China's Grain Production

A Decade of Consecutive Growth or Stagnation?

ZHUN XU, WEI ZHANG, AND MINQI LI

Some progressive writers have argued that while China's agricultural privatization achieved short-term gains, it did so by undermining long-term production facilities such as the infrastructure and public services built in the socialist era.[1] Environmental scholars have questioned the sustainability of the Chinese agriculture. In a report published in 1995, Lester R. Brown raised the question: "Who will feed China?" He argued that the Chinese population's changing diet, shrinking cropland, stagnating productivity, and environmental constraints would lead to a widening gap between China's food supply and demand, a gap the world's leading grain exporters would not be able to fill.[2]

China's official statistics showed that the country's grain production declined from 512 to 431 million tons between 1998 and 2003. However, according to the Chinese government, since 2004 it has achieved "ten years of consecutive growth" in grain production. According to the official statistics, China's grain production reached 602 million tons in 2013, nearly 40 percent above the 2003 level.

While the official statistics claim grain production has grown rapidly, China's surging imports of cereals and soybean suggest that its grain production has struggled to catch up with demand. From 2000 to 2012, China's cereal imports rose from 3 to 14 million tons, and soybean imports rose from 13 to 59 million tons. In 2012, China's cereal imports accounted for 5 percent of the world grain exports, and its soybean imports accounted for 61 percent of the world soybean exports.[3]

This article argues that China's actual grain production levels may be substantially lower than the officially reported levels; in fact, grain production has stagnated since the late 1990s. China's growing dependence on imports to meet its demand for grains will impose increasingly untenable pressure on the world grain market. In the long run, China's

Zhun Xu is an assistant professor of economics at Renmin University of China. **Wei Zhang** is an assistant professor in the School of Labor and Human Resources at Renmin University of China. **Minqi Li** is an associate professor of economics at University of Utah. Please address all correspondence to Wei Zhang (wzhang12@ruc.edu.cn).

grain supply may be further undermined by constraints of land and water resources as well as environmental degradation.

In recent years, some Chinese agricultural experts have questioned the reliability of China's official grain production statistics, and the second section discusses their opinions. The third section estimates China's total uses of domestically produced grains; it is argued that the estimated total uses can be a good proxy of China's grain production levels. China's official statistics may have overestimated China's actual grain production level in 2012 by about 100 million tons. The fourth section considers the long-term challenges to China's food supply, and the last section comments on China's privatized agricultural system.

Did China Produce 600 Million Tons of Grain?

According to the Chinese official statistics, China's grain production reached a record level of 602 million tons in 2013, marking the tenth year of consecutive growth starting from 2004.[4]

However, some Chinese agricultural experts have questioned the reliability of the official grain production statistics. In early 2012, when the Chinese ministry of agriculture announced that China had accomplished "the eighth year of consecutive growth" in grain production, a leading agricultural ecologist Jiang Gaoming argued that, for a variety of reasons, China's official statistics were likely to have overestimated the true grain production levels.[5]

Jiang pointed out that China's annual consumption of grains as food and feed was about 420 million tons. The official grain production level of 570 million tons in 2011 would imply a massive surplus of 150 million tons. However, there was no evidence of massive increase in grain storage. On the contrary, China's imports of cereals, soybean, and edible oil amounted to nearly 140 million tons of grain-equivalent in 2011.

In 2013, Li Changjin, a popular writer on China's rural issues and a visiting scholar at the Chinese University of Hong Kong, conducted field research in one of the rice-growing counties in Jiangxi province.[6] According to Li's research, since the early 1980s, the county's arable land had declined by about a third and the county's grain output had declined from 164 thousand tons in 1986 to 115 thousand tons in 2012. However, the county's official statistical publication showed that the arable land had not decreased and the grain output stayed at 166 thousand tons in 2012.

In the early 2000s, the Chinese government changed the agricultural subsidy policy. In 2004, the Chinese government started to implement

nationwide the "direct grain subsidy" (*liangshi zhibu*) policy. The policy intended to provide a cash subsidy directly to rural households, often in proportion to the reported sown areas. Li Changjin suspected that the "direct grain subsidy" policy might have given the rural local governments incentives to over-report the sown areas.

