Grain Production in the Yellow River Basin:

Report for the Water for Food Project

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April 17, 2005

As part of the river basins comparative study conducted by International Water Management Institute (IWMI) this paper presents findings and concerns based on the grain product and yield data in the Yellow River basin. Focusing mainly on agricultural changes in the Yellow River basin since 1949, the data was drawn primarily from *Agricultural Statistics of the People's Republic of China, 1949-90* (United States Department of Agriculture) and 11 *China Statistical Year Book*s for the years 1991-2002. To be more specific, the data before 1990 (inclusive) are from the former and those afterward are from the later sources. With the help of Excel, we transformed the data into charts that illustrates changes over decades in the Yellow River Basin.

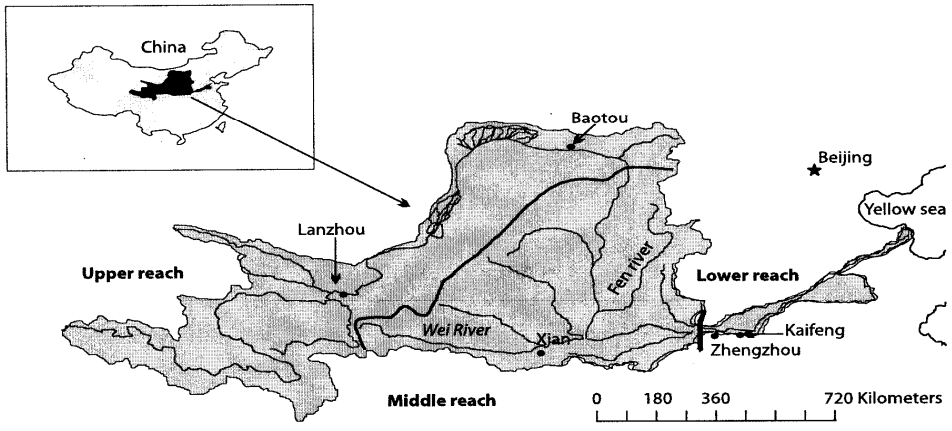
This paper examines major grain production for the eight provinces in the basin. Sichuan was excluded from the research because the Yellow River passes just a corner of the province, and its agriculture does not rely primarily on the Yellow River. The eight provinces in which the Yellow River is the primary source of their water are: Shandong, Henan, Shanxi, Shaanxi, Gansu, Inner Mongolia, Ningxia, and Qinghai . The total size of

the Yellow River Basin is 752,000 square kilometers. It provides water for 12% of China's population and 15% of its farmland. (Source: Xinhua News Agency, "Legislator Urges Law to Protect Yellow River," Xinhua General News Service: Domestic News, March 11, 2005. On line).

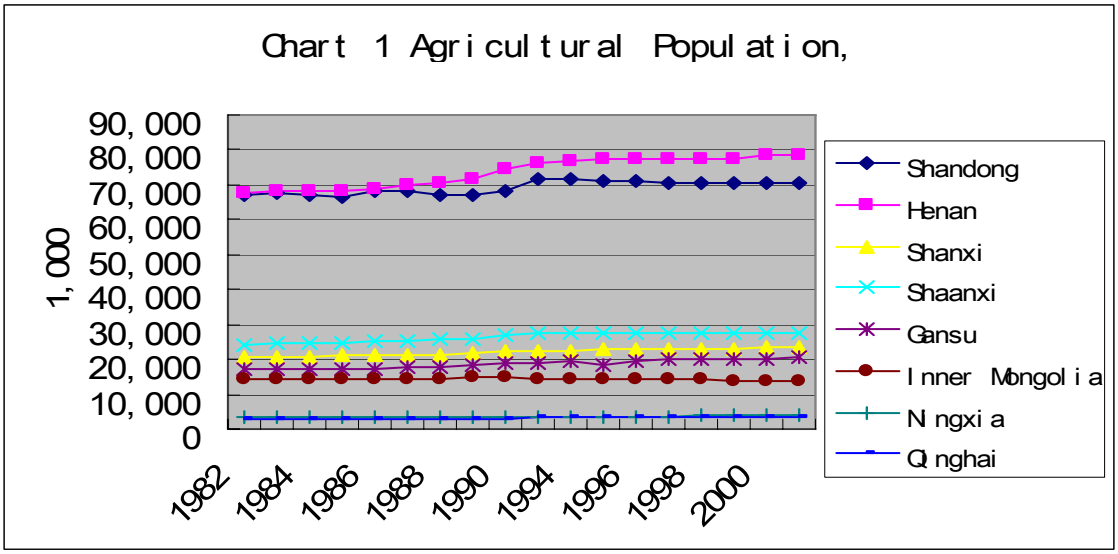
Basic Geographic and Demographic Characteristics

Designated as "the cradle of Chinese Civilization," the Yellow River Basin has played a key role not only in the historic and cultural identity of the Chinese people but also in the country's economic development. The Yellow River begins in the Qinghai-Tibetan plateau of Qinghai province. From there it flows across 8 other provinces and autonomous regions before emptying into the Yellow Sea north of the Shandong peninsula (figure 1). With a length of over 5,400 km, the Yellow River is the second longest in China and the 10th longest in the world. It drains an area larger than France. (IWMI Research Report 2003)

FIGURE 1.
The Yellow River Basin.



According to year 2000 statistics, the Yellow River basin is home to some 110 million people, around 9 percent of China's total population. In general, population densities are highest in the lower reach (Shandong and Henan) and are lowest in the upper reach (Qinghai, Ningxia, Inner Mongolia, Gansu). Chart 1 represents agricultural population and changes over two decades in the eight provinces in the YR basin. Henan is the most populated province in China, replacing Sichuan ever since Chongqing was placed under direct jurisdiction of the central government in 1997, while Qinghai is one of the least populated provinces in China. In addition, only Henan and Shandong have noticeable agricultural population increases after the 1980s while the trend of the other six provinces is almost linear. This no doubt reflects the greater productivity of agriculture in the flood plains of the Yellow River as it approaches its mouth in the Bohai Sea.



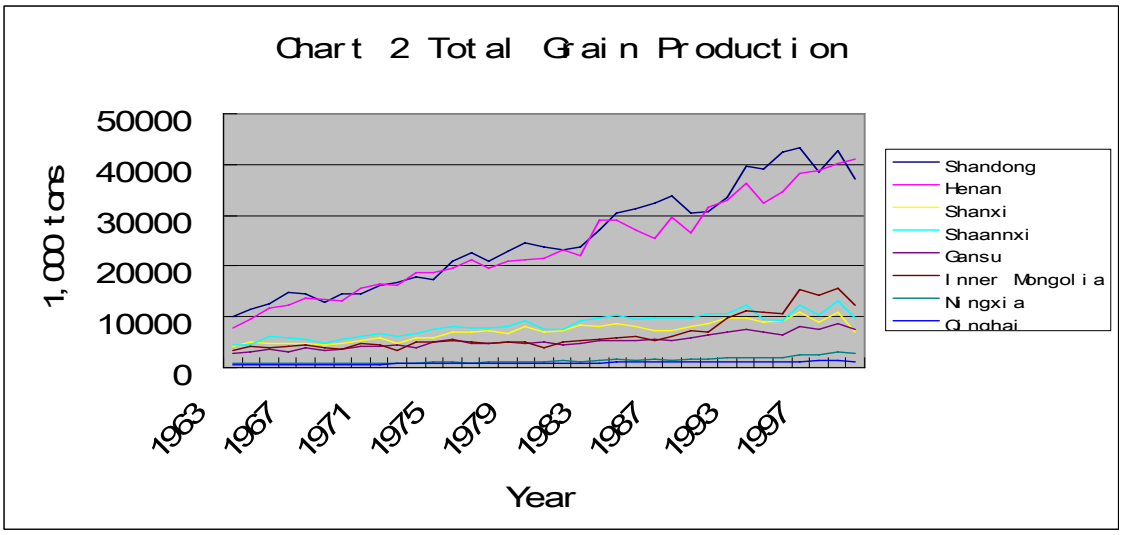
While urbanization increased rapidly after the 1980s, about 75 percent of the basin residents were still classified as rural, and dependent on agriculture for their livelihood.

