

Crop Production and Environment friendly-agriculture in China

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1. General situation of crop Production in China

1.1 China is a big agricultural country .

China has about 1.3 billion people, the greatest population in the world, of which nearly 0.9 billion people live in rural area, accounting for 70% of the total population (*He xifeng, 2003*) .

China is the biggest cereals producer and consumer as well. There are 1.28 billion hectares of sowing area and 450 million tons of total production of cereals crop. The total production of wheat and rice are the biggest and maize is the second in world (table1). It is estimated that 540-580 million tons of cereals will be in demand in China by 2010, 20 percent higher than that nowadays and 650 -700million tons by 2020 (*Qi shyun at al ,2000*).

Table1 Mainly cereal production in the world (2002) (Unit: k t)

Country	Wheat	Country	Rice	Country	Maize
world total	568109	World total	579477	World total	602027
China	89330	China	177589	USA	228696
India	71470	India	123000	China	124166
Russia	50000	Indonesia	48654	Brazil	35479
USA	43992	Thailand	27000	Mexico	19000
France	39031	Burma	21200	France	16000

Note

Data

from China Agriculture Almanac 2004

China is a big trader in crop products, including cereals, oil, rapeseed, vegetable, fruit and sugar. The trading volume of crop products has continuously been increasing since 1980. According to a statistics, there was nearly 10,000 million US dollars in export trade and 7000 million in import by 2002 (table 2).

Table 2 Chinese crop produces trade list (1980 – 2002) (unit: million US dollars)

	1980	1990	2000	2002
Export: total	1776	3847	7207	9051
Cereals, oil and rapeseed	481	1,237	2667	2422
Vegetables and fruits	1074	2293	4367	6402
Sugar	221	317	173	227
Import: total	2892	3038	5017	6901
Cereals, oil and rapeseed	2,472	2,535	4163	5825
Vegetables and fruits	104	113	677	838
Sugar	316	390	177	238
Net export: total	-1116	809	2190	2150
Cereals, oil and rapeseed	-1991	-1298	-1496	-3403
Vegetables and fruits	970	2180	3690	5564
Sugar	-95	-73	-4	-11

data from Anderson et al (2003)

1.2 Diversity of crop production in China

Chinese crop production has markedly regional distribution characteristics. Cereals are distributed in many regions all over the China. However, cotton production is mainly grown in Xinjiang and Shandong provinces and sugar in Guangxi province (table 4).

Table 4 Crop production and regional distribution in China (2003)

Crop	Total area (10 ³ ha)	Total production (10 ⁴ t)	Mainly province and proportion (%) in china	Mainly province and Proportion (%) in china
Cereal	99410.1	43069.40	Henan(9.0),Heilongjiang(8.2), Shandong(6.5),Sichuan(6.4), Anhui(6.2)	Henan(8.3),Shandong(8.0), Sichuan(7.1),Heilongjiang(5.8), Jiangsu(5.7)
Cotton	5110.6	4859709	Xinjiang(20.7),Henan(18.1), Shandong(17.3)	Xinjiang(33.0),Shandong(18.0)
Oil	14990.1	28110004	Henan(10.5),Hubei(10.1), Anhui(9.4), Sichuan(7.3),Shandong(6.8)	Shandong(12.9),Henan(11.0) ,Hubei(9.7)Anhui(8.2), Sichuan(7.7),
Suger	1657.4	96416459	Guangxi(42.8),Yunan(17.6)	Guangxi (50.4)

China has complicated cropping systems. There are different multiple cropping systems in different regions, such as rice/rice, rice/wheat and re-grown rice in southern region , winter wheat /summer maize in middle region and there are different crops, such as maize, soybean, rice , potato is grown in single harvests in the northeastern, and cotton, spring wheat and barley in westnorthern .

1.3 food security and agricultural environment are a big challenge in China

With population increasing and arable land decreasing, the Chinese food security is and will be serious problem so far and in further of agricultural development. China has less arable land and great population, the per capita arable land is only 0.1 ha, less than half of world average level. And the arable land is decreasing by 0.7% each year (fig1). In order to guarantee grain-production, Chinese government is building four major national commodity grain bases around the country; they are South Fertile Commodity Grain Base, Huanghuaihai Commodity Grain base, West northern Commodity Grain Base and Northwest Commodity Grain Base.