Under China's current agricultural statistical system, the national grain production statistics are inferred from a very small sample. The grain yields from the sample fields are used to project the nationwide yields using estimated sown areas.[7] If the sown areas are over-reported and the grain yields in the sample fields do not represent most of the country well, the official statistics would involve large upside biases.

Li Changjin believed that the county where he conducted field research was representative of the rice-growing areas in the Southern provinces. His rough calculation suggested that China's national grain production was likely to be around 500 million tons.[8]

China's Grain Production: Evidence from Grain Uses

Theoretically, a country's total grain production should always equal the country's total uses of domestically produced grains. Most of the grain output is used for either direct food consumption or feed consumption. As a country's population (like the Chinese population) shifts from plant-based diet towards a meat-based diet, the proportion of grain output that is used for feed consumption would tend to increase. Other grain uses include industrial consumption (such as grains used for biofuels production), inventory change, net exports, and seed consumption and losses.

Total grain production expressed in terms of use or consumption is thus as follows:

Total Uses of Domestically Produced Grains = Direct Food Consumption + Feed Consumption + Industrial Consumption + Inventory Change + Net Exports + Seed Consumption and Losses

Some statistical discrepancies are inevitable between the reported grain production levels and the estimated total uses. However, the statistical discrepancies should be reasonably small and distributed randomly across different years. One should not expect systematic divergence between the two series in either the positive or the negative direction. The following paragraphs explain how we estimate China's grain uses.

Food and Feed Consumption. China's National Bureau of Statistics conducts household surveys in both the urban and the rural

areas. The survey data include per capita consumption of rice, edible oil, meat, and other food intakes. Other studies have established the transformation coefficients that transform meat, eggs, aqua-products, and dairy products into grain-equivalents in China. For example, according to Liang Shumin and Sun Qingzhen's study, 1 kilogram of pork is equivalent to 4.6 kilograms of grains (see the sources of Table 1). Combining these data, we estimate China's total consumption of grains as food and feed. Table 1 shows how we estimate China's grain consumption as food and feed in 2012.

Table 1. China's Grain Consumption as Food and Feed, 2012

Per Capita Consumption (kg)	Urban	Rural	Transformation Coefficients
Grain (direct consumption)	78.8	164.3	1–1.1
Edible Oil	9.1	7.8	4.6–6.5
Pork	21.2	14.5	4.6
Beef and Mutton	3.7	1.9	3.65–4.6
Poultry	10.8	4.5	3.2
Eggs	10.5	5.9	3.6
Aqua-products	15.2	5.4	2
Dairy	14.0	5.0	0.2–1.2
Alcohol	6.9	10.0	0.72
Outside Dining (grain-equivalent)	117.6		1
Per Capita Grain Consumption (kg)	485	348	
Population (millions)	712	642	
Total Grain Consumption as Food/Feed (million tons)	345.3	223.4	

Sources: Urban and rural consumption of various food items are from *China Yearbook of Household Survey* (Beijing: China Statistical Press, 2012). The transformation coefficients are from Liang Shumin and Sun Qingzhen, "The Mid- and Long-Term Forecast of China's Food Consumption and Supply," *Zhongguo Shiwu yu Yingyang* (China's Food and Nutrition) 2: 37–401 (2006). The urban grain consumption through outside dining is estimated by assuming that grain consumption through outside dining is proportional to the monetary expenditures on outside dining.

Industrial Consumption. *BP Statistical Review of World Energy 2013* provides data of China's ethanol production from 2001 to 2012. In 2012, China produced 1.7 million tons of ethanol.[9] We assume that China's grain input-ethanol output ratios were the same as those in the United States. Based on this assumption, China's grain consumption for biofuels production in 2012 is estimated to be 7.2 million tons.

Inventory Change and Net Exports. The US Department of Agriculture (USDA) publishes estimates of China's grain stocks (including rice,

wheat, and coarse grains), which can be used to calculate the annual inventory changes (the difference between grain stock at the end of a year and the grain stock at the beginning of a year).[10] Net exports are exports less imports. China's grain exports and imports data are from *China Statistical Yearbook*, various years.[11] Grain exports and imports include exports and imports of cereals, soybean, and edible oil.

