Trends in agriculture and food production

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Summary: Agricultural reform resulted a shift from collective farming to small-scale production in China. This reform also has resulted a strong increase in gross agricultural output, which coincides with a slower increase in labour productivity. At the beginning of the reforms, agriculture accounted for 70 percent of total employment in China and still employs more than 50%. As a result of these reforms, China has undergone impressive economic growth also in the agriculture; the country has become one of the world’s top exporters and is attracting record amounts of foreign investment. The government has also stepped up investments in rural areas to meet the market demand for agricultural products. Results are very competitive compared to Central and Eastern European countries, where agriculture accounted for only 15 percent of total employment, but agricultural reform resulted a strong decline in gross agricultural output, which coincides with a similarly strong decline in employment. When approaching the issue of sustainable agriculture, we have to take into consideration, which China and India feed the largest populations in the world and both countries have had its own agricultural successes in the past 50 years. China has used land far more efficiently than many developed countries. With nine percent of the world’s arable land, China is responsible for the greatest share of agricultural production worldwide. Volume of produced pork, eggs, wheat, cotton, tobacco, and rice has increased and China exports an increasing amount of product each year. China has opened his borders, but do not expose food consumers to price shocks and producers to risks and disincentives. In this paper, the land-tenure system and the trends of agricultural developments are analysed in China and selected countries of EU.

Introduction

The economic development of China and India presents threats and opportunities at the same time, says the State of the World 2006 report (State of the World, 2006). The strategy these countries make in the next few years will lead the world either towards a future growing ecological and political instability—or a development path based on efficient technologies and better stewardship of resources. From 1978 to 2007, GDP in China grew at an annual average of 9.7% to become one of the largest economies in the World. Foreign trade grew at an average of 17.4% annual, the third largest in the world (World Bank, 1999). China has attracted 83.5 billion US$ of foreign direct investment and made overseas investment of 18.7 billion dollars, both are the biggest amount for developing countries. Per capita consumption grew by 4.4 times for urban and 4 times for rural residents (World Trade Organization, 2001, Winters, 2002).

The population living in poverty has dropped from 250 million to 20 million. China has benefited a lot from the trade and investment opportunities. Economic transformations generates one of the most sustained economic growth in the world since 1960 and has reduced the number of those living in poverty and also resulted a sizeable middle class and considerable environmental problems (Zhi, 2006). The GDP data published in 2006 indicate that the size of the economy, measured in financial terms, reached over US$ 2,500 billion, and GDP measured at Purchasing Power Parity (PPP) is four times higher than the above figure. Average incomes per capita at PPP are US$ 7,200, which is 25% of the average per capita income in the EU. There are large parts of the country, where income levels have reached, that of some developed East Asian and European countries. Many of China’s industries have become completely integrated into the world supply chain and China could become the largest exporter in the world by 2015 (Lan, 2003, 2005).

Agricultural development policy and land use

Land-tenure system in China combines private use rights with public ownership to provide economic incentives for farm households. Nominally, agricultural land is collectively owned by groups of 30–40 households (Sicular, 1988, 1995). In some cases, the village is the collective owner and there are around 10 groups in each village. Regardless of who owns the land, the village leadership may still influence and sometimes dictate land-use and land-allocation (Yao, 2000, Ho, 2001, Ho and Lin, 2003). Villages divide land parcels into four tenure categories, each with different rights and responsibilities attached. The most common allocation is “responsibility land,” which is allocated to households in return for the household’s commitment to deliver a quota of grain. The bundle of rights extended to farmers varies among villages, sometimes among groups in the same village, and also according to the tenure category of each parcel. The most important right allocated to farm households is the right to residual income, which allows farmers to freely sell their output and retain their earnings.

From the 1960s through the early 1980s, China taxed its agricultural sector by procuring commodities at below-market prices to subsidize urban consumption and industrial development (Lippett, 2000). In 1978, the government began to shift away from collective farming giving individual households greater control and decision-making powers over land and other resources. Economic growth in agriculture has been focused on the productivity of rural population.
Agricultural development policy can be divided into six periods. During the 1990s, central government taxation of farmers receded, although local taxes and fees have become more expressed for farmers. The first period, from the 1950s through the early 1980s is characterised by collective farming.

