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## **Are There Ways to Enhance China's Food Security?**

by

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# Are There Ways to Enhance China's Food Security?

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**C**hinese officials and newspapers express considerable concern about the country's capacity to feed its huge and still growing population. The rhetoric will be familiar to people in Western countries as a blend of "agrarian fundamentalism" and "Malthusianism." But beyond the official rhetoric, we will argue that reforms in land ownership and irrigation water pricing and management could have highly salutary impacts on agricultural output that could alleviate food shortages far into the future.

## The importance of food security in Chinese thinking and planning

Examples of agrarian fundamentalism are ubiquitous in the recent statements of China's political leaders. In fact, they seldom discuss the overall economy without first indicating agriculture's primal importance as well as the need for strong governmental support to the sector. At the First Session of the Ninth National People's Congress in March 1998, the retiring Premier Li Peng indicated that while China's agriculture is the foundation of the economy, it remains fragile. He said: "Agriculture has a direct bearing on our overall situation. We should never neglect agriculture because of good harvests over the years or because there is an adequate supply of agricultural prod-

ucts" (*China Daily*, 6 March 1998). As he outlined development goals for 1998, he began with the commitment that China will focus investment at all levels of government on agriculture, forestry, and water conservation. He also encouraged farmers and rural organizations to increase their labor and investment in agricultural enterprises.

The new premier, Zhu Rongji, installed at the People's Congress, is widely credited as the author of many economic reforms, including the "soft-landing" recently achieved as China moved from a period of significant inflation to price stability without a large diminution in the rate of growth of output. At his first press conference at the end of the Congress, Premier Zhu outlined the directions his new government would take (*China Daily*, 16 April 1998). He spoke of five reforms, and, true to form, the first dealt with the "circulation system for grain."

The premier pointed out that currently large grain reserves are the consequence of the "successful" agricultural policy of recent years, but he indicated that government subsidies had also increased—thus imposing a burden on the fiscal budget. Many types of "subsidies" affect grain marketing and distribution, including those for increasing quota procurement prices offered by the government, purchases by the State's special grain reserve, and grain storage and management by the government. So it is imperative,

Zhu indicated, that the marketing system for grain be reformed. He did not specify at the conference what reforms he had in mind, but, perhaps most significantly, he began his list with proposed agricultural reform, even though some of the others, such as reducing the number of government bureaucrats by 50 percent and cutting the number of government ministries from forty to twenty-nine, were truly revolutionary.

So why is there concern in China over the capacity of agriculture? The facts suggest that agriculture is doing very well, thank you. For three consecutive years (since 1995) the country has had bumper harvests despite unfavorable drought conditions in North China, a major wheat producing area. As suggested above, the principal worry has been about grain production, since grain is the basic staple in most Chinese diets. But grain production has grown at an annual rate of about 3 percent the past six years, higher than the rate of population growth. Vegetable, fruit, meat, egg, and milk consumption has increased sharply during the past decade, reflecting the considerable growth in demand and a concomitant increase in supply of these products. In aggregate, the average Chinese person consumes over 2,700 calories per day—approximately the same level of caloric intake as that achieved in economically advanced countries. Life expectancy, a good overall indicator of health, has risen to 70.8 years in 1997 from 70 years in 1990. Again, this level is typical of advanced countries, not developing countries like China. So, given these facts, why the concern?

The problem stems from a Malthusian view that agricultural output will not be sufficient to adequately feed China's population over the long haul. It is true that China has about 20 percent of the world's population (over 1.25 billion) and feeds them from only about 7 percent of the world's arable land. And that land base is shrinking. More than 4.4 million hectares of arable land have been lost to expansion of urban areas since 1978 (*China Daily*, 1 April 1998). Despite the one-child policy for each married couple in urban areas and a strong campaign to reduce birth rates in rural areas as well, the population is expected to grow well into the next century.

