

HOW SUSTAINABLE IS CHINA'S AGRICULTURE?

A Closer Look at China's Agriculture and Chinese Peasants

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Introduction

One of the most challenging problems in China's agriculture has always been the lack of arable land. China has less than 9% of world's arable land, but it has to produce food and other agricultural products for 22% of the world's population. On a per capita land basis, its arable land is just over one mu or 0.0827 hectares (1 mu = 0.067 ha), about one third of the world's average. More than 40% of the world's peasants work on this land area making the farm size per household very small, averaging less than 0.2 ha. In some more densely populated provinces, each household has less than 0.1 ha. In addition to very limited land, China also has very little water resources, only 6% of the world's water supply and only 25% of the world's average on a per capita basis. With a large population to feed and cloth, the limited arable land and scarce water resources place severe constraints on agricultural production. In China, long-term sustainability in agriculture depends on whether arable land and water available to agriculture can be maintained at least at current levels, and whether yields per cultivated area can increase.

Other important factors related to long-term sustainability in agriculture are by what methods arable land and other agricultural inputs are allocated among different kinds of agricultural production. The current debate on this question has been about whether China should continue to pursue its past policy of self-sufficiency in food (especially grains), or whether China should redirect its scarce land and other resources to produce products in which it has comparative advantages, satisfying its food needs through international trade. Another important question that must be addressed is how agricultural production can be modernized. With modernisation the number of people engaged in agriculture can be reduced, and "surplus" labour can be shifted to other areas of production. Another important dimension of China's agriculture is how different policies affect the well being of Chinese farmers. Nine hundred million people still reside in China's rural areas. Out of the total of 480 million people in the labour force in rural areas, 320 million are engaged in agricultural production. (Tan, 161)

When evaluating China's agricultural policy, we cannot focus only on the short-term outcomes of each policy alternative on agricultural production. The assessment of the appropriate agricultural policy for China should be based on whether and to what extent it can address these major questions. The appropriate agricultural policy for China or for any other country ultimately has to be determined on whether it is sustainable in the long-term.

This paper discusses these major questions by comparing and contrasting the policies of two distinctive periods. The first period covers the 30 years between 1949 and 1979 including the period of land reform and agricultural collectivization 1953 to 1958 when the commune system was established, and the 20 years of agricultural development under the commune system. The second period covers the time from 1979 when Agricultural Reform began and up till present. These two distinctive periods represent two entirely different models of development. Agricultural development during the commune years will be discussed quite thoroughly in this paper. The rather lengthy analysis of the first period is that without that historical background, it is not possible to understand what followed after the Agricultural Reform in 1979.

From 1949 to 1979, China pursued its own socialist model of economic development based on self-reliance. The self-reliance model required central planning with very specific goals. The immediate goal of economic development during this period was first to satisfy people's basic needs. Meeting people's basic needs, which included food, shelter, health, and education; and then gradually raise their standard of living, was the highest priority.

A related goal was to reduce the gap between the standard of living of urban and rural residents, who constituted the overwhelming majority of the population. The short-term goal for agriculture was to achieve self-sufficiency in grain and

other agricultural products for consumption and for raw materials needed in industry. The long-term goal was to preserve and improve arable land and to modernize agricultural production. Farmland capital construction included projects like squaring and terracing land, building irrigation and drainage system, reservoirs and pumping stations. The goal of farmland capital construction was to achieve high and stable yield land area. This kind of land work was also necessary for agricultural modernization, which included applying inputs such as fertilizer, improved seed strains; and using tractors and other kinds of agricultural machinery. Capital construction and modernization in production not only relieved peasants from their back breaking work, it also reduced labour needed for agriculture, so more people could work in factories to advance rural industrialization.

The Agricultural Reform enacted the "Family Responsibility System" and redistributed land to individual peasant households. The commune system was formally dismantled in 1984. The centralized State purchasing and marketing system, which was responsible for purchasing and distributing grain and major agricultural products, was gradually liberalised and the State reduced the number of items as well

as the quantities of each item it purchased. Peasants today mostly rely on the market as the main mechanism to regulate their production. Furthermore, China made some major changes in domestic and international trade policies to prepare itself for its accession to WTO in 2001. These new policies have further liberalized agricultural production and marketing and have linked China's economy more closely to the rest of the world. These developments in the past twenty-seven years have clearly signalled the change from a development model based on self-reliance to a model based on China's comparative advantages in the international economy. In agriculture, it means that China has shifted more of its resources toward the production of labour intensive products, such as fruits and vegetables for export, and imports the more land intensive products, mainly grains and cotton. It is not yet clear whether China has given up self-sufficiency in grain; the government claims that the self-sufficiency rate will be reduced from 100% to 95%. However, if China is to fulfil its commitments made to the WTO, it is questionable whether a 95% self-sufficiency can be maintained.

This paper consists of six sections. The first section provides the historical background of



policies and development priorities in each of the two periods. The second section evaluates the impact of farmland capital construction. Section III assesses the accomplishments in the modernization of agricultural production. Section

IV discusses the issue of self-sufficiency in grain and agricultural trade, and Section V covers the conditions of Chinese peasants. The last section discusses the long-run sustainability of China's agricultural development.

I. Recent Historical Background

Land Reform and the Collectivization of Agriculture

Before the 1949 revolution feudalism in China had lasted more than three thousand years. During this long historical period, a small number of landlords owned large areas of farmland, with the majority of people landless peasants. After the 1911 revolution that overthrew the Qing dynasty, land concentration continued. For example in 1934, just a decade and half before the 1949 revolution, landlord households, merely 4% of the total population, owned 50% of the land, while 70% of the peasant households only owned 17% of the land. (Wu Guo Bao, 179) Poor peasants who rented land often had to pay more than half of their income to the landlords. Land reform, which had begun in liberated areas before 1949, was the beginning of the end of this grossly exploitive land-owning system. After the revolution, between 1949 and 1952, land reform in the newly liberated countryside was completed, giving hundreds of millions of peasants a plot of land for the first time in their lives. Peasants cultivated their small plots of land, which averaged about 0.2 hectares per capita¹, with great enthusiasm. The output of both grain and cotton went up rapidly between 1949 and 1952. However, by 1953 grain production stagnated and cotton production actually decreased. (Su Xing, 24; Hsu and Ching, 28)

After more than one hundred years foreign invasion and domestic wars and long periods of neglect by landlords, much of China's scarce arable land was infertile. Wars that had continued for a prolonged period also destroyed much of the agricultural infrastructure build in the past. Aside from owning very small plots of poor quality land, the majority of peasants owned very few productive tools. Among the poor and lower middle peasant households, 60 to 70 percent of China's peasantry, many did not own a plough, let alone other tools or draft animals. Without farm tools or any other farm inputs, enthusiasm alone could not continue to increase production. Moreover, in 1953 and again in 1954, floods and droughts affected large areas of farmland. Individual peasants were defenceless against such natural disasters and/or personal mishaps such as illness or the deaths in the family. As a result, many peasant families were forced to borrow. Facing debts at usurious rates, they often had no other alternative but to sell their newly acquired land. Before the cooperative movement began, private borrowing and land sales began to rise, as had the number of peasants who hired themselves out as farm labourers. Had there not been a cooperative movement, there

would have been further polarization and re-concentration of land ownership. (Ibid.)

To resolve the problems of small land holdings and inadequate farm tools, the new government began the process of agricultural collectivization. Peasant households were encouraged to first form mutual aid teams, where several peasant households shared farm tools and farm labour. The next stage was the formation of the elementary cooperatives where peasant households pooled their land, labour, and productive tools together to farm. Under elementary cooperatives, output was distributed according to land, tools, and labour each household contributed. With increases in production, the cooperatives began to accumulate their own funds to buy the farm tools from households, which had owned them. After the cooperatives bought and owned its own farm tools, the movement reached the higher stage of advanced cooperatives. At this stage, since land and tools became collectively owned, the cooperatives no longer paid out dividends, and output was distributed among members only according to labour contributed. (Hinton, 115-116)

In 1958, the commune system was established, and communes replaced the xiang level governments in rural China. Each commune was in charge of agricultural production, industrial production, commerce, education and other cultural affairs, the health system, and self-defence militias. The commune system had a three-tiered ownership: 1. Communes built and owned large-scale irrigation and drainage systems, roads, hospitals, schools, factories, and other large agricultural instruments. 2. Production brigades built and owned factories, large agricultural machineries, milling stations, animal/poultry farms, and other facilities, whose use were shared by brigade members. 3. At the lowest tier were production teams, which were the basic accounting units responsible for planning and carrying out production, and distribution of products to its members according to work contributed (recorded in work points) by each household. It also took care of the distribution of quota grain, accumulation fund and the social welfare fund². The production team owned land, smaller agricultural machineries and other instruments. Before the commune system was dissolved in 1978, there were 52,781 communes, 690,000 production brigades, and 4,816,000 production teams. (Chinese Social Science Academy, 36) That meant each commune had about 13 brigades and each brigade had about seven teams. The average size of the production team came to about 20 to 30 peasant households.

Before the commune system was established, the Unified Purchase and Marketing System had been set up in 1953. This system was in charge of the circulation of the major agricultural output including grains, cotton, oil seeds, and many other products. The State set purchasing quotas and prices for these products, and communes were required to fulfil these quotas at preset prices. The State also received agricultural taxes in grains. The State also processed important agricultural products, such as grains, and oil and then sold them to urban and town residents at subsidized prices and were rationed according to the number and age of persons in each household. The system also facilitated the sale of cotton and other raw materials to State-owned factories for processing. Cotton cloth sold to consumers was also rationed and subsidized. In other words, the Unified Purchase and Marketing System used State procurement, which covered

all major agricultural products, to manage production and consumption of these products. In using the quantity and prices in State quota purchases and marketing, the State maintained stability in both the quantities and prices of these items. During this period, imports and exports of grains and other agricultural products were merely used to balance domestic production and consumption³. The policy and goal was to guarantee self-sufficiency and price stability in grains and other agricultural products.

During the two decades after communes were established, China made substantial gains in increasing agricultural production. China was able to increase grain production from 181 million tons in 1952 at the end of the recovery period to 285 million tons in 1977. With the exception of 1959-1961, grain production increased on the average by more than 3%, which was higher than the average population growth during the same period. The rate of growth during this period was higher than China's historical record and the records of most developing countries. (Groen and Kilpatrick, 1978, 619) By the end of the 1970s, China was able to achieve self-sufficiency in food. As stated previously, international trade in grains was merely used to balance the domestic markets. For example, between 1975 and 1977 China imported an average around 4 million tons of grain per year, a small fraction of its total production, while it exported grain and other agricultural products as well. (Groen and Kilpatrick, 1978, 640)

In addition to production increases, peasants in China did impressive work in infrastructure building, in preserving and improving arable land. (Accomplishments in agriculture during the commune years will be explained in more detail in later sections.) The commune system was also able to raise the standard of living and to improve the health and education for the vast majority of peasants in rural China. (See Section V.)

