

# Balanced Fertilization in Southern China: A Historical Review and Prospects

By Zhu Zhonglin, Tang Jinchun and Tu Shihua

*The government and industry should rapidly increase phosphorus (P) and potassium (K) fertilizer production. There should also be a better fertilizer allocation system, along with increased imports of K. Rapid price increases in recent years should be controlled or higher crop prices paid to farmers to offset higher fertilizer costs. A more timely supply and an improved distribution system are greatly needed. Farmer knowledge of proper fertilizer use needs to be better, and the soil testing/fertilizer recommendation network needs improvement.*

The 14 south China provinces lie in the tropical and sub-tropical belt and provide an agricultural production base for grain, oil, seed, fruit and vegetable crops for China. The soils in this region are generally poor in natural fertility and deficient in nitrogen (N), P and K. Nitrogen and P are applied in reasonable quantities, thereby maintaining soil fertility for these

nutrients. However, more K is removed by crops than is applied, creating a strong negative soil K balance.

In recent years, Canpotex Limited supported the Balanced Fertilization Demonstration Program, in cooperation with China's efforts. It has significantly increased awareness of the importance of balanced fertilization. Although many people know of the benefits of potash for improving crop

yields and quality and increasing farmer incomes, much still remains to be done, as shown in Table 1.

Research results on eight crops in six southern provinces receiving potash fertilizer in combination with N and P showed significantly increased crop yields (Table 2). Yield increases ranged from 11.7 percent with rice to 27.9 percent with wheat. In addition, K fertilizer increased crop resistance to insects and disease and improved the quality of agricultural products as well.

Balanced fertilization has improved in southern China with respect to N, P and K, but secondary and micronutrient deficiencies are becoming more frequent. True balanced fertilization must consider all plant nutrients, not just N, P and K, since inadequate supply of any essential nutrient reduces the yield-producing effectiveness of all the others.

Three main problems affect the use of balanced fertilization in southern China. These are:

**Table 1. Potassium balance sheet for farmland in southern China.**

Region	K <sub>2</sub> O balance, kg/ha/year	Reference
Shanghai outskirts	-70.5	F. Wang (1985)
Tai Lake region	-61.5	C. Liu (1985)
Less fertile land in Fujian	-55.5	J. Wu (1987)
Hang-Jian-Lake Plain in Zhenjiang	-37.5	G. Feng (1988)
Jiangsu province	-90.0	E. Wang (1988)
Shanghai outskirts (rice-rape)	-192.0	Y. Wang (1992)
Anhui province	-46.5	Q. Yu (1993)

- Low recovery of applied N fertilizer.
- Low application rates of P and particularly K.
- Domestic production and sale of inorganic fertilizer.

Nitrogen recovery can be improved by slow-release N products and by improved on-farm N management. Application rates of P can be increased although domestic production often lags behind demand, and the quality of P fertilizers is generally low. Domestic potash production supplies less than 2 percent of demand and, therefore, additional potash must be imported.

Potash is allocated on a quota system that does not come close to meeting demand. As a result, it creates inefficiency in the utilization of N and P and loss of money for farmers and the nation. Larger potash imports are the only solution to this problem.

In order to realize a more balanced use of N, P and K, China must increase phosphate fertilizer use and particularly increase potash imports while exploiting other potash resources. Research and extension on balanced fertilization need to be continued, strengthened and expanded. **BCI**

*Prof. Zhu Zhonglin is President, Sichuan Academy of Agricultural Sciences, Sichuan, People's Republic of China. Tang Jinchun is with Agricultural Techniques and Extension Centre, Ministry of Agriculture. Tu Shihua is with Sichuan Academy of Agricultural Sciences.*



*High yields require balanced fertilization.*

**Table 2. Effect of balanced K fertilization on crop yields in southern China.**

Crop	Yield, kg/kg K <sub>2</sub> O	Percent increase in yield
Rice	7.5	11.7
Corn	10.7	24.6
Wheat	12.2	27.9
Sweet potato	65.9	21.8
Rapeseed	2.9	16.8
Peanut	5.4	13.6
Cotton	1.6	15.1
Sugarcane	86.8	21.2

### **Significance of Balanced Fertilization...** *(continued from page 9)*

higher grain and cotton production and farmer enthusiasm for planting fruits and vegetables, inorganic fertilizer consumption is predicted to reach 42 million tonnes by the year 2000.

Grain production has not increased in relation to the increase in inorganic fertilizer consumption. This is due to two major reasons:

- Less efficiency in fertilizer utilization because of imbalances in use of primary, secondary and micronutrients.
- Large quantities that were earlier applied to grain crops are now being applied to fruit and vegetable crops.

China will gradually become self-sufficient in N, while most of the P will someday be produced locally. However, unless new deposits are discovered, K use will mainly depend on imports.

It is essential that inorganic fertilizers be used in China's push to maintain food security as population increases. Great gains in crop production can be made by improving the balance of the major plant nutrients applied, especially K. At the same time, attention should be paid to secondary and micronutrients. Utilizing more organic manure, particularly if mechanized application can be introduced, will further increase sustainable yields. But, supplies of K to farmers must be increased by importation. **BCI**

*Professor Lin Bao is Director, (Retired), Soil and Fertilizer Institute, Chinese Academy of Agricultural Sciences, Beijing, People's Republic of China.*