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China's Hidden Agricultural Revolution, 1980–2010, in Historical and Comparative Perspective

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Abstract

China finally underwent its modernizing (i.e., with increased labor productivity and incomes) agricultural revolution in 1980 to 2010, through dynamics unlike those of most other previous agricultural revolutions. It is "hidden" because the revolution has not come so much from the conventional and readily apparent increases of certain crops' output by weight due to new inputs, but rather mainly by the switch from grain production to more and more higher-value agricultural products like meat-poultry-fish, milk-eggs, and fruits and higher grade vegetables. That change has been driven by a revolution in the food consumption patterns of the Chinese people that came with rising incomes mainly from nonagricultural development. A comparison of China's agricultural history with others tells about the interactions of multiple factors, not just the role of markets and/or technology, or property systems, but rather their interactions with population-to-land resource endowments, differential rural-urban relations, state actions, and historical coincidences. China's is in fact most like India's, rather than "East Asia's," though even then with important differences stemming from its revolutionary legacies.

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In the 30 years between 1980 and 2010, the output value of Chinese agriculture rose sixfold (in comparable prices), or an increase of about 6% a year on average. That is a dramatic change that is unlike previous agricultural revolutions in history. It is different, first, in the scale of growth, which dwarfs earlier agricultural revolutions, such as the (less than) 0.7% growth per year in the classic eighteenth-century English agricultural revolution, and the 2–4% growth a year in the so-called green revolution of the 1960s and 1970s, which had actually begun much earlier in Japan, Taiwan, and Korea.

More important, it was different in the dynamic behind the growth. This new Chinese agricultural revolution has been driven above all by a revolution in the food consumption patterns of the Chinese people, which have come mainly through nonagricultural development and the rise in incomes. Chinese food consumption has been moving from the traditional 8:1:1 ratio of grain:vegetables:meat toward a ratio of 4:3:3, like that of the Chinese urban elite classes and Taiwan–Hong Kong. Earlier agricultural revolutions had been driven not by consumption changes but by increases in agricultural output (by weight) per unit area due to new inputs: such as animal power and animal fertilizer in the English agricultural revolution (or mainly tractors as in the later American agricultural revolution); or mainly chemical fertilizer and scientific seed selection (and, to a much lesser extent, tractors) as in Japan, Taiwan, and Korea.

The Chinese experience, in fact, most closely approximates not the earlier so-called East Asian pattern but rather its contemporaneous revolution in India. What China and India share is that the gains from the initial coming of modern inputs such as those in the earlier "green revolution" had been largely counteracted by their rapid population growth and powerful population-to-land pressures, such that per capita agricultural incomes rose little or not at all. That in turn severely limited market development of rural-urban trade. In both India and China, a modernizing agricultural revolution with significant advances in labor productivity and farm incomes had to await the "externally" generated consumption revolution of the 1980–2010 period.

Compared with the other "East Asian" countries, China has been distinguished by a much stronger persistence of its intense population-to-land pressures. Japan's population, by contrast, had increased little after about 1700, which was then followed by an industrialization of sufficient vigor from the

1880s to the 1950s to absorb enough people from agriculture to keep the agricultural population largely constant during the coming of modern inputs, thereby allowing for substantial growth in labor productivity and incomes. As for Taiwan and Korea, they had benefited from a Japanese (occupation's) local governance structure that successfully provided modern inputs for agriculture (even though more in the interests of metropolitan Japan than of the colonies), giving those places an earlier start already in the 1920s and 1930s in the "green revolution." Those inputs had made possible agricultural advances well beyond the rate of population growth, laying the foundation for substantial increases in labor productivity and rural incomes and consumption. That earlier modernizing agricultural development helped both Korea and Taiwan enter the ranks of developed nations by the late 1980s, well ahead of China, even today's China.

This empirical picture, it should be made clear, defies any simple marketist understanding of agricultural growth, a perspective that has become very influential in this neoconservative era of ours, and challenges also any simple emphasis on modern inputs alone, and/or on property systems alone. What it shows is that the roles played by population, market, technology, the property system, and the state are closely interconnected, and that each needs to be understood in conjunction with the others, not on its own.

The unusually heavy Chinese and Indian population-to-land pressures (resource endowment) have shaped profoundly the market structures of both countries. Less cultivated land per agricultural labor unit meant lower agricultural incomes, and lower agricultural incomes in turn meant fewer rural purchases of urban products, and hence lower development of rural-urban trade and a lower level of use of modern inputs. What Chinese and Indian agriculture had to await was the new dynamic of a consumption revolution wrought by the general expansion in the nonagricultural national economies. Those changes were what drove a basic restructuring of agriculture, from predominantly lower-value grain output to predominantly higher-value meat-fish (and milk-eggs), and vegetables-fruits production, thereby fueling the rise in agricultural productivity in terms of output value and of incomes, thence also powering expansive two-way rural-urban trade.

That contrasts sharply with China's earlier trade pattern in which the flow of goods was mainly unidirectional, with the countryside supplying "luxury goods" (e.g. "fine grains,"[1] meat-poultry-fish, fine cotton, silk thread, and so on) to the towns and cities, with very few rural purchases of goods from the towns and cities in reverse. Rural trade had remained largely limited to the exchange of subsistence goods among peasants (including long-distance exchanges between different regions), especially rural-produced foodgrains for rural-produced cloth and vice versa.

China's recent consumption-driven agricultural revolution has been helped also by two other significant long-term historic tendencies. First is the decline in the birth rate as a result of the vigorous implementation of a one-child policy from 1980 on (though less strictly in the countryside than in the cities), which finally resulted by the turn of the century in a steady decline in the rate of natural increases in working-age people entering the labor force. There was, at the same time, a massive movement of the surplus agricultural labor force into off-farm employment, first in rural industries (in the "leave the soil but not the village" 离土不离乡 pattern) in the 1980s, then in urban employment (in the "leave the soil and the village" 离土又离乡 pattern) since the 1990s. Together, those two historic tendencies helped raise the amount of land available per agricultural labor unit from the lowest point of only about 5.9 mu (or 0.98 of an acre) in 1990 to about 10 mu (1.67 acres) today. Though only a small change by Western standards, it has been enough to power substantial rises in agricultural incomes. Augmented by income from off-farm employment, the resulting increased rural consumption has led both to changes in rural food consumption patterns and also increased purchases of urban goods, to result in the spiraling rural-urban trade in eighteenth-century Britain witnessed and conceptualized by Adam Smith.

At the same time, the higher-value "new agriculture" has been distinctive for being "capital and labor dual intensifying" (Huang Zongzhi, 2010, 2014). Tented vegetable farming, for example, requires four times as much labor input per mu as open-air vegetable farming, both because each cropping requires more labor and fertilizer and also because of more croppings per year. Such farming also requires of course "capital" inputs, such as plastic tents and more fertilizer. The same applies to fruit orchards: one mu of an apple orchard, for example, requires 38 days of labor input, 3.5 times more than grain. As a further example, a small family farm raising 35 pigs along with feed grain cultivation requires 4 days of labor input per pig, plus 80 days for growing the grain, very different from the old foodgrain farms that raised just one or two scavengering pigs. Poultry, and beef cattle or milk cows, require even more intensive labor input and feed (Zhongguo nongcun tongji nianjian, 2004: 261, 274, 276–77, 278–79, 280, 281). All are both more labor and capital absorbing, and also produce higher returns per unit labor. The sources of funding for increased "capital" inputs is a subject that I have studied separately (Huang and Gao, 2013; Huang Zongzhi, 2014: chap. 8)—suffice it to say here that the new agriculture has brought fuller employment for agricultural labor as well as higher incomes, which have in turn fueled spiraling rural-urban trade, distinctly different from China's historical pattern.

The confluence of the three historic tendencies—of altered consumption, which led to much more production of higher-value agricultural products, of more land available per labor unit due to the decline in the birth rate, and of increased urban employment (and fuller employment of labor in the new agriculture)—is what has made up China's new-age agricultural revolution and the concomitant rises in farm incomes. Those, in turn, have helped power market development of an entirely different sort, to make up what I term the new "hidden agricultural revolution" (Huang Zongzhi, 2010, 2014).

I say "hidden" because it has been so unlike what had happened historically and is therefore easy to miss. Part of the reason the new revolution has been easy to miss is the way Chinese statistical data on farming are organized: mainly according to output (by weight) of crops, dominated still by the conceptual rubric of "agriculture" in the narrow sense of crops only, as opposed to "big agriculture" 大农业 in the broad sense, which includes "animal husbandry," "fishery," and "forest products." And the higher-value products of small farms, like animals and fish and poultry, have been categorized statistically under "animal husbandry" and "fishery" (牧, 渔), which call to mind large-scale pastoral animal raising or specialized fish farming and fishing, rather than what are actually mainly small family farm production. It has therefore been difficult to see the changes in the structure of agricultural output as a whole.

Vegetables add to the confusion. In the collective era, most vegetables consumed by peasants were self-grown and did not enter into national statistics and, even in the present, that still holds true to some degree. And, because vegetables are so perishable, they are frequently sold in nearby informal (periodic) rural and urban markets for which there are very little systematic data. More important, recent changes have been mainly in the form of switching from low-value vegetables (especially root vegetables [in the Chinese conception]—potatoes, carrots, taro, onions, and so on) to higher-value leafy vegetables (spinach, leek, coriander, Chinese broccoli, "water spinach" 空心菜, and so on), which are also difficult to differentiate in terms of output weight (vegetables can be as high as 65% to 95% in water content, with large variances between root vegetables and leafy vegetables). Finally, the new tented ("hothouse") vegetable growing is not readily distinguishable in the statistical data from open-air vegetable growing, just as farms raising both livestock (of 10, 15, or more animals) and feed grains are not readily distinguishable from the old-style grain farms that raised just one or two scavengering pigs. We will need to rely below mainly on sown acreage and output value data, which are more telling than output data by weight, in order to cut

Table 1. Yield of the Main "Old Agriculture" Crops, 1980–2010 (catties per mu).

