

FERTILIZER USE IN CHINA: TYPES AND AMOUNTS

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1. Background

Pre-historical use of fertilizers in China was probably similar to that in many other countries. History's earliest farmers experimented with various organic materials such as food waste, fish, ash, night soil, etc. as fertilizer and received small yield increases with these, as would be expected.

In reality in China, use of manufactured or mineral fertilizers did not come into play until the founding of "New China" with the Communist takeover in 1949. With war preoccupying the nation from the latter half of the 1930s until 1949, fertilizer manufacturing was probably of very limited scale. Thus, with mineral fertilizer use, 1950 is most commonly used as a starting date for China.

Historical data (Table 1) shows there were limited yield increases during the 2000 years prior to 1950, but once modern agriculture was introduced, including use of new varieties, fertilizer and other improved cultural practices; rice and wheat yields increased 86 and 68 kg/yr compared with 40 and 17 kg/50 yr, respectively, when no modern practices were used. This means that by using modern cultural practices including use of mineral fertilizer, China was able to feed its growing population (Figure 1).

Crop	Organic manure (average over 2000 years)	Modern agriculture and chemical fertilizer (1950 – 1986)
	Yield increase	
Rice	40 kg/50 years	86 kg/yr
Wheat	17 kg/50 years	68 kg/yr

Source: Lin Bao et al. 1989.

Table 1. Historical data of yield increases comparing the use of old systems of cropproduction relying on organic manure, with modern agriculture.

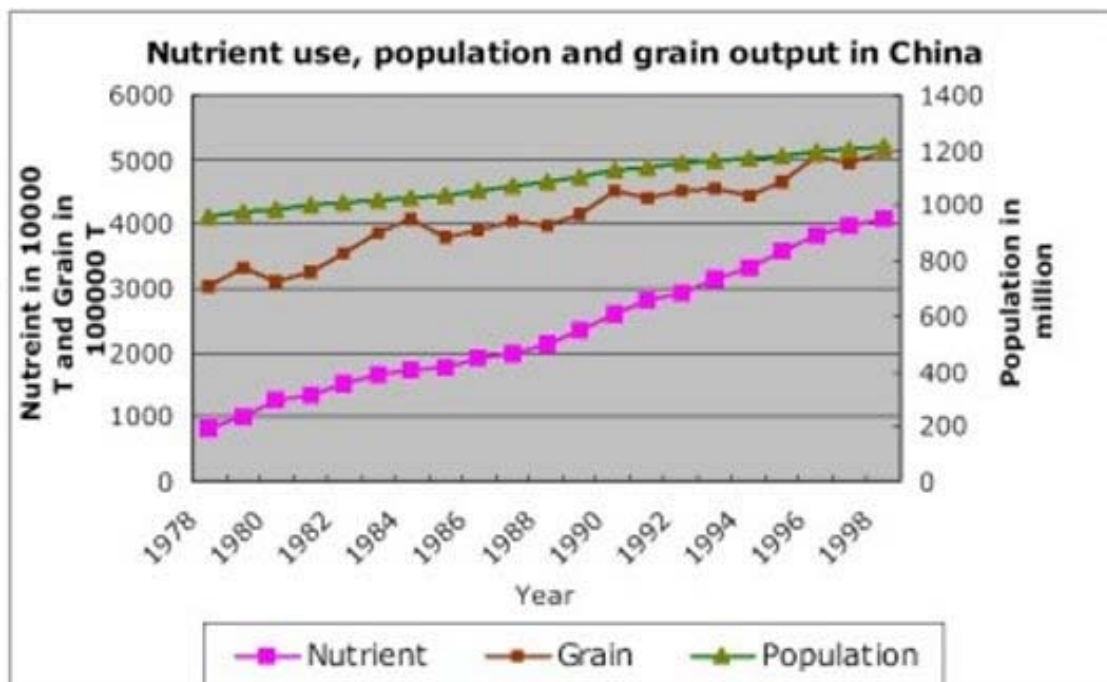


Figure 1. Fertilizer consumption, grain production, and population growth in China 1978-1997.

It has been estimated that fertilizer in China has contributed between 45 and 50% to grain yield increases in the past 30-40 years. Thus, up to approximately 50% of the yield increases shown in (Table 1) could be a result of increased fertilizer use.

Year	Total (N+P ₂ O ₅ +K ₂ O (in million tonnes)	Source of applied nutrient as % of total			
		Inorganic		Organic	
		Million tonnes	%	Million tonnes	%
1949	4.32	0.006	0.14	4.31	99.86
1965	8.68	1.94	22.4	6.74	77.6
1985	31.52	17.76	56.3	13.76	43.7
1990	40.86	25.90	63.4	14.96	36.6
1993	46.65	31.50	67.5	15.15	32.5
1995	52.95	35.95	67.9	17.00	32.1
2000 ^a	60.28	42.02	69.7	18.26	30.3
2005 ^a	66.31	49.73	75.0	16.58	25.0

a. PPI-HK Estimates (2000, 2005)

Source: Lin Bao, 1995. personal communication.