Deng's Agricultural Reform

In 1979, Deng and his supporters began the Agricultural Reform, which took several steps to break up the communes. By 1984, the commune system was dismantled and land and other collective properties were redistributed to individual peasant households⁴. In the very

beginning of the Reform, the government raised the price of grain and other agricultural products by an average of 25% within quota purchases and another 50% in a bonus above quota purchases. Grain production increased rapidly during the first few years of the Reform, with an increase of 22.5% during the five years between 1979 and 1984⁵. Then from 1984 to 1996, a period of twelve years, grain production increased by 20.4%, then fell from 1999 for four consecutive years, from 392 million tons in 1998 to 322 million tons in 2003⁶. The gap between total grain demand and grain production was about 40 million tons a year, most of which came out of State grain reserves.

In the early stage of the Reform, the Unified Purchase and Marketing System was maintained, but its scope reduced. The number of items in this system was reduced to 38 in 1985 - only 30 percent of the 1980 level. Then, since 1985, more products have been taken off the State procurement list, including pork, fish, poultry, tea, fruits and vegetables. However, by 1997 the government still controlled 44 percent of marketable grains, and 100 percent of cotton, tobacco, and silkworm cocoons. (Wu, Henry; 11-12) In the same article Wu also explained how in 1985, the government tried to replace the mandatory State procurement of grain with a voluntary contract sales system. However, the prices of grain offered by the government for

voluntary contract sales were too low to acquire enough grain, and mandatory grain purchases had to be restored. Then the State raised retail prices for urban rationed grains 68 percent in 1991 and another 45 percent in 1992, closing the gap between government procurement prices and urban retail prices, and reducing the amount of subsidies for urban consumers. Food prices increased sharply at the end of 1993 and the State then shifted its responsibility of maintaining grain market stability to provincial governors, requiring them to maintain balances in grain markets in their provinces.

Other major reforms related to China's accession to WTO will be explained in Section IV. These reform measures have already had a major impact on China's agriculture and will continue to influence the long-term sustainability of Chinese agriculture.

Increases in Agricultural Output 1949 – 1999

Table 1 below shows the output of various agricultural products and the annual rates of increases from 1949 to 1978 and from 1978 to 1999.

There were several reasons for the large increases in grain production during the early phase of the Reform. One obvious reason was, of course, the large increases in purchase price.

	1949	1978	1949-1978	1999	1978-1999
Agricultural products	10,000 tons	10,000 tons	Annual growth %	10,000 tons	Annual growth %
Grain ^a	11,318.00	30,477.00	3.47	50,839.00	2.47
Cotton	44.40	216.70	5.62	383.10	2.75
Oil-bearing Crops	256.40	521.80	2.48	2601.20	7.95
Sugarcane	264.40	2,111.60	7.43	7,470.00	6.20
Sugarbeet	19.10	270.20	9.57	864.00	5.69
Flue-cured tobacco	4.30	105.20	11.66	218.50	3.54
Tea	4.10	26.80	6.69	67.60	4.50
Fruit	120.00	657.00	6.04	6,237.60	11.31
Meat	220.00	856.30	4.80	5,960.90	9.68
Aquatic products	45.00	466.00	8.39	4,122.00	10.94

a. Grain includes wheat, rice and corn.

The purchase prices went up 70.1%, 68.6%, and 64%, for wheat, corn, and rice respectively from 1978 to 1983. (Liu, 170) The other reason was that during these earlier years, the prices of agricultural inputs had not yet gone up, and thus there were large margins between the costs of production and output prices. In addition, agricultural machinery and agricultural infrastructure, bought and built during the commune years, were still functional during these years. Fertilizer plants built in earlier years also increased fertilizer supply. The amount of

chemical fertilizer applied between 1978 and 1984 more than doubled, from 8,840 (1,000 tons) in 1978 to 17,398 (1,000 tons) in 1984.

Then, grain production declined from 1999 for four consecutive years. 2004 was the first year that saw an increase in grain production. China's imports of corn, soybeans, and cotton started to increase rapidly in 2003 and the agricultural trade turned from surplus to deficit that year. More discussion on agricultural production and trade will follow in Section IV.

II. Agricultural Land Preservation and Improvement

During the Communes Years

During years between 1958 and 1978, China pursued its socialist model of self-reliant development. Communes, production brigades, and production teams were in charge of planning and carrying out agricultural production. These units mobilized and organized large number of Chinese peasants to work on land preservation and improvement projects, namely farmland capital construction projects. These projects accelerated in the late 1960s and early 1970s when agricultural production was more stabilized and more labour could be diverted from farm work to construction. Alexander Eckstein, an expert on the Chinese economy, said the following about the farmland capital construction in his paper on "The Chinese Development Model":

More concretely, it indeed means reshaping the geographical features of an area to provide the physical conditions necessary for the application of an appropriate mix of other inputs, labour, machinery, fertilizer, and improved seed strains to bring about high and stable yields. This often requires squaring or terracing the land; at times it involves levelling mountains and transporting the soil manually in baskets for several kilometres to build a huge dam or to cover some areas with top soil. In many areas, it means constructing underground drainage channels, reservoirs, canals, irrigation channels, pumping stations, and tube wells.⁷ (Eckstein, 88)

The American Small-Scale Rural Industry Delegation witnessed a wide range of these farmland capital construction projects when the delegation, which consisted a group of scholars in the field of economics, agricultural sciences, sociology, and history, visited China in 1975 and wrote the following:

We saw ample evidence of increasing arable land through reclamation and

improvement projects in every area that we visited. In Shansi province, we saw badly eroded mountainous areas, with yellowish wind deposited loess soils, being reclaimed for good arable land. Impressive progress was made at Hsi-yang County and at the famous Taichai Brigade in reclaiming land through terracing of mountains and filling of gullies and riverbeds. In the nearby Hui County and Hsin-hsiang areas, north of the Yellow River, we came across many land development, irrigation, and water control projects, which have helped to transform sandy and marshy riverbeds into productive agricultural land. In Lin County, North Honan province, we saw the 70-km long Red Flag Trunk Canal and its 1500-km long distribution network. Water from the Chang River is brought from neighbouring Shansi province over rugged mountainous terrain to irrigate 40,000 ha. of fertile agricultural land. The canal was built by 20,000 workers and took almost 10 years to complete. (Perkins, 1977, 121)

As indicated by Eckstein, the goal of farmland capital construction was to bring about high and

stable yields. Levelling the land made irrigation possible. The whole network of irrigation and drainage system was built to prevent the devastating impact of drought and floods, so that farm output was not as dependent on the weather as it had been for hundreds of years.

Farmland capital construction projects were organized into different administrative units. Projects that were planned and carried out by the county or higher levels of government were larger in scale and were usually carried out by permanent year round construction teams. Such projects could involve a few thousand workers and were financed by county, provincial, or even the State (central) governments, but the brigades/communes also shared the cost by providing the year round construction workers. These workers continued to receive work points at their home units, and in addition, they received a small daily supplement from the county or higher level of government⁸. (Perkins, 1977, 197-198) For these larger projects State financial assistance was indispensable. As the State made significant progress in developing different industries, it was able to increase its investment in agriculture. Investment in agriculture as percent of its total investment also went up from 7.8% to 12.5% from 1957 to 1978. (See Table 2)

At the commune level, projects were often planned and carried out by several communes together, because the benefits of these projects were also shared. Smaller projects were carried out during the slack seasons of farm work. Chinese peasants worked hard on farmland construction projects by extending their workdays to the winter months; the number of days they worked in a year increased from 119 days in the mid-1950s to 250 days in the mid-1970s (Rawski, 7-8). In addition, the communes and brigades also paid for the material costs of these projects from their accumulation fund saved from their yearly output sold.

Table 3 shows that the percentage of irrigated farmland increased from 18.5% of the total cultivated areas in 1952 to 24.4% in 1957, 31.8% in 1965 and 45.2% in 1979. Even though for the large construction projects investment from the State was necessary, numerous smaller projects were self-financed at the commune level. Moreover, the key to the projects' success

really was due to the organization at the brigade and the commune level. According to a group of Chinese agricultural experts, the formation of communes in 1958 "put in place an organizational structure capable of mobilizing large quantity of surplus labour for large-scale projects involving restructuring of farm land and major irrigation works." (Perkins, 1977, 204)

These tremendous efforts made in farmland capital construction did not increase China's arable land; however, land area planted did increase due to the expansion of multiple cropping and inter-cropping. Multiple cropping was to increase the planting of crops from one to two, or from two to three (sometimes to four) in the growing seasons. Inter-cropping was planting one crop before the other crop was harvested.

Loss of Arable Land and the Deterioration of Land Quality after the Reform

The efforts spent to preserve and improve land during the commune years were reversed after the Reform began. Since the 1979 Agricultural Reform, large areas of farmland have been lost and continue to be lost to industrial use, tourism, residential and commercial housing, desertification, and other development projects, such as highway construction. In more recent years many peasants have also abandoned their land, because it has become increasingly difficult to earn a living by cultivating a small plot, when the price of inputs continues to rise with the price of output either stagnating or dropping. Moreover, natural disasters, both floods and drought, and environment pollution have claimed large areas of land and have seriously affected agriculture production. (See Section VI.)

There is no report on exact land loss figures since the Reform. From various estimates gathered, the following numbers are close approximates. Between 1981 and 1985 the yearly loss of arable land averaged about 5-7 millions mu, or about 335-469 thousands hectares. (1 mu = 0.067 hectare). By 1987 land loss increased to about 8 million mu, or 536 thousands hectares. Not much was reported about land loss in the 1990s, but it is certain that there was an upward trend, because one report in 2004 indicated, "According to incomplete statistics the yearly land loss in recent years averaged about 10

million mu per year.” (Li, et al., 287) Ten million mu equals to 670 thousands hectares. At least two authors confirmed that land loss in 2002 and 2003 accelerated and reached 25 millions mu (1,694 thousands hectares) in 2002 and 38 millions mu (2,546 thousands hectares) in 2003, 5.4 to 7.6 time of the average yearly land loss in the first half of the 1980s. (Li, et al., 288; Tan, 152)⁹ The rate at which land loss has accelerated is alarming; in 2003 as percent of total arable land, it reached 2%.¹⁰ The Worldwatch gave a lower estimate for the amount of land loss during the years since the 1979 reform, a half-million hectares each year, or about one-third of 1 percent. The total land loss over a period of 25 years amounted to 7 % of the total agricultural land. The Worldwatch estimate fails to show the upward trend of the more recent years. (Worldwatch, 15)

According to Lu Xue-yi, in addition to the loss of arable land, the fertility of land has also deteriorated, because of an increased use of chemical fertilizer and a decreased use of organic fertilizer. From 1976 to 1987 land area that used organic fertilizer decreased by 60%. (Lu, 2002, 5-6) Yang and others were also concerned



about the overuse of agricultural chemicals. They said the use of pesticides and herbicides has been increasing 10% annually in more recent years. They also stated that the overuse of chemical fertilizer has turned the marginal productivity of chemical fertilizer negative. An article put out by Index-China confirmed the overuse of chemical fertilizer, reporting that chemical fertilizer consumption has quadrupled since 1978. (Changes for the future, *Index-China.com*) The impact of applying such large quantities of chemicals not only has caused the quality of land to deteriorate, but has also caused serious damage to the environment. Moreover, more chemical residuals have been found in many different kinds of food. All of these factors negatively affect the long-term sustainability of China's agriculture. (See Section VI.)