Year	Grains	Cotton	Rapeseed
1980	[401][a]	81	123
1985	[546][a]	118	183
1990	617[b]	118	185
1995	683	129	207
2000	697	160	223
2005	766	166	263
2010	810	180	260

[a]Bracketed [ ] numbers are for rice and wheat only.
[b]1991 data.
Source. *Zhongguo tongji nianjian*, 2011: tables 13-16; *Zhongguo tongji nianjian*, 1983, 1984, 1987.

through the confusion. Data by output weight of vegetables, by contrast, add up only to a confusing and contradictory picture.

For the above reasons, the new agricultural revolution has been very easy to miss, by government policy makers no less than scholars. What follows in the sections below are the basic data and analysis of each of the major points outlined above.

The New-Age Agricultural Revolution

We begin here first with data on the "old agriculture." Table 1 shows the yield in successive years for the three major (open field) crops: grains, cotton, and rapeseed. As can be readily seen, in the 30-year period of 1980–2010, the yield of each increased by a little over 100%, which means an annual growth rate of about 2.4%, a rate basically comparable to what had occurred in the 1950s and 1970s (during which grain output grew at 2.3% a year, while population increased by 2% a year—see below). That is nothing like the agricultural revolution we are talking about.

But if we turn instead to the output value of the more encompassing category "big agriculture" (i.e., including "agriculture, forestry, animal husbandry, and fishery"), the agricultural revolution we are talking about becomes readily evident. In the 30 years from 1980 to 2010, the total output value of "big agriculture" rose to 590% (in comparable prices) of what it had been in 1980, as shown in Table 2. Within that, "animal husbandry" to a whopping 1,042%, and "fishery" to a still greater 1,904%. By contrast, "(small) agriculture," including vegetables and fruits in

Table 2. Gross Value of Output of Agriculture, Forestry, Animal Husbandry, and Fishery, 1980–2010 (with 1952 as 100).[a]

Year	Gross value of output	Value of agricultural output	Value of forestry output	Value of animal husbandry output	Value of fishery output
1980	224.9	203.6	1,014.8	306.4	1,270.7
1985	333.4	291.2	1,572.1	508.2	2,263.0
1990	420.5	356.7	1,601.1	704.4	4,238.2
1995	602.2	439.7	2,298.8	1,237.7	8,915.6
2000	807.8	549.6	2,808.5	1,811.4	14,074.0
2006	1,100.7	704.2	3,550.5	2,649.3	19,496.5
2010	1,320.2	828.3	4,681.9	3,195.5	24,198.4

[a]By comparable prices (可比价格).
Source. Zhongguo nongcun tongji nianjian, 2008: 111 (table 6-22); 2011: table 6-22.

addition to open-field crops, rose to a more modest 407% of what it had been in 1980.

As can be seen readily, the main growth in this 30-year period came not from increases in yield by weight per unit area of planted crops (which is the traditional meaning of an agricultural revolution), but rather from the reconfiguring of the structure of agricultural products, moving toward a greatly increased proportion of high-value-added products—meat-poultry-fish (and vegetables-fruits). And that, as we will see in greater detail in the next section, was mainly a consequence of the changes in the structure of the Chinese people's food consumption. The dynamic behind that altered structure of food consumption, in turn, was the rapid development of the national economy as a whole, including the movement of peasants into urban employment and their reliance on such employment to augment their household incomes. What resulted was greatly increased demand, especially for meat-poultry-fish and vegetables-fruits, causing thereby a demand-driven reconfiguring of the very structure of Chinese agriculture. It was that kind of change in consumption demand that drove the transformation in Chinese agriculture from mainly food crops to more and more animal husbandry cum feed crops and vegetables-fruits.

As Table 3 shows, the dramatic shift can be seen, first of all, in the changes in acreage planted under vegetables, from 47 million mu in 1980 to 285 million mu in 2010, or an expansion to 606% of what it had been in 1980. At the same time, there was a comparable expansion in the cultivation of fruit, from 27 million mu to 173 million mu, or to 640%. In 1980,

Table 3. Acreage and Proportion of Sown Area under Vegetables and Fruits (millions of mu).

Year	Vegetables (including melons used as vegetables)	Vegetables (including melons used as vegetables) %	Fruit orchards	Fruit orchards %
1980	47	2.2	27	1.2
1990	95	4.3	78	3.5
2000	228	9.7	134	5.7
2010	285	11.8	173	7.1

Source. *Zhongguo tongji nianjian*, 2011: table 13-1; *Zhongguo nongcun tongji nianjian*, 2011: table 7-3; *Zhongguo nongye nianjian*, 2009: 12-13.

Table 4. Acreage and Output Value of Major Agricultural Products, as Percentages of Total Sown Acreage and Output Value, 1990–2010.

Year	Vegetables sown acreage (%)	Vegetables output value (%)	Fruits sown acreage (%)	Fruits output value (%)	Grains sown acreage (%)	Grains output value (%)	Animal husbandry output value (%)	Fishery output value (%)
1990	4.3	—	3.5	—	—	31.4[a]	15.8	5.4
2000	9.7	14.4	5.7	4.2	54.6	17.4	18.6	10.9
2010	11.8	18.8	7.1	7.9	55.9	15.9	30.0	9.3

[a]Total of "food crops" 粮食 (which include potatoes and soybeans). There are no data for "grains" 谷物 alone for that year.
Source. *Zhongguo nongcun tongji nianjian*, 2011: table 6-14; 2002: table 6-14.

vegetables had taken up merely 2.2% of all sown acreage, and fruits 1.2%, totaling just 3.4% of all sown acreage. By 2010, vegetables took up 11.8% of sown acreage, and fruits 7.1%, together amounting to 18.9%—a very dramatic increase indeed from 1980.

Meat (pork, beef, mutton-lamb) production tells the same story, but in output weight: total output increased from 12 million tons in 1980 to no less than 79 million tons in 2010, an increase of 560% across the entire period (Zhongguo tongji nianjian, 1983: 178; 2010: table 13-19).[2]

More telling still are output value data. From Table 4 we can see that the output value of grains, as a proportion of the gross output value of all agricultural products, had declined to a mere 15.9% by 2010 (even though its proportion of sown acreage was still quite high at 55.9%). By contrast, the

proportion of gross output value occupied by vegetables rose to 18.8% and fruits to 7.9%. The increase in the proportion of output value occupied by meats is even more dramatic, reaching fully 30% by 2010, and of fish, also an impressive 9.3%. In 1978, meats and fish had amounted to a mere 17% of total agricultural output value (Zhongguo nongcun tongji nianjian, 2008: 99, table 6-13). In 2010, these major non-grain products from Chinese agriculture accounted for a total of 66% of the gross value of output of all agricultural products, towering far above the meager 15.9% that grains occupied. Chinese agriculture, in other words, had become predominantly the "new agriculture" of high-value-added products, no longer mainly the old agriculture of grains, cotton, and rapeseed.

To be sure, the farming of grains, cotton, and rapeseed is still important and not to be dismissed. As we have seen in Table 1, its output by weight per unit area roughly doubled in that same 30-year period. Moreover, as we can see from my separate study of the subject, even grain cultivation modernized considerably in the second half of the period (i.e., 1995 to 2010), with considerably more use of chemical fertilizers, insecticides, improved seeds, and tractors. It has in fact become quite highly modernized (Huang and Gao, 2013; Huang Zongzhi, 2014: chap. 8). But in terms of output value, it occupies a much smaller share than the new agriculture—less than a quarter. Many people continue to equate Chinese agriculture mainly with grain production (or grains plus cotton and rapeseed, the major categories of open-field agriculture); we need to revise that common notion on the basis of the data presented above.