Worth mentioning, significant numbers of rural labors working in the cities are nevertheless still classified as agricultural population due to the *hukou* problem. That is, they are still registered in a rural household even though they have actually moved into the urban areas. This may help explain the increased size of the agricultural population figures, which probably do not reflect the true situation.

Major Grain Production in the Yellow River Basin

The outlook for grain production is a matter of central concern in this research because of the dominant role of grain in the agricultural economy. Chart 2 shows changes on total grain production of the eight provinces in the Yellow River Basin. Changes in output vary from time to time and place to place. Generally there has been an upward trend in growth for the whole basin despite the fact that it was almost stagnant in provinces like Qinghai. Provinces such as Qinghai and Ningxia are limited by their ecological environment—the harsh climate and soil condition impeded agricultural development in these areas. The production of certain grain products remained zero in history till even present time. Thanks to the development of technology and the application of fertilizers, grain production in all the provinces in the YRB, including Qinghai and Ningxia, has increased although not proportionally steady over years since 1963 (Chart one), with Shangdong and Henan the leading provinces in total grain output. Without further data, it is hard to attribute the effects of technology, water, fertilizer or policies that contributed to the growth or the stagnancy; but in an effort to do so, we shall first look specifically at rice and wheat,

the two main grain crops in the basin to illustrate the trend of increased grain production and to identify the driving forces behind the increased yields.

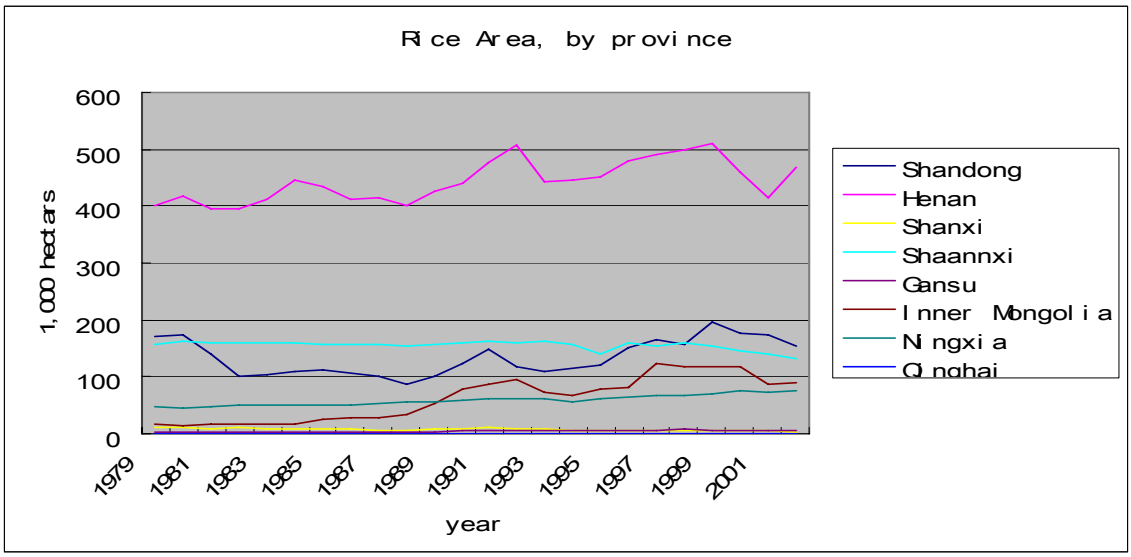


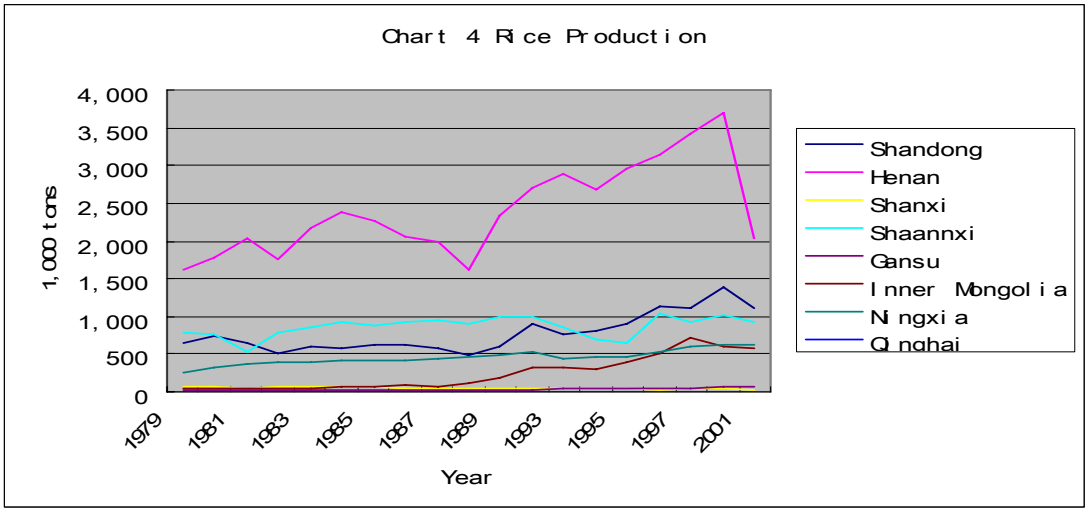
Rice

1. Water

China has the longest history of rice cultivation in the world, as cultivated rice originated here. 94 percent of the area planted in rice is found in southern China, where water is more plentiful. (Xu and Peel: 1991, p84) In contrast, rice paddy is sparse in the north, partly due to the poorer climate for rice-growing (the air is cooler and drier) but mainly because of the lack of water (far less precipitation and less ground water). In the Yellow River basin, nearly all the paddies are planted with round grain varieties, and a system of one crop a year predominates, although there are limited areas in the lower reaches where two crops a year are grown. Most peasants still use the transplanting method

for growing rice, but there are some areas where direct seeding has been adopted. The important point about rice growing is that the crop must be irrigated and the irrigation requirement in the Yellow River Basin (which is primarily in North China) is far greater because its rainfall is significantly lower than in southern China. The water requirement for rice is also two to four times higher than that of wheat, corn or cotton. This means that it is not economical to plant rice in the YR basin from the point of view of utilizing the available water for irrigation, even though the increase in crop yield in response to irrigation is highest for rice. As water resources are in short supply in the Yellow River basin, the area planted to rice there has been decreasing in provinces like Shanxi (from 12,000 hectares in 1979 to 4,000 hectares in 2002) in recent decades. (See chart 3) In some places dryland farming methods have been adopted for rice in order to save irrigation water. For rice production in the Yellow River basin, the availability of water (both rain water and ground water) is probably the primary factor that affects the total planted area and output.





2.

Technology

A breakthrough in seed breeding may also have contributed to increased rice yields. In 1973 the Chinese rice breeder, Yuan Longping, was the first person in the world to develop ternary hybrid rice. This rice is of good quality and it can increase the yield by more than 750kg/ha.(Xu and Peel: 1991, p85) It has contributed considerably to the increase in the rice yields in recent decades. Chart 4 shows rice production change over years and over difference provinces in the Basin. There was severe drought in the YR basin provinces in the 1990s, which is one of the reasons that the YR could not reach its mouth to the sea for several years. This may help to explain the drop in rice production in Shandong and Henan in the 1990s. Another possibility is that they simply made a policy decision to stop planting rice since it took so much water.

