Henan Integrated Management Potassium in Wheat-Maize Rotation System

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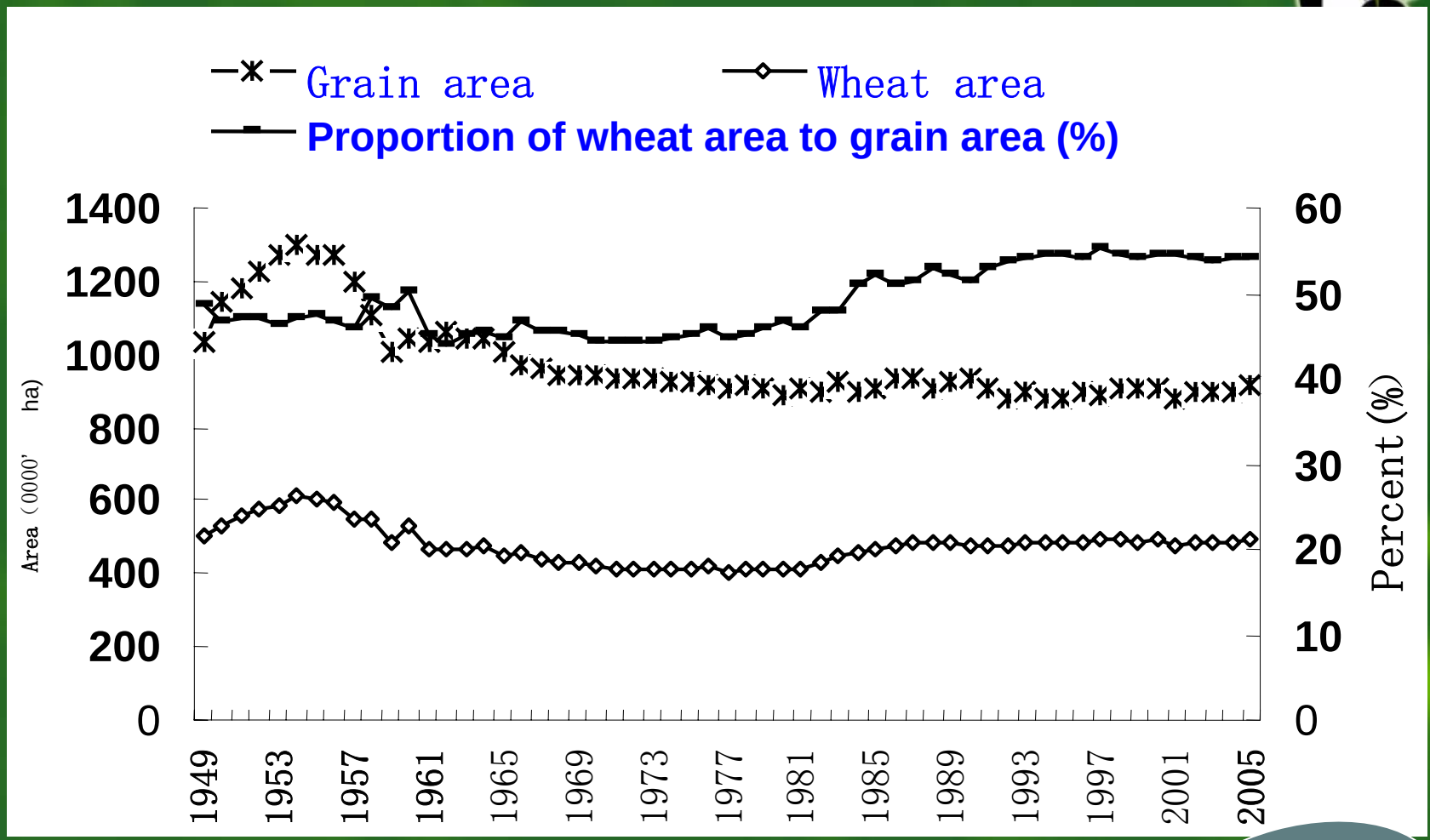
1. Production status and development of wheat and maize in Henan