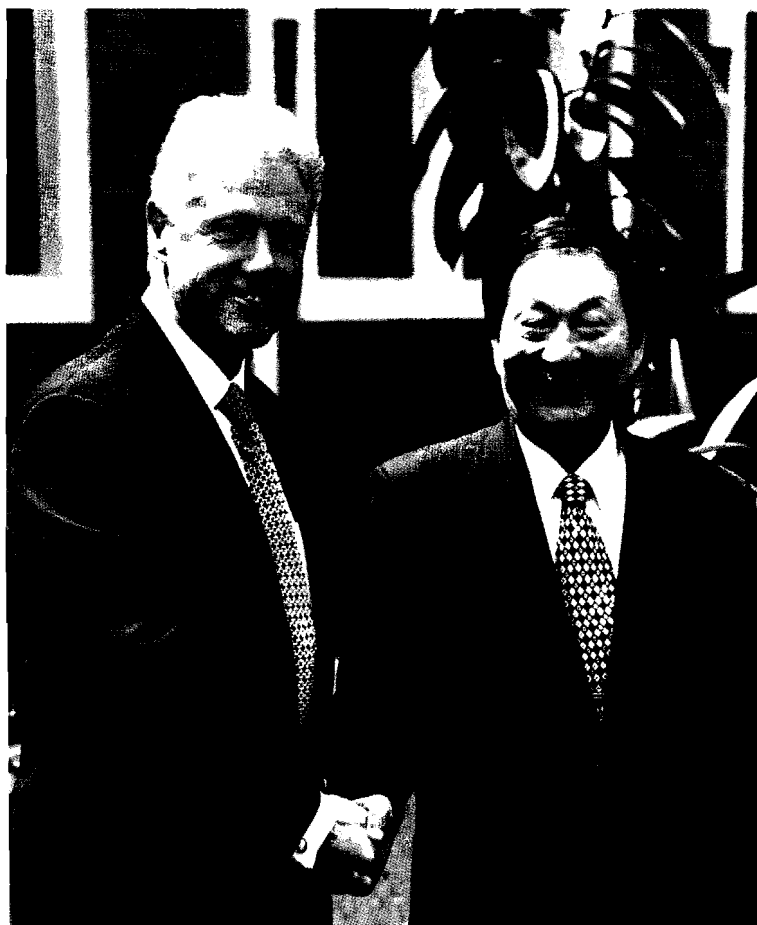
Nor is it just a shortage of arable land that is of concern. Government and other leaders also worry about water resources. China's current per capita water availability is only 25 percent of the worldwide average (*China Daily*, 26 March 1998). Agriculture consumes about 80 percent of the nation's water, in part because of low irrigation efficiencies (*China Daily*, 20 April 1998). Many water problems are believed to have reached serious levels: land subsidence caused by depletion of groundwa-

ter aquifers, high pumping costs from ever-deepening water tables, intrusion of brackish waters (including sea water) into irrigation and domestic water supplies, salting of soils, desertification of arid lands, and a deterioration of water quality to the point that an estimated 50 percent of underground water and two-thirds of the country's rivers are seriously polluted (*China Daily*, 20 April 1998).

In sum, the perceived worsening ratio of population to the quantity and quality of natural resources concerns the Chinese. These same Malthusian views also have been evident in the West for nearly forty years, despite mounting empirical evidence that they are invalid. They inspired doomsday predictions of worldwide famine prevalent in the 1960s and 1970s and remain with us today, despite increasing per capita food production almost everywhere except for some countries in sub-Saharan Africa.

One of the most prominent purveyors of this pessimistic forecast is the World Watch Institute located in Washington, D.C. Its president, Lester Brown, claims that "China may soon emerge as an important importer of massive quantities of grain—quantities so large that they would trigger unprecedented rises in world food prices" (Brown, p. 24). According to Brown, "its [China's] demand for food

President Clinton and Chinese Premier Zhu Rongji shake hands while posing for photographers at Diao Yutai, a government guest house in Beijing, China, Saturday, June 27, 1998.



AP/Wide World Photos

is exceeding the carrying capacity of its land and water resources." Apparently, China's leaders at least partially subscribe to Brown's Malthusian thesis.

### The productivity record

That so much Chinese pessimism should exist just now is somewhat puzzling given the tremendous increases in agricultural productivity that have occurred in the last twenty years. Total agricultural output increased tremendously after the reforms initiated by Deng Xiaoping in the late 1970s. The most significant of these reforms was the "household responsibility system" of the early 1980s. Under the reforms, farm families contracted for and managed plots of land previously operated by collectives. The families retained all residual production after meeting prespecified procurement quota requirements and paying taxes. As a consequence, grain output increased by a third, and the gross value of agricultural output increased by 42.2 percent between 1978 and 1985. As Lin has shown, this spectacular output growth was primarily the consequence of productivity change rather than the commitment of more land. The household responsibility system was clearly a significant factor contributing to productivity change. The introduction of modern agricultural technology was also important (Huang and Rozelle), and, of course, the two are related since greater profit incentives for the family would lead to adoption of profitable technologies.

The lessons of that institutional change are clear and powerful. The system of collective agriculture provided few incentives for individual effort and productivity enhancement and generated colossal free-riding. Output was shared among all members of a team, but the benefits of withholding inputs was captured entirely by the individuals who supplied them. Incentives to shirk were strong and ubiquitous. The same disincentives existed for individual investment in the improvement of human skill and capacity. But, as the farm family was given control of production decisions, as well as much more freedom to market its output wherever and whenever it wished, productivity increased sharply. The household captured the full benefits of its work and enhancement of skills.