Lu also noted that since 1980, there has been loss of irrigated land. Before 1980, irrigated land area had increased by 8 to 10 million mu a year but after 1980 no additional irrigation systems were built, and old systems ceased to function due to lack of maintenance. Irrigated land area has since continued to decrease. Lu further stated that not only there was loss of arable land, and there has also been the loss of more than 100 million mu of natural forest, 1 billion mu of pasture land, and increasing desertification. (Lu, *Ibid.*)

As section VI will describe, China has suffered a serious problem of water shortage due to the high growth of industrial production and urbanization. Increasing water use for industry and for urban residents diverted water from agriculture and rural residents. The water shortage has already had serious effects on agricultural production, and has kept many rural residents from improving their standard of living. In addition to the problem of water shortage, there have also been flooding and other natural disasters that have affected agriculture. These problems will determine whether China can achieve long-term sustainability in agriculture. (See discussion in Section VI.)

After the collapse of the communes in 1984, all the previous farmland capital construction projects stopped. In the past the communes and brigades used their accumulation funds for land improvement projects — but after the xiang government replaced the commune and the cun

replaced the brigade as the new administrative units, their functions changed. Collective owned enterprises, which were important sources of income for brigades and communes were first contracted to individuals and then privatized. From the mid-1980s to the early 1990s these enterprises flourished and the new owners got very rich and became the first group of "10,000 RMB households" (in total assets) in China, building themselves big mansions. The first five years of the Reform also saw incomes of peasant households increased due to the higher purchase prices paid to the peasants during the early years of the Reform, and many of them used the increased income to build houses.

China's rural villages looked prosperous during those years, when agricultural surpluses were used to build new houses, but at the same time, basic infrastructure, such as irrigation and drainage systems, land improvement projects, and agricultural machinery began to deteriorate. Moreover, when the State increased the purchase prices for agricultural products, it drastically reduced its investment in agriculture. In addition, as the communes began to collapse, the social welfare system under the commune, such as health care and education and subsidies to the poorer households also disintegrated. More on the conditions of the peasants will follow in Section V.

III. Modernization of Agricultural Production

Agricultural Modernization during the Commune Period

The modernization of agricultural production and farmland capital construction went hand in hand. If peasants had not worked so hard to prepare the land, it would not have been possible to use agricultural machineries such as tractors, power tillers, harvesters, seeders, and trans-planters – nor would it have been possible to transform irrigation from buckets of water on carrying poles, to the electric powered irrigation stations.

One of the most important reasons for the achievement made in agricultural modernization during the commune years was the development strategy of the worker-peasant alliance. For any country in the initial stages of industrialization, surplus has to be transferred from the agricultural sector to the industrial sector. That is, a less developed country has to rely on surpluses from agriculture for the initial investment in industries; the agricultural sector has to be "exploited" in order for the industrial sector to grow. The problem for many less developed countries and for China after the Reform is that shifting the surplus out of agriculture continues for too long a time. When the agricultural sector is not being replenished beyond the initial period, there will not be enough resources left to modernize production.

Under the work-peasant alliance development strategy during the first thirty years of the Peoples Republic, the State implemented policies that gradually reduced the burden imposed on the agricultural sector. As the industrial sector grew, the State also replenished the agricultural sector with modern inputs. Table 2 shows that between 1957 and 1978, agricultural taxes

as percent of total State revenue decreased, investment in agriculture as percent of total State investment increased. Moreover, State expenditures on Agriculture as percent of total State expenditure increased, and the terms of trade for the agricultural sector became more favourable. In addition, the State investment in industries that produced agricultural inputs, such as tractors and other agricultural machinery, as percent of total heavy industry investment also increased. The State sold agricultural machinery to the communes and production brigades at increasingly lower prices. The lowering of prices made it possible for the different levels of rural production units to purchase these inputs in order to mechanize production. In addition to these contributions made possible by the State, the peasants worked extremely hard, as previously mentioned, on farmland capital construction and other land improvement projects. That meant that the communes and production brigades took resources from their accumulation funds and shifted labour from agricultural work in order to build for their future.

In addition to these large agricultural instruments, simple machines were also used to replace

Changes in the Economic Relations Between the State and the Collective		
	1957	1978
Agricultural Investment as % of Total State Investment	7.8 ^a	12.5 ^b
Investment in Agricultural Inputs as % of State Heavy Investment in Heavy Industry	3.0 ^a	11.1 ^b
Agricultural Taxes as % of Total State Revenue	9.6	2.5
State Expenditures on Agriculture as % of Total State Expenditures	7.4 ^a	12.6 ^c
Terms of Trade for the Agricultural Sector (1950=100)	130.4	188.8
a. for the period 1953-57 b. for the period 1976-78 c. for the period 1976-77		

Source: Nicholas R. Lardy, *Agriculture in China's Modern Economic Development*, Cambridge University Press, 130-131; *Statistical Year book of China*, 1983, 445-447; and Xi-Yi, *Pricing Problems under Socialism* (in Chinese), Beijing: China's Finance and Economic Publishers, 1982, 76.

Modernization of Agriculture During the Communes Years				
	1952	1957	1965	1979
Tractor ploughed area as % of cultivated area	0.1	2.4	15.0	42.4
Irrigation area as % of cultivated area	18.5	24.4	31.8	45.2
Power irrigated area as % of total irrigated area	1.6	4.4	24.5	56.3
Kilos of chemical fertilizer applied per hectare	0.7	3.3	18.7	109.2
Small hydropower stations in rural areas	98	544	n.a.	83,224
Generating capacity of power stations (1,000 kilowatts)	8	20	n.a.	276.3
Total horsepower of agricultural machinery (10,000 hp)	25	165	1,494	18,191
Large and medium size tractors (1,000)	1.3	14.7	72.6	666.8
Small and walking tractors ^a (1,000)	n.a.	n.a.	4	1,671
Motors for agricultural drainage & irrigation (10,000 hp)	12.8	56.4	907.4	7,122.1
Combined harvesters	284	1,789	6,704	23,026
Motor fishing boats	n.a.	1,486	7,789	52,225
a. Although these were intended for agricultural use, many were used for transporting goods.				

Source: *Statistical Year Book of China*, 1983, 186, 197 and 1981 *China Economic Yearbook* (in Chinese), VI, 13

human labour in milling and threshing. For example, a commune owned and run rice mill replaced hand pounding for rice processing and reduced the number of man-hours needed to process one ton of rice from 400 to only 10. (Eckstein, 89)

Rural Industrialization and Rural Employment

Rural industrialization was part of the effort to modernize agricultural production. The Great Leap Forward in 1958 was implemented to give a big push to industrialize China's rural area, but projects and workshops started

during the Great Leap Forward could not be sustained. One reason for the unsuccessful attempt to industrialize China's countryside at that particular time, was that many projects of the Great Leap Forward had been carried out with great haste. Another reason was the crop failures during 1959 – 1961, or the so called three Difficult Years, when China suffered both drought and floods. It should be noted here that the Great Leap Forward has been demonized and blamed by those who have favoured the de-collectivization of agriculture. A group of Chinese "scholars" has spent sometimes their entire career to "document" the number of

death during the Great Leap Forward years. It is true that mistakes were made and there was starvation and malnutrition in certain areas and many people did die. However, the 30 million to 50 million number of deaths claimed by these "scholars" are grossly overstated and totally inaccurate¹¹.

By the mid-1960's, however, agricultural production began to increase rapidly and many of the workshops and small factories that had been shut down were revived and began to flourish. Initially there had been five types of small-scale rural industries, fertilizer, cement, small iron and steel, agricultural machinery, and power stations. As agricultural production adopted more modern inputs, nearby factories formed a good support system. These industries used locally available materials, which in the case of industries like cement, saved high transportation costs. Agricultural machinery factories provided timely services for repair and maintenance. When peasants set up these industries, it was done mainly by trial and error, until they eventually succeeded. With the development of these industries a whole new crop of technical personnel was created. Therefore, from the original five types of industries, rural industrialization expanded to processing food and other agricultural products, manufacturing bicycles and other light industrial products, textile and machinery for textile industries, and a variety of other industrial products.

According to the rural Small-Scale Industrial Delegation who visited China in 1975, China's farm machinery manufacturing industry at the time was going through a rather dynamic period and both the products and the production process were being changed rapidly and upgraded. As a result, the State shifted the production of less complex machines to factories owned and operated by communes and production brigades. These workshops, observed by the Delegation: "are progressively tackling more challenging production problems." (Perkins, ed. 1977, 119) The Delegation also concluded the rural industrialization had accomplished other objectives, such as, reducing the pace of urbanization, limiting the need to depend on foreign technology, and reducing the social and economic status between urban and rural, industrial and agricultural sectors. Additionally, the Delegation also concluded

such development had helped spread technical capabilities throughout the rural population. (Ibid., 116) Therefore, the Great Leap Forward had challenged the peasants to industrialize and the peasants not only met the challenge but also did exceedingly well.

According to Eckstein, a well-known expert on the Chinese economy, China in the 1950s still had remnants of open unemployment in cities and underemployment in the rural areas, especially during the winter months when agricultural work was slack. In his article, he said that the rapid expansion in industry, transport and other sectors resolved the unemployment in cities and farmland capital construction work in rural areas absorbed the underemployed in rural areas. Eckstein also said that the Great Leap forward was the first systematic, conscious, all-out campaign to use labour (an abundant factor) to create capital (a scarce factor). He went on to say that although the Great Leap forward failed due to many errors in planning and implementation, the Great Leap Forward concept as a development strategy was well suited given China's factor endowments (meaning abundant labour and scarce capital). (Eckstein, 88)

By the mid-1970s, there was little sign of either unemployment or underemployment in China's rural areas. As previously mentioned the number of days Chinese peasants worked during a year on the average increased from 119 days in the mid-1950s to 250 days in the mid-1970s. (Rawski, 7-8) The American Small-scale Industry Delegation found that there was no fear among the peasants that agricultural mechanization might create unemployment. Instead, they consistently found that "the Chinese look at mechanization as an effective tool to improve labour productivity and to release labour for more productive employment." (Perkins, ed, 1977, 118) As a matter of fact, by the mid-1970s there were labour shortages in many rural areas, and factories had to be closed during the busy planting and harvesting seasons so that workers could work in the field.