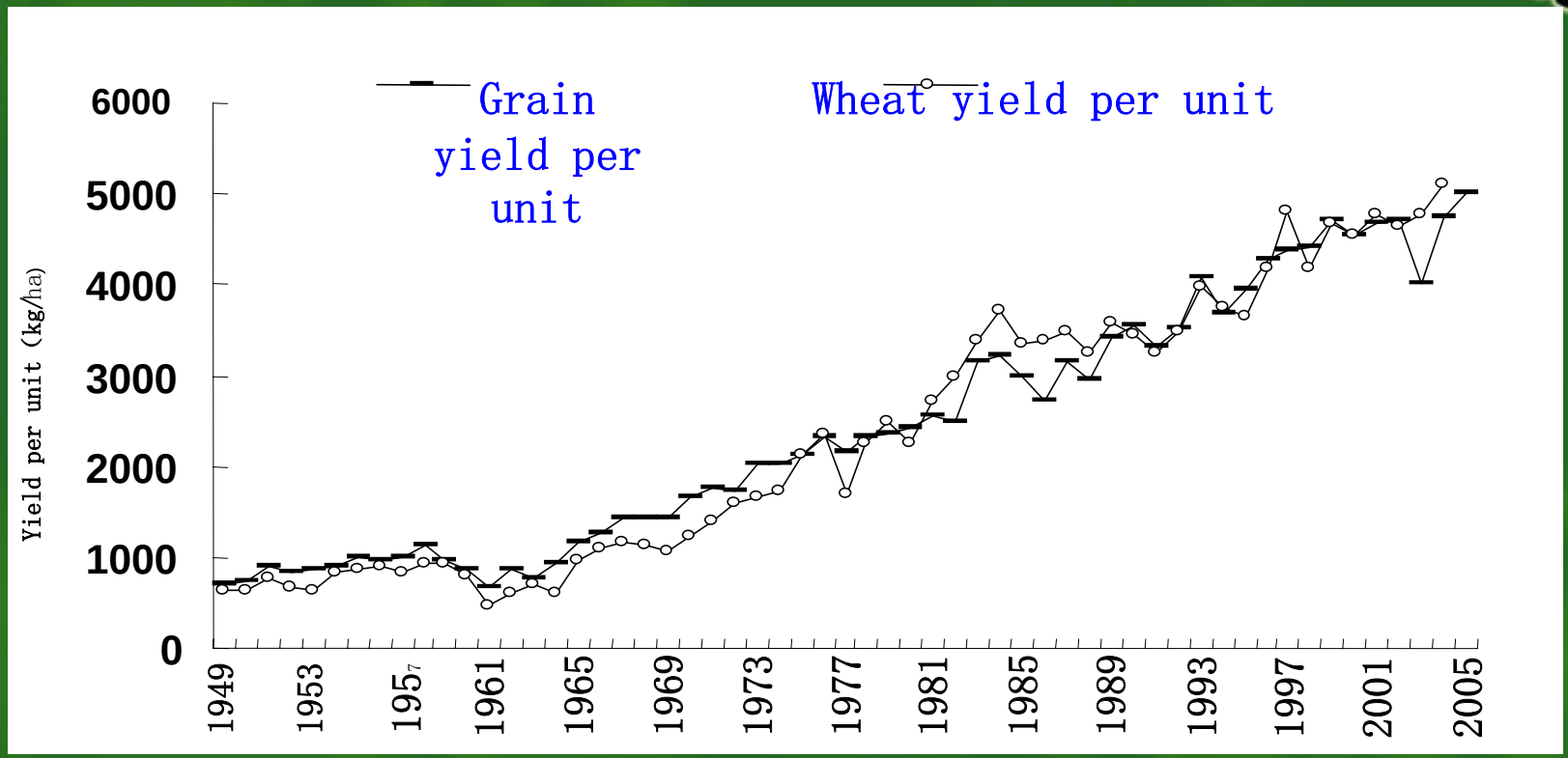
- **Henan annual wheat area is about 74 mill. mu, that is home to 55% of grain crop area in Henan, and account for 25~28% of wheat area in China.**
- **Henan wheat yield has accounted for 25.7% of the total wheat yield in China in 2005.**
- **Not only the wheat plant area、total yield, but also the contribution for wheat to our country all stand first on the list**