The critical question for China now is whether there might be additional opportunities for institutional reform that will also have significant impacts on agricultural productivity. We believe that converting land from collective to private ownership and a more rational pricing and allocation of irrigation water may provide such opportunities. Both may prove to be difficult to implement because of political resistance by powerful interest groups. But some inquiry into possible output responses to these

reforms would appear to be in order. We would argue that even though the output increases may not match those of the Deng Xiaoping reforms, there are compelling reasons to expect that they could be substantial.

### Land ownership reform

In China, communities own land, and individual families are given only a usufructuary right to use the land. The conditions of use are set forth in formal contracts between the farm family and the local collective, usually the administrative village. The contract stipulates the duration of the use rights, the farm family's obligations in terms of fulfilling delivery quota of output and paying local taxes, and the right of local government to terminate the contract in case of violation by the family. However, the contract does not usually specify either the plots of land contracted to families or the measures which prevent the reassigning of land by village cadres. It merely guarantees the community's right to lease land to a farm family and specifies the corresponding obligations of the family.

So what do we know about the tenure security of extant contracts? The evidence is not encouraging. The duration of use rights (the contract) was initially set at fifteen years according to a central government directive issued in 1984. Local government cadres, however, have discretion to make adjustments in the terms of the contract, and frequent land reallocations occur as a result of population changes and other factors. The rationale for this discretion is that since land is owned by the collective, every member has an equal entitlement to his or her share. When increases or decreases in family size occur due to birth, death, or marriage, or when a reduction of collective land occurs due to the conversion of land to other uses, land redistribution occurs. Various surveys show that most villages have had at least one major readjustment of land since the commencement of the household responsibility system in 1978, and the average number of major adjustments is 1.7.

What are some of the economic-efficiency implications of the current contractual arrangements? Individual farmers probably can expect to capture the benefits from the application of most current inputs (labor, seeds, fertilizer, pesticides, and simple implements) even with short or uncertain contract periods because the payout period on these inputs is confined to one season. They can also expect to capture benefits from some semidurable capital inputs that are not land specific, such as tractors, planting and harvesting machines, and animals used for power, even with relatively frequent redistribution. But consider decisions to make land-specific investments such as soil conservation and irrigation

capital improvements. These long-lived and costly investments require a long-term and relatively secure planning environment if they are to be deemed economically feasible. Implementation, therefore, would be seriously affected by land contract uncertainty.

On the other hand, if an active land market existed, a private landowner could capture the benefits of such investments since his or her expected economic rents would be capitalized into land values and could always be recouped when the land was sold. Unless the contract somehow guaranteed that the investor could capture the value of investment in the event that the land contract was terminated or modified, however, an absence of a land market would create significant disincentives to invest. The contract system also does little to encourage increased mobility of labor to higher-valued employment that an owner-tenant relationship would provide if the land were privately owned.

The central government has been pressing for longer and more stable contract leases that disregard changes in population. We believe that this is desirable. Underinvestment problems would be mitigated by a longer and more stable contract system, perhaps one that permitted transfers of contracts among farmers. But local cadres have resisted even this small reform because they would lose the discretionary political power that accompanies the reallocation of land. Current policies discourage the development of a lease market because farmers fear that leasing their land would signal to cadres their willingness to give up their share ownership. So, even though the central government currently allows the transfer of land leases, very few such cases happen because local cadres prevent it.

### **Irrigation water reforms**

We have already enumerated the host of water problems emerging in China. These are familiar problems in all irrigation regimes throughout the world but are likely to be especially severe when water is priced below its use-value and no land market exists.

As in most countries, water in China is a "social" resource technically owned and controlled by the polity. Through organized irrigation districts, farmers and local cadres have a strong voice in the allocation of water to individual users. Irrigation system construction costs are generally borne by provincial and central government. The operation and maintenance costs, however, tend to be borne locally, generally in the form of capital and labor assessments. The regulations for irrigation districts provide for charging a water fee. But even though the districts are encouraged to base water charges on the volume distributed, in practice the fee is

usually based on the land area served because of the lack of water-measuring devices (Manoharan). Hence, at the margin of water use the price is zero, which effectively prevents the fee from serving as a water-allocating device.

The typical water-application technology over the bulk of Chinese agriculture is gravity flow or "flood" irrigation. As elsewhere in the world where these primitive methods are utilized, irrigation efficiencies (the ratio of water used consumptively by the plants to the total amount diverted) are very low, at around 50 percent (Han, Jiang, and Yan). In addition, canals are mostly unlined so large seepage losses occur. Since water is often a critical limiting factor in agricultural production, especially in North and West China, reducing the seepage and evaporation-transpiration losses could have an important impact on agricultural output.