Seed Consumption and Losses. Seed consumption uses grains as inputs in the subsequent production cycles. According to China's *Compilation of National Agricultural Cost-Revenue Statistics*, seed consumption accounts for less than 2 percent of China's annual grain output.[12] There is no official data on grain losses. But Liao Yongsong, a researcher at the Rural Development Institute of the Chinese Academy of Social Sciences, estimated that about 2 percent of China's grain output was lost in storage, transportation, and processing.[13] We assume that seed consumption and losses amount to 5 percent of China's total uses of domestically produced grain.

Total Uses of Domestically Produced Grains. Table 2 reports our estimates of China's total uses of domestically produced grains for selected years. Chart 1 compares the estimated total uses with the official grain production levels from 1981 to 2012.

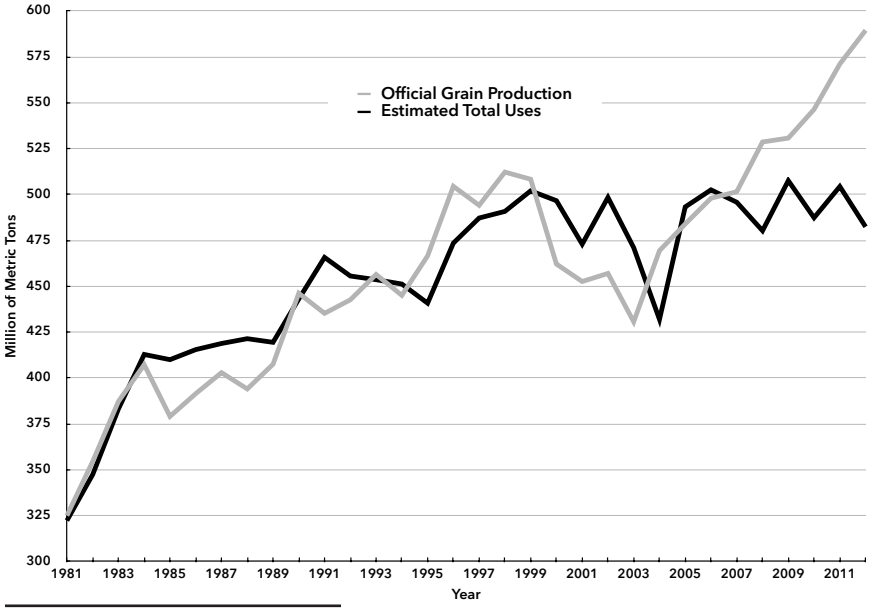
Table 2. China's Total Uses of Domestically Produced Grains, Selected Years

Grain Uses (million tons)	1981	1990	2000	2010	2012
Food and Feed	327	420	500	553	569
Industrial	0	0	0	7	7
Inventory Change	-8	15	-18	6	8
Net Exports	-13	-14	-10	-103	-125
Seed and Losses	16	22	25	24	24
Total Uses	322	443	497	487	482
Official Grain Production	325	446	462	546	590
Discrepancy Ratio (%)	0.8%	0.7%	-7.0%	12.1%	22.2%

Sources: See the sources of Table 1 and the text of the section on "China's Grain Production: Evidence from Grain Uses." The discrepancy ratio is defined as the ratio of the difference between the official grain production level and the estimated total uses over the estimated total uses. Positive or negative discrepancy ratios indicate official production levels being higher or lower than the estimated total uses.

From 1981 to 2007, the estimated total uses tracked closely the official production levels. Whatever discrepancies that exist between the two series are small and appear to be randomly distributed. In twelve

Chart 1. China's Grain Production and Total Uses of Domestically Produced Grain, 1981–2012 (million of tons)



Sources: See the sources of Table 1 and the text of the section on "China's Grain Production: Evidence from Grain Uses."

out of twenty-seven years, the official production level was higher than the estimated total uses. The largest "positive gap" happened in 2004, when the official production level was 8.7 percent higher than the estimated grain uses. In the other fifteen years, the official production level was lower than the estimated total uses. The largest "negative gap" happened in 2003, when the official production level was 8.6 percent lower than the estimated grain uses. Over the entire period 1981–2007, the average discrepancy ratio was -1.3 percent. That is, on average, the official production levels were only 1.3 percent smaller than the estimated total uses. These results suggest that for the period 1981–2007, the estimated total uses were reasonably good proxies of official production levels.