The changes of wheat plant area in Henan



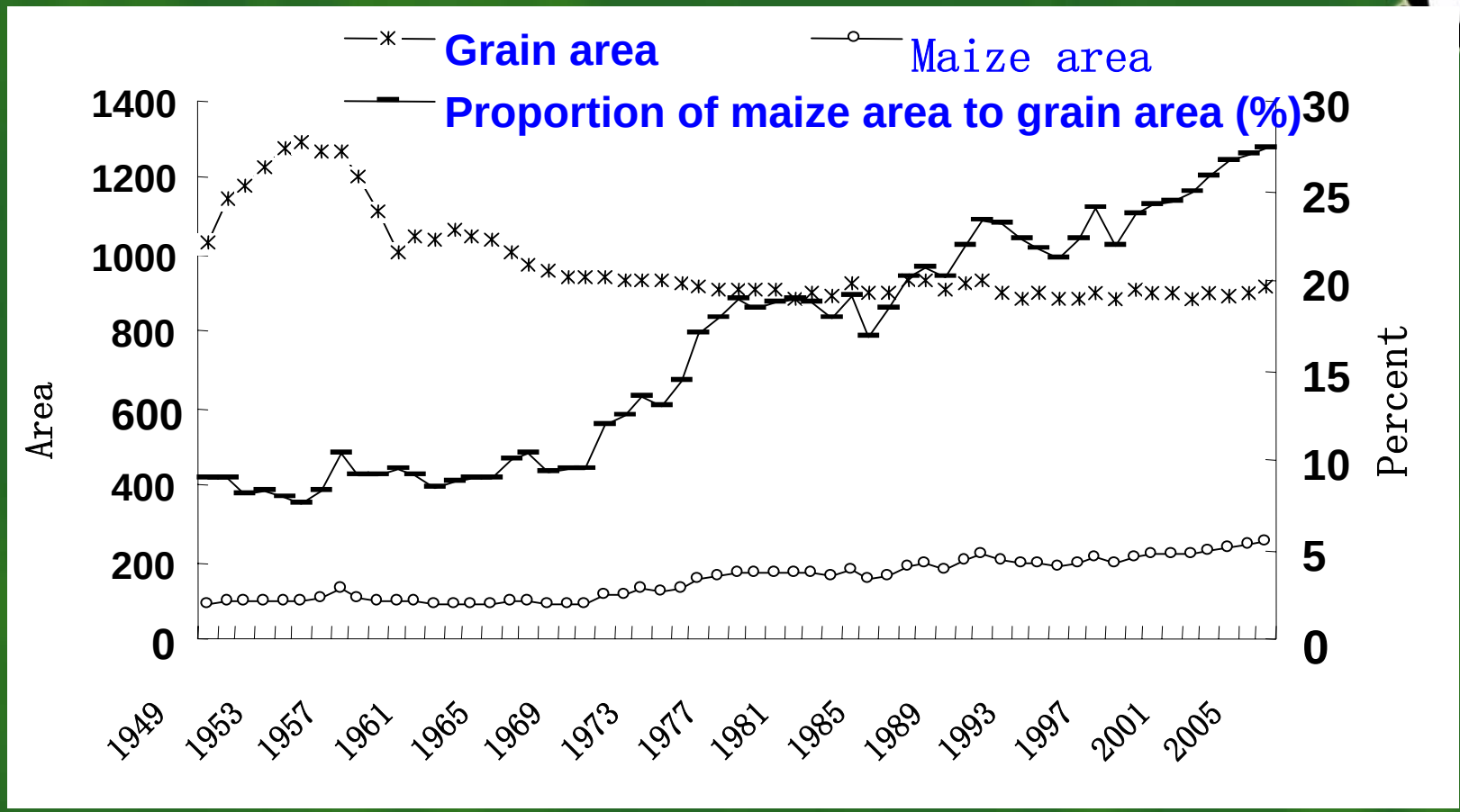
75100000 mu in 2006

The trend of wheat yield per unit in Henan



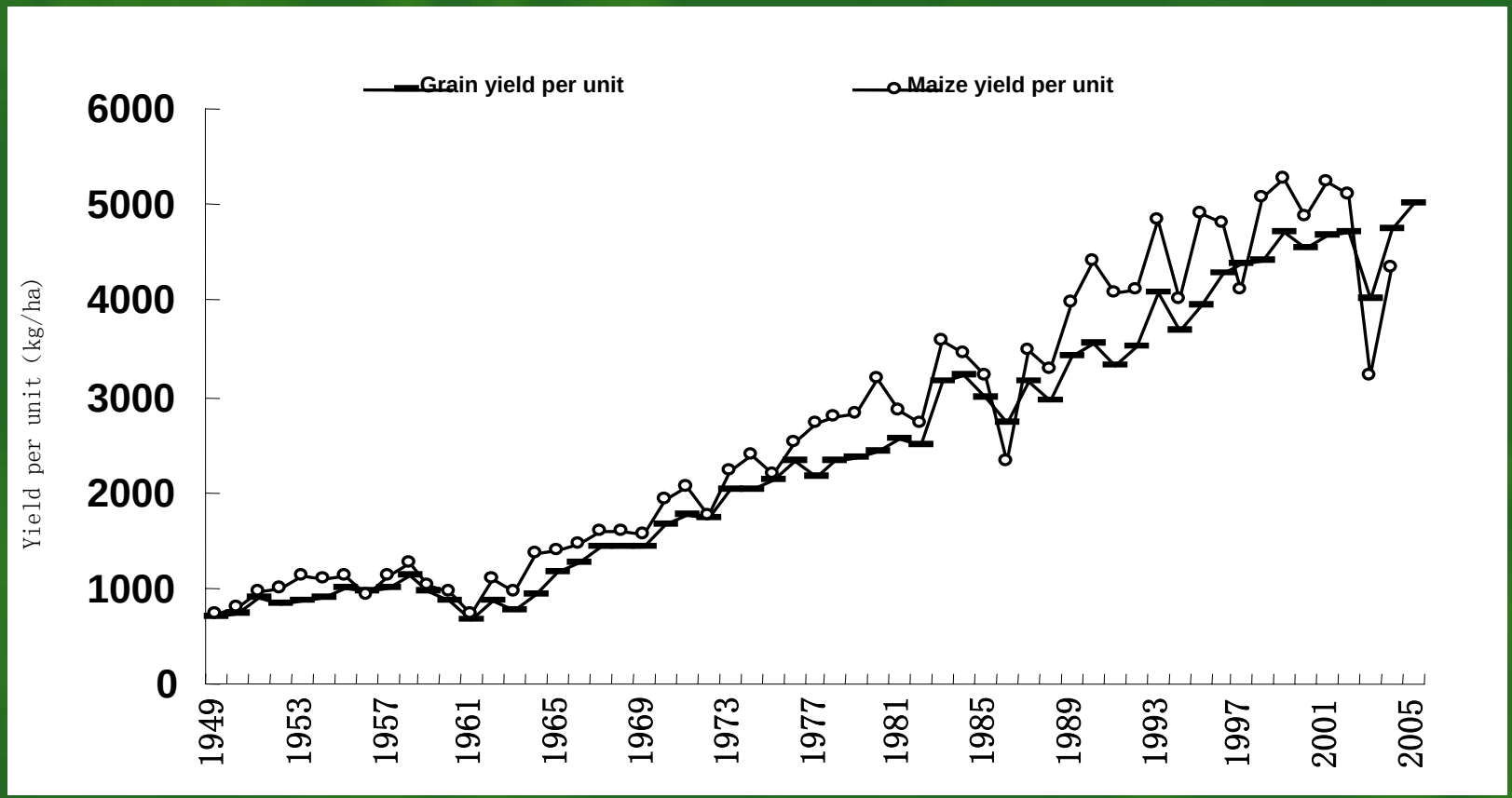
The wheat yield per unit increased from 150kg to 341kg. The per mu wheat yield reached 717.2kg from demonstration field in Wen country in 2006.