The Revolution in Food Consumption

There have been dramatic changes in food consumption patterns, as Figures 1, 2, and 3 show on the basis of data drawn from the State Statistical Bureau's investigations. Overall, the consumption of "food crops" 粮食 (i.e., foodgrains, plus grain substitutes like potatoes and soybeans) declined greatly, from an average of 240 kilograms (kg) per person in 1980 down to about 130 kg in 2010, as shown in Figure 1. For a people who had for centuries consumed mainly staple grains, this has been a historic change. (The consumption of vegetables, if measured only in terms of weight, however, shows not much change—for all the reasons discussed earlier. The telling data are sown acreage and output value, shown above, not by weight as in Figure 1.) At the same time, the consumption of meat-poultry-fish among urbanites increased from the 27 kg per capita in 1980 to 50 kg per capita in 2010 and, among rural people,

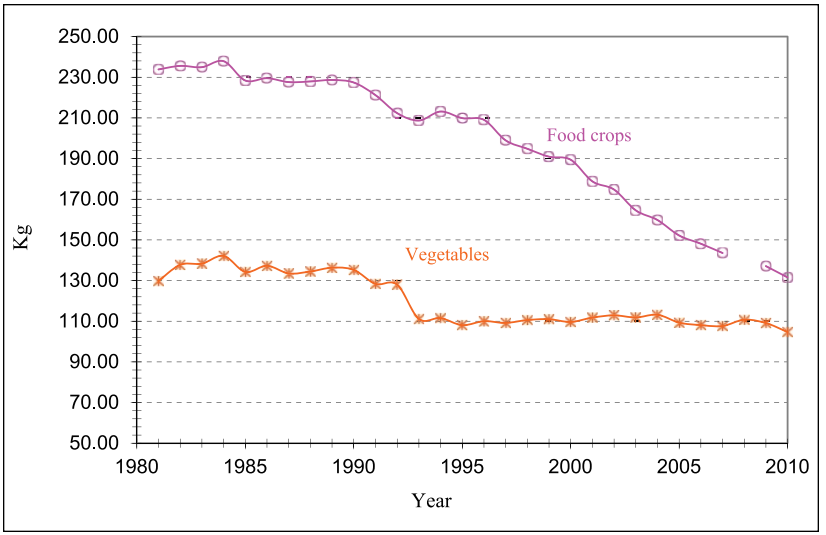

Figure 1. Per capita consumption of food crops and vegetables, 1980–2010.
Source. Zhongguo tongji nianjian, 1993: table 8-7; 1996: table 9-6; 2003: table 10-10; 2005: table 10-11; 2006: table 10-9, 10-29; *Zhongguo tongji zhaiyao*, 2000: 106; *Zhongguo nongcun tongji nianjian*, 2011: table 11-3; data for 2006 to 2010 are from *Zhongguo tongji nianjian*, 2008, 2009, and 2011.

from 11 kg to 25 kg, as shown in Figure 2. There have been substantial increases also in milk and eggs consumption, with per capita consumption just about doubling in both urban and rural areas, as shown in Figure 3. The Chinese people, clearly, have changed rapidly from a diet of mainly staple grains to greater and greater consumption of meats-fish-poultry and milk-eggs (and higher-grade vegetables), with a concomitant decline in the consumption of grains (Huang Zongzhi and Peng Yusheng, 2007; updated in Huang Zongzhi, 2014: chap. 5).

To be sure, there is still a substantial gap between urban and rural living standards, shown partly by the differential between the 50 kg of meat-poultry-fish of urbanites versus the 25 kg of rural people, as well as a similar difference in milk-eggs. Nevertheless, the changes, though certainly varying in accordance with income, have clearly occurred among all classes in Chinese society. As further evidence, the State Statistical Bureau's data on meat (pork, beef, mutton-lamb) and poultry consumption for different urban income groups show parallel changes between the top 10% and the bottom 10% of the urban population in the period 1995–2005: in 1995, the top group consumed 30.2 kg per capita, the bottom group 17.5 kg; by 2005, the top group was consuming 37.5 kg, the bottom

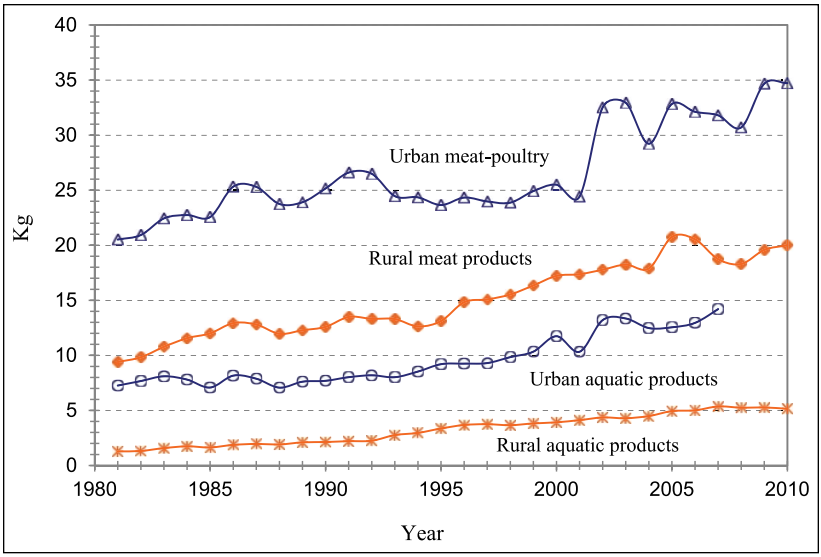

Figure 2. Meat and fish (aquatic products) consumption per capita, separately of urbanites and rural people, 1980–2010.
Source. Zhongguo tongji nianjian, 1993: table 8-7; 1996: table 9-6; 2003: table 10-10; 2005: table 10-11; 2006: table 10-9, 10-29; *Zhongguo tongji zhaiyao*, 2000: 106; *Zhongguo nongcun tongji nianjian*, 2011: table 11-3; data for 2006 to 2010 are from *Zhongguo tongji nianjian*, 2008, 2009, and 2011.

group 23.7 kg (Zhongguo tongji nianjian, 1996: table 9-10; 2006: table 10-13). There can be no mistaking the overall trend for the population as a whole, excepting the poorest.

Here we might observe further that food consumption is one of the first among different kinds of consumption to change: whether higher- or lower-income urbanites or rural people, what is shared in common is the long-standing association of meat-poultry-fish (and to a lesser extent, also higher-value varieties of vegetables and fruits) with celebratory occasions (e.g., wedding banquets) and the most highly desirable of foods. Of course, there is also the strong cultural association of food with social status and well-being, even more than other consumption goods such as clothing and other accessories. The wish to eat well, more like the elite urban classes (and the people in wealthier Taiwan and Hong Kong), is very nearly a universal instinct among all income groups in China. It should not be surprising that the changes in food consumption patterns (as well as the explosive growth of all manners of eateries) have been very much at the cutting edge of all consumption changes.

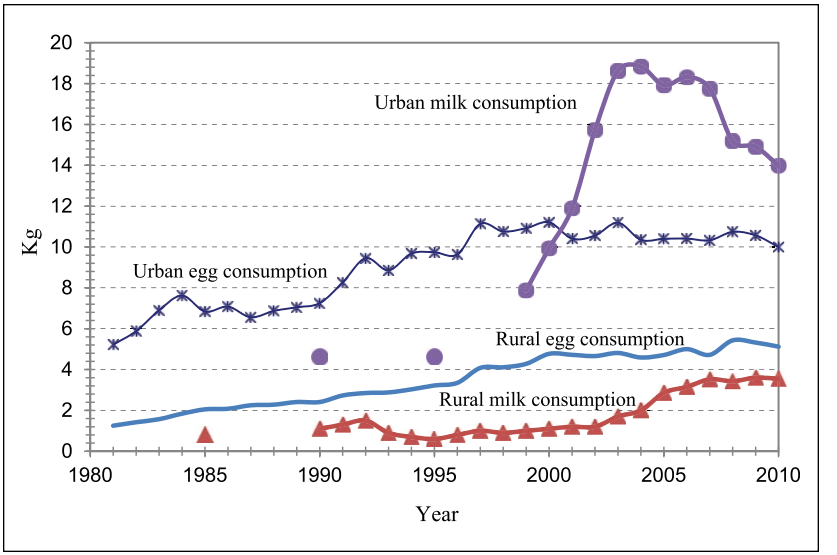

Figure 3. Milk and eggs consumption per capita, separately of urbanites and rural people, 1980–2010.
Source. Zhongguo tongji nianjian, 1993: table 8-7; 1996: table 9-6; 2003: table 10-10; 2005: table 10-11; 2006: table 10-9, 10-29; *Zhongguo tongji zhaiyao*, 2000: 106; *Zhongguo nongcun tongji nianjian*, 2011: table 11-3; data for 2006 to 2010 are from *Zhongguo tongji nianjian*, 2008, 2009, and 2011.

This is despite the large differences in income and even larger differences in consumption of other products between urban and rural people, and between the upper and lower classes.

Declining Population Pressures on the Land

Population pressures on the land declined considerably in this same period. Figure 4 gives the changing dimensions of three closely interrelated quantities: the total number of employed (persons in the economy), rural and urban; the total number of the rural labor force; and finally, the total number of the agricultural labor force. It should be clear that the first is largely a matter of changing birth rates, dependent mainly on the natural increases in the number of persons entering employment each year. The second, however, is affected not only by natural increases but also by increases in urban employment: the higher the urban employment, the lower the rural labor force. As for the third, it is affected in addition by rural off-farm employment: the higher the off-farm employment,

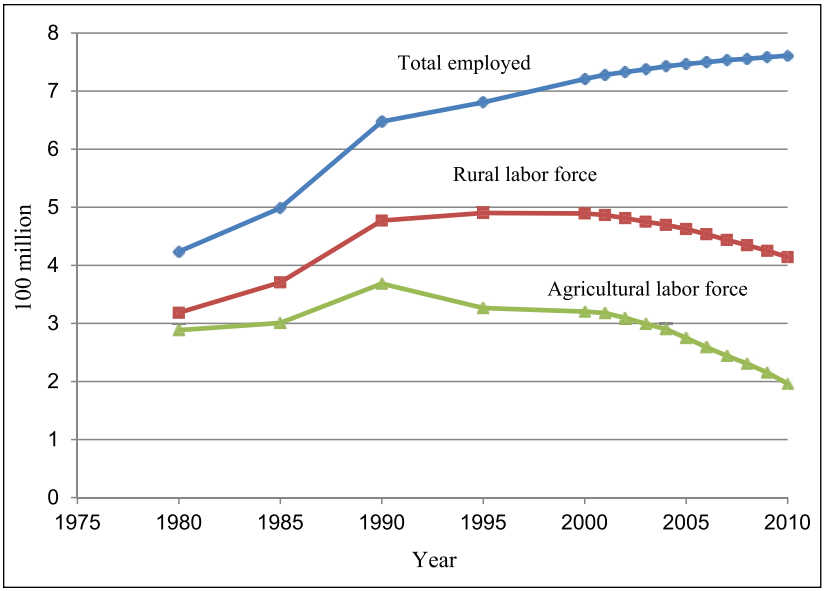

Figure 4. Changing dimensions of employment in China, 1980–2010.
Note. The agricultural labor force is arrived at by deducting from the rural labor force those employed in township and village enterprises, private enterprises, and the self-employed. The agricultural labor force is defined the same way as in the (second) decennial survey of agriculture in 2006: i.e., those engaged in farming for more than six months a year (and thus excluding those engaged in farming "part-time," for less than six months a year).
Source. Zhongguo tongji nianjian, 2011: table 4-2. For numbers of urban and rural employed, see Huang Zongzhi, 2014: tables 11.2, 11.3.

the lower the agricultural labor force. Our focus here will need to be on the third curve, the changing numbers of persons engaged in agriculture. That is what tells about the changing ratio of cultivated land per agricultural labor unit, a critical factor in agricultural labor productivity and incomes for China.