Pricing water at its true supply cost, or at the value of its best alternative use (opportunity cost), has been an effective way to increase irrigation efficiency and reduce evapo-transpiration losses in U.S. agriculture. We see no reason to expect a different response in China. By pricing water rationally, total agricultural production could be increased by (1) extending irrigated acreage made possible by water savings, (2) changing cropping patterns to higher-valued crops, (3) employing more water-efficient irrigation technologies such as sprinkler and drip systems, and (4) improving water management practices such as avoiding overwatering. Based on experience elsewhere in the world, and given water demands outside agriculture, we would expect that

*(cont. on p. 24)*

(cont. from p. 21)

(3) and (4) could be especially important in China, although it must be recognized that capital to purchase new technologies is more scarce in China than in economically more advanced countries. Opportunities to exploit (2) may be more difficult in China because of limited markets (demand) for higher-valued crops, such as fruits and vegetables, unless export markets can be found.

Of course, higher water prices would increase costs that might have complex effects on output. Labor, land, and capital all imperfectly substitute for water. Increasing water prices might increase costs, and this could decrease net incomes unless improved yields offset these higher costs. But a variety of income redistribution tools could be used to prevent any net income losses, and these would almost surely be more efficient than underpricing water. A substantial research effort is required to understand these complex questions. All we mean to suggest here is that there is a strong likelihood that output would increase by a more rational pricing and allocation of water.

### Some additional observations

We do not mean to infer that, if adopted, the reforms suggested here would be the most important determinants of future agricultural production in China. In the final analysis, output prices and costs and the mobility of resources will be crucial to the profitability of the sector. If China's agricultural price policy produces favorable output prices relative to costs, as it has in the recent past, then agriculture will likely prosper. Also critical is the rate of technological advance, which is closely tied to investment in research and extension activities. In our view, investment in extension-type activities to guide farmers to more profitable methods and technologies is likely to produce a high return, given the undeveloped nature of current extension support. In addition, more investment in agricultural and irrigation infrastructure, reforms in the seed system, less spoilage losses in storage and transport, and better rodent control will also have salutary impacts on output.

What we do mean to suggest, however, is that the lack of land and water resources per se is probably not an important limiting factor in the near future if those resources are managed better. Considerable uncertainty in the current land-lease contract system impedes productivity and output. Private ownership of land would permit land markets to develop that would provide incentives for a more productive agriculture. A potential cost of these gains from private ownership could be a greater

concentration of wealth in land if some farmers sell out to others and pursue other labor alternatives. But we fail to see why this should lead to a diminution of welfare so long as land exchanges are voluntary. We would add that if land privatization is simply politically infeasible, then an "iron-clad" lease in perpetuity with easy transferability would also provide much of the needed security and mobility in land-use rights.

A more rational pricing of irrigation water would provide incentives for higher use efficiency that would also increase agricultural output. But other water reforms are also needed, such as better maintenance of structures and facilities, more rational urban-rural water allocations, better management of underground water aquifers, and elimination of subsidies to water-inefficient crops—such as rice—in the North of China. Taken all together with the two reforms discussed in this article, we believe that the Malthusian specter that is alleged to have China in its grip will be postponed for a long time to come. ■

### ■ For more information

Brown, L.R. *Who Will Feed China?* New York: W.W. Norton, 1995.

*China Daily* (various dates).

Han, G., F. Jiang, and J. Yan. "2,000 AD: Water Environment Problems of China." *Int. J. Soc. Econ.* 18(1991):174-79.

Huang, J., and S. Rozelle. "Technological Change: Rediscovering the Engine of Productivity Growth in China's Rural Economy." *J. Develop. Econ.* 49(1996):337-69.

Lin, J.Y. "Rural Reforms and Agricultural Growth in China." *Amer. Econ. Rev.* 82(March 1992):34-51.

Manoharan, T. "Irrigation Management at Collective Sector Level: A Note on Decentralization in the PRC." *Remaking Peasant China: Problems of Rural Development and Institutions at the Start of the 1990s*. J. Delman, C.S. Ostergaard, and F. Christiansen, eds., pp. 179-202. [Copenhagen], Denmark: Aarhus University Press, 1990.

Prosterman, R., T. Hanstad, and B. Schwarzwader. "Implementing the Legal Framework for Rural Land Tenure: Evidence and the Way Ahead." Unpublished paper presented at the Workshop on Land Tenure, Land Markets, and Productivity in Rural China, Beijing, May 1998.

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