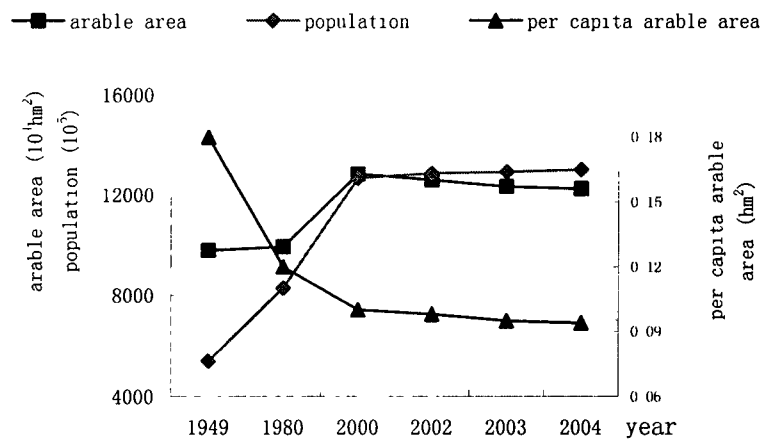


Fig. 1 the arable land and population in China (Data from resource communique of territory 2004)

China agricultural environment is facing many serious problems, including water and soil erosion and sandstorm which make arable land decrease and deteriorate; heavily polluted by fertilizer, pesticide, plastic film, manure and etc. Chinese crop production must guarantee food security and friendly environment.

2. Challenge of Agricultural Environment in China

2.1 Arable land decreasing and poor

From 1997 to 2004, China arable land reduced 5.7%, which is 7.47 million hectares within only eight years (*State of Environmental Protection Administration of China 2004*). There is overall low quality of cultivated land now in China features in that the soil nutrient is out-of-balance, the fertilizer efficiency is dropping, the environment is worsening, etc.

2.2 Soil Erosion

In China, the types of soil erosion mainly include hydraulic erosion, wind erosion, freeze-thaw erosion, landslide, mud rock flow and hill avalanche, in which hydraulic erosion and wind erosion are most common and spread most widely. The existing area of soil erosion of different degree in China is 3.67 million km², accounting for about 38.2% of the national territory, in which hydraulic erosion occupies 1.79 million km² and wind erosion 1.88 million km² (*Ministry of Water Resources, 2004*). Wind erosion of soil is very important element of sandstorm increasing.

2.3 Plastic film pollution

China consumes a large amount of plastic film and claims to be the biggest country that implements "White Agriculture Project " in the world, covering more than 70% of the area. By 2004, the annual consumption of agricultural plastic film has already been up to 1,200,000 – 1,300,000 tons, coverage is above 16,667,000hm² (*Wang, 2003*) .The plastic film pollution area is over 7,800,000 hm². Statistics shows that the agricultural plastic film remaining in China is up to 350000 tons every year (*Yang, 2000*).

2.4 Pesticide and fertilizer pollution

China is a large agricultural country and also a big country in production and consumption of chemical fertilizer and pesticide (Fig.2). The amount of both fertilizer application and the agriculture chemical consumption in China is 44,120,000 and 1,320,000 tons respectively in 2004, which is maximum in the world (*State of Environmental Protection Administration of China, 2004*). Over 20 million hm² arable lands are polluted by pesticides and fertilizer in China. The proportion of applying fertilizer is imbalanced, N:P:K was 1:0.39:0.22, and the world average is 1:0.6:0.4. The use of organic fertile only accounts for 25% of the total amount, and the reasonable proportion is about 40%. At present, the utilization ratio of

chemical fertilizer in china is only 30% to 40%, lower than 50% to 60% in the developed countries (Li, 2001)

