields of high quality.

The key issue is that China must import more potash now or suffer economic losses in the future. BCI