Advancement in Agricultural Technology

Another aspect of agricultural modernization was the improvement in seed strains. After the commune was established, the communes

and the central government set up as many as 40,000 agricultural technological expansion and improvement stations¹². The network of these stations covered the whole rural area, and they greatly improved the level of technology for agricultural production. (Wu, Guo Bao, 181)

According to an agricultural specialist, Thomas B. Wiens, China was able to improve the seed strains rapidly, due to the cooperation of these technological expansion and improvement stations that were located in different climate zones:

The extraordinary speed with which hybrid rice went from breeding to full-scale production is the most, spectacular example yet of a facility, which gives China several years' edge over other countries in the rapidity with which plant breeding results can be applied. In most breeding programs outside the tropics, the time lag between first cross and large-scale production was and is 8 to 10 years. This lag is dictated by the need in conventional breeding for six or seven generations of crossing and selection work to stabilize the characteristics of hybrid seed, then evaluate it in field trials, and finally multiply the seed, publicize and persuade farmers to accept it. The Chinese have organized a selection system permitting up to three generations per year, usually including one in the province of origin, another in Nan-chang (Kiangsi province), and a third on tropical Hainan Island. ...Moreover, through the creation of the "four-level research network" (the levels being county, commune, brigade and team), China has evolved a system permitting simultaneous stabilization, selection to local adaptability, evaluation and seed multiplication in the shortest possible time. (Wiens, 680)

During the 20 years when agricultural production was organized under the commune system, China was able to modernize its agricultural production for a number of reasons. One of the most important reasons was how communes and brigades mobilized peasants to put incredible amounts of labour into farmland capital construction projects. The peasants were extremely motivated to invest in their future and the future of China's agriculture. The

other important reason was that communes, brigades and teams were able to save surplus from agriculture into accumulation funds, which were then invested in agricultural machinery and for the purchase of other modern agricultural inputs from the industrial sector. Lastly, the State pursued the worker-peasant alliance strategy of development; after the initial years the State made efforts to reduce the surplus taken out of the agricultural sector, replenishing the sector with financial resources and industrial products needed in agricultural production and modernization.

Agricultural Reform and the Great Leap Backward in China's Agriculture

As stated earlier the State began the Reform with large increases in the purchase prices of grains, resulting in rapid rise of peasant income. At the same time, however, the State cut the levels of spending on agricultural. From 1979 to 1981, the State decreased its share of agricultural capital construction investment as percent of its total investment from 11.6 % to only 6.8 %¹³. (Perkins and Yusuf, 14) Yang and his co-authors also showed the gradual decline of State's investment in agriculture from before the Reform to the two decades after the Reform. They stated in their paper that during the 1950s through the 1970s China had built large-scale irrigation projects and the conditions for agricultural production had showed very obvious improvement. They continued to say that in more recent years capital construction has gradually declined. They then gave statistics to support their statement. From the Second Five-year Plan to the Fifth Five-year Plan (covering the period 1961-1980) State spending on agricultural capital construction was 11.3%, 10.7%, 9.8% and 10.5% of its total capital construction expenditures, respectively. But the level of State spending in agricultural capital construction as percent of the total dropped for the Sixth, Seventh, and Eighth Five-year Plans (covering the period 1981-1995) to 6.2%, 3.2% and 3.0%, respectively. According to Yang et al., this much lower level of funding has caused the malfunction of one-third of the 84,000 reservoirs built during the earlier period. (Yang, et al., 75)

After the communes were dismantled, the responsibility of agricultural production returned

to the individual peasant household. Higher purchase prices increased peasants' short-term income but the State rapidly decreased its expenditures on capital construction and will have a disastrous long-term impact on agricultural development. Also, with the collapse of the three tiered ownership system under the communes, the functions of planning for the future (setting aside accumulation funds for investment), carrying out production and organizing labour for capital construction work all fell apart. While during the commune years, much of the accumulation funds came from commune and brigade owned factories, but as these factories were privatized many individuals got rich quickly and used their wealth to re-invest in their businesses and to build themselves mansions and spent money lavishly. Individual peasants also used their increased income from higher priced farm products to build houses. Therefore, as State investment in agriculture dwindled, practically no private investment took its place. The Agricultural Reform thus helped divert agricultural surpluses from investing for the future to raising peasants' current consumption; Short-term prosperity in China's rural areas occurred at the same time long-term foundation of agriculture began to deteriorate.

All the favourable conditions for the modernization of agriculture during the commune years disappeared after the Reform. During the last fifteen to twenty years, when China's GDP has grown at very fast speed, averaging at least 10% annually, China actually has had a problem of over-investment, amounting to more than 30% of China's GDP. China has invested heavily in many different kinds of infrastructures in and around cities – highways, large commercial and residential buildings, airports, tourist spots, shopping malls, sometimes practically building entire new cities – like Pudong near Shanghai. Many of these new infrastructures are currently under-utilized. However, during the same period China has neglected investment in infrastructure related to agricultural production. The government cut its investment in agriculture and agricultural related industries, and the private sector has shown little interest in investing in agricultural infrastructure because of the long-term nature of such investments and the low expected rate of return.

Lu Xue-yi, the Chinese agricultural specialist, confirmed the problem of lack of investment and de-mechanization in China's agriculture as observed by Yang, et al. He said that between 1980 and 1986, machine farmed land decreased 11.1%. He also said that after the initial period following the Agricultural Reform, irrigation and drainage systems and other land work began to fall apart due to lack of maintenance. Moreover, no large size reservoirs had been built since 1980. Lu also noted the decline in organic content in agricultural land. (Lu, 2002, 5) Agricultural machinery bought earlier by production brigades and communes aged, and individual peasant households have had no money to invest in new ones.

Moreover, in some areas, for example, the Yangtze Delta, where the population density has always been high, land was divided into small strips during the Reform and leased to individual peasant households, only to be further subdivided as the population grew. The result was tiny strips of land that could no longer be cultivated by large-scale agricultural machinery. Peasants went back to old ways of farming, each with simple farm tools, as they had done before collectivization. It is no wonder peasants say, "We worked so hard for thirty years to build up our farmland, but overnight we returned to pre-Liberation days."

In central and northwest China, where individual land plots average around one mu or more, major crops (wheat and corn) are still harvested by combines. In these areas private individuals, who invested in combines would set out (or hire drivers) during harvest seasons to harvest crops from farm to farm, charging 40 –45 RMB per mu. Combine owners can earn tens of thousands RMB during the harvest season, and after costs are deducted, make quite a large profit. A documentary made in 2003 called "The Iron Reapers", showed that many poor peasants work as hand reapers during the harvesting season in areas that are hard to reach by combine. These peasants have to compete with the machines by lowering their price to 35 RMB per mu. Many leave home, travelling long distances by bus with their hand reapers to harvest wheat. The documentary showed men working 12-hour days in the hot sun harvesting an average of 1.5 mu land each day and earning about 45 RMB for gruelling, backbreaking work.

Some days they did not get work, so after the whole harvesting season, each man came home with less than 200 RMB. (Iron Reapers, a documentary, 2003)

The Chinese government realized the seriousness of the lack of investment in agriculture, and it has tried to increase agricultural loans of through financial institutions. Between 2001 and 2005, agricultural loans doubled¹⁴. However, most of these loans were small short-term loans of less than \$1,000 and the lending institutions were not sure how the loans were used. (US Department of Agriculture, (<http://www.ers.usda.gov>) It does not seem likely that small short-term loans would be used to finance long-term capital and infrastructure investment.

Chinese agriculture will continue deteriorate, because it desperately needs more investment. The central government has promised more investment, but it is far from adequate. The modernization of agriculture during the commune years came to a halt when the Reform redistributed land to individual peasant households and the State reduced its investment in agriculture. As stated above, individual peasants lack the ability and incentive to invest

in large agricultural instruments. Moreover, with the collapse of the communes, labour could no longer be organized as it had been by the former brigades and communes to work on intensive and extensive land improvement projects. This partially explains the large numbers of unemployed and under-employed peasants in the countryside.

Chinese agriculture will continue deteriorate, because it desperately needs more investment. The central government has promised more investment in the 11th Five-year Plan (2006-2010) to modernize agricultural production and to revitalize rural villages, however, the impact of this increase on agriculture and rural areas has yet to be evaluated during the implementation period of the next few years.

Small-scale farming that relies mainly on physical labour means low labour productivity and low peasant income. Since work on land improvement projects stopped, peasants have applied large quantities of chemicals in order to increase the land yield. However, this short-term solution of the peasants has reached its limit and has already damaged the quality of the land, causing more problems for the long-term. After the initial increase peasant income



in recent years has been squeezed by unstable and frequently falling output prices and rising input prices, and higher taxes/fees, yet the markets of China's agricultural output will be further affected by the imports from abroad. (See next Section.) Many rural families have a hard time making ends meet and must rely on money sent home by family members working

as migrants in cities. Recent efforts made by the central government to raise purchase prices and cut taxes will help to a certain degree, but these measures will not solve the problems of small-scale farming: low labour productivity and lack of long-term investment to modernize agriculture.

IV. Food Security and Grain Self-sufficiency vs. Achieving Comparative Advantages through International Trade

Self-sufficiency in Food

During the commune years, with the exception of 1959-1961, China achieved food security and self-sufficiency in grain. From the Chinese government's perspective at the time a food policy closely related to foreign trade would expose China to the risk of sudden trade embargoes, thus rendering China vulnerable to foreign pressure. (Eckstein, 80) The development model in the socialist period regarded food as something to satisfy people's need, not as a commodity. Therefore, stable and increasing food supply was given one of the highest priorities in economic planning.

Table 1 demonstrates the large increases in various agricultural products that provided both urban and rural residents with adequate food supply and raw material for clothing. With the exception of some very poor communes, most peoples' lives in rural China improved immensely. The great improvement made on the fertility of land increased grain yields per each mu of land. Since the total area of arable land stayed about the same or even decreased slightly, the increase in grain output came entirely from the increases in grain yield. Newly built irrigation and drainage systems during the commune years made it possible for peasants, for the first time, to look forward to a future where their crops would no longer have to depend so much on the weather. Mechanization made it possible for many peasants to be finally free from much of the most backbreaking work in the fields.

Further Changes in Agricultural Policy to prepare for China's accession to the World Trade Organization

The Agricultural Reform in 1979 fundamentally changed the direction of agricultural development. However, until the mid 1990s China still maintained its policy on self-sufficiency in food.

During the 1990's, earnest negotiations for China to join the World Trade Organization

were underway. As stated previously, before the Reform the State in China controlled production and the distribution of agricultural products, and also controlled international trade. Those controls were gradually liberalized throughout the 1980s. However, for China's WTO accession, further changes in both domestic agricultural policies and policies regarding international trade in agricultural products were necessary.

The conditions set for China's accession to the WTO are in three broad categories: 1) market access, 2) limits on domestic support for agricultural producers, and 3) limits on subsidies for agricultural exports. China is also required to eliminate its existing technical barriers to the import of several important agricultural products. The provisions on market access include tariff reduction and minimum access opportunities under a tariff-rate quota system. (Lardy, 75)

Market access provisions include lowering the average statutory tariff rate and setting up a tariff-rate quota system. The tariff-rate quota system is a way to eliminate all non-tariff trade barriers, such as import quotas and import licenses. It works this way: the importing countries set low tariff rates on the agreed minimum quantity (quota) for each of their imported agricultural products, called quota tariffs. For imports above this minimum quantity, higher tariff rates can be set. The minimum quantity at low tariff rates

would provide market access for exporting countries and the high tariff rates for above the minimum quantity would serve as a protective measure for the importing country. The larger the minimum quantity and the lower the tariff rates set for within and above this minimum quantity, the more accessible the market is.