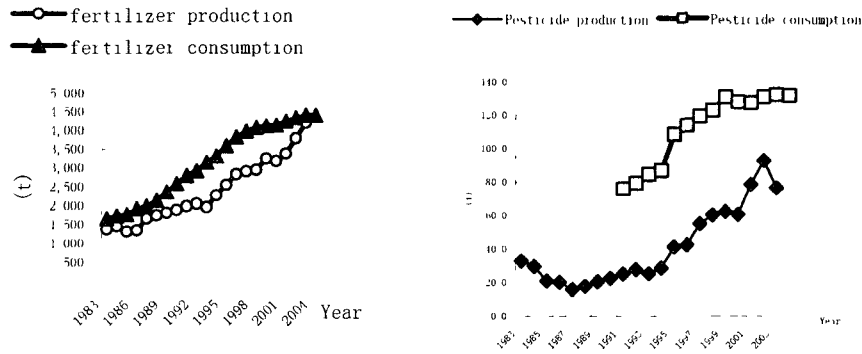


Fig 2 the fertilizer and pesticide production and consumption

2.5 Heavy metal pollution

At present, the arable land area polluted by heavy metal (Cd,As,Cr,Pb,etc) is nearly $2000 \times 10^4 \text{hm}^2$, accounting for 20% of the total arable land (2004, LinQiang). The sewage irrigated areas of about 1,400,000 hm^2 s The land area of heavy metal pollutes is about 64.8% of the area of sewage irrigated, among them slight pollution account for 46.7%, common account for 9.7%, seriously account for 8.4% (Cui, 2004). Investigation also indicates that the heavy metal polluted grain reached 12 million tons every year (Lin, 2005), and found 5,482,000 hectares serious contaminated area of soil in 24 provinces and cities(Shi, 2004).

2.6 Organic pollution

At present, agricultural self polluting potential and risk are also very great, such as animal manure and crop straw. Probably there is 40×10^8 tons, 6.5×10^8 tons straw nearly have 2/3 to burn or turned into the organic pollution every year. (Zhang, 2005)

3. Development of Environment-friendly Agriculture in China

China has not only been guaranteeing food security with high yield and efficiency, but also do friendly environment in crop production. In order to Development of sustainable agriculture China has been studying the different modes of environment friendly agriculture (Fig. 3).

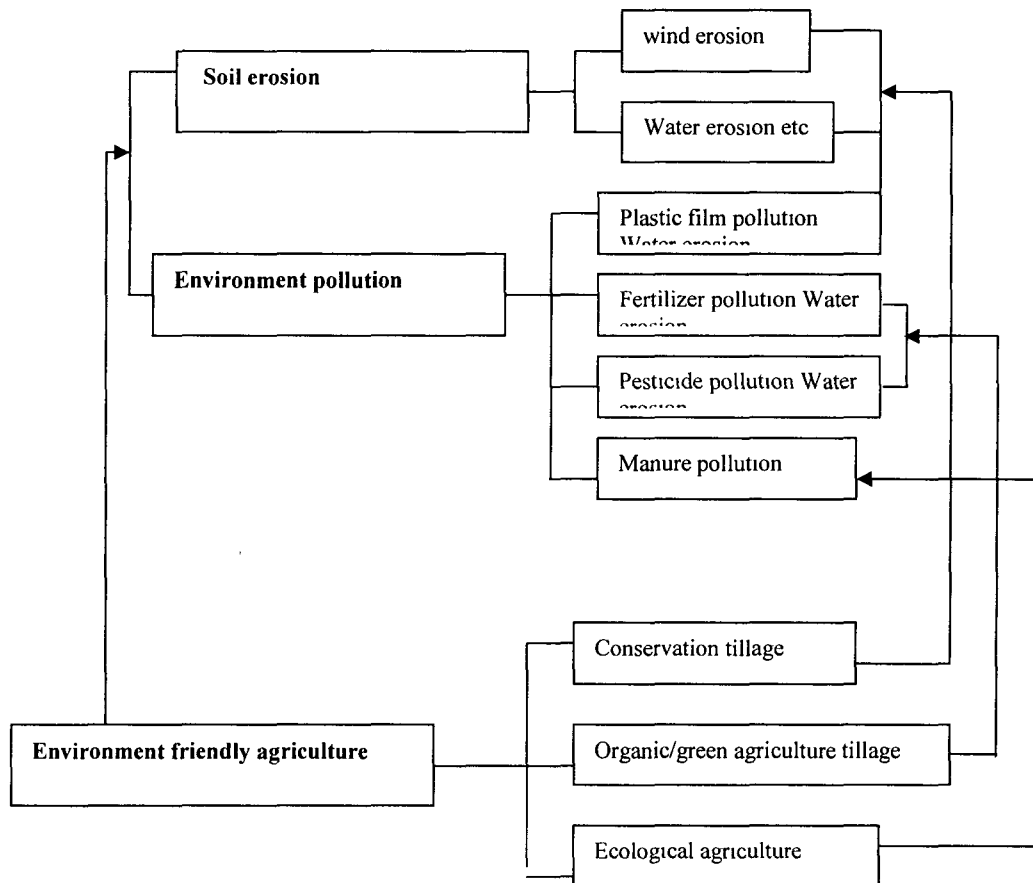


Fig 3 the Challenge of Agricultural Environment and Technique of Direction : Crop Production and Environment-friendly Agriculture in China