The second period from 1979 to 1984, coincides with the introduction of the household responsibility system (HRS) and adjustments in the state purchase price for agricultural products. These price adjustments resulted an overall improvement in development of trade for grain and oilseeds. Local free markets were gradually given permission to re-open as an outlet for farm surpluses. After the fulfilment of the state procurement quotas, most products could be exchanged in deregulated local markets at higher than the quota price. Before economic reform, state commercial enterprises and marketing co-operatives had the exclusive entitlement to purchase grain and oil crops. By 1984, the share of state marketing dropped down to 91 percent for the 12 most important crops and livestock products and the overall agricultural output increased significantly.

In the beginning of the third reform period (1985–1989), a program was introduced to enhance the functioning of rural markets. Over this relative long period the adjustments of agricultural policies occurred in favour of market liberalization, quantities and prices were determined by market mechanisms. The debate was particularly intense in the second half of the 1980s, when the rate of growth of agricultural production fell and it was further acerbated in the beginning of the 1990s, when increases in agricultural prices affected inflation. In 1985 the marketing of many products, including animal products, fruit and vegetables, was deregulated, and a voluntary procurement contract for rice, wheat and maize was introduced. The introduction of the rural market program led to stagnating agricultural production and decreasing grain production (Lardy, 1998). This observation might be partially explained by the fact that labour mobility was allowed and an important labour outflow from agriculture took place. Following a decrease in grain production, the procurements quickly lost its voluntary character so that contracts were mandatory again in 1986, but the procurement quota for grain was partly reduced. In addition, a new subsidy system for fertilizer and fuel was introduced for the cultivation of grain and oil crops to encourage higher production (Lardy, 1998).

Following criticisms of the impact of the rural market program, the government introduced a set of adjustment policies in 1990 and the government implemented reform in the cereal sector to phase out the old centrally planned supply system in favour of more market oriented solutions. Cereal and oilseed price subsidies to urban dwellers were eliminated; purchase and selling grain prices were equated. Interregional grain transfers were replaced by a contract system between provincial governments (Nguyen and Wu, 1993). The government reformed the input supply system by removing subsidies and allowing private firms to supply inputs to producers. The system of supplies of fertilizers and fuel for deliveries of grain and oil crops to the state agencies was converted to monetary payments. However, market reform in agriculture remained incomplete, which is reflected by the different degrees of price and quantity controls in different sub-sectors (grain, cotton and oil corps versus livestock and vegetables), by the segmentation of regional agricultural markets, and by the isolation of domestic markets from international markets.

Political changes in 1994 initiated the fifth period (1994–1998). Most reforms aimed at a rebirth of self-sufficiency policies, not only at the national level but also at the regional level (OECD, 1997, Nyberg and Scott, 1999, Lu, 1999). It was not allowed for the relatively developed regions to purchase grain from other regions. Private grain traders were not allowed to buy grain from farmers before the latter had fulfilled their respective state purchase contract. The Governor’s responsibility system was introduced in 1995 to maintain the overall balance of grain supply and demand. Policy instruments included stabilization of planting area, output, and stocks, as well as the installation of local reserves to directly regulate grain markets and stabilize prices. Some local governments have also reintroduced command purchase and others have set barriers to regional grain trade.
The rural market reforms for cereals, oil crops and cotton were also largely reversed, but the state procurement prices for grain and cotton increased substantially (Tian and Zhang, 2003). Between 1993 and 1996 prices for cereals and cotton doubled and the gap between the regulated quota procurement prices and market prices (for grain) narrowed substantially (Peng, 1998). In 1997, market prices even fell below the quota prices. In order to protect the interest of grain producers and to meet food security goals, the central government launched a price support policy and set a support price level for all cereals and subsidies were provided to the state grain marketing enterprises (Hsu and Gale 2001).