The changes of maize plant area in Henan

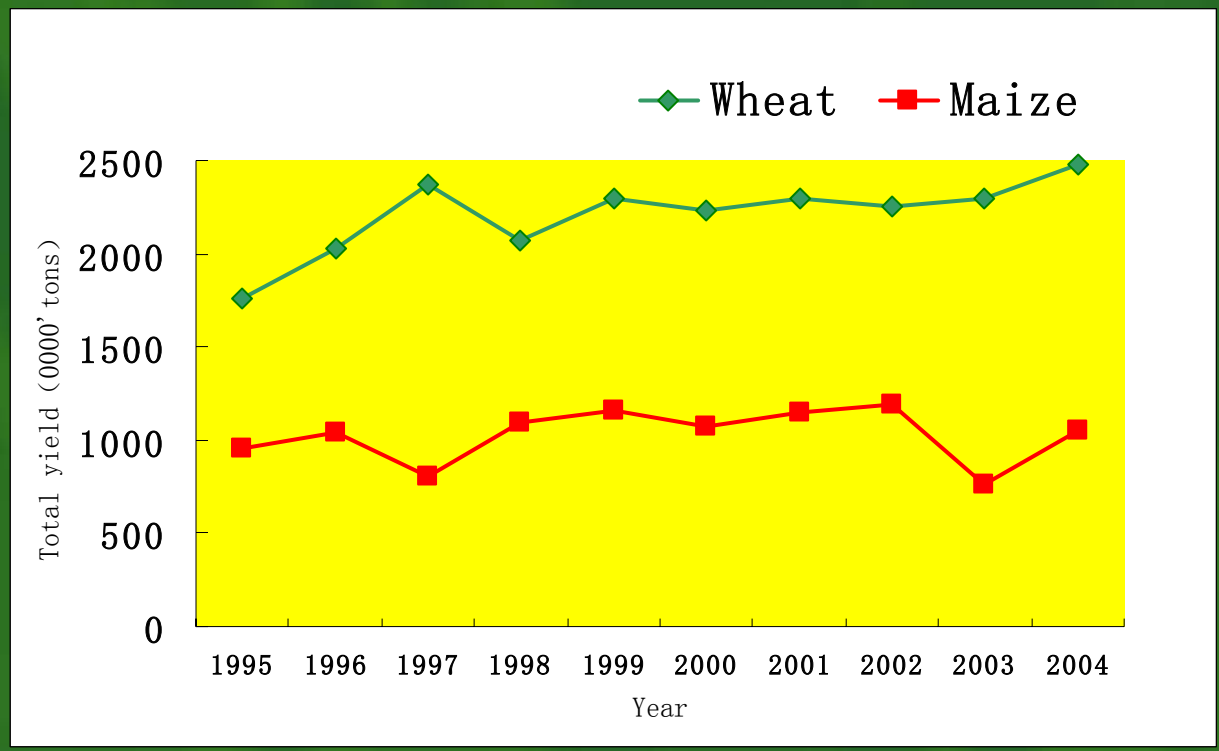


Maize is the main grain crop in Henan, next only to wheat, and the annual plant area is about 32 mill. Mu. The total yield is above 10 billion Kg.

The trend of maize yield per unit in Henan



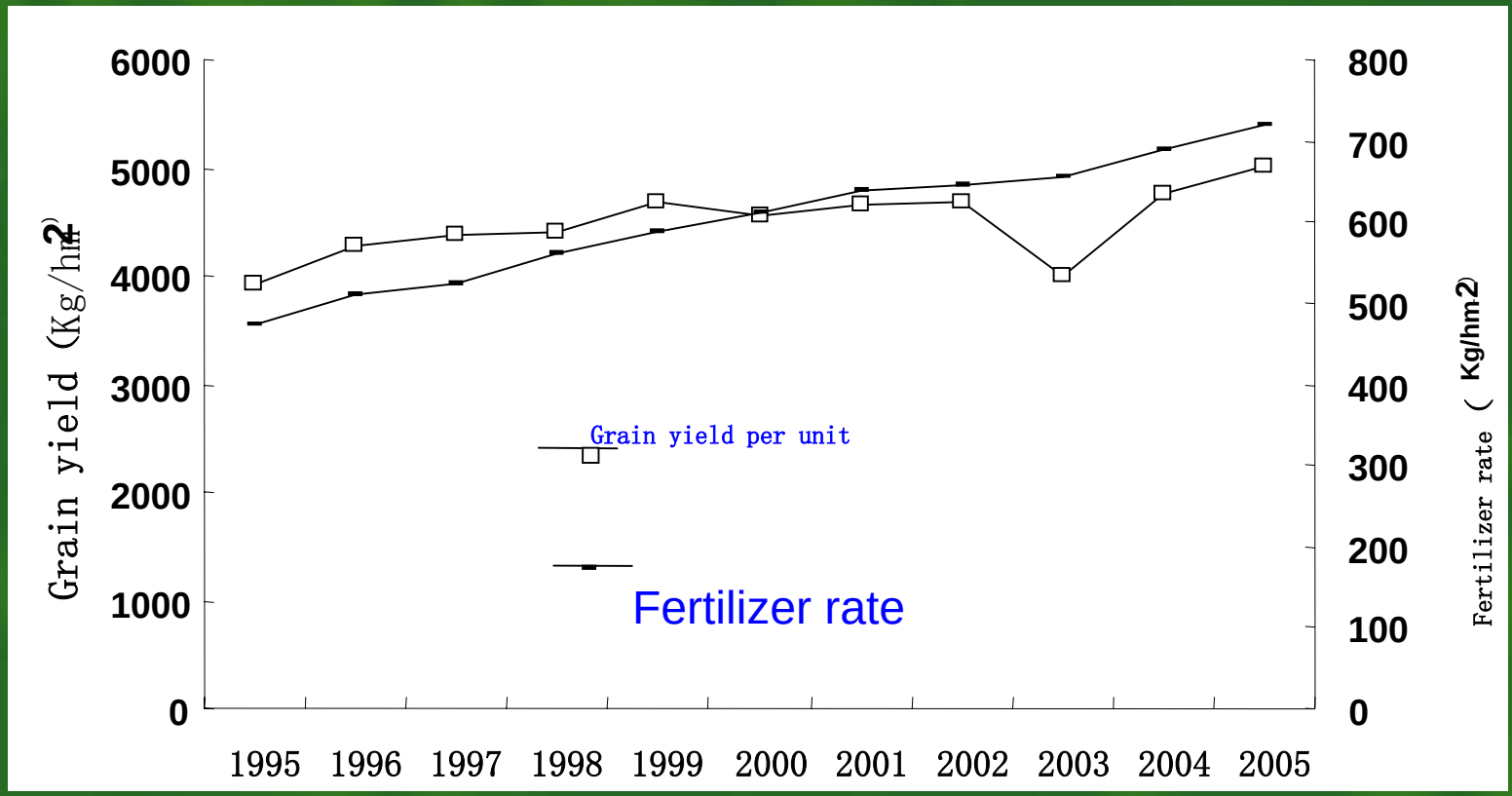
The trend of total yield of wheat and maize in Henan