3.1 Development of conservation tillage

The study of conservation tillage has been carried out and Popularized for solving the problem of soil erosion. The methods of covering with straw and less tillage have taken a great role in protecting soil from water and wind erosion. It has been shown that the conservation tillage has markedly decreased water and wind erosion of soil and sandstorm. The soil fertility has been resumed with conservation tillage system. For example, the huminic acid content in upper layer has increased from 0.89% to 1.34% in wheat field in

Shanxi provinces. The earthworms have increased to 10-15 from 0 before conservation tillage, the total soil aggregate and micro-aggregate contents were increased. At the same time, farmers have been accustomed to covering field with straw instead of burning. The farming cost has reduced by 15%~20%. The crop production have been increased by 10%~15%. And farmer's income has increased 20%. So far scientists are improving the conservation tillage technology in different ecological regions of China.

3.2 Ecological agriculture

In the past 40 or so years, China has accumulatively improved 670,000 sq km of soil-eroded area. The forest coverage rate has increased to 13.92 percent. Up to now, the ecological agriculture system in china has developed by using national ecological agriculture for reference and according to the situation of the country. There are different modes of ecological agriculture in different regions of China., such as “methane pool-pig/bird house-W.C.-sunlight greenhouse mode” in northern, “pig-methane pool-orchard” in southern.

3.3 Organic/green agriculture

Developing Organic/green agriculture to protect agricultural resource from fertilizer pollution and Pesticide pollution. In China, organic agriculture is in its relatively early stages, although Asia has the largest organic area. About two thirds of the provinces and autonomous regions in China have been involved in organic production, processing and trading. Zhejiang and An'hui provinces in the eastern part of China are the pioneers of organic farming.

In 1992 the Chinese Ministry of Agriculture established the China Green Food Development Centre (CGFDC). The program certified to two grades: the “A Grade Green Food”, which allows the use of limited and specified agrochemicals at safe levels; and the “AA Grade Green Food”, which is quite close to organic food in terms of standards. By the end of 2001, more than 2,000 green food certificates had been issued on products produced by various farms all over China, among which 48 were certified as “AA Grade Green Food”. The success of the green food sector, especially the “AA Grade Green Food”, provided China with a sound agricultural experience for the development of organic systems (*Zejiang 2002*).

In 1994, in order to promote the development of organic foods and to protect the rural environment from pollution, the State Environmental Protection Administration of China (SEPA) established the Organic Food Development Centre (OFDC). OFDC then prepared a comprehensive set of organic farming production and food processing standards and management regulations for the organic food label. These

standards cover crops, eggs and milk products, apiculture, mushrooms, sprout products and wild plant collection; processing of organic products, distribution and sales; storage and packaging; inspection and auditing; air, irrigation and water quality used in production; and permissible and prohibited materials for production and processing. OFDC is now responsible for inspection, certification, labelling, research, education and training related to the development of organic food (FAO, 2002). It is likely that the organic industry will now grow rapidly in China, and more domestic organic certifiers will be established. There are also several foreign organic certifiers from Europe and the USA operating in China.

Certified products include soybean, buckwheat, sesame, sunflower and pumpkin seeds, rice, walnuts, pine nuts, tea, apicultural products, medicinal herbs and milk, and a few processed products such as fruit juices, noodles and beverages (FAO, 2002). Before 1999, more than 95% of the certified organic products of China were exported, especially to Japan, EU countries and North America.

However, in the last two years food safety issue has become a growing concern in China, resulting in the growth of the domestic organic food market. With economic development being experienced and an increasing common public concern over food contamination, demand for organic products is likely to increase. It is estimated that in the coming years the sales volume of main organic foods might rise from one to two percent of the entire food sales in China (FAO, 2002).

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