Wheat

1. Water

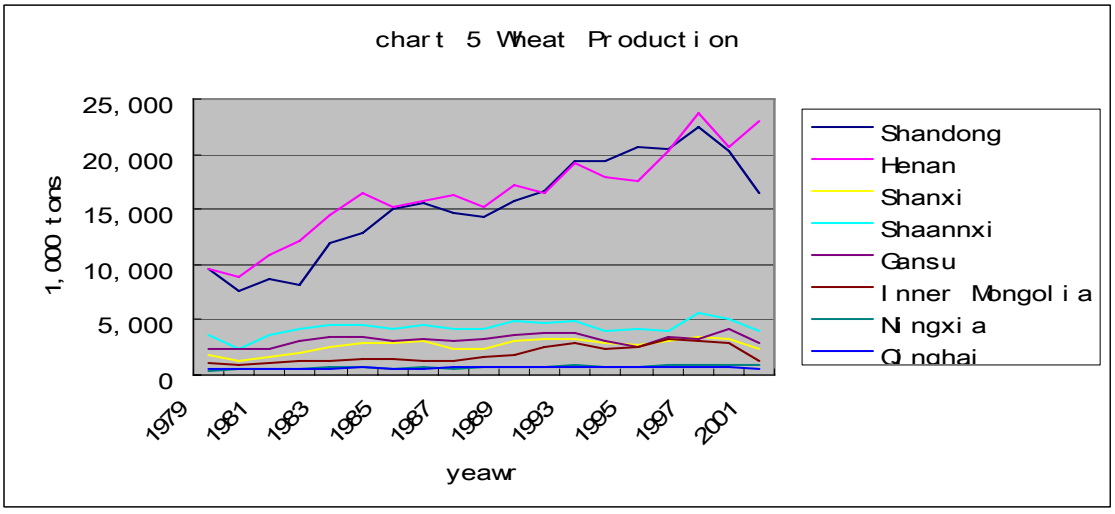
Wheat is the second largest crop in China, and wheat flour is the staple food preferred by people in northern China. Wheat is adaptable and is grown nearly everywhere in China, but the main growing area is in North China, where half of the total crop area is located. All of the wheat planted in the Yellow River basin is winter wheat. Because of the short frost-free period in the basin, it has long been the practice there to interplant the wheat crop with an autumn-harvest crop. However, where no irrigation is available, it is often necessary to follow the system of three crops in two years since even in the southern part of each provinces of the basin there is insufficient soil moisture available to support two crops a year. On the Loess Plateau in the Yellow River Basin (Shanxi, Shaanxi and Gansu), there are large areas of dry land, and the most general cropping system there is to harvest four crops every three years. (Xu and Peel.1991, p87)

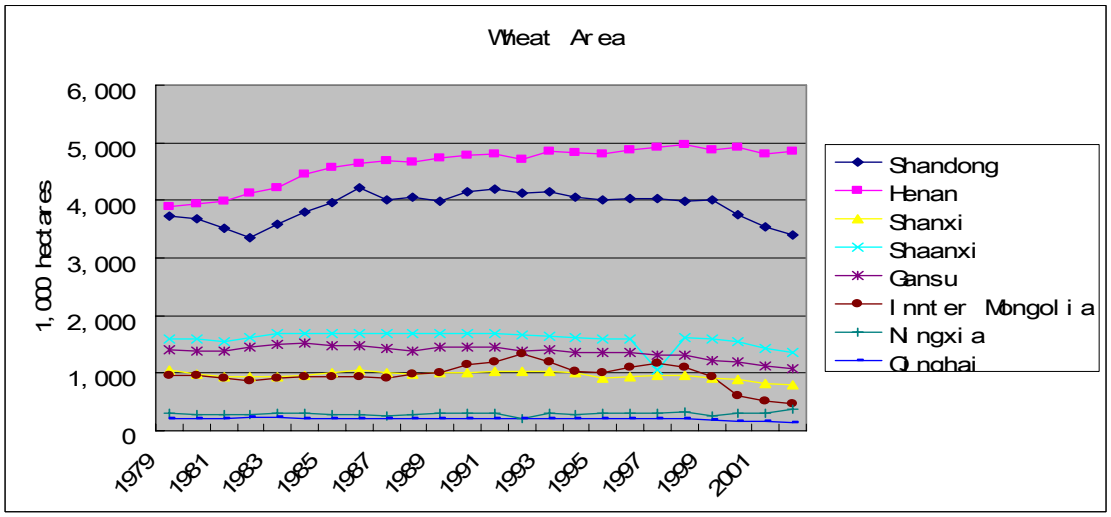
Chart 5 shows wheat production change over years and over different provinces in the YR Basin. Shandong and Henan, which are located in the lower reaches and benefit from more favorable natural conditions than other regions in the basin, were in a dominant position in wheat production. Wheat yields grew fairly steadily in Shandong from 1979 to 2001. In 2001, however, Shandong's production plummeted, dropping to production levels of 11 years earlier, in 1990.In the 1979-2001 period, Henan's wheat production also went up—although hardly in a steady line. As with rice production, severe drought in the YR basin provinces in the 1990s, no doubt explains much of the drop in wheat production in Shandong and Henan in the 1990s. But other (unknown) factors, such as policy decisions to plant more high value crops, or urbanization, may have contributed to the decline. But to

know this would require a study of agricultural policy for these provinces –which is something that should be done to make this study complete.

2 Policy.

In addition to what was just stated, for both rice and wheat, it may well be that the government made a decision to import more rice and wheat, because it is cheaper on the world market. This allowed Chinese farmers to grow high value crops, or abandon farming altogether.





Policies affecting Grain Production

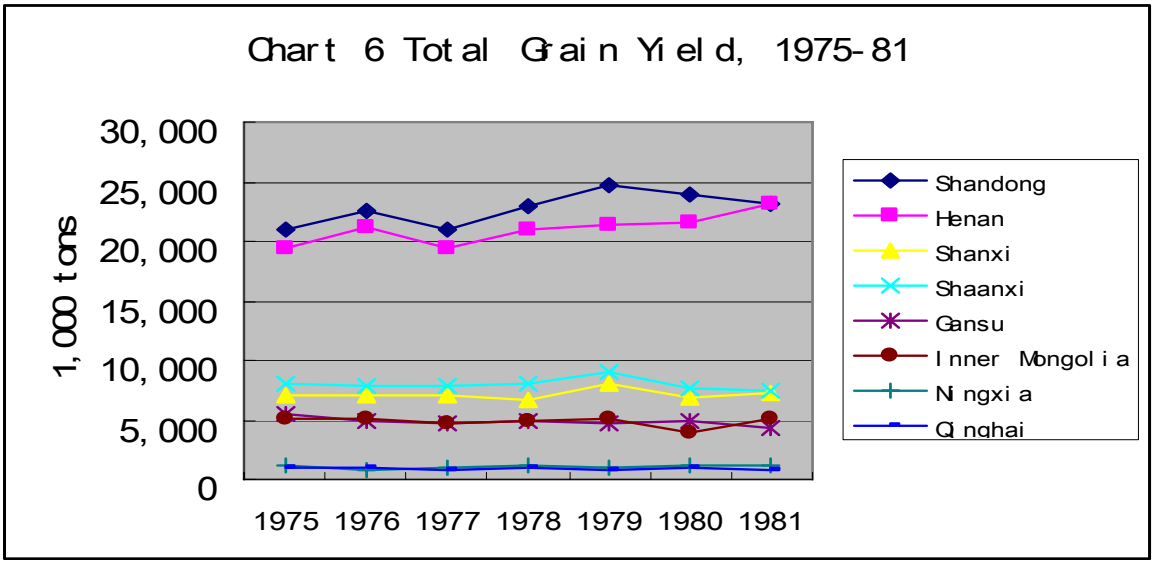
Before agricultural reforms began in 1979, China maintained low food grain prices and rationed basic necessities so as to insure a more equitable distribution of supply. During the "ten bad years" from 1966-76, China's agricultural policy was driven by political considerations, with "egalitarianism" a key element. An adequate supply of grain was insured through production planning based on area targets. As a further incentive to grain production, price for grain sold above the quota were about 30 percent above the quota price. Utilization of collective labor for land and water development and compost as fertilizer, coupled with significant technological advances for the major grain crops, allowed the government to maintain low prices. (Baker: 1982, p167)

In December 1978 the Third Plenum of the Chinese Communist Party adopted new policies that gave high priority to agriculture. Changes in agricultural policy have taken three forms: (1) price incentives (the quota prices for grain were raised by 20 percent, and the above-quota prices were set at 50 percent above that), (2) higher allocation of industrial goods and resources to agriculture (e.g. electrical power for pumping irrigation water, and chemical fertilizer), and (3) a restructuring of agriculture within the commune to allow for greater resource mobility and flexibility in production decision making. (Barker, 1982, p167) and (4) the re-establishment of local free markets, where peasants could sell excess grain, vegetables and high value crops and sideline production articles. In addition, China moved away from the collective form of production that had characterized Chinese agriculture from the time of the "Great Leap Forward" in 1958 to the end of the "ten bad years"

in 1976. By the early 1980s, almost all the agricultural communes had been dissolved, and production was based on the "household responsibility system:" individual households would contract to provide a certain amount of grain to the government each year. Any excess grain could then be sold by the farmers on the free market.