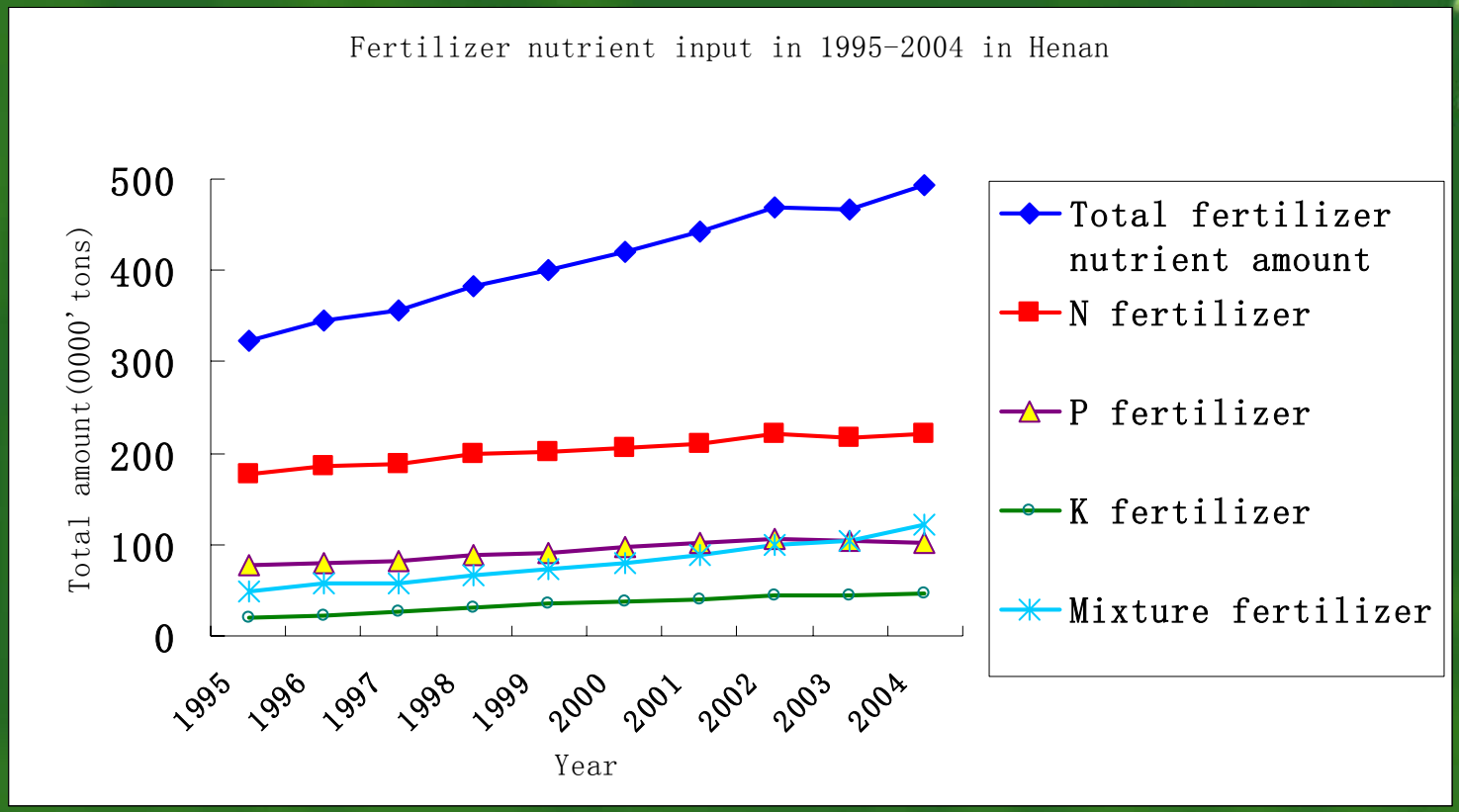
The total wheat yield has been increasing from 0.868 billion kg of 1978 up to 25.77 billion kg of 2005.The yield increased by 4.4% per year.

2. Fertilizer nutrient input in wheat-maize rotation in Henan

Condition of fertilizer applied and grain yield in decade



The amount of fertilizer applied always increase these year. The amount of fertilizer applied in 2005 was 2.4 times as much as that of 1990, while the grain yield was 1.3 times as that of 1990.



The K fertilizer input amount per year was about 345000 tons in recent 10 year,2.8kg for cropland per mu. If all K fertilizer used only for wheat and maize, there was still 3.2kg for cropland per mu. Compared with the recommended K fertilizer application amount, the K fertilizer input amount was still not enough.

2. Fertilizer nutrient input in wheat-maize rotation in Henan

The result was obtained from monitoring for several years:

- **Average fertilizer application amount per ha (chemical fertilizer + organic manure):638kg**
- **The ratio of N-P_2O_5-K_2O was 1:0.48:0.35**
- **The ratio of organic manure and inorganic manure was 1:2.4**
- **The proportion of N, P in chemical fertilizer amount to the total N, P application amount was 81.0% and 75.0% respectively while the proportion of K in organic manure to total K application amount was 66%**

From the above data showed that the N fertilizer applied abundantly and P fertilizer applied basically in reason while K fertilizer application deficiency.

Condition of fertilizer nutrient input in wheat-maize rotation from surveying 20 farmers in Xiping and Yanshi location in 2004-2005

Fertilizer nutrient input of wheat and maize in Yanshi location （**kg/mu**）

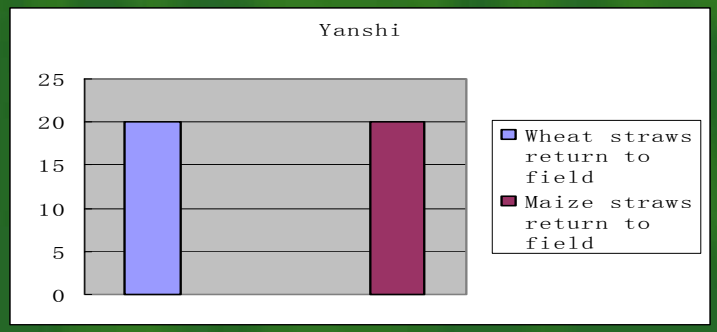
Level	Wheat			Maize			Wheat + Maize		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
Low	8.7	4.1	0	10.5	3.8	0	19.2	7.9	0
High	15.7	10.0	8.9	17.2	5.6	6.0	32.9	15.6	14.9
Average	13.4	8.3	5.2	14.5	4.8	3.6	27.9	13.1	8.8

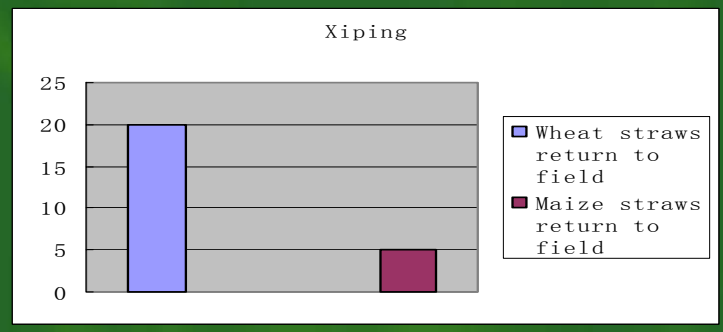
Fertilizer nutrient input of wheat and maize in Yanshi location（**kg/mu**）