As Figure 4 shows, the total number of employed persons in China expanded most rapidly between 1980 and 1990, from just over 400 million to about 670 million, a consequence of high birth rates that peaked in the 1960s and 1970s. The rise of numbers of the rural labor force largely paralleled that trend, increasing from about 300 million to about 500 million. As for the agricultural labor force, it was shaped by the above tendencies, but also by the coming of vigorous rural industrialization in the 1980s, and other off-farm employment (e.g., trade and transport) as well. On balance, natural increases remained greater than increased off-farm urban and rural employment until about 1990, up to which year the total numbers of the agricultural

labor force still continued to rise, from just under 300 million to the all-time high of almost 380 million in 1990, adding substantially to population pressures on the land. Cultivated acreage per farming labor unit therefore declined from about 7 mu in 1980–1985 to about 5.9 mu in 1990.[3]

In the 1990s, the rate of natural increase in the labor force began to decline (due to birth control measures) while urban employment increased rapidly. As a result, the total number of people employed in agriculture leveled off by 1995–2000, at just about 300 million. Increased employment in the cities and off-farm employment in the countryside during those years were absorbing numbers roughly equal to the natural increases in the rural labor force.

The next big change in terms of population-to-land ratios came at the turn of the century. On the one hand, there was a fairly sharp decline in the rate of natural increase in the labor force—a consequence of birth-control measures implemented strictly since about 1980—shown by the declining slope of the total employment curve in Figure 4, dropping from an annual average increase rate of 1.37% between 1980 and 1995, down to just 0.6% by 2005 (see Huang Zongzhi, 2014: 95). At the same time, continued vigorous expansion in urban employment (after a decline in the rate of increase, from the average increase of about 15 million a year in 1980–1996 down to about 6.5 million a year in 1997–2000 [as a result of the massive layoffs in medium and small-scale state-owned enterprises during those years], but then rose back up to more than 10 million a year after that) brought first a leveling off in the size of the total rural labor force in the 1990s, and then a steady and later accelerating decline after 2000. Along with steadily expanding off-farm employment in the countryside, in rural enterprises and off-farm self-employment, the result was an even sharper decline in the agricultural labor force, dropping down below 200 million by 2010.

That was a dramatic change compared to the roughly 300 million engaged in farming just a decade earlier in 2000, and an even more dramatic change when compared with the all-time high of the Chinese farming labor force at close to 380 million in 1990. In terms of cultivated acreage per farming labor unit, that meant an expansion from 5.9 mu in 1990 to about 10 mu (1.67 acres) in 2010—miniscule on U.S. scales, but a dramatic increase in Chinese terms.

At the same time, we need to consider the fact that much of the "new agriculture" is both more labor- and more capital-absorbing than the old agriculture. The combination of more cultivated land per capita, higher-value and more labor-absorbing farming, and additional household income from off-farm employment of one or more of the household's members, is what has propelled the new agricultural revolution as well as enhanced rural food (and other) consumption of the type and scale outlined in the preceding sections.

I have shown in separate studies how this new farming has been driven predominantly by small peasant farms not large-scale capitalist farms, and how the funding for the increased use of modern inputs (fertilizer, improved seeds, and tractors, as well as other "capital inputs"—plastic tents, plastic covers, hothouse structures, and so on) has come in no small measure from the peasants' hard-earned savings from off-farm employment, on a scale that totals more than the state's investment in agriculture, as well as the investments of large-scale capitalist enterprises (Huang, Gao and Peng, 2012; Huang and Gao, 2013; Huang Zongzhi, 2014: chaps. 7, 8). Suffice it to note here once more what has been demonstrated above: first, there has been the fact of a hidden agricultural revolution, evidenced mainly in greatly increased production of higher-value agricultural products in place of the older open-field grain (and cotton and rapeseed) cultivation. Second, that revolution has been driven in its first instance by the altered food consumption patterns of the Chinese people in recent years. And, finally, that same agricultural revolution has benefited greatly also from the increases in cultivated acreage per capita that have been made possible by declines in the birth rate since about 1980 as well as the vigorous expansion of off-farm employment both in urban and rural China.

Together the above add up to a picture of growing and spiraling rural-urban exchange. As peasants' incomes rose with the new agriculture, and rising labor productivity and incomes from that new agriculture (even with the heavy exactions by merchants due to the grossly unequal power relations between big commercial capital and the small peasant household, which I have studied separately: Huang Zongzhi, 2014: chap. 10; see also Huang Zongzhi, 2012a), they have been able to buy many more urban goods. That has made possible the food consumption revolution shown above, as well as increases in consumption in the wealthier villages of all manners of urban manufactured goods, including cell phones, televisions, refrigerators, computers, even automobiles, and so on. For the first time in centuries, the Chinese countryside has in recent years been actively engaged in a broad and rapidly expanding two-way trade with the towns and cities (more below). That has profoundly altered the basic structure of rural-urban trade (even as land exchanges and bank loans to peasants still remain severely constrained).

China's Agricultural Revolution, Compared with Those of England, Japan, Taiwan, Korea, and India

To place the recent Chinese agricultural revolution into a historical and comparative perspective, we turn below to observations about just how this

Chinese new-age agricultural revolution differs from other, previous major agricultural revolutions in history, by comparing it first with the classic eighteenth-century English agricultural revolution, and then the modern agricultural revolutions (with the coming of modern inputs of scientific seed selection, chemical fertilizer, and tractors) in Japan and Taiwan-Korea, and finally with India's most recent agricultural revolution. Some scholars have pictured premodern agriculture and the modernization of agriculture as essentially the same in all times and places when given a market economy, as neoliberal economics doctrine would have it (e.g., Schultz, 1964)—nothing can be farther from the truth, as we will see below.

Differences from the English Agricultural Revolution

In my past work, I have researched in depth what happened in Chinese agriculture since the Ming and Qing (in North China and the Yangzi delta) in my three-volume study (Huang 1985, 1990; Huang Zongzhi, 2014), and compared that in detail with the eighteenth-century English agricultural revolution (on the basis of the large body of literature on that subject—Huang, 2002). Here I will merely highlight the broad outlines of the differences, referring only to the most important secondary literature on the developments in England.

We must first note the fundamental structural difference between premodern Chinese and English agriculture. Chinese agriculture in the premodern era was highly labor intensive, so much so as to gradually drive out animal husbandry (because it takes six to seven times more land to support the same number of people on beef, milk, and cheese as it does on grain—John Lossing Buck, 1937: 12), to become a crops-only (distinguished from mixed crops cum animal husbandry) agricultural economy. England in the eighteenth century, by contrast, was above all a mixed crops and animal husbandry economy. This was the result of the great differences in farm size (or population-to-land pressures) between the two: the average size of English farms in the eighteenth century was 125 acres, compared with China's 1.25 acres (7.5 mu) (Huang, 2002).

Agricultural changes in the Yangzi delta in the eighteenth century and earlier were mainly along the lines of further intensification of labor input per unit land, by switching, for example, from rice cultivation to cotton cultivation, which required eighteen times more labor input (including yarn spinning and cloth weaving) per mu than rice, though not to anything comparable to that multiple in returns. Or, from rice to mulberry-silk cultivation, which required nine times the labor input per mu, for about three to four times the returns. Those changes brought an increased degree of commercialization to

the Yangzi delta, but at the cost of reduced returns per unit labor—which I termed "involutionary commercialization" (Huang, 1990).

What happened in the eighteenth-century English agricultural revolution was very different. There, labor productivity nearly doubled during the century, mainly from the increased use of animal power (and animal fertilizer to restore soil productivity), a consequence of the enclosure movement (before that, farm animals were fed on common land, and farming and animal husbandry could not be integrated) and the spread of the Norfolk cropping system, of rotations from wheat to turnip to barley to clover, the wheat and barley for human consumption, and the turnip and clover for animal feed. The result was a near doubling in total agricultural output as well as per unit labor productivity, such that by 1800, just over a third of the population were able to feed the other two-thirds, as E. Anthony Wrigley (1985), Eric Jones (1981), Robert Allen (1992), Mark Overton (1996), and others have shown (cf. Huang, 2002).