China agreed to reduce the average statutory tariff rate for agricultural products from 22% to 15% by January 2004. China's average statutory tariff rates for agricultural products are much lower than the rates for other large developing economies. The rates for Argentina, Brazil, India and Indonesia are 30.9%, 27.0%, 32.4% and 36.9% respectively. China also set a much lower rate for its most sensitive product, wheat, than what Japan set for its most sensitive product, rice. Moreover, China agreed to bind all tariffs at the new low statutory rates, meaning not to raise these rates in the future, but other countries only agreed to bind some of their tariffs at rates much above the statutory rates. (Ibid., 79)

China not only agreed to extremely low quota tariff rates for many agricultural products: 1% for wheat, corn, rice, and cotton; and 9% for soybean oil. It also set large initial quotas (minimum quantities) through 2004 for these products, and these initial quotas were to be increased after 2004 (2006 for soybean oil). The final quotas for these items were also set at very large quantities, several times that of 1998 actual import levels ranging from 4.3 times for soybean oil and cotton, 6 times for wheat, 20 times for rice and 29 times for corn. Moreover, even though the above quota tariff rates were set much higher than the within quota tariff, yet they are still much lower comparing to rates set by developed countries. The above quota rates China set were 65%, 51%, and 43% in 2004 for wheat, corn, and rice. In contrast, above quota tariff for developed countries are: 150% for European Union's wheat and 200% for United States' sugar. For dairy products the US and Canada set the above quota tariff rate at 250% and EU set it at 500%. Japan set its above quota tariff for both wheat and rice at 350%. (Lardy, 77-79) Therefore, China has pursued a much open agricultural trade policy compared to large developing countries as well as developed countries.

As far as domestic supports for agricultural

producers is concerned, China does not have the financial ability to even give subsidies at the level allowed by the WTO. The OECD countries admitted in a newly released *Review of Agricultural Policy* report, that China's farm support was less protected than most OECD countries. The average support and subsidies the Chinese government provided farmers in 2000-2003 was around 6% of the farmers' income, while the support and subsidies provided by the governments of the United States, EU, and OECD, were 20%, 34%, and 31% of the farmers' income, respectively. The Japanese government gave its farmers supports and subsidies equaling 55% of their income in 2002-2003. (OECD News Report, November 14, 2005)

China also agreed not to subsidize its agricultural exports and to terminate the technical barriers for its import of several important agricultural products. The policy reforms agreed by the Chinese government on its accession to the WTO have already had a strong impact on China's agriculture currently and the future impact is expected to be even more profound.

The sharp drop in grain production between 1999 and 2003 was the impetus for the government's emergency increase in the agriculture budget. The government used an additional \$3 billion in 2004 for a 25% increase to support the price for wheat and rice and for improving agricultural infrastructure. (Earth Policy Institute, Eco-Economy update, March 10, 2004) Grain production went up both in 2004 and in 2005, reaching the output level of 1998 and further increases are expected in 2006, although the grain output for 2006 was recently adjusted downward, because the two-months summer drought affected 15% of China's grain producing farmland. (*Asian Times*, China Business, December 23, 2006)

Issues Around Self-sufficiency in Food and Agricultural Trade

Before China joined the WTO in 2001, some Chinese scholars and economists advocated the benefits of its membership. Yu-he Chen and others said in their article, "While access to the WTO, China enjoys the multilateral and stable most-favoured nation with 134 WTO membership countries. China enjoys any agreement set

by any two-membership countries. All these will give us the spacious market to export our agricultural products." (Chen, 1) In essence, they advocated using trade as a vehicle to achieve better utilization of resources through importing grains from land rich countries and exporting agricultural products that are labour intensive, such as fruit, vegetable, flower, drug materials, fishery products and meat.

Another author, Hui-yu Liu argued that "grain security" and "grain self-sufficiency" are two different concepts. In other words, a country can achieve "grain security" without having to rely on its own grain production. She said that producing all the grain China needs is against the law of comparative advantage and inconsistent with the meaning of "grain security". She then continued to say that China's total exports of goods increased from \$9.75 billion in 1978 to \$183.8 billion in 1998, averaging an annual increase of 17.2% and exceeding the export growth rate of all Asian countries during the same period. China had thus been able to accumulate \$140 billion in foreign exchange. She anticipated that after China's accession to the WTO, the United States and other Western countries were going to eliminate quotas for China's textiles exports and the exports of other labour intensive products, thus anticipating further growth in China's exports. Her conclusion was that it was groundless to worry about China's ability to pay for its food imports.

There has been discussion outside of China regarding issues of China's self-sufficiency in food and agricultural trade. Ilan B. Solot raised the "conflicting nature of the main components of the Chinese government's agricultural policy," namely, "(a) food security and grain self-sufficiency, (b) raising farmers' income, and (c) trade liberalization and integration with world market."

Solot correctly pointed out that food security and grain self-sufficiency were achieved in the past by four important mechanisms implemented by the Chinese government. These mechanisms were State trading, tariffs and value-added tax, import and export licensing, and foreign trade management. However, since the Agricultural Reform began in the late 1970s these mechanisms were gradually phased out, and with trade liberalization under the WTO, all of

these mechanisms have been eliminated. Solot also saw, that as farmers plant their crops depend more and more on the market mechanism, it is challenging for the government to figure out the right mix of relative support prices to achieve food security and higher farmer income at the same time. (Solot, 38; 39-40)

Even though China still insists that food security and 95% grain self-sufficiency are the goals of its agricultural policy, and the government spends a big sum to maintain storages of significant amounts of grain, it is difficult to see how maintaining adequate food storage helps achieve food security in the long run. During the four years of declining grain production (1999-2003) the gap between grains consumption and production almost exhausted all the stored grains. It does not seem reasonable to assume that it is possible for China to achieve both its goal of food security and its desire to be integrated into the world food market in the long run.

China's Recent Experiences in Agricultural Trade

According to a news report from People's Daily online, while in 2002 China still had a surplus in agricultural trade, during 2003 the value of agricultural exports increased 36.9% while the value of agricultural imports went up 61.5%, resulting a deficit in agricultural trade. The report said that with further opening up of the Chinese market in 2003, foreign soybeans, cotton and other material products began to "launch a massive offensive". In 2003, China imported 20.74 million tons of soybeans valued at \$6.42 billion, an increase of 83.3% in quantity and an increase of 120% in dollar value. The quantity of soybeans imported that year exceeded domestic production. Cotton imports also went up sharply in 2003 to a total of 870,000 tons valued at \$1.17 billion, up 390% in quantity and 530% in dollar value from 2002. Cotton exporters completely used up the quota allowed for lower tariff. Moreover, China's corn imports were insignificant during the ten years before 2005, importing several thousands tons of corn but exported 6-8 million tons of corn to South Korea and Japan. However, in 2005 the Chinese Ministry of Agriculture approved the import of transgenic corn from the United States, and the situation changed dramatically. It is predicted that within

a number of years China will become a net corn import country. China also imported 5.41 million tons of edible vegetable oil worth \$2.58 billion in 2003, up 69.9% in quantity and 96.9% in value from the year before. The report also indicated that due to natural disasters in some countries, the prices of these imported products rose significantly¹⁵. (People's Daily online, June 15, 2004 and Chinanews, NEWSGD.com, Beijing, August 21, 2006)

While China's import of food, especially grains has been surging, its food exports have met increasing barriers from advanced countries. According to the latest news report in the summer of 2006, the Chinese Ministry of Commerce showed that every year, 90% of China's agricultural products and food exporters have suffered from trade barriers set up by other countries, and the loss has amounted to \$9 billion every year. Agricultural products affected by trade barriers have now extended from vegetables, fruits, tea, and honey to animal and aquatic products. The technological trade barrier has become the biggest obstacle to the export of Chinese agricultural products. (Chinanews, NEWSGD.com, Beijing, August 21, 2006) Some examples of such barriers include: in May 2003, Japan banned the import of all poultry products from China, because Japan claimed that bird flu



virus was detected in the duck meat imported from China, causing China's agricultural exports to Japan to decrease 22.5% that year and China's export of frozen chicken to drop sharply. Also in July of the same year, Japan put into practice the Seeding Amendment Act, which stipulates that organizations or individuals who reproduce and sell protected seeding will be penalized. Since many Japanese companies have contracted Chinese agricultural enterprises to cultivate onion, spinach, ginger, and garlic from what might have been protected seeds, these products may become the targets of the Japanese Seeding Amendment Act. (People's Daily online, June 15, 2004)

The People's Daily concluded that China now faces two basic conditions. The first is that China's small-scale traditional agriculture cannot compete with foreign modern agriculture. The second is that China has to face an unfair competition environment, because the developed countries use high subsidies and other measures to protect their agriculture. Neither of these two conditions is likely to change in the near future. It further stated, "In its extensive and important commitments made during negotiations on China's WTO membership, Beijing neither gave its agriculture high amount of support and export subsidy as the developed countries did, nor did it impose high tariff to protect its own agriculture as the developing members did." Therefore, the report concluded that the challenges facing China's agriculture would exist for a long time. (People's Daily online, June 15, 2004)

As more and more people in China gradually understand the negative impact of WTO membership on China's agriculture, Eisenburger and Patel posed the question: "One might ask what China received in exchange for a radical opening of its agricultural sector," because they noted that many scholars have agreed that the WTO has required China to commit to greater and faster market opening than it required other developing country to commit. Then they quoted the candid response of this question by the US Secretary of Agriculture, Dan Glickman. Glickman's answer was "absolutely nothing." The reason that China did not receive anything in return for joining the WTO, was that before it had joined, every country, with the exception of the United States, had already granted China

permanent Most Favored Nation (MFN) status, which is the biggest benefit a WTO member can receive. Moreover, the United States had also granted China the MFN status on an annually renewable basis for more than 15 consecutive years. (Eisenburger and Patel)

In addition to the imports of food and other agricultural products, China in recent years has also imported large quantities of agricultural chemicals, including chemical fertilizer and pesticides. According to information provided by the US Commercial Service, China has become one of the biggest agro-chemical consumers and importers in the world, and in 2004 the United States supplied 27% of China's fertilizer imports and 22% of its import of pesticides. (In the last several years, the US has become the No. 1 pesticides exporter to China.) Upon China's accession to the WTO, tariffs for fertilizer imports dropped from 11% to 6%, and the import tariff for

volumes within the quota is only 4%. Moreover, after the five-year transition period, the State-controlled trading system will be dismantled and foreign firms will gain the right, not only to export but also to market fertilizer. (BUYUSA.GOV - US Commercial Services) The trend, therefore, shows that China will not only become more dependent on imported food, but will also be more dependent on the import of agricultural chemicals.

It is not difficult to see that those who advocated and still advocate using international trade to achieve China's comparative advantage in agriculture had and still have a rather unrealistic expectation of the benefits of China's WTO membership. However, problems encountered by China in international trade during the past five years have gradually brought a different reality to those who believed in so-called free trade.