In May 1998, a new grain reform was announced in order to reduce the financial effects of the grain support program. The central government deepened the reform in the grain marketing area. The new policy is summarized as “four separations and one improvement”. The four separations set for grain marketing include separating government policy from commercial business functions; central grain reserves from local commercial reserves; central and local responsibilities on grain marketing and new debts from old debts. The one improvement means that quota procurement prices are determined by the prevailing market price. At the beginning of this agricultural development period, the original idea was to introduce a transition period before the total liberalization of the grain sector. However, the huge government debt caused the direction of the grain marketing reform to make a surprising change Wu, 1997, Wu et al. 2001, Xu, 2002, Brümmer et al 2006). The central government announced a means of simultaneously recovering the huge government debts, and raising market prices over state procurement prices (Holbig, 2004, Huang et al. 2004). This involves tightening up the country’s grain marketing system and returning it to government monopolistic control.

The permanent crop and arable land areas is about 10% of the total territory of the country in China, while India cultivate about 50% of its territory (Figure 1). This is higher proportion than the means of 15 EU countries before the enlargement in years 2003 (Figure 1). China has 10 persons to feed per hectare of arable land, which is more than twice the world average of 4.4 persons per hectare. China is largely self-sufficient in food production. Yields of major crops in China are above world averages (Table 1). China’s share of world agricultural production exceeds its share of world population for most major commodities. China produces over 40 percent of the world’s pork and vegetables. China’s low shares of milk, sugar, beef, soybean, and fruit production reflect its relatively low consumption levels for these commodities. Importing soybeans, allows China to free up one part of its land for higher yielding crops. High production and consumption of vegetables in China also makes efficient use of scarce land resources. China maintains its high level of food production by double- and triple-cropping and applying large quantities of fertilizer and labour to its limited land base. In contrast with China, Hungary is richly endowed with farmland. China has over 300 labourers for every 100 hectares of farmland. The size of arable land and permanent crop in EU (15) was less than 2 hectares in 1961, but sharply increasing and it was close to 6 hectares in 2007 (Figure 3). The size of arable land and permanent crop is less than 2 hectares in the Netherlands and more than 10 hectares in France. This is much higher than the World average. China’s farms are small and mostly cultivated by households. China has 10 persons per hectare of arable land and permanent crop area, which is less than half the world average. The average household cultivates about 1 hectare, which is located different places. Farmland is still owned collectively by villages and village leaders allocate land-use rights among households based on family size and labour availability.

Table 1: Participation of China in production of some selected crops in years 2004–2007
Source of data: www.fao.org/statistics/