However, since 2008, a significant and systematic gap has emerged between the two series. From 2008 to 2012, the official production level was consistently higher than the estimated total uses and the gap widened from 10.1 percent in 2008 to 22.2 percent in 2012. These systematic and widening gaps cannot be explained by normal statistical discrepancies. Either there are large underestimating biases in the various sources we use to estimate China's grain uses, or the official statistics have greatly overestimated China's actual grain production levels.

The estimated total uses are the sum of grain consumption as food and feed, industrial consumption, inventory change, net exports, seed consumption, and losses. It is possible that the seed consumption and losses are higher than the assumed 5 percent of total grain uses. However, if this were the case, it would be difficult to explain why the estimated total uses matched the official production levels reasonably well from 1981 to 2007.

Grain exports and imports are based on China's official statistics and can be verified by international trade statistics. Inventory changes and industrial consumption of grains are small and do not drive the overall trend. In 2012, inventory change and industrial consumption added up to 15 million tons, accounting for 2.5 percent of the official grain production or 3.1 percent of the estimated total grain uses. By comparison, the discrepancy between the official grain production and the estimated total uses in 2012 was 108 million tons, which equaled 18.3 percent of the official grain production or 22.2 percent of the estimated total uses.

The grain consumption as food and feed is calculated using data from official household surveys conducted by China's National Bureau of Statistics. It is possible that the official surveys have underestimated the true grain consumption levels. However, the estimated total uses that were largely based on the estimated grain consumption as food and feed did match the official production levels well up to 2007. There is no particular reason to think that China's official household surveys have become less accurate since 2007 and there is no obvious incentive for the National Bureau of Statistics to under-report the household grain consumption levels.

Our estimates show that China's grain consumption as food and feed grew at an annual rate of 10.3 million tons from 1981 to 1990, 8.0 million tons from 1990 to 2000, and 5.7 million tons from 2000 to 2012. The slowdown in grain consumption growth is consistent with the slowdown of China's population growth and the generally accepted observation that as per capita income rises, the demand for food tends to rise more slowly.

In 2000, the estimated total uses were larger than the official grain production by about 7 percent. The inventory change, net exports, seed consumption, and losses were relatively small and offset each other. The discrepancies between the official grain production, the total uses, and the estimated grain consumption as food and feed were reasonably small (see Table 2). Thus, our estimate of the grain consumption as food and feed in 2000 can be considered reasonably reliable. If one takes this estimate as the starting point, and assume that China's grain consumption as food and feed grew from 2000 to 2012 at the same rate as it did in the 1990s, then China's consumption in 2012 would be 597 million tons (rather than 569

million tons). This may be seen as the upper limit of the plausible range of grain consumption as food and feed in 2012. China's total use of domestically produced grain in 2012 would be 510 million tons (rather than 482 million tons). But even with this assumption, it would still leave 80 million tons (or 13.6 percent) of the official production unexplained.

On the other hand, it would be interesting to note that the Chinese government started to implement the "direct grain subsidy" policy in 2004. It is possible that three or four years after the implementation of the policy, many rural local governments began to realize that they could receive more subsidies by over-reporting sown areas or by not reporting lost sown areas (which might result from labor force migration, urbanization, or environmental degradation), they could maintain previous levels of subsidies.

The above analysis suggests that it is more likely that the Chinese official statistics have overestimated China's actual grain production levels than that our estimated grain uses understate these levels. If the estimated total uses of domestically produced grains can be considered good proxies of China's actual grain production levels, our estimates suggest that China's actual grain production is currently about 100 million tons below the official production level. While the official grain production had increased by about 90 million tons from 1998 to 2013, our estimates suggest that China's actual grain production most likely has stagnated since the late 1990s.