The impact of these incentives on agricultural production as a whole and on production of various crops and regions was profound. Prices rose for both grain and non-grain crops. Farmers gained significant flexibility in choosing what crops to grow once they had fulfilled the government-set quotas for grain. So, with the implementation of the household responsibility system, in which each household contracted to sell the government a certain amount of grain (at fairly low prices) any land that was not needed to satisfy the government quotas was put into cash crops, such as vegetables, that would bring higher prices than grain in the markets.

The immediate response to the new agricultural strategy was positive. The production of both grain (from 22,880,000 tons in 1978 to 24,720,000 tons in 1979, see chart 1) and nongrain rose sharply in 1979, despite a decline in total grain hectares. Chart 6 shows changes in grain yields right before and after 1978. (This increase was partly due to the very favorable weather conditions in that year.) But the fact that it was primarily policy, not weather, that made the difference is evident from the continued overall increase in agricultural production until 1999.



Grain Production and Water Demand

The agricultural need for water in the Yellow River basin is very high, and often exceeds the capacities of traditional shallow wells or small local irrigation systems. In addition, excessive dependence on irrigation magnifies the risk of salinization, alkalinization, or waterlogging of the surface layers**. Total irrigated area in China as a whole has more then doubled since 1949, and approximately half of the total cultivated area is officially reported to be irrigated.** Since 1949 more than 23 million new and deeper tubewells have been constructed In the YR Basin. Tubewells (nearly all with power-driven pumps) are responsible for most of the expansion in irrigated area in the YR basin. (Hsu, 1982, p61)

There were also a series of dams built along the Yellow River since 1949. Dams on the slow-moving reaches of the Yellow River have aggregated problems caused by heavy

silt loads. Silt form the easily eroded loess soil banks quickly fills reservoirs and clogs distribution system. Settlement basins, many of which have been built, provide a short-run solution. “The Chinese were distressed to find that their projections for the life span of settlement basins and reservoirs behind many of the Yellow River dams completed in the 1960s were far too high. Many filled with silt in three to five years, disrupting plans for both irrigation and power production.” (Baker: 1982, p58)

What the official totals of “irrigated” land do not tell us is the extent to which irrigation is actually available when and where it is needed. An area supplied by shallow wells may be described as “irrigated,” but may get insufficient water toward the end of even a moderate drought. Increased demands on groundwater from new and deeper wells may draw down reserves faster than they can be recharged by rivers or rainfall; total flow varies widely from year to year and season to season; rapid siltation may weaken or destroy the entire system within a few years. (Hsu: 1982, p62)

In most parts of the Yellow River Basin, agriculture must have ongoing irrigation in large and reliable amounts. Water availability must not vary with gross swings in rainfall amount and must provide all of a crop’s demands during hot summer droughts. Some analysts believe that nearly all of China’s potential for increasing grain yields lies in the combination of more irrigation, more fertilization, and higher yielding varieties. Of these, water is clearly the most critical and the most limited. It is also the factor that is most difficult to increase. But it could also be argued that increased yields could result from policy changes, such as taxation and subsidies. In 2004, taxation policy was, in fact, changed so

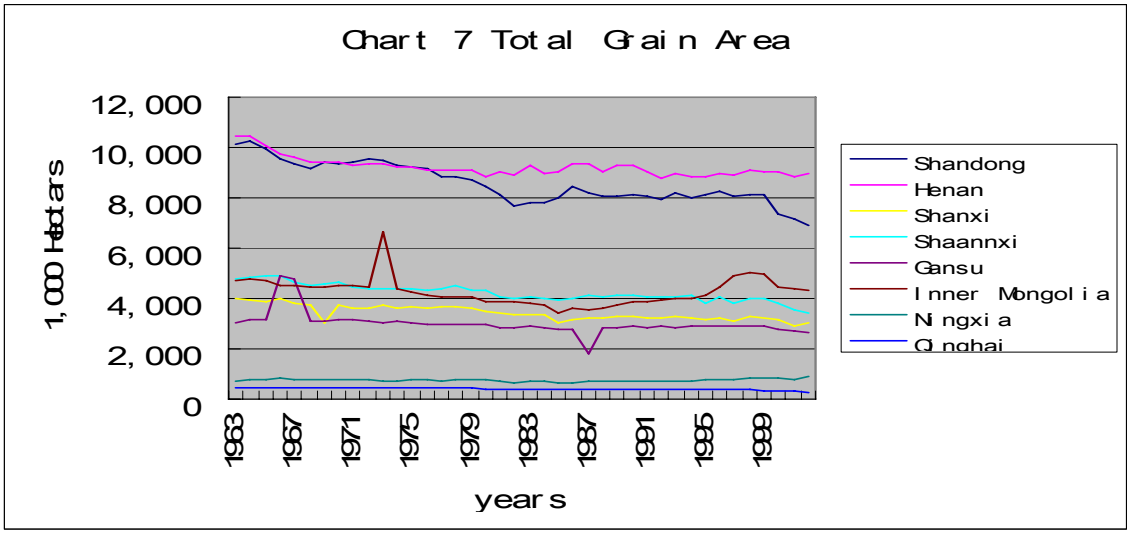
that peasants no longer were taxed on the total amount of land that they owned, even if they did not farm it. With lower taxes, farmers can rotate their crops, leave fields fallow, and so on, in efforts to restore the health of the land. In short, they do not have to engage in ever more intense agriculture so as to increase yields just in order to pay their taxes and make ends meet.

Addressing China's water and food issue in this manner may obscure a more important question: **Should China be aiming to increase yields to the greatest extent possible by greater use of irrigation, fertilizers, pesticides, and new varieties?** China already has extraordinarily serious problems with degradation of both water and land through irrigation (which has led to increasing salinization of the soil and may degrade the soil irreparably; lower water tables to the point that ground water in some places can no longer be recharged); fertilizer and pesticides, which have led to significant pollution of ground and surface water (According to China's own environmental deputy minister, 70% of the water is heavily polluted); and new varieties, which although hardier or more productive, tend to require even more water, more fertilizer, and more pesticides. As these inputs lead to such severe negative externalities, perhaps China should be encouraged to consider buying (cheaper) grain on the international markets (and is produced in areas of the rest of the world where the negative externalities are lower).

Raising Cropland Productivity

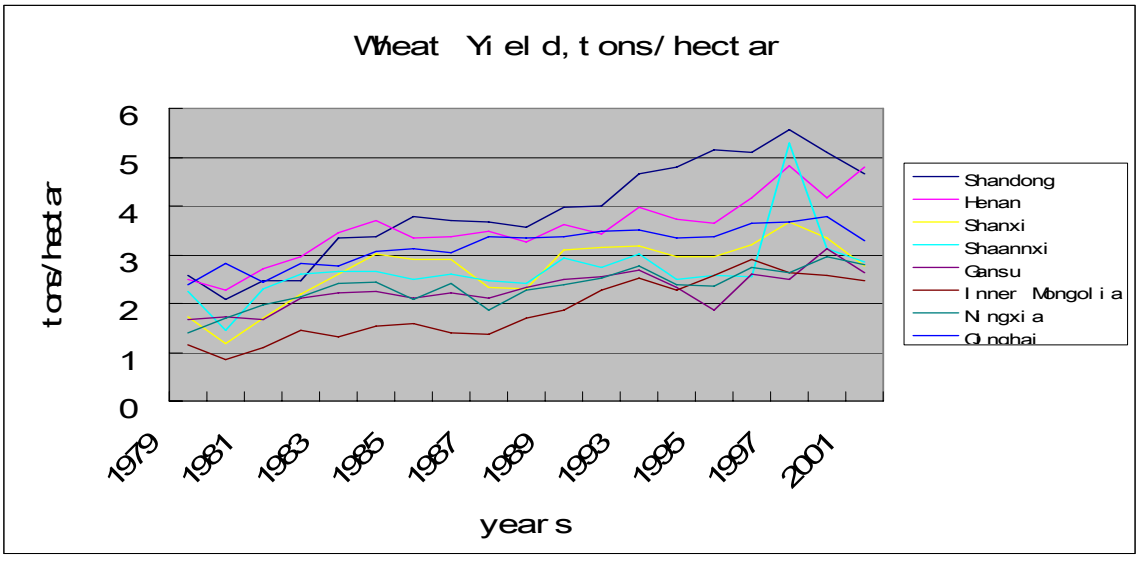
As shown in Chart 7, cultivated area in the Yellow River basin is no longer ex-