| Harvested area (million ha) | Yield (t/ha) |
|-----------------------------|-------------|
| term                        | China (%)   | World China | World China | China (%) |
| Rice, paddy                 | 18.82       | 155,985     | 29,358      | 4.12       | 6.28       | 152.5      |
| Maize                       | 18.03       | 150,788     | 27,175      | 4.86       | 5.36       | 110.3      |
| Wheat                       | 10.59       | 217,366     | 23,014      | 2.81       | 4.52       | 160.7      |
| Soybeans                    | 9.78        | 94,087      | 9,198       | 2.31       | 1.72       | 74.4       |
| Vegetables fresh            | 48.23       | 17,479      | 8,403       | 14.13      | 17.26      | 122.1      |
| Rapeseed                    | 24.63       | 28,565      | 7,023       | 1.73       | 1.69       | 97.7       |
| Seed cotton                 | 15.46       | 34,319      | 5,304       | 2.07       | 3.78       | 182.2      |
| Potatoes                    | 25.92       | 19,011      | 4,929       | 16.76      | 14.42      | 86.1       |
| Sweet potatoes              | 52.24       | 8,999       | 4,701       | 13.94      | 21.64      | 155.3      |
| Groundnuts, with shell      | 20.37       | 23,078      | 4,698       | 1.55       | 3.00       | 193.1      |
| Watermelons                 | 56.23       | 3,459       | 1,948       | 26.66      | 31.93      | 119.8      |
| Apples                      | 39.91       | 4,837       | 1,931       | 13.11      | 13.39      | 102.1      |
| Cabbages and brussicas      | 56.10       | 3,097       | 1,737       | 22.10      | 20.14      | 91.2       |
| Cucumbers and gherkins      | 63.47       | 2,526       | 1,604       | 17.37      | 17.04      | 98.1       |
| Plums and sloes             | 66.77       | 2,367       | 1,580       | 4.04       | 2.95       | 73.0       |
| Tomatoes                    | 30.24       | 4,589       | 1,388       | 27.57      | 23.50      | 85.3       |
| term                              | Harvested area (million ha) | Yield (t/ha) |
|----------------------------------|-----------------------------|--------------|
|                                  | China (%)                   | World        | China (%)   | World         | China (%)   | World   |
| Tobacco, unmanufactured          | 35,15                       | 3,928        | 1,381       | 1,67          | 1,89        | 113,5   |
| Tangerines, mandarins            | 64,11                       | 2,042        | 1,204       | 12,48         | 9,86        | 79,0    |
| Sugar cane                       | 6,13                        | 20,815       | 1,272       | 68,19         | 77,60       | 113,8   |
| Beans, dry                       | 4,62                        | 26,451       | 1,221       | 0,71          | 1,51        | 211,9   |
| Asparagus                        | 89,97                       | 1,338        | 1,204       | 5,11          | 5,06        | 99,0    |
| Pears                            | 70,06                       | 1,673        | 1,173       | 11,78         | 10,28       | 87,3    |
| Tea                              | 40,40                       | 2,757        | 1,114       | 1,34          | 0,95        | 71,0    |
| Broad beans, horse beans, dry    | 40,50                       | 2,630        | 1,065       | 1,77          | 2,08        | 117,4   |
| Eggplants (aubergines)           | 54,85                       | 1,912        | 1,052       | 16,79         | 16,80       | 100,1   |
| Sunflower seed                   | 4,42                        | 23,166       | 1,023       | 1,28          | 1,82        | 142,2   |
| Peas, dry                        | 14,87                       | 6,678        | 0,993       | 15,8          | 1,28        | 80,8    |
| Onions, dry                      | 27,94                       | 3,403        | 0,951       | 18,59         | 20,77       | 111,7   |
| Millet                           | 2,55                        | 35,895       | 0,917       | 0,88          | 2,07        | 235,5   |
| Barley                           | 1,55                        | 56,301       | 0,872       | 2,45          | 4,15        | 169,4   |
| Buckwheat                        | 32,06                       | 2,700        | 0,863       | 0,81          | 0,79        | 97,9    |
| Peaches and nectarines           | 46,55                       | 1,493        | 0,695       | 11,73         | 11,27       | 96,1    |
| Spinach                          | 79,08                       | 0,871        | 0,689       | 15,61         | 16,76       | 107,3   |
| Garlic                           | 56,28                       | 1,183        | 0,666       | 12,88         | 17,40       | 135,0   |
| Persimmons                       | 89,78                       | 0,735        | 0,660       | 4,42          | 3,40        | 76,9    |
| Chillies and peppers, green      | 36,55                       | 1,732        | 0,633       | 14,93         | 20,84       | 139,6   |
| Sesame seed                      | 8,08                        | 7,659        | 0,619       | 0,44          | 1,00        | 225,6   |
| Sorghum                          | 1,33                        | 43,469       | 0,576       | 1,40          | 4,49        | 321,7   |
| Other melons (cantaloupes)       | 43,08                       | 1,238        | 0,533       | 20,87         | 24,90       | 119,4   |
| Lettuce and chicory              | 49,85                       | 1,043        | 0,520       | 21,92         | 22,17       | 101,2   |
| Linseed                          | 18,83                       | 2,612        | 0,485       | 0,91          | 0,99        | 108,4   |
| Carrots and turnips              | 40,10                       | 1,196        | 0,480       | 22,25         | 18,21       | 81,9    |
| Natural rubber                   | 5,47                        | 8,601        | 0,470       | 1,13          | 1,13        | 100,0   |
| Grapes                           | 6,25                        | 7,454        | 0,466       | 8,96          | 13,09       | 146,2   |
| Mangoes, guavas                  | 9,88                        | 4,478        | 0,442       | 7,12          | 8,41        | 118,1   |
| Cauliflowers and broccoli        | 38,39                       | 0,999        | 0,383       | 17,89         | 20,88       | 116,8   |
| Oranges                          | 9,62                        | 3,866        | 0,372       | 16,42         | 7,53        | 45,8    |
| Pumpkins, squash                 | 20,92                       | 1,520        | 0,318       | 13,41         | 19,00       | 141,7   |
| Bananas                          | 6,83                        | 4,324        | 0,295       | 17,78         | 23,82       | 134,0   |
| Triticale                        | 7,57                        | 3,652        | 0,277       | 3,32          | 1,86        | 56,0    |
| Cassava                          | 1,43                        | 18,514       | 0,265       | 11,85         | 15,97       | 134,8   |
| Peas, green                      | 22,79                       | 1,087        | 0,248       | 7,36          | 9,58        | 130,2   |
| Castor oil seed                  | 18,26                       | 1,303        | 0,237       | 0,99          | 0,93        | 93,9    |
| Oats                             | 2,02                        | 11,593       | 0,234       | 2,07          | 2,85        | 137,5   |
| Rye                              | 3,46                        | 6,479        | 0,223       | 2,24          | 2,55        | 113,5   |
| Beans, green                     | 23,16                       | 0,921        | 0,213       | 7,00          | 11,39       | 162,6   |
| Walnuts, with shell              | 27,99                       | 0,672        | 0,188       | 2,54          | 2,66        | 104,7   |
| Sugar beet                       | 3,28                        | 5,367        | 0,176       | 46,75         | 55,35       | 114,1   |
| Flax fibre and tow               | 35,06                       | 0,472        | 0,165       | 2,08          | 4,33        | 208,1   |
| Chestnuts                        | 39,97                       | 0,338        | 0,135       | 3,68          | 6,91        | 187,6   |
| Tung Nuts                        | 72,16                       | 0,187        | 0,135       | 2,44          | 2,73        | 112,0   |
| Ramie                            | 96,80                       | 0,114        | 0,110       | 2,48          | 2,52        | 101,7   |