The rise of labor productivity in agriculture contributed to later English economic development in a host of different ways: it released labor for off-farm production, first in handicraft production in town (protoindustrialization), then later in industrial manufacturing. At the same time, the rise in farm incomes and in off-farm employment contributed to big changes in consumption (what might be called a "consumption revolution"), argued and shown by Jan de Vries (1993) for the Netherlands and Lorna Weatherill (1993) (with probate records) and others for England. Town development in northwestern Europe as a whole ("early urbanization"—de Vries, 1984) helped drive rural-urban trade, of rural "rude products" for town "manufactures," and thence also foreign trade, along with increased division of labor, competition, and "capital" and prosperity—that Adam Smith saw and conceptualized (Smith, 1976 [1776]: esp. 384–97).

In addition, the development of town-based protoindustrial production (mainly textiles) helped provide off-farm employment, leading in turn to earlier and more universal marriage (because the young no longer needed to wait to inherit the family farm to gain financial independence) as David Levine (1977), Roger Schofield (1994), and others have demonstrated. Further, the relatively early development of the coal industry in England and scientific-technological advances helped provide the preconditions for industrialization (which was further propelled by resources from Britain's colonies). The conjuncture of those multiple tendencies was what gave rise to the British industrial revolution to come (Wrigley, 1988; Huang, 2002).

Nothing of that sort happened in the Yangzi delta. There handicraft production remained tightly entwined with family farming, each lending the farm household part of its necessary support, and neither being able to

support the household by itself. Cotton cultivation and yarn spinning and cloth weaving together formed the so-called trinity (花、沙、布三位一体) of small peasant farm production. (The coming of factory-spun yarn in the twentieth century would break up that earlier trinity but, even so, peasant "native cloth" weaving persisted strongly.) The silk story was only slightly different: mulberry cultivation, silkworm raising, and silk thread spinning were similarly united in the peasant household, but silk fabric production, because of its higher requirements in technique and the greater expense of the silk loom, became a specialty town production separated out from farming, and did pay enough to sustain a family. Even so, there can be no disputing the sharp differences between Chinese handicraft production and English proto-industrialization, for the persistent entwining of farming with handicraft "subsidiary production" 副业 persisted well into the post-1949 period—like (rice) straw rope and basket weaving, cotton cloth weaving, embroidery, scavenger farm animals (pigs) raising, and so on, in village collectives even if not in peasant households—until the coming of rural industrialization in the 1980s. Even today, as I have pointed out in a separate study, the Chinese (half worker half cultivator) family unit continues to play an important role in economy and society (and culture) that is very different from the highly individualized Western pattern (Huang, 2011b; cf. Huang, 1990, 2002).

One key factor, of course, is the much greater population-to-land pressures in China, something that cannot be argued away by theoretical constructions such as those of Theodore Schultz (1964), as I have documented and analyzed separately and in great detail elsewhere (Huang Zongzhi, 2014: chap. 9; Huang Zongzhi 2008). Suffice it to say here that Schultz argued tautologically that, given efficient market allocation of resources, surplus labor simply could not have existed—by defining surplus labor as labor of zero value, which is a straw man, since population pressure is clearly relative, just as underemployment or "hidden unemployment" is. Obviously, even in economies with a very high degree of population pressure, few if any laborers would work for zero value, but that does not erase the very great differences between China and England in their population-to-land resource endowment, as has been seen above.

It is important to point out here that population pressures and the workings of the market do not make up an either/or binary as Schultz would have it (given perfect workings of the market, there can be no population pressure), but rather need to be seen as interdependent and interactive. China's greater population pressures meant the much more persistent intertwining of farming with handicraft production, the two together serving like a pair of twin crutches for household subsistence; England's more abundant land (relative to farm population), on the other hand, meant the easier separation of protoindustrial production from farming, such as what occurred in the eighteenth century. And the

combination of more abundant land with the Norfolk system meant advances in agricultural labor productivity which, when joined with protoindustrial development in town, meant many more exchanges of goods (trade, or "market development") between town and country. That contrasted sharply with China, where commercial (market) development continued to be driven mainly by extraction (in the form of land rent), and by involutionary production of cotton or silk, which yielded lower returns than grain farming per unit labor (even as it enhanced the total output value per unit land), but not by the commercialization of profit-seeking, entrepreneurial production (Huang, 1990: chaps. 5, 6).

Extraction- and involution-driven commercialization, rather than enterprise-driven commercialization, kept peasants at the margins of subsistence, which, in turn, severely limited market development because rural people simply could not afford to purchase much in the way of urban goods. We have detailed records (from Japanese Mantetsu field investigations) of what villagers of (North China and) the Yangzi delta purchased in the way of urban goods: even as late as the 1930s, they consisted only of subsistence modern urban goods—matches, kerosene, and a small amount of cotton cloth (6.1% of total purchases), plus subsistence traditional urban goods like salt, sugar, soy sauce, edible oils, and some tobacco (4.9%), tea (3.3%), and wine (4.8%). In the still poorer North China villages, there were no purchases of tobacco and tea at all, and only a miniscule amount of wine (1.8%). The bulk of peasant involvement in the market was in fact just the exchange among peasants (including long-distance trading) of grains for cloth and vice versa (Huang, 1990: chap. 6, see esp. tables 6.1, 6.2, 6.3, 6.4). That contrasts sharply with the rural purchases of clocks, pocket watches, mirrors, books, paintings, table linen and silverware in eighteenth-century Netherlands and England, as detailed by de Vries (1993) and Weatherill (1993).

The premodern Chinese rural-urban market was mainly unidirectional, not the kind of mutually reinforcing and spiraling development of rural-urban trade that Adam Smith wrote about. It is a terrible error to reduce these differences through the very fuzzy concept of what in some of the literature has come to be dubbed simplistically "Smithian growth" (e.g., Pomeranz, 2000: 17, passim), without actually reviewing Smith's writings, and as if there were some magical market dynamic that obtained universally in all premodern economies without regard to differences in factor endowments, market structures, production relations, and rural-urban relations.

Differences from the "East Asian Model"

As for East Asia, Kaoru Sugihara has argued for a so-called labor-intensive East Asian model of economic development as opposed to the resource- and

capital-intensive model of Western (especially U.S.) development (Sugihara, 2003). It is an appealing argument, for the "East Asian" countries obviously do share a greater labor intensity in agriculture than Western countries. I myself have examined differences between East Asia's agricultural modernization through "small but fine" family farming, as opposed to the "big and coarse" pattern of the United States and, to a lesser degree, Western Europe. The former relied much more on land-productivity-enhancing inputs like chemical fertilizer and improved seeds, while the latter relied much more on labor-productivity-enhancing inputs like tractors (Huang, 2014; Huang Zongzhi, 2014: postscript, 425–64)

But that must not blind us to the big differences. As Hanley and Yamamura argued on the basis of the s*hūmon aratame chō* religious registers, which are comparable to parish registers of the European context, Japanese population grew little or not at all in the century and a half before the Meiji Restoration (1868), which placed Japan in a very different position from China in the eighteenth century and after (Hanley and Yamamura, 1977). Even more important, during the period when modern inputs came to Japanese agriculture, from about 1880 to 1950, the agricultural population of Japan remained largely constant (Hayami et al., 1979: 11–12), such that the gains from modern inputs devolved fully to increases in agricultural labor productivity and incomes.

By contrast, when modern inputs came to Chinese agriculture during the 1960s and 1970s, agricultural output did grow by 2.3% a year, but population also grew at nearly the same rate, by 2% a year (and labor input in agriculture even more), which meant very little increase in per capita output, and hence little or no advance in agricultural incomes. What happened in Chinese agriculture, once again, was mainly a matter of labor-intensification of agriculture (not rising labor productivity), by organizing peasant men and women collectively to work more days per year, by ever increasing labor input per cropping and more croppings per year. When computed in terms of payments per labor day, there was in fact no increase at all (Perkins and Yusuf, 1984; Huang, 1990: chap. 11).

All that occurred while industrial output increased at about 11% per year, which meant an overall pattern of industrial development without agricultural development (or industrial development with agricultural involution), "development" being understood here not just as output growth but also as rises in labor productivity and incomes—a very different pattern from Japan's simultaneous developments in agriculture and industry (Perkins and Yusuf, 1984: chaps. 4, 6; Huang, 1990).

A particularly telling fact has to do with the role that tractors played in agriculture in the Yangzi delta (China's most developed area) in the 1960s

and 1970s. Instead of saving labor (and therefore enhancing labor productivity), what tractors did was mainly to enable the change from double cropping (rice + winter wheat) to triple cropping (early rice + late rice + winter wheat), because tractors made possible the plowing of more land in the great rush period between the harvesting of the late rice and the planting of the winter wheat by August 10, within a two-week period or less. Thus did labor-saving tractors lead, paradoxically, to further labor intensification, in the form of triple cropping (Huang, 1990: 225ff). That kind of "involution" (lower returns per cropping and lower returns per workday) meant little or no advances in labor productivity and rural incomes.

A further difference between Japan and China was the successful development of co-ops in Japan, due to a particular historical coincidence. I have examined this in detail in a separate study (Huang Zongzhi, 2015), and will just summarize the outlines here: Japanese local government of the late Meiji period had taken on agricultural modernization as its main concern and did much to provide modern inputs to farmers. Then, under postwar U.S. occupation (and under the influence of a group of occupation officials who identified closely with Franklin D. Roosevelt's New Deal policies—Cohen, 1987), land reform was implemented, which effectively created an agricultural economy of mainly small owner-cultivators. And, further under U.S. direction, highly democratic co-ops controlled by peasants were organized to takeover many of the agricultural extension resources and responsibilities of the local governments (which of course drew the willing and active participation of almost all peasants), to provide "vertical integration" (processing and marketing of agricultural products) for the small farmers (see especially Kurimoto, 2004; Moore, 1990; and Esham et al., 2012; cf. Huang Zongzhi, 2015). The result was the sustained growth of Japanese agriculture, especially in the two decades of the 1960s and 1970s (Hayami and Yamada, 1991: 19, table 1-2). The co-ops saw to a dignified existence for Japanese farmers, and also to greater social equity in income distribution in Japanese society as a whole, by helping small farmers avoid the heavy merchant exactions that have occurred in Reform China (more below). The result has been more equal distribution of income in society than in Reform China: a Gini coefficient in Japan of 37.6 (in 2008), ranking number 65 of 141 countries, compared with China's 47.2 (in 2013), ranking number 114 (CIA, 2015; Huang Zongzhi, 2015).