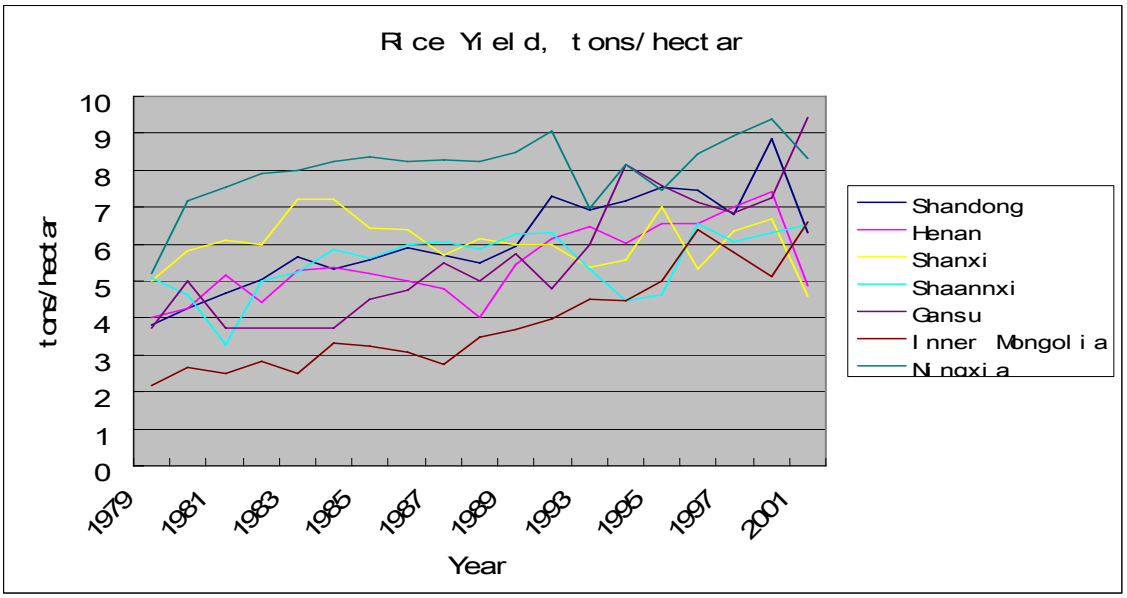
panding, therefore, future growth in food output can come only from raising yields. For the Yellow River basin, improving productivity essentially means raising yields of the three grains that occupy most of its cropland: rice, wheat, and corn, as well as oil crops. In his study Brown categorizes the changes in China's land productivity since 1949 into four distinct periods. The 28-year span from 1950 through the launching of economic reforms in 1978 was marked by a slow but steady rise in yields. The only notable interruption to this was 1955-61, a span that encompassed the Great Leap Forward, when yields were actually declining steeply because of ill conceived rural collectivization and agricultural policies. In addition to reducing incentives to farmers to work hard by collectivizing the 5% of agri-cultural land that was still in private plots, farmers engaged in close planting (reducing the amount of sun, water, and soil for each plant), triple cropping (attempting to harvest 3 crops in one years) in traditional double-crop areas; and double-cropping in traditional one-crop areas, as well as deep ploughing. It was also during this period that literally thousands of small and large earthen dams and irrigation projects were built.

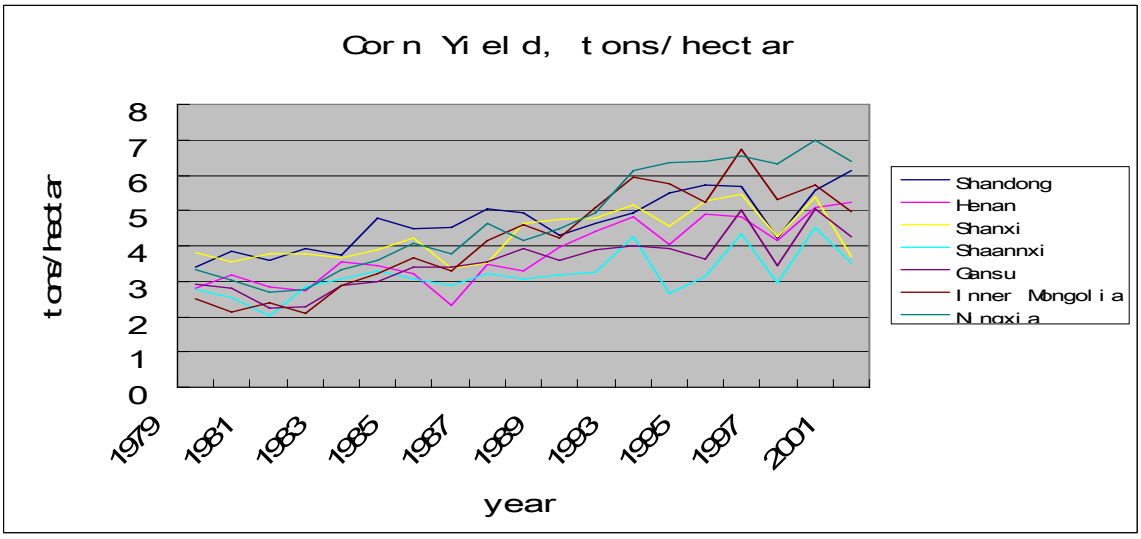


Once the country had recovered from the chaos and famine associated with the Great Leap Forward by 1962, land productivity resumed a gradual but steady rise. Some of the improvement during this period came from the spread of dams and irrigation after 1958; and some may be attributed to returning a percentage of the land to private plots; but again during the "ten bad years" from 1966 to 1976, some of the worst aspects of Great Leap Forward policies returned, and agriculture continued to be a weak sector.policy change.

With the change of agricultural policy in 1978 that led to the breaking up of virtually all communes, the adoption of the "household responsibility system," and the "privatization" of land (that is, although farmers do not "own" land, they acquired long-term leases on the land they worked, production increased dramatically. Farmers who sought to become "rich" poured more labor into their land, and used far more water, fertilizers, pesticides and herbicides than before.. Charts below show changes in yields of the three major grains from 1979 when the agricultural reforms took place to 2002 in the Yellow River basin.







Concluding Remarks

From the discussion above, we can identify the principal sources of future yield growth in grain production as: (1) technology: varietal improvement, (2) fertilizer, (3) irrigation, and (4) policy and management skills. Research is being done to develop new varieties of grain with greater yield potentials and resistance to insects and diseases. The

rate of fertilizer application per hectare will continue to increase in the foreseeable future. The national government has also taken increasing responsibility for decision making in the construction and improvement of irrigation facilities. Emphasis has moved from small-scale projects at county level to more capital-intensive and large-scale endeavors. The South-North water transfer project, which began in 2003 and hopes to bring water to the parched areas of the north, including the Yellow River Basin, is a good case in point. Beyond the mechanical problems outlined above, skillful management at all level is needed to establish institutional frameworks in dealing with the problems.