Table 2: Participation of China in the consumption of plant nutrients 2004–2007
Source of data: www.fao.org/statistics/

| Consumption in nutrients million tonnes | China | World | % |
|----------------------------------------|-------|-------|---|
| Nitrogen (N total nutrients)            | 30,264| 95,716| 31,6|
| Phosphate (P2O5 total nutrients)        | 11,226| 38,713| 29,0|
| Potash (K2O total nutrients)            | 5,367 | 28,085| 19,1|

Figure 4: Trends in nitrogen fertilizers use between (1961–2004) in selected countries
Source of data: www.fao.org/statistics/

Figure 5: Trends in phosphate fertilisers use between (1961–2004) in selected countries
Source of data: www.fao.org/statistics/

Figure 6: Trends in potash fertilizers use between (1961–2004) in selected countries
Source of data: www.fao.org/statistics/
Nitrogen, phosphorus and potassium fertilizer use per hectare is more than 3–4 times higher than the world averages. Nitrogen input is 150–180 kg/ha, which is higher than the means of EU (15). China uses similar amount of phosphorus and potassium as the EU countries. The rate of application of tendency of nitrogen, phosphorus and potassium fertilizer increasing in China and the input level of fertilisers are decreasing in EU, especially in the new EU member states (Figure 4–6). The high levels of fertilizer and pesticide use in China mean that further expansion of agricultural output through greater input use may not be sustainable (Guo, 2002). China has started to return environmentally fragile land to more sustainable forest or grass land, which further reducing the availability of land for arable crops. China has a relatively high share of irrigated land. Water supplies are dwindling in northern China, and pollution from industrial effluents and agricultural runoff is worsening. To accommodate growing consumer demand for food, the agricultural sector will probably need to make more efficient use of limited land and water resources by changing the mix of crops planted, adopting higher yielding varieties, improving land management and/or consolidating land holdings to achieve size economies.

Changing structure of livestock production

Dramatic increase in animal protein consumption would not have been possible without a rapid expansion of domestic livestock industry in China. Since 1985, pork output has increased markedly, reaching over 51.838 million tonnes in 2003–2006. Beef sector has grown from an inconsequential output level in the 1980s to the third largest in the world. Likewise, China has moved into second place behind the United States in total output of poultry meat. China produces more than 90% of the meat of mules, asses, goose and guinea fowl (Table 3). China is a dominant producer of duck meat.