Kaoru Sugihara points to greater equality in income distribution as an important aspect of his so-called East Asian development model, but he does not consider at all the very important role played by the co-ops, in sharp contrast to the grave inequalities of Reform-period China (Sugihara, 2003). Today, with just 1% of Japan's GDP coming from agriculture, the countryside is no longer that important for overall social equality. For China, however,

there can be no improvement in social equality until second-class peasants and peasant-workers get more equal treatment, as I have argued in detail in a series of articles (Huang, 2009, 2011a, 2013; updated in Huang Zongzhi, 2014: chaps. 11, 12, 13).

This commonly ignored issue of co-ops is really a much bigger story than it might seem at first glance. The great irony is that China, which had been among the most equal nations in terms of income distribution during its collective era, has today become one of the most unequal in the world. A key factor here, I suggest, has been its failure to develop effective co-ops such as those in Japan (especially in the 1960s and 1970s) to serve small peasant interests. As I have shown in detail in a separate study, today only about a third of all farm households in China belong to co-ops, and of those co-ops, only perhaps 20% can be considered genuine co-ops that are controlled by peasants and serve the interests of peasant members, and almost all of them are small in scale, unable as they are to obtain any kind of credit from the state's formal banks. Perhaps 30% of the co-ops today are "fake" co-ops, controlled in fact by big investors who use the co-op name in order to obtain state grants and subsidies. Perhaps another 40% fall somewhere in the middle (Huang Zongzhi, 2015: 27ff). The majority of small peasants today are therefore left to deal with big commercial capital almost entirely on their own, under extremely unequal power relations (Huang Zongzhi, 2012a; updated and expanded in Huang, 2014: chap. 10). This has been a major factor behind the gross inequalities in income that have arisen.

It is a striking irony of history that the People's Republic of China, which originated with a revolution based mainly on the peasants, and with a land reform and rural collectives that saw to equal distribution of income in its early history, should have become far less successful than Japan in the development of co-ops and in social equality. What China very much needs today is social (or "socialist") reforms—especially more vigorous support for the development of genuine co-ops, to deal with the horrendous social inequality afflicting peasants, still the majority of the Chinese population (Huang Zongzhi, 2015; cf. Huang Zongzhi, Gong Weigang, and Gao Yuan, 2014).

Another illustrative comparison is of China with Taiwan and Korea, the other main countries of the so-called East Asian model of development, after Japan. Their difference from China comes principally from their histories as Japanese colonies (even though the Japanese colonial governments were principally concerned with Japanese interests), and also the shared experience in the historical coincidence of Japanese-style local administration with later postwar reform under American direction or influence.

In Taiwan, the key was, first of all, the Japanese colonial government's active provisions of modern inputs to agriculture. As Samuel Ho has shown,

chemical fertilizer use rose by 730% between 1910 and 1940, and improved seeds were another significant factor (Ho, 1968: 318). As a result, agricultural output advanced by 3.6% a year between 1917 and 1937, while population grew by a lesser 2% (Teng-hui Lee [李登辉] and Yueh-eh Chen, 1979: 78). Alice Amsden (1979) estimated a total agricultural growth of about 100% in the 50 years of Japanese occupation. That means an agricultural revolution of dimensions comparable to the eighteenth-century English agricultural revolution, in half the time, and along with significant advances in agricultural labor productivity and incomes, very different from mainland China's pattern down through to the eve of its new-age hidden agricultural revolution.

As in Taiwan, agricultural modernization in Korea began under Japanese occupation. As Kenneth Kang and Vijaya Ramachandran (1999: 792, table 6) have shown, the Japanese occupation government did two main things: one, it expanded irrigated acreage sixteenfold, from 10,000 hectares to 160,000 hectares, and greatly expanded chemical fertilizer use between 1920 and 1940, from 1.5 kg/hectare to 208 kg/hectare. While the population increased at just 0.87% a year during that period, agricultural output expanded first by the modest rate of 0.5% a year between 1920 and 1930, but then rose to 2.9% from 1930 to 1939, as Sung Hwan Ban has shown (Ban, 1979: 92–93). Overall, in the period 1918 to 1971, agricultural labor productivity grew at a rate of 1.4% a year, more than doubling in that period of just over 50 years, or roughly twice the rate of the classic English agricultural revolution (Ban, 1979: 105).

What has been overlooked is that both Taiwan and Korea were favored to some degree also by that same historical coincidence of Japanese local governance + later American occupation (or decisive influence) in the formation of agricultural co-ops. There were the same main patterns: a Japanese local administration that effectively supplied modern inputs to agriculture; a land reform that saw to the predominance of small owner-cultivators; and co-ops to provide vertical integration in processing and marketing (even though the Korean co-ops were not democratized with peasant participation until the 1980s—Burmeister et al., 2001: 9–20; cf. Huang Zongzhi, 2015). Successful agricultural modernization, in turn, laid the foundations for fuller market development of rural-urban trade and the successful attainment of the income levels of developed economies by the end of the 1980s.

A key difference between the experiences of Japan (1880–1950) and Taiwan-Korea (1920–1980) as opposed to China (1960s and 1970s) during the period of the initial coming of modern inputs was of course relative agricultural labor productivity growth. While Japan and Taiwan-Korea's agricultural growth significantly exceeded their population increases, thereby raising

agricultural labor productivity and incomes, China's did not. China's truly modernizing agricultural revolution, complete with increased labor productivity and incomes, and increased rural consumption of urban goods and hence fuller development of rural-urban trade, had to await a later time and a different dynamic than just modern inputs.

What is truly instructive about the Japan and Korea-Taiwan experience in agricultural modernization is not simply that it was (obviously) labor intensive, but perhaps even more so, that it entailed the (historically coincidental) development of effective co-ops, which did much to see to a dignified income for small peasant farmers by largely eliminating exploitative merchant extractions such as what have happened in Reform China. Capitalist Japan, and capitalist Taiwan and Korea, paradoxically, proved to be considerably more equal than (erstwhile revolutionary and socialist) Reform-period China. We have seen above the more equal income distribution of Japan than Reform China. More surprising still is Taiwan, with its score of 34.2 (in 2011), ranking number 47, and Korea 31.1 (in 2011), ranking number 29 (CIA, 2015), as opposed to China's of 47.2 (ranking 114). It is one of the dramatic ironies of history that (erstwhile) revolutionary and socialist China should have been unable to develop co-ops in its Reform period equally effective as those in Japan-Korea-Taiwan.

China's New-Age Agricultural Revolution Compared with India's

To lend a further sense of quantitative scale to the above discussion and to set the stage for a comparison of China's agricultural history with India's, we turn here first to the sensible guesstimates of changing GDP per capita developed by comparative economic historian Angus Maddison. I say "sensible" because Maddison's work has been largely free of the kinds of theoretical-ideological presumptions that have affected much of the literature. And I say "guesstimates" because premodern economic data are finally mainly anecdotal, not the more systematic enumerations that make up modern economic data. Maddison's sensible guesstimates, in conjunction with more reliable modern data, can perform the useful function of lending a rough sense of scale to the qualitative discussions above and below. Table 5 gathers together the relevant data in Maddison's work.

In our earlier discussion, we have already seen the dynamics behind the changes conveyed by these data: how Britain already in the eighteenth century had embarked on per capita agricultural productivity growth, long before China; how Japan in the period 1880 to 1950 became the first Asian country to do so; how Taiwan and Korea (because of the foundations laid by Japanese colonialism) had begun the march of modern per capita agricultural productivity growth

Table 5. GDP per Capita for China and Comparison Countries, 1700–2003 (in 1990 "International [U.S.] Dollars").

	Britain	China	Japan	Taiwan	Korea	India
1700	1,405	600	570	—	—	550
1820	2,121	600	669	—	—	533
1913	5,150	552	1,387	—	—	673
1950	6,907	439	1,926	936	770	619
1978	—	978	12,584	5,587	4,064	966
1998	18,714	3,117	20,413	15,012	12,152	1,746
2003	—	4,803	21,218	—	—	2,160

Source. Maddison, 2001: 90, table 2-22a; 304, table C3-c. Data for 2003 are from Maddison, 2007: 44, table 2.1.

already before 1950. Maddison's data, taken with appropriate caution, lend a sensible quantitative dimension to our narrative. As those data suggest, China's historical experience in development is finally most like India's: the two countries share in common a very low per capita GDP as late as 1978: China with $978 and India $966, very different indeed from Britain's, and also from Japan and Taiwan-Korea's.

The basic similarity between China and India consists in their relative shortage in land endowment relative to population or, in other words, their population-to-land ratios. Under that constraint, neither country's rural populations benefited much from the coming of modern inputs associated with the "green revolution" in the 1960s and 1970s. Both countries were under the immense pressures of a 2% a year population growth (that resulted from declining death rates that came with the introduction of modern public health and medicine). Population growth therefore basically "ate away" what might have been gained in the way of labor productivity and incomes through modern inputs. As Table 5 shows, in the period 1950 to 1978, there were only modest improvements in GDP per capita. Significant modern increases had to await developments that came after 1980 in their respective consumption revolutions that stemmed largely from nonagricultural development.