Grain occupies a dominant position in the Chinese agricultural economy. What happens in the grain sector will have a critical effect on the rate of agricultural and economic development in the future. China has been remarkably successful in raising land yields mostly because it irrigates such a large share of its cropland. But it is unlikely, unless there is some new breakthrough, that yields will be increased dramatically. The agricultural sector is now by far the largest consumer of the Yellow River's waters and pressure is growing to decrease agricultural water use. Already the Yellow River Conservancy Commission plans to cut water consumption in the agricultural sector by some 10 percent by 2010. (YRCC: 2001) The efficient growth of grain in a severely overpopulated region like the Yellow River Basin which is suffering from a water shortage depends on the development of new technology, physical and institutional infrastructure, as well management to raise yield productivity and therefore total grain output to meet the need of the growing population. But, to refer back to the earlier questioning of a policy that increases

yields, but only at the cost of increased inputs (fertilizer, irrigation, pesticides, herbicides—as well as labor and machinery) and severe degradation of the land and water, China must consider the broader implications of focusing solely on increasing yields. The real need is to improve efficiency (cost/benefit) of agricultural production, with full attention given to the negative externalities generated by China's inefficient agricultural practices. The fact that even with significantly lower labor costs in China than anywhere in the developed world, grain cannot compete on price/quality grounds on the international market is evidence that China must address efficiency in grain production.

Implications for the Yellow River Basin

So what does the above (and the historical policy analysis that follows) have to do with the cultivation of crops, cropping patterns, and grain yields in the Yellow River area?

The overall national political policies, as well as economic policies shaped by political considerations rather than what was sensible for the YRB, have really dictated cropping patterns, how many dams were built, the development of irrigation, how water has been used, and so on. But now that China has become much more aware of its need to manage the land and water of the YRB, and hence to manage what crops are grown, and where they are grown, it is in a different situation. This is where the Yellow River Conservancy Commission comes in, and where it plays a role in determining crops grown, land use, water use, etc. Your own knowledge about the YRCC should be plugged into the above broader history of national policies that have affected the YRB to come up with realistic policy suggestions for the YRCC.

ADDENDUM: HISTORICAL BACKGROUND OF POLICY THAT MAY HAVE AFFECTED AGRICULTURAL PRODUCTION, AND THE LIMITATIONS OF THIS STUDY.

China's History and Policy background for Xiaoyan Wang's study of the Yellow River Basin,
Suzanne Ogden

In an effort to ground Xiaoyan Wang's findings about crop yields and changes in cropping patterns in the Yellow River Basin, I am writing a broad historical overview of the period IWMI is covering for their project.

As interesting as it would be to have the 1930s baseline for the project, at that time in history, China is suffering from a civil war, a Japanese invasion, and general chaos. Indeed, by the 1930s, China has been in the throws of internal violence for a number of years, and continues to suffer from social chaos, military and political violence, and economic disasters brought on by the instability throughout the first part of the 20th century. Agricultural production in the Yellow River Basin, as elsewhere, would have been deeply affected by the societal breakdown; and agricultural data would have been difficult to gather, much less verify.

In the 1930s, land holdings were far larger than in the period after 1949. Before land reform from 1949-52, landlords controlled much of the land, and simply hired peasants to farm it (a fact that Mao Zedong played on to win the revolution that brought the Chinese Communist Party to power in 1949).

Indeed, the overall political, economic, and social environment for the entire 20th century is quite relevant to understanding cropping patterns, yields, use of water, and so on. For example, after the communists gained power in 1949, they returned land to individual peasant owners, meaning it was broken up into small plots and, basically, peasants could grow what they wanted. As they had free markets, they would not just grow grain—although they would pay an equivalent of a grain tax to the government. Then, as now in the 21st century (when in some ways they have come full circle), once they had satisfied the grain quota tax, they were likely to grow the crop that had the highest market price.

For urban consumers, there were grain coupons, which guaranteed urban citizens a certain amount of grain per day. Perhaps grain at that time was so highly prized (given 100 years of threatened and actual starvation for many parts of China in chaos) that they did indeed grow primarily grain. But one thing is fairly certain—agricultural production soared, as peasants were able to farm for the first time in decades in a secure environment; and the land was their own, so they poured themselves into it. The irony here was that, to reward the peasants

for their support, the communists turned each and every one into a petty capitalist, small land-holder.

This was not to last, however—not just because of the ideological embarrassments that land ownership created for communists, but also because they were convinced that collectivization would bring higher yields. So, when the process of land reform was completed by 1952, China launched its first 5-year plan (1953-57). Peasants were moved into “lower level agricultural producer cooperatives,” but these were no larger usually than a village, some 100 to 1000 people (many of whom were members of one’s own extended family). Then, the government could set about controlling what was produced in a far more systematic way. 15 % of the land remained in private hands and, no doubt, was used to grow high value crops, not just grain. These products could be sold in the still functioning free markets.) Again, production and crop yields went up significantly; and of course, that 15% private land had far larger yields than the 85% land in the cooperatives, as peasants poured their labor, and resources, into it.

The key point for this period is, then, that cropping patterns were starting to be controlled and determined by a centralized government structure of economic planning—decisions about which crops to grow were being made by higher levels, although of course the centralized ministries did not ignore local officials who knew what would grow best in their region (at least they did not ignore them until 1958).

In the 2nd 5-year plan, from 1955-57, peasants were then moved into collectives, about 10 times the size of the first 5 year plan producer cooperatives; and their private plots were reduced to 5% of total land. Again, this meant the government could have, and no doubt did, order more grain to be produced, and could control more precisely the cropping patterns for 95% of agricultural land. And the government ordered them to produce whatever they thought was needed (grain, cotton, oil producing crops, industrial crops), not high value crops like veggies, fruits, etc. Needless to say, the government policy also controlled how much land was turned over to cattle grazing, how much grain was raised for livestock, and so on. The goal of the government was to have agriculture support the needs of an economy that emphasized heavy industrialization, in the Soviet Union’s style.

The population also started to grow rapidly in the context of a peaceful, stable society. To wit, the leader Mao Zedong saw a large population as a good thing—ultimately a substitute for expensive industrial equipment (especially in agriculture).

Why did the government steadily increase the level of collectivization of agriculture? Since the first phase of collectivization, 1953-57, has resulted in larger yields, thanks to economies of scale, and there was not significant resistance from a peasantry grateful to the communists for providing a peaceful environment and bringing economic development, they thought even larger economies of scale during the 2nd 5-year plan would also increase yields.

More dams and irrigation ditches could be built and more nonarable land could be reclaimed.

However, because of peasant unhappiness in some areas, production increases were stalling; and so came the Great Leap Forward in 1958, where all private property was eliminated and all peasants were moved into communes of enormous size--often incorporating from 10,000-70,000 peasants. Although this was obviously a mistake (certainly with hindsight if not before), at the time the CCP rationalized it with the argument that yields really would increase if they had larger farms. So, by 1958, the government controlled decisions on crop planting in 100% of agricultural areas.

I'm sure you are aware of this background, and the 3 disastrous years that followed; but again, I'm only mentioning this because from 1958-1961, cropping patterns, and productivity, were affected by disastrous nation-wide agricultural/political policies (set out by those who were “red” (i.e., revolutionary, committed to the goals of the communist revolution); rather than “expert.” Mao Zedong thought that revolutionary zeal (and harder work—reflecting one’s political commitment) could overcome the constraints of nature. It turned out not to be so. For example, when peasants tried to grow 2 crops of grain in areas that had only ever grown one crop during the season, or 3 crops in areas that had only ever grown 2 crops, yields plummeted. (Quip after GLF’s failure: 3 x 3 is not as good as 2 x 5..) Problems with this policy were exacerbated by a policy of “digging deep” and “planting close.” Further, in this era there was an emphasis on just growing grain (and I assume oil producing and industrial crops). “The whole country grows grain” and “self-sufficiency in grain” became the shibboleths seized with even more fervor during the Cultural Revolution that disastrously affected agriculture (that policy began some time between 1966-76—not sure of dates). During the Cultural Revolution, the policy was even more extreme, for it meant that whole areas were removed from producing products that grew well in that area, such as cotton, and fruit, and turned into grain producing areas (so China could claim self-sufficiency in grain).