Level	Wheat			Maize			Wheat + Maize		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
Low	9.0	5.0	4.1	8.5	0	0	17.5	5.0	4.1
High	16.0	8.5	10.5	18.0	4.8	4.8	24.0	13.3	15.3
Average	12.3	7.3	6.1	13.6	4.0	3.5	25.6	11.3	9.6

The result of the survey from Yanshi and Xiping location

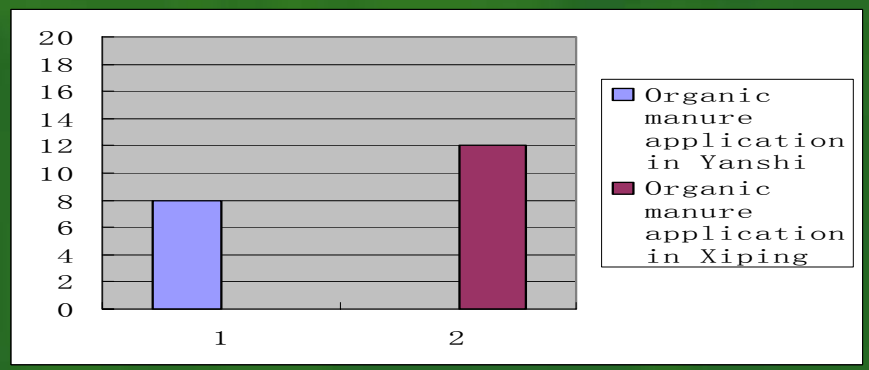
1. Straws return to field:





2. Organic manure application:

Organic manure mainly used in wheat season and the amount was 1-2 Fang



3. Fertilizers application

From the survey, the farms attached much importance to mixture application of N, P and K fertilizers in wheat season while used N fertilizer mostly in maize season.

- In Yanshi location, the ratio of N and K application amount used on wheat and maize was 1:0.39 and 1:0.24 respectively.
- In Xiping location, the ratio of N and K application amount used on wheat and maize was 1:0.48 and 1:0.26 respectively.

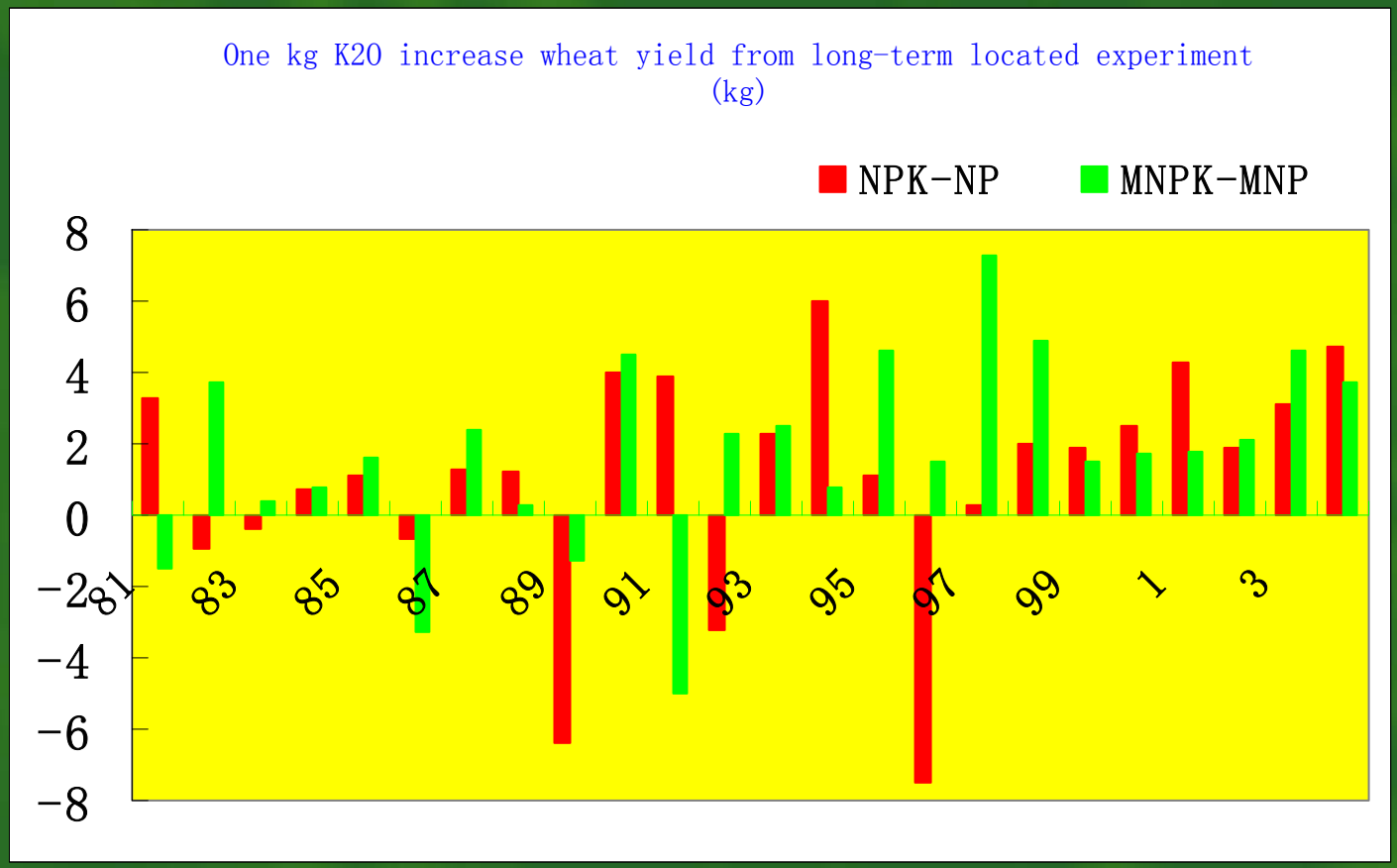
3. Soil potassium in wheat-maize rotation system area in Henan