However, we need to point out here also the very important difference between the two countries that Amartya Sen and his coauthor Jean Drèze have shown: although the two countries were similarly poor in 1978, China was in fact substantially more advanced than India in terms of several indicators of social development. Starting from similar infant mortality rates in 1960, China was able to reduce its from 150 per thousand down to just 37 by 1981, while India merely reduced its from 165 to 110. In the same period, China was able to raise its average life expectancy at birth from 47.1 to 67.7,

Table 6. Indicators of Social Development, China and India Compared, 1960–1991.

	Infant mortality (per thousand births)	Life expectancy at birth	Literacy rate, males	Literacy rate, females
China				
1960	150	47.1	—	—
1981	37	67.7	68	51
1991	31	68.3	87	79
India				
1960	165	44.0	—	—
1981	110	53.9	39	26
1991	80	59.2	64	55

Source. Drèze and Sen, 1995: 64, 71, tables 4.2 and 4.5.

while India was only able to raise its from 44.0 to 53.9. And China was able to raise its male literacy rate up to 68%, while India managed just 39% (see Table 6). (These differences, of course, were consequences largely of what China was able to do through its rural collective organization that saw to subsistence, health, and basic education.) Those differences, Drèze and Sen argue, help explain China's more successful subsequent development after 1978 (Drèze and Sen, 1995: chap. 4; see also Saith, 2008). The key idea here, of course, is that social development is a major causal factor in economic development. That is also the guiding principle of progressive entities like the International Labor Organization (ILO) and the World Bank's Social Development Department and Social Development and Labor Protection Unit (Huang, 2009).

In addition, Maddison's figures point to another important difference: China's pre-1978 development was more successful than India's. China's per capita GDP in 1950 of just $439 was substantially lower than India's of $619, mainly because of the decades of destruction from protracted wars. To reach parity with India as it did by 1978, China's planned economy had to grow more (by Maddison's data, by a total of 123%, compared with India's 56%). As a World Bank study has shown, China's GNP grew by 2.7% a year between 1959 and 1979, almost double that of India's 1.4% for the same period (Drèze and Sen, 1995: 67). Of course, this was mainly due to China's rapid industrial expansion, by 11% a year between 1952 and 1980, according to the authoritative study of Perkins and Yusuf (1984). That is to say, one must not be too ready to dismiss planned economies as utterly misguided and complete failures.

We can now turn to examine the basic similarity between China's new agricultural revolution and India's. We have seen above how China's present agricultural revolution has been powered mainly by changes in food consumption patterns of the Chinese people, which in turn has led to the fundamental restructuring of agriculture. Essentially the same thing has happened in India. As Ashok Gulati has pointed out, between 1977 and 1999, foodgrain consumption per capita in India shrank from 192 kg to 152 kg (and in the cities alone, from 147 kg to 125 kg); rural consumption of fruits rose 553%, of vegetables 167%, of milk and milk products 105%, and of meat-eggs-fish 85% (Gulati, 2006: 14).

Such changes are easy to miss, as noted earlier, because researchers are accustomed to looking toward two kinds of agricultural revolutions, one being the classic English agricultural revolution in which labor productivity rose with a certain new input (increased farm animal use), followed later by the use of mechanical power (tellingly computed in terms of numbers of "horsepower"). The other is the so-called East Asian model or "green revolution," which saw mainly the use of chemical fertilizer and improved seeds, and was evidenced mainly in the consequent expansions in the yield of certain crops. Both kinds of revolutions were evidenced by gains in yield by weight of given crops per unit area. But, in the past 30 years of Chinese and Indian agriculture, the revolutionary growth has been evidenced mainly in the expansion of output value from the growing of a larger proportion of higher-value agricultural products, and not just of certain crops by weight. In that respect, the Chinese and Indian agricultural revolutions are very similar indeed.

Where China and India differ is in the accompanying social changes. India's pattern is closer to the "capitalist" model, which Lenin argued, in his *The Development of Capitalism in Russia* (1956 [1907]), was occurring in prevolutionary Russia: namely, that rural society was coming to be differentiated between capitalistic farmers (rich peasants) and a growing agricultural proletariat. That basic characteristic of capitalist agriculture, it turns out, is truer of India in 2000 than in Lenin's Russia: fully 45% of the agricultural labor force in India were landless laborers (compared with just 25% in 1961), one-half of whom fell below the poverty line (as defined by the World Bank) (Dev, 2006: 17–18).

The same thing has not happened thus far in Reform China. Under its household responsibility system, by which the use rights of farmland were equally distributed village by village, Chinese peasants have not simply fallen into the pattern of differentiation between labor-hiring rich peasants and a landless agricultural proletariat. The great majority of Chinese peasants remain roughly equivalent "smallholders" (though they own only the use rights of the land and are not free to sell that land). Income differences among

peasants are mainly between different areas (the relatively well-to-do and the relatively poor areas), and not within villages and the same areas. To be sure, there has been significant requisitioning of (mainly suburban land) by the local governments for urban development purposes, but that amounts to probably no more than about 5% of the total cultivated land (or a total of perhaps 100 million mu, an average of about three million mu a year), mainly in suburban areas (Huang, 2015: 240–45, 271n1). And there have also been big pushes by local governments, especially in the last few years, toward the development of large farms by aggressively encouraging or even forcing transfers of peasant use rights to big farmers or agricultural firms. Some critics have argued that such transfers totaled cumulatively as much as 340 million mu by the end of 2013, or about a sixth of all farmland (Zhang, Oya, and Ye, 2015: 308). However, field research reports (see below) show that a large proportion of transfers of farmland has occurred among neighbors and kin, from those leaving for urban work to those staying to farm, and not from small peasants to big farmers and agricultural enterprises.

The third decennial survey of agriculture in 2016 (which in the past was published within a few years of the survey) should give us reliable data for distinguishing between the two. For now, we need to see that, even though local governments have been actively promoting and supporting "dragonhead enterprises" since the 1990s, we can be quite certain that more than a decade later, in 2006, at the time of the second decennial national survey of agriculture, there was still just 3% of the farm labor force who were full-time agricultural workers (Huang, Gao, and Peng, 2012). In part, that was due to the strength of the household responsibility system, and in part also to the vitality of small farming, such that even many of the larger enterprises continue to opt to work through contracting or purchase-order arrangements with small farm households, rather than hire full-time labor on their own.

Small farming in fact continues to enjoy important advantages over large farms under the objective conditions of the present: they need not pay rent for the use of others' responsibility land; they need not worry about the work incentives of hired workers and the expense of hiring supervisors; and they can use low-cost auxiliary labor (of the women and the elderly), in conjunction with the family's part-time adult male labor (who work off-farm but many of whom can help out in the busy seasons). That is why small farms are generally more profitable than large farms (Huang Zongzhi, 2012b: 5–9, 2012a: 90–96, 2015: 24–27). These advantages of family farming have been documented in detail by many field studies, among the most solid of which are the studies of vegetable farming in northwest Shandong by Gao Yuan (Huang, Gao, and Peng, 2012: 153–57), of cotton farming (and some animal raising) in Hubei by Lin Huihuang (2012), of fruit (navel oranges) growing

in southern Jiangxi by Chen Baifeng (2012), of tobacco farming in Hubei by Jiao Changquan (n.d.), and of grain farming in northwest Shandong by Gao Yuan (2014) and in central Anhui by Zhang Jianlei et al. (2016). That is why even the large-scale enterprises tend to depend on family farms (through contracts or purchase-order agreements) rather than hire labor in the conventional capitalist mode.

In the new agriculture, for example, small farming with tented vegetables, the flexible household labor unit is particularly well suited for meeting efficiently and cost-effectively the intense, frequent, and irregular inputs of labor required. As for animal raising, the small farm growing its own feed and joining that with animal raising is able to take advantage of economies of scope (by combining two or more mutually supporting productive activities, rather than simple economies of scale) in ways that large-scale animal farming (using manufactured feed) cannot.

Even in big, open-field "old agriculture," the vitality of small farming is evidenced in the fact that small farms in the past fifteen years have increasingly resorted to hiring in tractor plowing, sowing, and harvesting, and using herbicides to save weeding labor, once the opportunity costs of family labor (in off-farm employment) come to exceed the costs of hiring such services. Those have therefore become widely available in the countryside. (For detailed quantitative data, see Huang and Gao, 2013; cf. Huang Zongzhi, 2014: chap. 8.) In any case, there can be no doubt that the great majority of the cultivated land today continues to be farmed by small peasant family farms, for all the reasons adumbrated above.

The relative non-development of full-time hired labor in agriculture (an agricultural proletariat) helps explain the differences between China and India in the relative proportions that the poor occupy among their agricultural populations. According to the World Bank's 2008 report on poverty, in 2005 fully 42% of India's population lived below the poverty line (defined as $1.25 per day), over half of whom were the rural landless agricultural proletariat (Dev, 2006: 19). By contrast, only 15.9% of China's population lived under that same poverty line (World Bank, 2008).

To be sure, an important part of the reason for this difference is the more rapid development of China's national economy in the past 30 years than India's. To refer once more to Maddison's guesstimates shown in Table 5, the per capita GDP of China was more than double that of India's already in 2003. That faster growth and higher per capita income have no doubt enlarged the effects of the agricultural revolution being discussed here. We must add, however, along the lines of the argument advanced by Sen and Drèze, that China's higher degree of social development in its collective era is clearly also an important reason for that difference.