So the history of yields of crops and cropping patterns in the YRB would be deeply affected by these broad policy guidelines set at the top. They were quintessentially political decisions, not decisions based on scientific agriculture or economics. If the data were available for the YRB, it would probably look something like this:

1949-52: land reform and individual ownership. Yields increase.

1953-57: first 5-year plan. Yields increase

1957-58: 2nd 5-year plan. Yields may have increased, but are stalling

1958-62: Great Leap Forward. Yields plummet. Few products besides grain. No free markets. A lot of large-scale agricultural infrastructure built. Assumptions are that dams are good, and that much of China’s non-arable land can be made arable through irrigation and terracing. Thousands of dams have been built since 1949, and especially in periods such as GLF when agriculture at its most collectivized form.

1962-65: Recovery and return to 5-15% free markets, but keep commune structure and many

economies of scale.

1966-76: “Politics in Command” Red over Expert (i.e., to be revolutionary is everything; experts are suspect). National policy of grain self-sufficiency and abolition of free markets (not sure of when it began). Production again stalls; but not combined with other factors that led to disaster w/ GLF—i.e., withdrawal of Soviet support, bad weather, and the worst features of the commune system, such as eating in communal mess halls. Further, it could be argued that sending youth and ‘rightist’ intellectuals and experts down to the countryside, although they may have been somewhat useless in the fields, had some positive effects that kept the system from collapsing. This is not a relevant argument to the point of yields in YRB, however.

1976-78: China coming out of the “ten bad years” and wondering what to do. “Politics in command” is slowly abandoned, experts in agriculture would be slowly returning to their positions and once more being listened to.

1979-early 1980s: Deng Xiaoping abolishes commune structure, with its inherent economies of scale, and all land is turned over to individuals. Free markets restored. Agricultural sector restored to life through “household responsibility” and contract system of each farmer producing a contracted amount of grain to the government. The rest is theirs to keep. At first this results in farmers becoming wealthy;

mid-1980s-2003: in this period new issues, again in the policy environment, affect production: arbitrary taxation of peasants by local officials; taxes on actual land owned, even if not farmed, by peasants forces them to use more fertilizers and more pesticides and more water just to keep production going up and be able to pay all the taxes and arbitrary fees. Land tax and other taxes and fees have also meant that farmers could not rotate their crops and leave some land fallow.

The policy on agriculture (and broader economic, fiscal policy) in this period also leads to many peasants seeking to escape agriculture and moving into small towns and cities. Better to have easier work and more predictable incomes. But this in turn started to cause serious problems for agriculture: Although the government wants more peasants off the land to increase efficiency in production (again through moving back to economies of scale—larger farms), in the country as a whole, grain production has been falling because the profit margin is virtually nonexistent. Further, without bogging this down with endless detail, the issue of property rights for agricultural land has also led to problems with policy, and what types of crops farmers will and will not grow.

Of course, one of China’s responses to this decline in grain production is to buy grain on the international grain market on the principle of comparative advantage; but the government is loathe not to be able to feed its people without importing grain as they see this as increasing China’s vulnerability to international interference. (They are also worried that other countries in the developing world might be very upset if China’s vast grain needs were to drive up the price of grain on the world market.) On economic grounds, they know it makes no sense to grow all their own grain; but again for political reasons, they are in a dilemma about it.

In the meantime, as for cropping patterns: the production of high value agriculture products increased (even if at the expense of grain production). And the farmers have chosen to intensify the inputs (labor, water—irrigation, fertilizers, pesticides, herbicides) to get the most out of their land. In the short-run, this no doubt has meant higher yields. But already it has also led to saline soils with lower yields; pollution of the surface and ground waters, to the point that in some places in the YRB, the water quality is in the 4-5 range, not useable even for irrigation; and all the other knock-on effects for land and water pollution.

2004-2005:

In the last year, one of the most positive efforts the government has made to address agriculture, which may affect both yields and cropping patterns—as well as the ecology—is to increase its subsidies to farmers; and to decrease its taxes on farmers, especially the land tax. This may result in growing methods becoming more rational and better for environment.

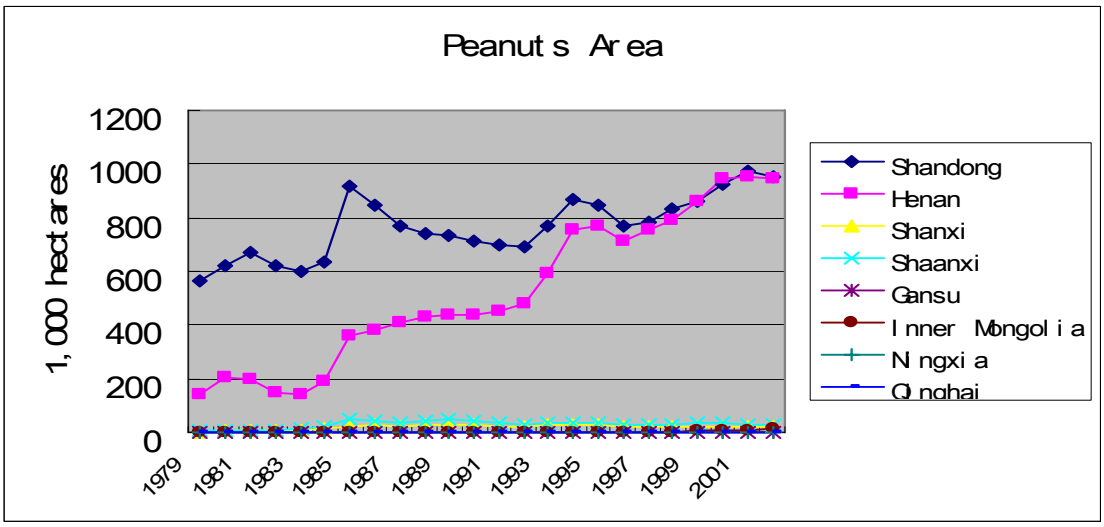
Rather than telling you more of what you probably already know about these policies and how they affect farmers' choices of crops to grow, I'll just conclude by saying that these broader economic/agricultural/political policies that are not specifically about which crops to grow have indeed affected what crops *ARE* grown and how high their yields are.

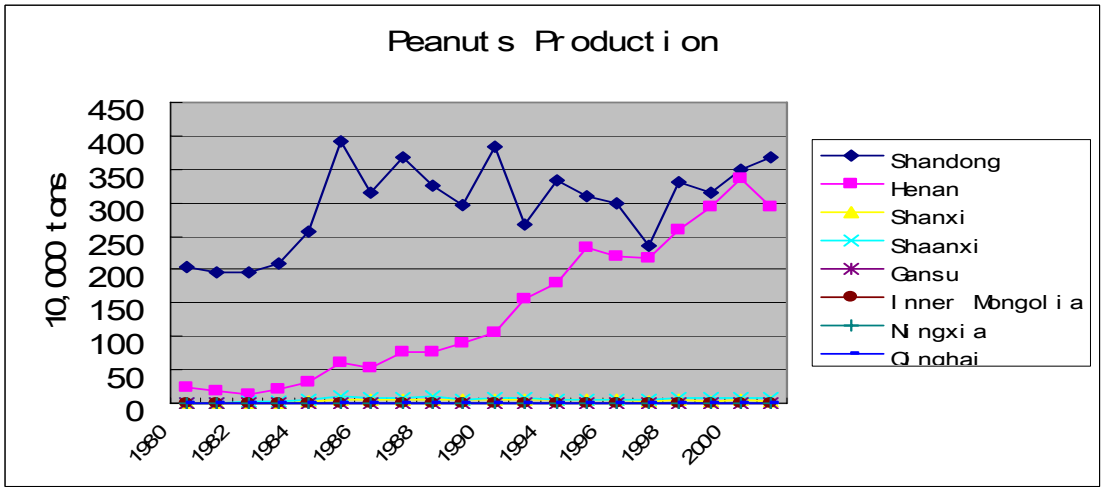
So what does this have to do with the cultivation of crops, cropping patterns, and grain yields in the Yellow River area? The overall national political policies, as well as economic policies shaped by political considerations rather than what was sensible for the YRB, have really dictated cropping patterns, how many dams were built, the development of irrigation, how water has been used, and so on. But now that China has become much more aware of its need to manage the YRB, and hence to manage what is grown and where, it is, I assume a different situation.