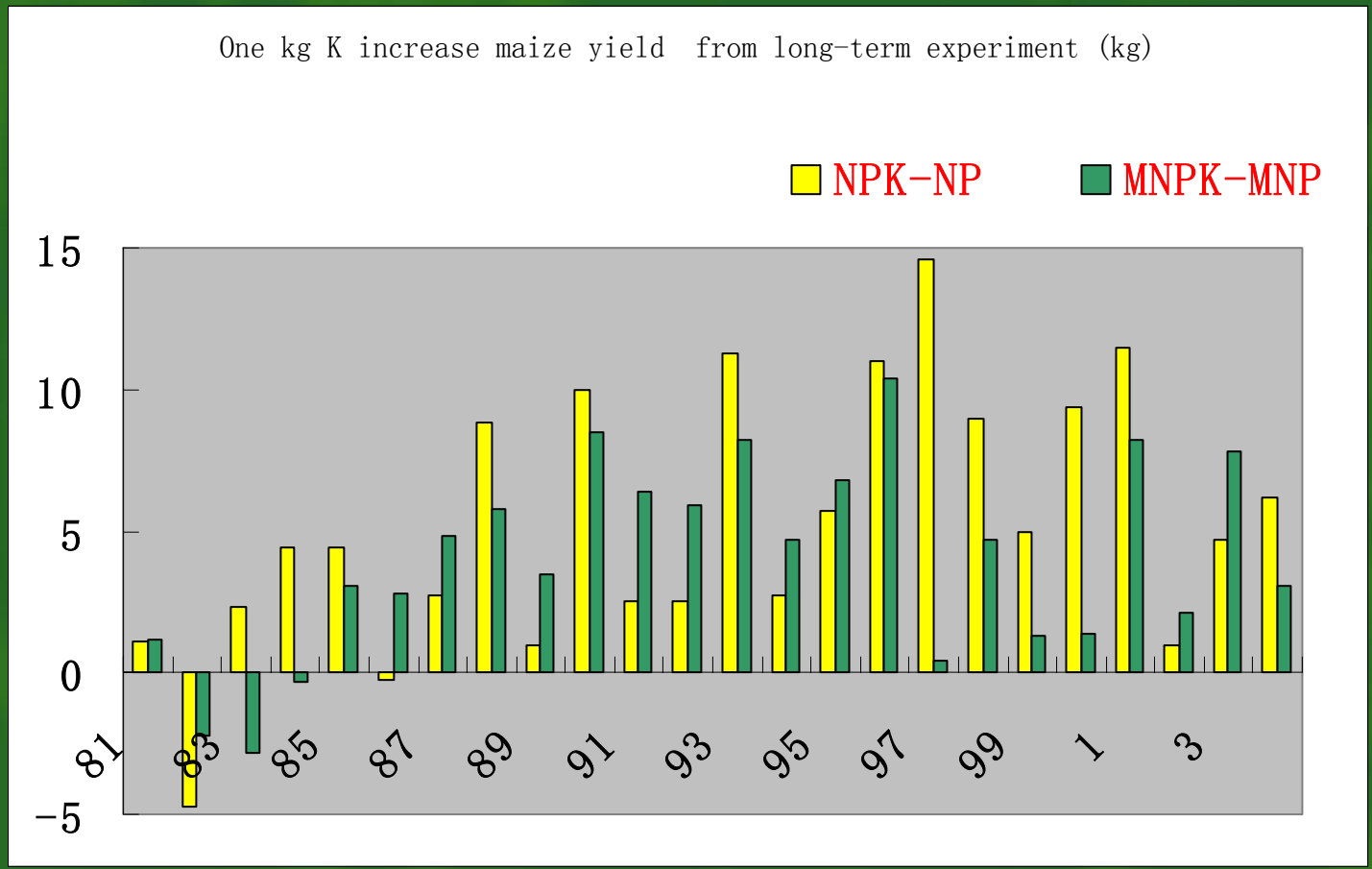
The content of available K in wheat-maize rotation are (mg/kg）

Type	Average content	Range	C.V %
High yield	118.8	59.5－267.8	38.38
Middle yield	90.2	49.5－216.0	32.35
Low yield	115.5	52.5－244.2	53.64

Results from the above table indicated that the K content in cropland area is low. Compared with the content 134.3 mg/kg obtained from the second national soil survey project, the available K decreased heavily. According to the nutrient balance in cropland soil, the lack of K nutrient(K_2O) reached 145 kg/hm^2.

4. Effect of K-fertilizer from long-term located and seasonal experiments in wheat-maize rotation system in Henan




One kg K increase maize yield from long-term experiment (kg)
NPK-NP
MNPK-MNP
15
10
5
0
-5
81
83
85
87
89
91
93
95
97
99
1
3