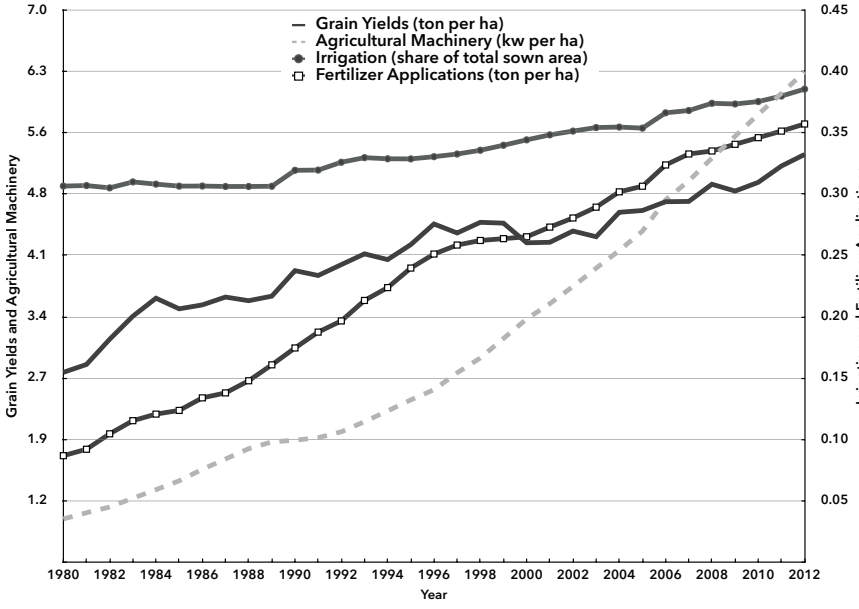
Who Will Feed China?

The rapid growth of modern agriculture has been based on mechanization, chemical inputs (fertilizers, pesticides, and herbicides), irrigation, and high-yield seeds responsive to fertilizers and irrigation. Modern agriculture depends heavily on the nonrenewable fossil fuels for the production of chemical inputs, operation of farm machines, packaging, and transportation.

From an ecological perspective, modern agriculture is fundamentally unsustainable. Mechanized tillage, use of chemical fertilizers, and large-scale monoculture lead to soil erosion. Pests develop generic resistance to pesticides. Perennial irrigation leads to waterlogging, salinization, and aquifer depletion. In the long run, all elements of modern agriculture suffer from diminishing returns.[14]

China's agricultural growth in recent decades has been driven by large-scale application of modern agricultural inputs. Chart 2 shows the relationship between China's grain yields and agricultural inputs for the period 1980–2012.

Chart 2 China's Agricultural Inputs and Grain Yields, 1980–2012



Source: National Bureau of Statistics of China, *China Statistical Yearbook*, various issues, www.stats.gov.cn/tjsj/ndsj/.

From 1980 to 1996, China's grain yields in average grew by 109 kilograms per hectare a year, irrigated area as percent of the total agricultural sown area grew by 0.15 percent a year, fertilizer applications grew by 10.3 kilograms per hectare a year, and agricultural machinery power grew by 95 watts per hectare a year. An increase in grain yields by 100 kilograms was associated with an increase in irrigated area by 0.14 percent, an increase in fertilizer applications by 9.4 kilograms per hectare, and an increase in agricultural machinery by 87 watts per hectare.

From 1996 to 2012, China's grain yields on average grew by 51 kilograms per hectare a year, irrigated area as percent of the total agricultural sown area grew by 0.34 percent a year, fertilizer applications grew by 6.6 kilograms per hectare a year, and agricultural machinery power grew by 234 watts per hectare. An increase in grain yields by 100 kilograms was associated with an increase in irrigated area by 0.67 percent, an increase in fertilizer applications by 13 kilograms per hectare, and an increase in agricultural machinery by 457 watts per hectare. Compared to the period 1980–1996, each of the three modern agricultural technologies experienced substantial diminishing returns over the second sixteen-year period.