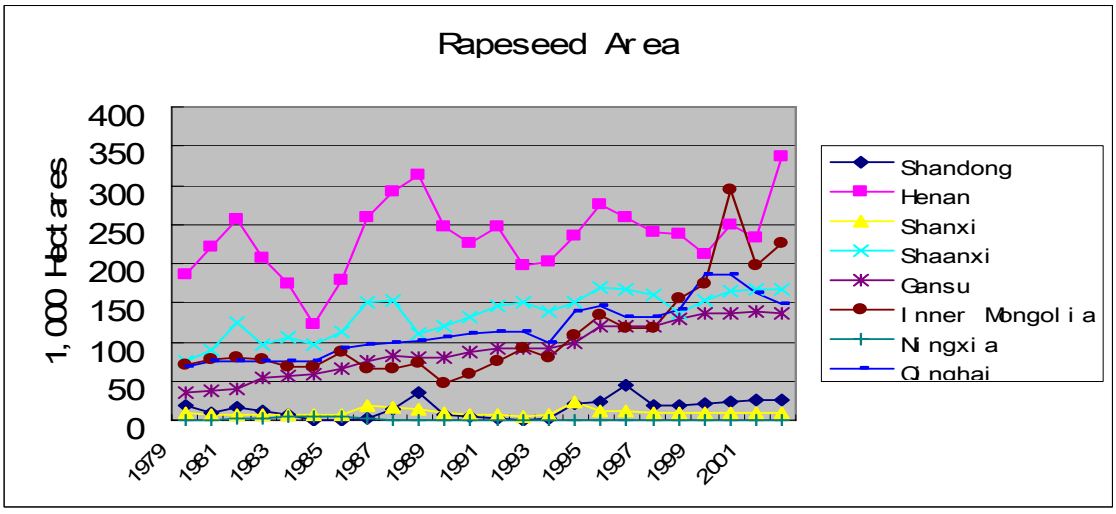
This is where the Yellow River Conservancy Commission comes in, and where it plays a role in determining crops grown, land use, water use, etc. You know much more about this than I do, and should be able to plug in knowledge about the YRCC into the above broader history of national policies that have affected the YRB.

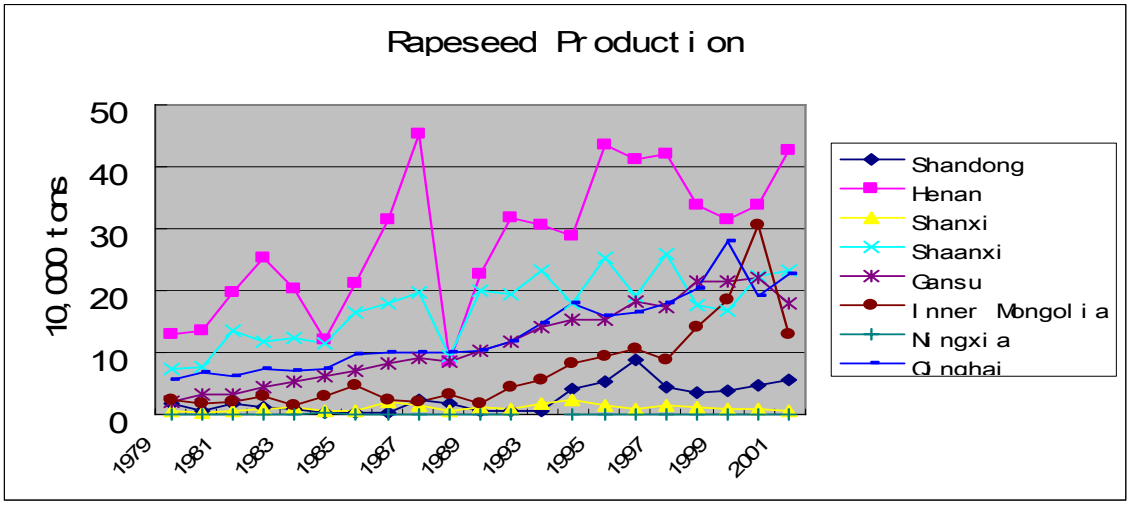
Although I do not claim that my overview is absolutely correct in every detail, and it is unable to address specific agricultural policies in the YRB, I think it will be quite useful to you in putting the data from Xiaoyan in perspective. The broader national policy guidelines on the economy, and on agriculture, were applied to the country as a whole; and although there could be modification at the lowest production level, they were only modifications within the broader policy guidelines. In short, when the policy was to merge land into agricultural collectives, everyone had to merge their land in collectives. And when the communes were broken up in the 1980s, save a handful, all communes were broken up into small private land holdings.

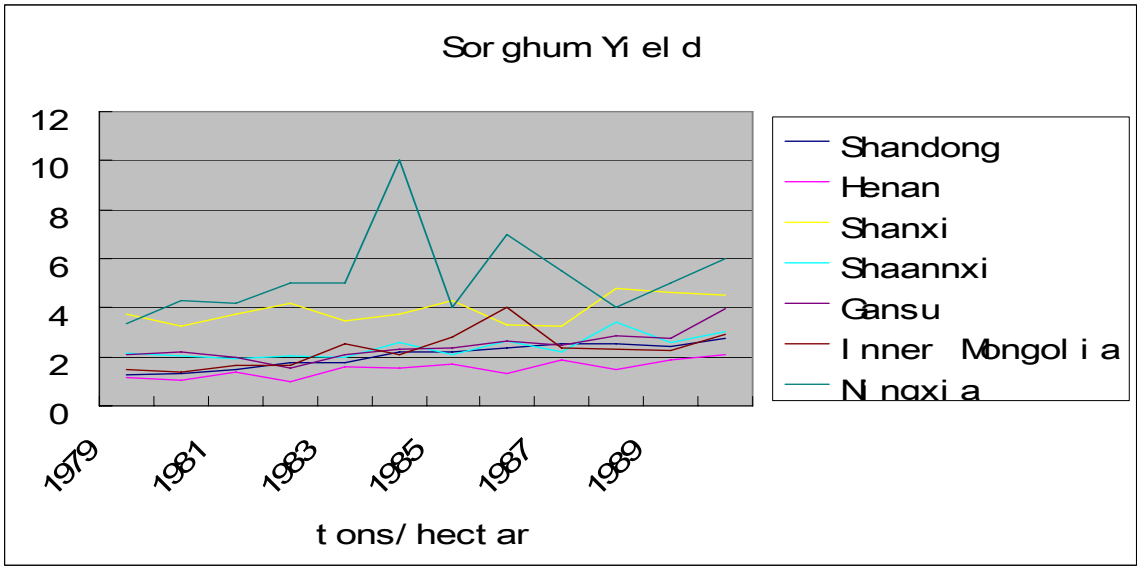
Appendix


Peanuts Area
1,000 hectares
1200
1000
800
600
400
200
0
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
Shandong
Henan
Shanxi
Shaanxi
Gansu
Inner Mongolia
Ningxia
Qinghai


Peanuts Production
10,000 tons
450
400
350
300
250
200
150
100
50
0
1980
1982
1984
1986
1988
1990
1994
1996
1998
2000
Shandong
Henan
Shanxi
Shaanxi
Gansu
Inner Mongolia
Ningxia
Qinghai


Rapeseed Area
1,000 Hectares
400
350
300
250
200
150
100
50
0
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
Shandong
Henan
Shanxi
Shaanxi
Gansu
Inner Mongolia
Ningxia
Qinghai


Rapeseed Production
10,000 tons
50
40
30
20
10
0
1979
1981
1983
1985
1987
1989
1993
1995
1997
1999
2001
Shandong
Henan
Shanxi
Shaanxi
Gansu
Inner Mongolia
Ningxia
Qinghai


Sorghum Yield
12
10
8
6
4
2
0
1979
1981
1983
1985
1987
1989
tons/ hectar
Shandong
Henan
Shanxi
Shaannxi
Gansu
Inner Mongolia
Ningxia

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