V. The Conditions of Chinese Peasants

Peasant Income and Other Benefits During the Commune Years

During the period between 1957 and 1978 (with the exception of the three difficult years, 1959-1961) peasant income rose steadily, and the income gap between rural and urban residents also narrowed. From figures provided by the Ministry of Agriculture and the State Statistical Bureau, Perkins and Yusuf calculated that during the commune years, income per labourer in rural areas on the average increased faster than the income per worker in urban areas. As a result the ratios between urban workers and peasants narrowed from a ratio of 5.5:1 in 1957 to 3.5:1 in 1975, and then to 2.9:1 in 1979. These two authors explained that this narrowing took place despite the fact that the ratio of value added per capita rose much faster in the industrial sector than the agricultural sector from a ratio of 4:1 to 8:1. Therefore, incomes in rural areas were rising in step with agricultural production, but during these twenty-two years, urban workers were receiving a smaller and smaller share of the value added in the industrial sector¹⁶. (Perkins and Yusuf, 125)

Moreover, due to the income distribution of the commune system, cash income for peasants was only a small part of their total income, when in-kind income was included. Thus, cash income was only one measure among others to indicate the welfare of the peasants¹⁷. During the commune years, the production teams first took out the taxes (paid in grain) to the State from their total annual production then each team deducted its production costs (excluding the cost of labour). Next they deducted the quota grain for their members and saved seeds to be used next year. Then they sold the rest of their crops and other products to the State for cash. Out of the total cash income received,

one part went to the accumulation fund for investment purposes and another part was set aside for the welfare fund. The rest was then distributed to the members according to the labour each member contributed based on a work-point system.

Peasant women benefited from the work-point system, because for the first time the work they contributed was explicitly accounted for. The income they brought home from the work-points they earned raised their status in the family. Even though women earned fewer work-points for a day's labour, the average differential in male and female work points was gradually reduced.

Practices to reduce gender inequality during the socialist period were big steps forward¹⁸.

Each member of the production team received a quota grain¹⁹ from his/her production team, even if he/she was too young, too old, or too sick to work. In addition to food grain, teams also used the welfare funds to provide low cost health care and low cost education for their members²⁰. The welfare funds covered major expenses for needy families²¹. The State also allocated funds to pay for education (teachers' salaries and school construction) in the rural areas, as well as the training of teachers and healthcare personnel working in the countryside. Table 2 shows that agricultural taxes as percent of State's revenue decreased, and State expenditures on agriculture as percent of State total expenditures increased during the socialist period.

One of the most important achievements during the commune years was the accessibility of medical care for rural residents. Before the revolution Chinese peasants not only suffered inadequate nutrition, they were also deprived of the most basic health care. During the 1930s China's crude death rate was 27 per 1,000, and the infant mortality rate was 156 per 1,000 births for the country as a whole, and may have been as high as 200 per 1,000 in the peasant population. Approximately a third of all children died before the age of five. For the peasant population life expectancy at birth was twenty-five. (Perkins and Yusuf, 133-134) These kinds of grim statistics are not surprising, if we consider that in 1949 only one hospital bed existed for every 24,000 rural residents. (See Table 4) There was no preventive medicine to speak of. The health conditions in China were so deplorable, that China was known as the "sick man of Asia", and, of course, sick women and sick children as well.

After the establishment of the People's Republic, the new government launched many mass campaigns to eliminate infectious diseases through educating and mobilizing the masses. By the late 1950s major diseases such as malaria, intestinal parasites, schistosomiasis, respiratory diseases, syphilis, typhus, and tuberculosis were either eliminated or under control. Mobile health clinics also started vaccinations for preventable diseases and provided peasants with information on preventive diseases and birth control.

After the communes were established in 1958, they began to set up a cooperative medical system. Then medical services provided by the cooperative medical system greatly expanded and upgraded during the Cultural Revolution, when more financial support came from the State, and when medical personnel came from the cities to help train medical doctors and other health workers in rural areas²².

The cooperative medical system had several tiers. At the team level there were the barefoot doctors, who treated his/her teammates' minor illness and detected more serious problems, referring them to either brigade clinics or the commune/county hospitals. The healthcare system put great emphasis on preventive medicine. It continued the earlier tradition of educating the masses on health awareness. Children received routine checkups and various inoculations at appropriate ages. Women were taught birth control methods and the importance of prenatal and postnatal care. In the better to do communes, women also received an annual check-up.

Members of the commune paid a fee to join. For a family of five, it amounted to about 7.5 RMB a year. The production team contributed between 0.1 and 1 Yuan per member from the welfare fund to the commune's health fund. For every visit to the brigade health clinic there was a registration fee of 0.05 to 0.1 RMB and a small amount for the medicine he/she was given. For serious illnesses treated at the commune or county hospitals, such as an operation or other sophisticated treatment, the patient paid about 10 RMB to cover half of the cost and the commune paid the other half from its health fund. The overwhelming majority of the rural residents were able to afford such payment. (Perkins and Yusuf, 141)

With the advancement in the health care system after the revolution, the number of hospital in rural areas increased almost four times from 1949 to 1957, more than four times from 1957 to 1965 and again almost another four times from 1965 to 1978, reducing the number of rural population per hospital bed from 24,201 in 1949 to 693 in 1978, a 35 time reduction.

The improvements made in education in rural China after the revolution was equally

Number of Hospitals and Hospital Beds					
Year	Hospitals	Hospital Beds (thousandths)		Ratio of hospital beds to population	
		In the whole country	In rural areas	For the country as a whole	In rural areas
1949	2,600	80	20	1:6,667	1:24,201
1957	4,179	295	74	1:2,174	1:7,392
1965	42,711	766	308	1:943	1:1,932
1978	64,421	1,856	1,140	1:515	1:693

Source: State Statistical Bureau, *Zhongguo nongyi Zhaiyao*, 1983, pp. 13 and 92

impressive. When the Peoples' Republic was established in 1949 there was no accurate estimate on the literary rate of the population. However, it was assumed to be only around 20% to 40%, with the overwhelming majority of the literate population living in cities. After 1949, many literacy campaigns were implemented throughout China. By 1958 there were 86 million children, 67% of the relevant age group, enrolled in elementary schools, and the secondary school enrolment of that age group was around 17%²³. (Prybyla, 212) By 1976, 95% of all children in the appropriate age group in rural areas were attending primary schools. (Sigurdson, 505; Gardner and Idema, 226) The percentage was adjusted downward slightly by data released in 1980, but still showed 150 million students in 924,000 primary schools, or 93% of the relevant age group, and about 90% of the children in rural areas were attending primary school. (Perkins and Yusuf, 177) The drive behind the expansion of primary school enrolment in rural areas was that each commune built, on the average, fifteen primary schools. For the country as a whole, half of the secondary school age children, or 60 million, were enrolled in secondary school, and in rural areas, the figure was slightly lower than 50%. (State Statistical Bureau, 1981, 451)

China's efforts in improving health and education in rural areas achieved very impressive results. By the end of 1970s, even though China was still a poor country, its health and education indicators were closer to the developed countries than to other developing countries. The crude death rate was reduced from 27 per 1,000 in the 1930s to 6 per 1,000 in 1979. The infant mortality rate per 1,000 live births decreased from 156 to 56 during the same period. Life expectancy at birth increased to 64 years in 1979 – almost doubled in only one generation.

Children enrolled in primary school as percent of the school age group were 93% in 1978. (Sidel and Sidel, 92-93)

The faster pace of income increases in rural areas versus the urban areas, and the improvement of other aspects of the lives especially in health and in education for rural residents from the late 1950s to the late 1970s meant that after the initial period of development, the agricultural sector was not continuously drained of its surpluses. Not only did agricultural taxes as percent of State revenue decrease, expenditures on agriculture as percent of total State expenditures also increase, as shown in Table 2. Moreover, the more favourable terms of trade for the agricultural sector in this period meant the communes could afford to buy more agricultural inputs from the industrial sector and with higher income and better terms of trade, rural residents could afford to buy more consumer goods as well. This meant the burden on the agricultural sector gradually decreased, and it became possible for the communes to invest more of its surpluses in agricultural production and in rural industrialization. It also meant that the rural population was able to gradually raise its standard of living. All of this was accomplished by the pursuit of the worker-peasant alliance development strategy during the socialist period explained in the earlier sections of this paper.

Peasants' Income and Lack of Benefits after the Agricultural Reform

After the Agricultural Reform, the average income of Chinese peasants rose rapidly during the initial phase (1979-1984) at the annual rate of 15.5%. This was largely due to the large increases in the State purchase prices as stated

in Section I. From 1985 to 1988 annual income growth became more moderate and the rate of increase was reduced to 5.1%, and then for the period 1989-1991, it further fell to just 1.7%. Peasants' income again rose more rapidly again from 1992 to 1996, because the State again increased the purchase prices for agricultural commodities. Then from 1997 to 1999, the production of agricultural commodities was steady but market prices declined. Lu calculated that the average grain price (rice, wheat, and Maize) fell from 1.0355 RMB/jin (one jin = half a kilo or 500 grams) in 1996 to 0.7075 RMB/jin in 1999. Peasant income as a whole during the same period dropped from 10,355 billion RMB to 701.5 billion RMB, a decrease of 328 billion or about 32%. (Lu, 2001) Then, for the four consecutive years after 1999, crop production decreased, and the downward trend was not reversed until 2004.

Lester Brown, an environmentalist who has paid close attention to China's grain production, attributed the sharp decline in grain production to the decrease in grain-harvested areas from 90 million hectares in 1998 to 76 million hectares in 2003²⁴, in addition to other reasons. However, he neglected to point out that continuing increase in farm input prices since the early 1990s and the sharp drop in government grain purchase prices in 1998 and 1999 were important factors behind farmers abandoning their land. (Tan, 101-102)

Currently 320 millions peasants still rely on farming as their main source of income. These peasants have had a very hard time making ends meet. Since the end of the 1990s, many peasants have lost or abandoned their land and many more also suffered the effects of natural disasters, which also have become more frequent in recent years.

A large and growing number of peasants are migrating to cities to work, sending whatever they can from their meagre wages home, so their families can survive. Currently the estimated number of migrant workers is about 150 million. According to Bai, as the problem of unemployment grows worse, and as more peasants lose their land (40 million peasants lost their land in 2004), the number of migrant workers is expected to increase another 106-108 million between 2001 and 2010. (Bai's point 10) Younger males leave home usually to find

construction work in cities, leaving women to do the heavy farm work and also care for the young and the aged. Many younger couples also leave together to work in cities and leaving their children to be cared by their grandmothers. Many young women also migrate to work in the exporting industries in the coastal areas. These young women workers earn low wages in dangerous factories and often suffer abuse from their employers. Other young women from rural areas in central China work as domestic helpers for wealthy families in large cities. Woman migrant workers account for about 40% of the total migrant workers, and the figure is on the rise. (Li, et al., 276)

Migrant workers have suffered the brunt of the exploitation and have the least protection of any kind. They do not have any health insurance and thus do not receive any medical care when they are sick. These workers suffer the highest rate of work-related injuries. As large numbers of able-bodied young men and women left home the burden of work on the remaining members usually women increased. Statistics indicates that woman labour force already accounts for more than 60% of the total agricultural labour force and they produce 60% of the agricultural output. In a survey of rural labour force in Sichuan Province woman labour engaged in agricultural and other production accounted for 69.6% of the total²⁵. (Li, et al., 275-276) Moreover, discrimination against women has persisted and since the Reform gender inequality has only increased. For example, when a family has both daughter and son there is pressure for the daughter to enter into the labour force at much younger age and start bringing money home, so her brother can continue his schooling.