In 1996, China conducted the first nationwide land survey using satellite photography technology. The survey found that China's total arable land was 130 million hectares in 1996. From 1996 to 2003, China lost 9.3 million hectares of arable land.[15] Since then, the official statistics show that China's arable land has stabilized around 120 million hectares. However, much of China's arable land has been degraded by soil erosion and industrial pollution.

According to research conducted by the Chinese Academy of Sciences, about one-sixth of China's arable land (or 20 million hectares) has been polluted by heavy metals. About 40 percent of China's land is affected by soil erosion, salinization, and desertification.[16] According to a paper published at the 19th World Congress of Soil Science, under the existing trend of soil erosion, China's grain yields may decline by 11 percent from 2005 to 2030 and by 15 percent from 2005 to 2050. As a result, China may face a food deficit of 14 percent of the expected food demand by 2030 and a food deficit of 18 percent by 2050.[17]

Worldwide, irrigated land accounts for less than 20 percent of the total cropland but contributes 40 percent of the total food production. On average, irrigated land is about three times as productive as rain-fed land.[18] China's per capita water resources are only one-quarter of the world average. But almost 40 percent of China's total sown area is irrigated.

In 2012, China's total water use by the agricultural sector was 388 cubic kilometers, accounting for 63 percent of China's total water use. Out of the 388 cubic kilometers, 113 cubic kilometers was withdrawn from the nonrenewable ground water.[19] As the ground water becomes depleted, about 30 percent of China's currently irrigated agriculture will be threatened. Given the land, water, and environmental constraints, China will have growing difficulty to raise domestic grain production. Indeed, according to our estimates, China's grain production has stagnated over the past one and a half decades.

From 2000 to 2012, China's total imports of cereals and soybean rose from 16 to 72 million tons. China's imports in 2012 accounted for 19 percent of the world total exports of grains and soybean.[20] From 2000 to 2012, China's imports of cereal and soybean grew at the rate of 4.7 million tons a year. At this rate, China will need to import 157 million tons of cereals and soybean by 2030. This is the equivalent of 41 percent of the world grain and soybean exports in 2012 or the total grain production of Brazil and Russia combined.

According to Carleton Schade and David Pimentel, due to the loss of arable and irrigated land, the world will struggle to meet the food demand

by the mid-twenty-first century. The world will fail to provide enough food for between 1 and 4 billion people by 2050.[21] If the world grain and soybean exports fail to increase significantly between now and 2030, China's rising imports will impose unbearable pressure on the world grain market. Many small and poor countries will be priced out of the world grain market. China may find itself unable to afford the surging food prices.

Whither Chinese Agriculture?

There is widespread recognition that large-scale capitalist agriculture based on fossil fuels is fundamentally incompatible with environmental sustainability and cannot provide long-term solution to the world's food problem. However, among some progressive scholars and activists, there is a tendency to romanticize petty peasant mode of production (small-scale agricultural production in which the peasant families own the land and other means of production) as an agricultural system that is more equitable and sustainable than the capitalist mode of agricultural production.

In the early 1980s, China privatized agriculture and in effect restored the petty peasant economy in agriculture (with nominally commodity ownership). Since then, the world has observed what may have been the largest experiment of the petty peasant economy in modern time.[22]

Even today, the capitalist mode of production has made only limited intrusions into the Chinese agricultural sector. According to a recent survey by China's Ministry of Agriculture, as of 2012, there were 877,000 capitalist or quasi-capitalist "family farms" in China. The total arable land on which they operate was 12 million hectares, or 10 percent of the national total. Their average land-holding was 13 hectares, much larger than the average land-holding of a peasant family under the "Household Responsibility System," which was only 0.5 hectare. The largest 16,500 "family farms" each had a land-holding greater than 70 hectares.[23]

Because of the legacy of the Chinese Revolution, China's petty peasant agriculture has developed under relatively "free" conditions, without oppression of feudalism or other pre-capitalist social relations, which continue to affect economic and social development in many Asian, African, and Latin American countries.