Such qualifying considerations should not obscure the fact that the social organization of Chinese agriculture today remains very different from India's pattern of predominantly (labor-employing) capitalist agriculture. This fact clearly has much to do with China's socialist past of land revolution, without which the system of equal distribution of land rights in the household responsibility system would have been unthinkable. That system is the main reason why Chinese farming today remains predominantly small family farming. Even those of us who are greatly concerned about the growing inequality of the recent decades, and the Chinese government's misguided policy of favoring large-scale farms, need to acknowledge that fundamental reality.

To this writer at least, the question of the future direction of Chinese agriculture remains an open one, not already simply and irrevocably "capitalist," and with alternative possibilities still open. In recent years, the Chinese government has certainly been very much misguided by neoliberal economic doctrine in favoring "dragon-head" agricultural enterprises over small farming, the more so because in this respect of trusting in scale economies and the "industry-ization" of agriculture 产业化, neoliberal and Marxist doctrine seem very much agreed (to wit, the mistake in setting up big collectives) (Huang Zongzhi, 2015; Huang, 2014; Huang Zongzhi, Gong Weigang, and Gao Yuan, 2014). Even so, the government has not shown any sign of revoking or ending the household responsibility system of equal distribution of use rights, which is the key to the current differences between China and India.

For those who would insist that China is already completely or inevitably "postsocialist" and simply "capitalist," or "state capitalist," one wonders if what is implied is not the call for another violent revolution, which the Chinese people most certainly could not bear. In my view, what is needed is rather more in the way of social (or "socialist") reforms—such as helping to support small farming rather than big farms and enterprises, and of co-ops to help small peasants cope with the big market and exploitative commercial capital—to address the monumental and urgent problem of the severe inequalities today, and also to help expand further domestic consumption for more sustainable development of the national economy.

Conclusion

This article, then, by taking a broadly historical and comparative overview of the recent Chinese agricultural revolution, has shown how China's modernizing agricultural revolution was delayed until the 1980s largely because of China's population-to-land pressures, which had long ago driven out animal husbandry and precluded the kind of labor productivity advances through animal power use that occurred in the eighteenth-century English agricultural

revolution. That population-to-land resource endowment constraint compelled instead the persistent long-term entwining of farming with handicrafts, each supplementing the other for household subsistence, and thereby largely precluded the kind of protoindustrialization cum small town development that accompanied England's agricultural revolution. That same constraint also shaped profoundly the structure of China's market economy: the subsistence-level countryside simply could not afford urban goods and generate the market dynamics of rural-urban trade that Adam Smith saw and conceptualized. Then, in the 1960s and 1970s, when modern inputs came to Chinese agriculture, the productivity gains wrought were largely erased by rapid population growth. The genuinely modernizing agricultural revolution did not come until 1980–2010, and was driven above all by a market demand in food consumption stemming mainly from nonagricultural development that restructured Chinese agriculture toward higher-value products. That dynamic was helped along by its confluence with declining population-to-land pressures as a result of reduced fertility and expanded urban employment. The new agriculture of higher-value products, moreover, has been both labor- and capital-intensifying, thereby helping to absorb surplus labor and enhancing rural incomes.

China's agricultural history, in other words, cannot be understood simply in terms of market dynamics, or technical inputs, or even both of those, to the exclusion of the population-to-land resource endowment, as Theodore Schultz would have it. It needs to be understood instead as the interplay between those factors and the population-to-land resource endowment, not just one or the other. (And, although the coming of the new-age agricultural revolution has indeed been closely connected to market developments, its dynamic has come from a consumption revolution entirely outside of Schultz's field of vision.)

Nor can China's agricultural history be reduced simply to some supposed labor-intensive "East Asian model," as formulated by Kaoru Sugihara. In contrast to China, Japan's population had grown little from about 1700 on, and its agricultural population had remained constant during the coming of modern inputs in 1880–1950, thereby allowing significant advances in agricultural labor productivity and incomes, and simultaneous rural and urban development. As for Taiwan and Korea, they had benefited early from the modern inputs for agriculture provided under the Japanese local administration, and thereby achieved substantial productivity and income advances already by the 1920s and 1930s, which helped pave the way for their later development and successful entry into the ranks of advanced economies by the late 1980s. To lump all of those with China as a uniform labor-intensive model of development, even if illuminating in part, obfuscates these important differences.

In fact, the differences between China and Japan-Taiwan-Korea are in many ways more important than their shared labor-intensive characteristic. Paradoxically, the truly instructive aspect in the experience of Japan-Taiwan-Korea has rather been their relatively successful experience with agricultural co-ops, not considered by Sugihara at all. Those were the result of a historical coincidence: the combination of effective Japanese local government agricultural administration in supplying modern inputs for agriculture, with changes wrought under the American occupation-directed land reform to create an agricultural economy of small owner-cultivators and agricultural co-ops that took over many of the resources of the local governments. Those succeeded in providing small cultivators with processing and marketing services for their products, to help them deal with the big market and avoid the high extractions of merchant capital, thereby retaining more of the market profits for themselves. They thereby helped ensure greater income equality for Japanese society, as well as Taiwanese and Korean society, as a whole. It is for their historically contingent development of co-ops, not simply their similarity in labor-intensive development, that Japan-Taiwan-Korea turn out to be truly instructive for present-day China.

It is actually India's agricultural history and recent agricultural revolution, not Japan-Taiwan-Korea's, that most resembles China's. First in the shared fact that India had been unable to modernize (i.e., achieve higher labor productivity and incomes) with the initial coming of modern inputs, because of its heavy population pressures, and despite its free-market economy. And then, in the shared nature of its modernizing agricultural revolution, also driven by the shift in food consumption and the consequent restructuring of agriculture toward higher-value products. The China and India comparison reminds us again that no simple focus on market and technology to the exclusion of population-to-land resource endowments can suffice.

At the same time, India's great difference from China brings back into focus how much China's revolutionary and socialist past has shaped its present agricultural revolution. Its higher degree of social development in the collective era set the basis for stronger and faster subsequent economic development as a whole, as Amartya Sen and Jean Drèze made clear. And its revolutionary heritage in equal land distribution has underlain the equal distribution of land use rights under the household responsibility system, which has ensured that Chinese agriculture did not follow simply the capitalist path of agricultural modernization as has India, now with landless laborers making up 45% of its agricultural labor force, but rather the path of predominantly small peasant family farming.

That has happened despite the Chinese government's persistent error of favoring large farms and agricultural enterprises over small farming, because

of a blind faith in the economies of scale—an error of both neoliberal and Marxist economic doctrine (among the nation's decision-makers). Small family farming, in fact, has exhibited a dynamism and economic efficiency, especially in the new agriculture, that the larger farm operations have not been able to match—so much so that even agribusinesses have resorted widely to contracting with small family farms rather than hiring agricultural workers in the typically capitalist manner (see esp. Huang, 2011b).

In short, no simple-ism (e.g., capitalism or socialism, neoliberalism or Marxism) or factor(s) (e.g., markets and/or technical inputs) can give us an accurate understanding of China's agricultural history and its recent revolution. What is needed is historically based analyses of the multiple interactive factors of the market, technology, population-to-land endowments, state actions, the property system, and social (and rural-urban) relations, along with attention to historical contingencies. Different and crisscrossing combinations of those are what explain the similarities and differences of the agricultural revolutions considered in this article. Single-factor explanations can sometimes be illuminating, but more often than not they obfuscate or conceal the larger picture and the empirical realities. We need to grasp also the particularities and contingencies of each country's experience for genuine understanding of its past and present. It is, finally, the linking of theoretical conceptualization with empirical evidence that brings abstractions down to earth and keeps them from becoming mere idealizations divorced from reality.

Author's Note

This is a short overview based on my three-volume study of Chinese agriculture, past and present. Volume III is thus far available only in Chinese (published 2014), as is an earlier shorter version of it (published 2010). Where individual chapters of those volumes are available also in English as articles, I will refer to those. In addition, of the articles written since the 2014 book, English versions are cited where available.

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Notes

1. That is, 细粮, rice and wheat (flour), the staple of urbanites, distinguished from "coarse grains" 粗粮, such as corn, millet, barley, sorghum, and grain-substitutes

such as sweet potatoes and soybeans, which were consumed mainly by peasants, and some by farm animals.

2. Longworth et al., 2002, have studied in detail the production of beef from 1980 to 2000, during which total output expanded twentyfold, reaching 100 million head of cattle, a change that they termed the "beef revolution."
3. I use here the approximate total cultivated acreage figure of 2.0 billion mu. As is well known, the Chinese government has repeatedly pledged to maintain the "red line" of no less than 1.8 billion mu of farmed land, but a satellite measurement in 2012 found actually 2.02 billion mu, substantially higher than the numbers the government had been using (Chen, 2014; cf. Huang, 2015: 271n1).

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Philip C. C. Huang has just published (in 2014) an enlarged and updated edition of his three-volume study of civil justice from the Qing to the present, and completed the third volume of his study of rural society and economy from the Ming and Qing, now published with an expanded and updated edition of his earlier two volumes in a new three-volume edition. In addition, a collection of his methodological and theoretical articles has just been published (in October 2015). All of the above are published by the Law Press (Falü chubanshe) in Beijing, in Chinese. Readers can access most of his recent writings in Chinese, many of which are also available in English, at www.lishiyushehui.cn.