Another big burden on the peasants is the legally and illegally levied taxes and many different kinds of fees charged by the local governments, which have gradually increased since 1985. According to Lu, the actual burden on peasants in some areas could be as high as 15-20 percent of their gross income. In addition, the poorer an area is, the higher the proportion of people who depend upon agriculture as their main source of income, and the higher the burden these peasants have to bear. Therefore, for peasants in central and western China, where the main source of peasant income comes from agriculture, the

burden of taxes and fees further lowered their real income. (Lu, 2001)

Peasants have not only have been taxed beyond their limits, but also many local officials in rural China have used brutal force to collect taxes and fees. Chen Gui-di and Chun Tao, two journalists, investigated and reported many shocking cases in Anhui Province. (Chen and Chun) In addition to tax collection, government officials also used equally brutal force to evict peasants from their land without just or sometimes any compensation, on land being seized for industrial and/or commercial purposes. The number of peasant protests against land seizure has grown rapidly in recent years²⁶.

Lu attributed the low level of peasant consumption to their stagnated income. He said that the peasant population as a whole comprises seventy percent of China's population, but they are only able to buy 30 percent of the total goods. The low income of the peasant population also means that their savings are only 19 percent of the nation's total savings. (Ibid.) When the income of peasants, who still make up the vast majority of China's population, is not improving, there are little hopes for China's domestic market to expand.

After the break up of the commune system the cooperative medical system and the rural education also collapsed. Peasants lost all of their benefits. The loss of health, education and other benefits has affected the welfare of the peasants severely. When the funding from the State on education either stopped or being severely cut, many school teachers in rural areas have not been paid and some school house are falling apart²⁷. According to the *Status of Rural China, 2003–2004*, participation rates for peasants in any kind of insurance are very low. In 2002, the participation rate for the rural population in old age insurance was 7.7% but only 1.4% of the insured actually received an old age pension. The percentage of people who received a minimum living expense relief was only 0.5%.²⁸ Only about 5% of rural residents participate in cooperative health insurance. In 2002, 170 million people were affected by natural disaster, but only 9.4 million, about 5%, received any kind of disaster relief. (Li, 63)

The absence of any preventive medicine has meant that infectious diseases, such as tuberculosis, schistosomiasis and many other infectious diseases, which were eliminated in the 1950s, have returned in full force²⁹. Women have suffered even more severely due to the lack of preventive care. Several health surveys in Hebei Province showed that there were high incidences of diseases related to women's reproductive systems among rural women. In some areas, for example Zhangbei County, as many as 30-40% of all women suffered from reproductive system diseases. Many of these women never had check-ups and ignored obvious symptoms, because they could not afford to pay enormous health care costs, often giving up on any treatment altogether. (Li, et al. 281) The poor health of rural women is not limited to isolated counties in one or two provinces but is widespread.

In addition, new infectious diseases, such as HIV/AIDS and SARS have caused suffering for tens of million people, not only from the effects of the disease, but also from denials and cover-ups of the government, and the low priority governments at all levels have place on public health. If the deadly bird flu does hit rural areas in China, peasants would be defenceless against it.

Moreover, people in rural areas have suffered disproportionately from diseases caused by environment pollution. The shortage of water, which has been increasingly worsened, has impacted the rural residents more seriously than urban residents. More discussion will follow in the next section.

In the almost 30 years after the Agricultural Reform, as the income distribution has become more unequal, the income gap between city/town residents and rural residents has also widened, as well as the income gap among residents in different regions. According to the statistics of the UN, the income share of China's lowest 20% of the population was only 4.7% and the income share of the highest 20% of the population was about 50%. According to Bai Jing-fu, the vice-chair of a Research Center in the State Council,³⁰ the 20% highest income group to the lowest 20% income group in Jiang-su province (the province where the city of Shanghai is located) the ratio is 10.7:1 (Bai's point 6) This figure help show the urban/

rural divide well, because the overwhelming majority of the top 20% are likely to live in the prosperous eastern coastal cities and the bottom 20% scattered around the countryside.

Peasants have suffered unstable and stagnated income and they lost the health care and

education benefits, and the security they once had during the commune years. Many of them have migrated to cities in order to earn enough to survive. The majority of peasants are indeed returning to the bad old days before the revolution.

VI. Long-run sustainability of China's agricultural development

As it was stated in the beginning of this paper, compared to the size of its population, China has always had very scarce arable land and scarce water resources. In Section II, we saw that since the Agricultural Reform in 1979 and the collapse of the commune system in 1984, past efforts of land preservation and improvement have stopped, and infrastructure for irrigation and drainage in rural China that had helped maintain a balance between agricultural production and the land as well as natural environment has deteriorated. This development has critically affected the long-term sustainability of China's agriculture. Furthermore, since China's Agricultural Reform is part of the overall Reform that China launched in 1979, when we analyze the long-term sustainability of China's agriculture, we need also take a closer look into the rest of China's economy in order to understand how it has impacted agricultural production, the rural villages and the peasants. In the sub-section below, the impact of the export-led growth will first be examined. The focus of the discussions that follow will be on the future impact of resources shortages and environmental pollution on the long-term sustainability of agriculture.

Rapid Depletion of Natural Resources under the Policy of Export-led Growth

China is a large but resource poor country. An important component of China's Reform is to open up China and to pursue an export-led economic growth strategy. As China's exports expanded rapidly in the 1980s and then accelerated since the late 1990s, the problems of scarce resources have become much more serious. Exporting large volumes of industrial products at accelerated speed is the most important factor responsible for the rapid depletion of China's scarce natural resources and the problem of environmental pollution. Additionally, higher levels of consumption including the purchase of automobiles by the richest 15-20 percent of the Chinese population (they number more than 200 million and only a small fraction of them live in rural areas) have also contributed to the depletion of natural resources and environmental problems.

As discussed earlier, when it comes to the problem of China's scarce resources, land and water are highest on the list. China's water resources have always been scarce. The average water available per person is now only 2,200 cubic meters, about a quarter of the

world's average. According to the Ministry of Water Resources, from 1998 to 2004 factories and urban residents water consumption increased from 25% of the total to 34% of the total consumption. (Bloomberg.com, February 22, 2006) Currently the shortage of water is approaching a crisis level. (See below)

In addition to land and water, however, energy is also extremely scarce, and the rapid growth in GDP has intensified the problem of the energy shortage. Bai Jing-fu alerted the readers on the problem of rapid increases in China's energy consumption. (Bai's point 5) He said that as the rate of export growth has accelerated since the late 1990s, China's oil consumption increased 100% from 1990 to 2001. By 2005 China's oil consumption surpassed Japan and became the second largest oil consumer in the world, second only to the United States. China's domestic oil production has not been enough to meet its oil demand. Thus oil imports doubled in merely five years, from 1998 to 2003, and increased another 40% in the first half of 2004. (*Time Asia*, October 18, 2004) In 2005, China consumed 300 million tons of crude oil, 123 million tons of which were imported³¹.

Large quantities of water and energy have been

fed into industries that produced large quantities of industrial goods for export. Factories built to produce these goods for export have occupied large areas of land formerly used for agriculture. Furthermore, water and energy shortages have been aggravated by inefficient uses of these resources. The Chinese Ministry of Water Resources pointed out that since China only recycles 20-30 percent of its industrial water, water consumption per industrial output is five to ten times higher than that of the industrialized countries. (Bloomberg.com, February 22, 2006) In the case of energy usage, China has the same problem of inefficiency. According to Bai's report, for every dollar of GDP increase, China's energy use is 4.3 times that of the US, 7.7 times that of Germany and France, and 11.5 times that of Japan. (Bai, *Ibid.*)

As discussed earlier, massive industrial and urban development has already taken increasingly large areas of arable land from agriculture. The development strategy of the last twenty some years only intensified the problem resource scarcity and threatened its long-term food security. Therefore, China's Economic Reform that began in 1979 has in the short-term generated high rates of GDP growth by accelerating the growth of China's export of industrial products. However, by adopting such a strategy of economic growth, China has depleted its scarce resources at very fast rates. The growing shortages of water, agricultural land, and energy have already had a negative impact on agricultural production, rural villages, and the peasants. These shortages, in addition to the deterioration of agricultural infrastructure will ultimately make agriculture unsustainable in the long-term. (See discussion below.)

The Crisis of Water Shortage

In the long-term China is facing a water shortage crisis. Projections made earlier show residential demand for water will increase from 31 billion tons in 1995 to 134 billion tons by 2030, and industrial water demand will increase from 52 billion tons to 269 billion tons during the same period. (Worldwatch Institute, News release, April 22, 1998.) There is simply not enough water in China to go around. The expanding industrial and residential water consumption means water supply for agriculture will have to be further squeezed. Moreover, distribution of

water is very uneven; water shortages in some regions like the Northwestern provinces are most acute and could only get much worse in the future.

The Yellow River is the second largest river in China, which had provided water for Chinese people and its agriculture in central China for thousands of years. Today heavy water consumption upstream has exhausted the Yellow River's water supply and caused water shortages for the 170 million people in this region. Since this region is also an important grain production area, water shortage has already begun to affect grain production and the effects will worsen in the future. Even though there were instances before the 1990s when the Yellow River ran dry before reaching the sea, the problem has become increasingly worse since 1990. In 1997, the Yellow River ran dry for a record breaking 226 days. (Yi, 1, 12) Yi Hui-min, author of *The Warning of Yellow River*, stated that the exhausted water supply, the problem of river pollution and increasing occurrences of flooding were spreading nationwide. In 1998 both the Yangtze River in the south and Song Hua River in the North had the worst floods in 100 years. In 1999, the Yangtze River flooded again rendered 600,000 people homeless. (Yi, 1) This indicates that the supply side of water shortage has not been entirely caused by the lack of rain (especially in areas along the Yangtze River); rather the cause has been the lack of capacity to harness the rainfall.

Not only are water supplies from rivers, especially in Central and Northwest China, dwindling, China is also losing ground water rapidly from overuse. The ground water level of many cities is approaching dangerously low levels. For example, Beijing's ground water table, according to the Ministry of Water Resources, has dropped 1.5 to 2 meters a year. The Ministry said that the lower water table would not only further aggravate water shortage; it will also lower the quality of water and increase the risk of earthquakes and landslides. ("China's Water Shortage to Hit Danger Limit in 2030," People's Daily Online: <http://english.peopledaily.com.cn/>) The heavy loss of groundwater has also speeded up desertification in the northwest. According to the director of Gansu's Desert Control Research Institute, Ji Yongfu, overuse of groundwater and overgrazing has caused the desert to advance

at a rate of about 2,000 square kilometres a year. (Bloomberg.com, February 22, 2006)

In the late 1990s, 300 of China's 617 cities faced water shortages, (Ibid.) and the situation has only continued to deteriorate. When confronted with water shortages, cities are likely to restrict water use for agriculture in nearby regions. In one example in 1994, farmers in a region near Beijing were not allowed to use their regular source of water supply from the reservoirs for irrigation, because the city's fast growing need for water was given a higher priority.