Table 2. Total nutrient and percentage of organic and inorganic fertilizer applied in China.

National grain production has correlated well with mineral/inorganic fertilizer consumption in China as well as with population growth (Figure 1). Thus, use of mineral fertilizers has been an effective means of increasing food for the growing population. This is expected to be less correlated with grain production in the near

future as redistribution of mineral fertilizers from low valued grain crops to increased use on higher valued cash crops such as fruits, vegetables, medicinal and ornamental crops takes place. For example, in 1986 vegetable and orchard crops occupied 5.3 and 3.7 million ha, respectively. By 1996, these areas had increased to 12.6 and 8.6 million ha, an increase of 138 and 132%, respectively, over 10 years.

Organic sources of plant nutrients have played, and still do play, an important part in meeting China's plant nutrient requirements. It was not until the late 1960s that mineral fertilizer use really became a common practice with farmers (Tables 2 and 3).

Year	N (mmt)	P ₂ O ₅ (mmt)	K ₂ O (mmt)	Ratio N : P ₂ O ₅ : K ₂ O
1952	0.078	-	-	
1965	1.33	0.61	0.003	1:0.46:0.002
1985	12.09	3.11	0.0804	1:0.26:0.07
1988	14.17	3.82	1.102	1:0.27:0.07
1990	16.38	4.62	1.479	1:0.28:0.09
1995	20.22	6.32	2.69	1:0.31:0.13
1996	23.66	10.55	4.07	1:0.45:0.17
1997	24.11	11.20	4.50	1:0.46:0.19
1998	24.80	11.28	4.77	1:0.45:0.19
1999	24.45	11.75	5.07	1:0.48:0.21

Source: Potash and Phosphate Institute, China Program.

Table 3. Mineral fertilizer consumption in China 1952-1999 in million metric tonnes (mmt).

China has often been cited by those supporting low input or organic farming, as a country that fed and clothed its people using only organic fertilizers or low input systems for supplying plant nutrients. This may have been true decades ago. But as population increased these systems which transported organic materials containing plant nutrients from upland soils to the lowland paddy soils either by man or by animal waste, ceased to provide enough plant nutrients for producing higher yields. Furthermore, by using this system upland soils became degraded resulting in massive soil erosion, a problem that still exists in many parts of southern China. This has changed in recent times (Table 2). There are two important points to note from the data in Table 2. The first is that inorganic/mineral fertilizer has gone from virtually 0% of the total plant nutrients applied in 1949 to 67.9% in 1995, while the organic portion has gone from 100 to 32.1% in the same period. During this period, the total plant nutrients applied increased more than 12 fold. The second important fact to note is that the total amount of organic fertilizer used increased almost four times during this same period. That means Chinese farmers are not using less organic fertilizer than before, they are using more, but supplementing it with more and more mineral fertilizer to achieve today's high sustainable yields.

Probably the supply of plant nutrients from organic sources will stabilize around 25% of the total around 2005. The simple fact is that there is just not enough organic material available to provide the quantity of plant nutrients needed for high yield agriculture to feed China's growing population. Therefore, China will continue to increase its use of mineral fertilizers into the foreseeable future.

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Biographical Sketches

Dr. Sam Portch is Director, China Program; PPIC Vice President for China and India Programs. A native of Milton, Ontario, Canada, he is Director, China Programs and Vice President for China and India Programs. After receiving his B.Sc. of Ag. and M.Sc. from McGill University of Montreal, Canada, Dr. Portch was a research assistant at the University of Arkansas, U.S., where he also obtained his Ph.D. He has spent the last 30 years working in international agriculture. Dr. Portch joined PPI/PPIC in 1988 as Deputy Director, China Programs. He took his present position in 1989. He has experience in over 35 countries working with both government and private companies, and has traveled to all parts of China and most of India's major agricultural areas.

Dr. Ji-Yun Jin is PPI/PPIC Deputy Director, North China. A native of Henan Province, China, he is a Deputy Director of the PPI/PPIC China Program located in Beijing. Dr. Jin earned his B.S. degree in agronomy from Jilin Agricultural University in 1977, M.S. degree in plant nutrition from the Chinese Academy of Agricultural Sciences (CAAS) in 1982, and his Ph.D. in soil science from Virginia Polytechnic Institute and State University (VPI&SU), USA in 1985. In 1990, Dr. Jin joined the staff of PPI/PPIC, heading the Beijing office. Before joining the Institute, Dr. Jin worked in the Soil and Fertilizer

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