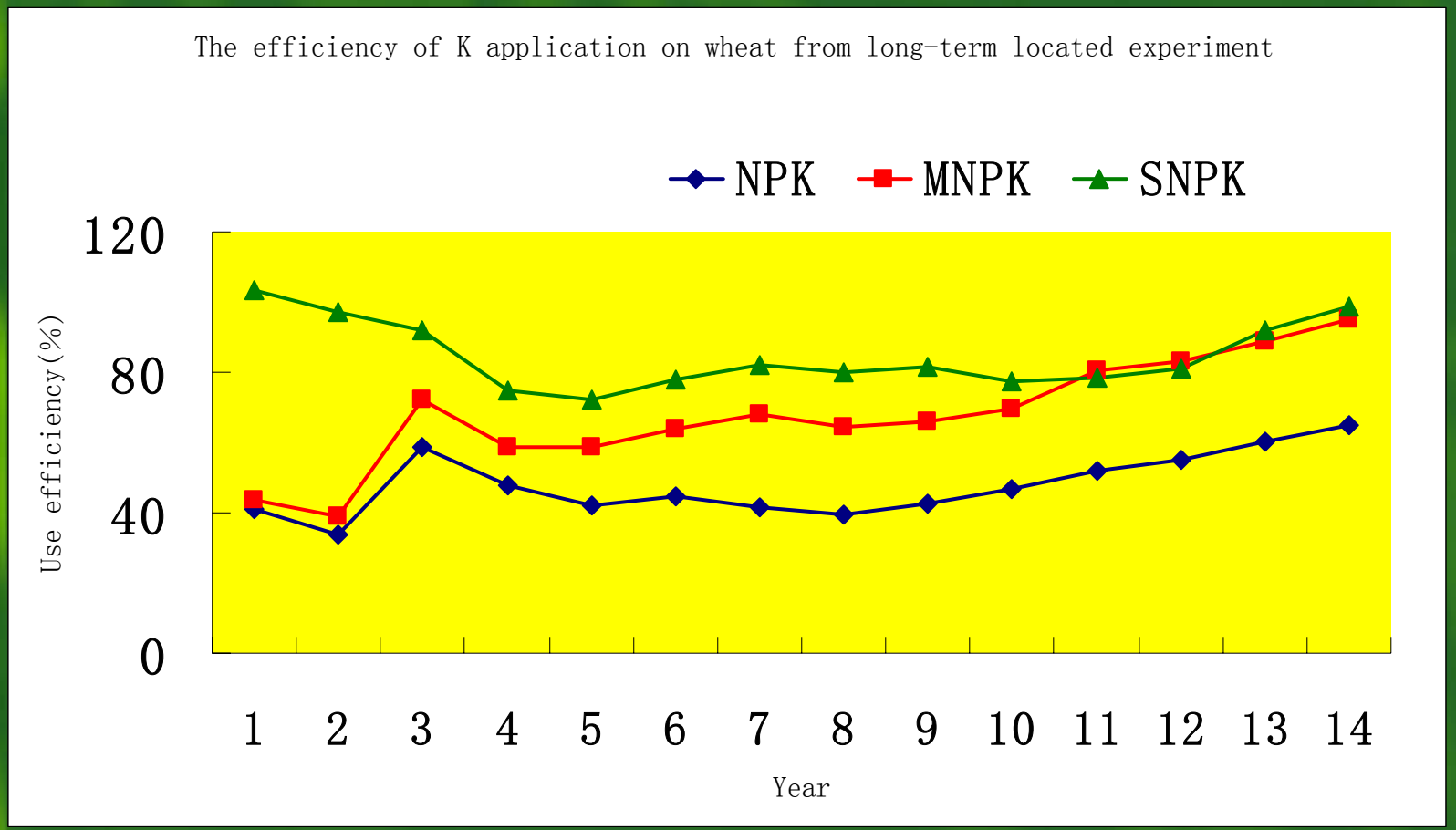
One kg K_2O increase yield can be obtained from NPK-NP and MNPK-NPK, the result showed :

- **The condition of one kg K_2O increase yield was not the same in different years. One kg K_2O increase wheat yield by 2.1kg per year on average with no organic manure application while increase wheat yield by 2.6kg with organic manure application.**

- **One kg K_2O increase maize yield by 5.9kg per year on average with no organic manure application while increase maize yield by 4.8kg with organic manure application.**

- **The phenomenon of the yield decreased with K fertilizer application mainly appeared at the early of the long-term experiment. This might caused by the high content of K in soil. The available K in soil has been decreasing in spite of K application**

The efficiency of K application on wheat from long-term located experiment

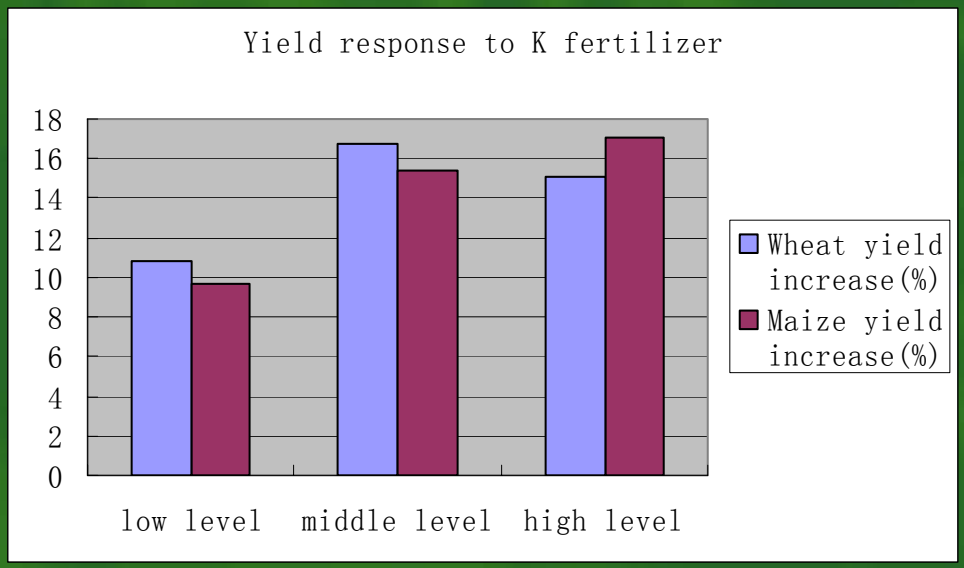


Seasonal effect of K fertilizer on wheat and maize

Rate kg/hm^2	Wheat				Maize			
	Increased %	aver age	kgK_2O increase kg	Aver age	Increased %	aver age	kgK_2O increase kg	Aver age
105—112.5	5.4—18.6	10.8	3.4—11.0	6.2	6.4—14.9	9.7	3.3—9.2	5.5
150	9.2—28.5	16.7	2.8—11.9	6.5	11.2—22.1	15.4	4.5—9.5	6.2
187.5—195	11.2—27.0	14.9	2.5—10.9	5.1	13.4—25.2	17.1	4.2—8.3	5.7

The result obtained from 6 seasonal experiments on wheat and maize helped by IPI in 2003-2006

All the experiments were conducted on the locations of middle or low level content of available K in soil, and the result showed that:



K fertilizer application level:

Low level: 105—112.5 kg/hm^2

Middle level: 150 kg/hm^2

High level: 187.5—195 kg/hm^2

Therefore, the yield response to K fertilizer was obvious, and applied potassium 150 kg/hm^2 for wheat and 150—187.5 kg/hm^2 for maize were recommended in Henan.


THANK YOU
处 理 3
N10P5 K10