The Environmental Crisis

Beginning in the 1980s environmental pollution became a serious problem, and the environment has only deteriorated at faster pace since the mid-1990s. Environmental experts in China have given different estimates on the loss of production due to environmental disasters, and the World Bank has said that China is in an environmental crisis and in recent years an estimated 8% to 12% of China's annual production was lost due to the crisis. (Bai's point 5)

Water pollution has brought tremendous loss to agricultural production and has caused serious illnesses for people who live around it, mostly peasants in rural areas. The government-run People's Daily reported in 2005 that in Liukuaizhuang, a village of 6,000 people near the city of Tianjin, water pollution drove the cancer rate to up 25 times that of the national average in 2004. In addition, the chemical plant accident that has caused the contamination of the Songhua River caught attention in international news and tremendous damages for peasants in the affected areas. Another horrific incident in 2005 polluted the Yangtze River, China's longest river, after a zinc smelter spilled cadmium into the water, a toxic metal that can cause neurological disorders and cancer.

While these large-scale accidents sent shock waves around the nation and the world, the impact of smaller scale but constant dumping of industrial wastes into rivers and ground and the excessive use of chemical fertilizer, pesticides and herbicides in agriculture are even more devastating. According to the Water Ministry, most of China's rivers are seriously polluted and contaminated by toxins. A report

published by the Water Resources Ministry - *The China's Water Resources 2000*, said that of all the water in China's rivers, a total length of 114,000 kilometres, only 28.9% is of better quality (ranked class I and II), and 29.8% is a lesser quality (ranked class III). 16.1% of water in rivers is dangerous for human to touch (Class IV) and the rest, or 25.2% of all water in rivers is too polluted to use for any purpose (Class V). The Worldwatch gave similarly gloomy statistics on water pollution. It said that in 2004 water quality was monitored at 412 sites on China's seven rivers, 58 % were found to be too dirty for human consumption. (Worldwatch, 7)

According to Worldwatch, of the 20 cities with the most polluted air worldwide 16 are in China. The State Environmental Protection Administration estimated that some 200 Chinese cities are estimated to fall short of World Health Organization standards for the airborne particulates that have been the cause of many respiratory diseases. Air pollution is just as serious in many of China's major cities as indicated by the rapid increases in respiratory diseases. Sandstorms are a major cause of respiratory disease. Last Spring Beijing and other northern cities in China were hit by one of the largest sand storms in recorded history from the Mongolian desert. Since the fast advance of desertification, above a rate of about 2,000 square kilometres a year, sand storms have become increasingly worse, affecting cities in Korea, Japan and even Taiwan. Coal burning has also filled many Chinese cities' air with sulfur dioxide, which has resulted some of the world's worst acid rain. Worldwatch further estimated that 30 percent of China's cropland is now suffering from acidification, which not only damages the farm but also forest, and human health. (Worldwatch, 7)

Even if China can stop the deterioration of its environment immediately, the effort needed to clean up the environment and restore ecological balance is tremendous. Long-term sustainable development cannot even begin until work on reversing the environmental deterioration is well on its way.

Heavy Burdens on the Peasants are not Sustainable

Peasants in China have been heavily burdened during the twenty some years after

the Agricultural Reform that started in 1979. Although quite a few rural residents did get very rich, their wealth came mostly from commercial activities, not from working on the land. The 320 million peasants, who still work to produce crops and/or other agricultural output, are doing poorly. The fact that as many as 150 million peasants have already left the countryside to work in cities shows that these many peasant households need the money sent home to survive. In rural villages, peasant households that receive money from their family members working in cities are usually much better off. This fact is significant because it means that Chinese agriculture can no longer support its

peasants.

The majority of peasants' lives poorly and do not have any access to preventive healthcare or can they afford to get needed medical treatment—yet they have to live in an environment that is getting increasingly polluted. Many of them have already suffered from water shortages, and the situation is only likely to get worse. The government has not offered any long-term solution to all the problems Chinese peasants are facing. This means that situation of Chinese peasants, like China's agricultural land, natural resources, and the environment is not sustainable in the long-term.

Conclusion

China is a large but resource poor and environmentally fragile country. It has very limited arable land and resources, which has to support a large population. Throughout Chinese long history, its people have suffered through many natural disasters such as flooding and draught. The reason behind the collectivization of agriculture was the understanding that Chinese people have to resolve the problem of poorly endowed natural resources and the fragile environment collectively. The strategy of development during the socialist period was that China's rural areas and Chinese peasants had to be develop together with urban areas; peasants' health, education and general living conditions had to be improved as much as possible together with that of the workers and other urban dwellers. Base on the alliance between workers and peasants, China before the Reform went a long way in advancing agricultural production and modernization by preserving and improving the land and the environment. That model of development was proven to be sustainable in the long-term.

The Agricultural Reform that began in 1979 hastily abandoned the model of development of the previous decades. The overall Economic Reform of the past twenty some years has pursued the strategy of using large quantities of manufacturing exports to boost the GDP growth rate. This strategy of development has used up enormous resources, land, water, and energy and also has caused serious water, air, and ground pollution. Agriculture in the meantime has been unduly deprived of these resources. Moreover, the agricultural sector has also been deprived of the investment needed to update its infrastructure and build new ones. As agricultural production returned to individual

households, labour could no longer be organized to do farmland capital construction work. While significant gains had been made in modernizing agricultural production in the previous decades, such efforts could be continued after land had been divided into small family plots. China's small-scale family farming is inefficient in terms of land and labour productivity. When considered with all the other factors stated in the last section of this paper, China's agriculture is not sustainable in the long-term, and Chinese people will face a vulnerable food supply with foreign countries gradually taking over a larger share of the Chinese food market³².

ENDNOTES

- 1 Please note that on page 1 it is stated that the average farm size per household has currently decreased to 0.2 hectares.
- 2 Each team member entitled to a certain amount of grain despite whether he/she contributed labour. Accumulation fund was reserves for investment and welfare fund was to help those in need.
- 3 Exports of agricultural products were mainly to acquire enough foreign exchange for imports of agricultural products.
- 4 Land has been leased to the peasants. Peasants have the use right but are not allowed to sell the land.
- 5 The reasons for the first fast increases and then the stagnated and later decreases in grain production will be discussed in Section III.
- 6 Grain production increased in 2004 – 2006.
- 7 Eckstein's original footnote: "These major construction projects have been under way for some times. They could be observed during my visit to China in December 1972. They were given a renewed impetus by the National Conference on Learning from Taichai held in September and October 1975 and were described in some detail in American Rural Small-scale Industry Delegation, Rural Small-Scale Industry, Chapter 5, pp. 2-5 and chapter 6, p. 7.
- 8 According to the American Rural Small-Scale Industry Delegation for the projects they visited the supplement amounted to 2.3 catties (one catty equals 500 g) and .40 RMB.
- 9 Both authors obtained the data from the same source. However, this website is no longer available. <http://www.hnagri.com/00luo/00314.htm>
- 10 The total area of arable land for 2002 and 2003 given by both authors were 1,889 millions mu and 1851 millions mu.
- 11 The overestimated number of death was based on inaccurate population figure in 1957, which was projected from the population figure in 1953. These "scholars" also assumed normal birth rate (30%) in 1960 and 1961 to estimate the population of 1961. However, the actual birth rates for both years were below 30% and it was 20.86% in 1960 and 18.92% in 1961. See convincing arguments made by Gao Mobo to dispute the overestimation of death number in Gao's book, 126-128.
- 12 These stations operated at the county, the commune, the brigade, and the team levels.
- 13 The State also drastically reduced its investment in industries that produced farm machinery, chemical fertilizer, and pesticides, from the annual average rate of 2,439 million RMB during the 1976-78 period to only 1,645 in 1979 and the share of investment in industries that produced agricultural inputs decrease from 11.1 percent of the total to 6.6 percent of the total. (Perkins and Yusuf, 15)
- 14 Agricultural share of all loans stayed between 6-7% during 2000 and 2005.
- 15 The average prices for the imported soybeans, vegetable oil, cotton and natural rubber rose 20%, 16.1%, 29.7% and 33.1% respectively over the last year. These price increases resulted an additional \$1.78 billion.
- 16 Source of statistics: Ministry of Agriculture, *Zhongguo Nongye Nianjian*, 1980, 41, 347; *Zhongguo Jingji Nianjian*, 1981, V3, 7; *Zhongguo Jingji Nianjian*, 1982, VIII-3; and State Statistical Bureau, *statistical Yearbook of China*, 1981, 135, 199, 302, 434-36.
- 17 In a similar way wages for workers in State enterprises only indicated part of their total compensation. Workers during the socialist period received subsidized housing, utilities, medical care, education and many other benefits..
- 18 In 1965 for a full day's work, women received on the average two-third of what men received but by 1973 women received, on the average, nine-tenth of what men received. (Perkins, ed., 1977, 231) The justification for the differential treatment was men's work usually required more strength. See: Pao-yu Ching, 1988, 426-437.
- 19 The amount of the quota grain varied according to a person's age and whether he/she actively participated in production on the assumption that children and older people need less grain and an actively working person needs to consumer more grain.
- 20 The out of pocket expenses for medical treatment were extremely low. Students only paid for their own notebooks, pencils, etc.

- 21 The five guarantees for the needy families (including people who had lost their ability to work, or the elderly who had no children) were: food, clothing, shelter, medical, and burial.
- 22 During the Cultural Revolution health clinics were added at the brigade level and the commune clinics were upgraded into full-fledged hospitals. Also, the bare-foot doctors began working at the team level.
- 23 For rural school age children the secondary school enrollment was perhaps only 10%. (Perkins and Yusuf, 173)
- 24 Brown explained the reasons for the decrease: "Several trends are converging to reduce the grain area, including the loss of irrigation water, desert expansion, the conversion of cropland to non-farm uses, the shift to higher-value crops and a decline in double-cropping." To show the significance of the 70 million ton decrease in grain production between 1998 and 2003, he said that it was more than the total yearly grain harvest of Canada. (Brown, March 12, 2004)
- 25 The survey was conducted in seven county near Luzhou City in Sichuan.
- 26 The reported number of protest involving more than one hundred people for the nation as a whole increased from 74,000 in 2004 to 97,000 in 2005.
- 27 There are some prosperous villages that have funded their own schools and also rich private individuals who have built schools as charity.
- 28 It is a form of welfare relief – a small cash payment to help the extreme poor. The amount is about 130 RMB for city and town residents. The amount is unknown for rural residents.
- 29 Nationally, 900,000 people have been infected by schistosomiasis and an estimated 30 million are no at risk. (*New York Times*, February 23, 2005)
- 30 The Research Center belongs to a State Council Committee. This Committee supervises and manages State assets.
- 31 As late as 1992 China still exported oil.
- 32 Author's note: this paper was completed in early 2007, therefore, it does not include more recent developments including the abolishment of agricultural taxes, the new government initiative of building new socialist villages, or the impact of higher grain prices in the world market on China's food supply.

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