Despite such "ideal" conditions, the modern Chinese agriculture has produced essentially the same social and environmental consequences as the more typical capitalist agricultural systems. Since the 1980s, China's rural areas have served as the main supplier of cheap labor force to the urban capitalist economy, undermining the bargaining power of the urban

working class. China's inequality in income and wealth distribution has risen to levels comparable to other capitalist "middle-income" countries.

Like capitalist agriculture, Chinese agriculture of today relies heavily on fossil fuels, synthetic chemical inputs, and, frequently, irrigation water polluted with industrial chemicals, resulting in land degradation and more water pollution. In many parts of rural China, pollution of soil, water, and crops has reached catastrophic levels. It is reported that there are about 250 "cancer villages" in China, where a disproportionally large fraction of the local population has died of cancer.[24]

The Chinese experience over the past three decades has demonstrated that the individual peasant households, even though they are "petty," do not have a natural tendency to pursue socially and environmentally sustainable objectives. Surrounded by the capitalist economic system, Chinese peasants are constantly induced as well as pressured by the logic of the capitalist market to pursue short-term private gains at the expense of the community and the environment.

The only "success" the privatized Chinese agriculture can claim is that it has achieved substantial increases in food production (partly by utilizing the infrastructure built in the socialist era) and provided massive amounts of relatively cheap food (though occasionally poisonous) to the labor force employed by the urban capitalist sector.

However, if this article's analysis proves to be valid, it would suggest that the only "success" of the privatized Chinese agriculture is beginning to fall apart.

The challenge for China and the world is to develop a new agricultural system that can manage the material exchanges between human society and nature in a sustainable way, can provide adequate and nutritional food to the entire population, and can distribute and deliver the food in accordance with social equity. It is difficult for us to imagine that these objectives can be accomplished by a social and economic system other than socialism.

Notes

1. For example see William Hinton, *The Great Reversal: The Privatization of China, 1978–1989* (New York: Monthly Review Press, 1990); Dale Wen, *China Copes with Globalization: A Mixed Review*, (International Forum on Globalization, 2005), http://edgefunders.org; Pao-yu Ching, *How Sustainable Is China's Agriculture: A Closer Look at China's Agriculture and the Chinese Peasants*, (Pesticide Action Network Asia and the Pacific and People's Coalition of Food Sovereignty, 2008), http://archive.foodsov.org.

2. Lester R. Brown, "Who Will Feed China?," *World Watch* 7, no.5 (September/October 1994), http://lv.psu.edu.

3. China's cereal imports are from *China Statistical Yearbook*, various years, www.stats.gov.cn/tjsj/ndsj/ (in Chinese); world grain exports are from the Earth Policy Institute, "World Grain Production, Consumption, and Trade, 1960–2012" (table), January 17, 2013 http://earth-policy.org; China's soybean imports and the world soybean exports are from the Earth Policy Institute, "Soybean Imports to China and Total World Soybean Exports, 1980-2012" (table), June 6, 2013, http://earth-policy.org.

4. National Bureau of Statistics of China, "Announcement of Grain Output in 2013 by the National Bureau of Statistics," November 29, 2013, www.stats.gov.cn (in Chinese). China's definition of grain output includes cereals, tubers, and beans. Output of beans refers to dry beans without pods. Tubers are converted to grain equivalent at the ratio of five to one.

5. Jiang Gaoming, "Why Does China

Import So Much (Grain) with a Per Capita Grain Output of 852 *Jin*," *Science Net* blogs, January 20, 2012, http://blog.sciencenet.cn (in Chinese).

6. Li Changjin, "Be Aware of the Grain Security Crisis," *Shehui Guancha* (*Social Observer*) no. 10 (October 2013), http://mall.cnki.net (in Chinese).

7. The grain sampling survey in 2013 was carried out in 480 thousand rural households, or only 0.2 percent of the total number of rural households; see National Bureau of Statistics of China, "Announcement of Grain Output in 2013 by the National Bureau of Statistics."

8. Li, "Be Aware of the Grain Security Crisis."

9. *BP Statistical Review of World Energy 2013*, http://bp.com.

10. United States Department of Agriculture, *World Agriculture Supply and Demand Estimates Report (WASDE)*, http://usda.gov, December 10, 2013; "Grain: World Markets and Trade," http://usda.mannlib.cornell.edu. USDA publishes the grain stock data by trade year. This article transforms the USDA data to a calendar year basis data by taking the moving average of the trade year stock data. For example, the grain stock in 2010 is assumed to be the average of 2009/2010 stock and 2010/2011 stock. Other institutions like Food and Agriculture Organization of the United Nations (FAO) also publish their estimates of China's cereal stocks. The FAO data suggest a smaller increase in inventory in the recent years than the USDA data, which implies an even smaller grain output estimate compared to our estimate.

11. National Bureau of Statistics of China, *China Statistical Yearbook,* various years, www.stats.gov.cn/tjsj/ndsj/ (in Chinese).

12. The Pricing Department of China's Development and Reform State Commission, *Quanguo Nongchanpin Chengben Shouyi Ziliao Huibian* (*Compilation of National Agricultural Cost and Revenue Statistics*) (Beijing: China Statistical Press, 2013).

13. Liao Yongsong, "How Much Grain Does China Consume," Working Paper, February 27, 2012, http://rdi.cass.cn (in Chinese).

14. Edward R. D. Goldsmith, "Farming and Food Production under Regime of Climate Change," in Andrew Mckillop with Sheila Newman, eds., *The Final Energy Crisis* (London: Pluto Press, 2005), 56–73.

15. Jie Chen, "Rapid Urbanization in China: A Real Challenge to Soil Erosion and Food Security," *Catena* 69, no.1 (January 2007): 1–15.

16. Ibid.

17. Liming Ye, Jun Yang, Ann Verdoodt, Rachit Moussadek, and Eric Van Ransk, "China's Food Security Threatened by Soil Degradation and Biofuels Production," paper presented at the 19th World Congress of Soil Science, August 1-6, 2010, Brisbane, Australia. https://biblio.ugent.be.

18. Carleton Schade and David Pimentel, "Population Crash: Prospects for Famine in the Twenty-first Century," *Environment, Development, and Sustainability* 12, no. 2 (April 2010): 245–62.

19. National Bureau of Statistics of China, *China Statistical Yearbook 2013*, www.stats.gov.cn/tjsj/ndsj/ (in Chinese).

20. See note 3. China's imports of cereal and soybean do not include the imports of edible oil.

21. Shade and Pimentel, "Population Crash"; Chinese Ministry of Agriculture, "The First National Family Farm Survey Reveals That There Are 877,000 Family Farms Nationwide, with an Average Operating Size Greater Than 200 mu," June 4, 2013, www.moa.gov.cn (in Chinese).

22. In the Leninist and Maoist tradition, the term "petty peasant economy" refers to petty commodity production or simple commodity production in agriculture, where small-scale production is undertaken by peasant households that own some or all of their means of production.

23. Chinese Ministry of Agriculture, "The First National Family Farm Survey ."

24. *The People's Daily* Network, "Revealing the National Map of Cancer Villages," February 21, 2013, http://env.people.com.cn (in Chinese).

MONTHLY REVIEW *Fifty Years Ago*

SPELLMAN: You often use the word revolution, is there a revolution underway in America today?

MALCOLM X: There hasn't been. Revolution is like a forest fire. It burns everything in its path. The people who are involved in a revolution don't become a part of the system—they destroy the system, they change the system. The genuine word for a revolution is *Unwälzung* which means a complete overturning and a complete change and the Negro Revolution is no revolution because it condemns the system and then asks the system that it has condemned to accept them into their system. That's not a revolution—a revolution changes the system, it destroys the system and replaces it with a better one. It's like a forest fire like I said—it burns everything in its path and the only way to stop a revolution is to ignite a fire that you control and use it against the fire that is burning out of control. What the white man in America has done, he realizes that there is a Black Revolution all over the world—a non-white revolution all over the world—and he sees it sweeping down upon America and in order to hold it back he ignited an artificial fire which he has named the Negro Revolt and he is using the Negro Revolt against the real Black Revolution that is going on all over this earth.

—A.B. Spellman, "Interview with Malcolm X,"
Monthly Review, May 1964