Since market reforms in the 1980s, an increasing number of traditional households in China have taken advantage of expanded marketing opportunities to raise additional animals for sale in local markets. Many households shifted their focus from crop production to livestock and increased the swine from 1 or 2 head per household to 10, 50, or 100 head. Encouraged by growing applications of imported technologies and management practices, large-scale commercial operations have also increased since the 1980s. Since 1985, the share of China’s pork produced by traditional households has declined from 95 percent to less than 80 percent. Traditionally, livestock production was a sideline activity for many households; more farms are now specializing in livestock production. Households that specialize in livestock production and large commercial operations have risen in share and they produce 15% of overall livestock production. This transition in livestock production has important impacts on feed use. Traditional household operations make full use of readily available, low-cost feedstuffs. They often feed their swine with large quantities of water plants, vegetables, tubers, crop residue, table scraps, wheat and rice bran. These low-quality feeds are supplemented with some grain, protein meals, and concentrates, but traditional swine diets are often deficient in protein and energy, causing low productivity. Specialized producers often employ more advanced management and breeding practices and feed their livestock with grain and protein meal and archive roughly 36 percent more yield than

| Table 3: Participation of China in the production of some selected animal products in years 2004–2007 Source of data: www.fao.org/statistics/ |
|---|---|---|---|---|---|
| Items | Animal (million head) | Yield (kg/ head) |
| | China | World | China | World |
| Meat of Mules | 0.630 | 0.634 | 99.4 | 100.00 | 100.40 | 99.6 |
| Meat of Asses | 2.156 | 2.318 | 93.0 | 80.00 | 78.90 | 101.4 |
| Goose and guinea fowl meat | 555.567 | 601.318 | 92.4 | 4.00 | 3.97 | 100.9 |
| Duck meat | 1.931374 | 2.535651 | 76.2 | 1.30 | 1.45 | 89.5 |
| Pig meat | 662.548 | 1.323583 | 50.1 | 78.24 | 79.02 | 99.0 |
| Hen eggs, in shell | 2.197371 | 5.669611 | 38.8 | 11.02 | 10.55 | 104.5 |
| Goat meat | 146.705 | 382.571 | 38.3 | 13.26 | 12.34 | 107.5 |
| Rabbit meat | 377.529 | 1.057389 | 35.7 | 1.42 | 1.46 | 97.3 |
| Goatskins | 139.646 | 399.397 | 35.0 | 2.60 | 2.47 | 105.4 |
| Horse meat | 1.609 | 4.911 | 32.8 | 120.94 | 154.88 | 78.1 |
| Sheep meat | 154.226 | 536.840 | 28.7 | 15.10 | 15.64 | 96.5 |
| Sheepskins | 144.310 | 533.874 | 27.0 | 2.80 | 3.20 | 87.5 |
| Sheep milk, whole, fresh | 40.120 | 193.686 | 20.7 | 27.02 | 47.08 | 57.4 |
| Cattle meat | 49.613 | 296.740 | 16.7 | 135.84 | 203.34 | 66.8 |
| Cattle Hides | 47.684 | 306.153 | 15.6 | 34.00 | 25.20 | 134.9 |
| Chicken meat | 7 480.023 | 48 694.760 | 15.4 | 1.38 | 1.45 | 94.9 |
| Buffalo meat | 3.420 | 22.775 | 15.0 | 98.88 | 137.86 | 71.7 |
| Buffalo Hide | 3.299 | 29.778 | 11.1 | 30.00 | 27.47 | 109.2 |
| Buffalo milk, whole, fresh | 5.347 | 53.229 | 10.0 | 525.48 | 1 492.20 | 35.2 |
| Camel meat | 0.067 | 1.525 | 4.4 | 221.80 | 207.24 | 107.0 |
| Cow milk, whole, fresh | 9.652 | 241.441 | 4.0 | 2 751.58 | 2 236.18 | 123.0 |
| Camel milk, whole, fresh | 0.072 | 4.305 | 1.7 | 202.08 | 347.80 | 58.1 |
| Bird meat | 0.805 | 57.644 | 1.4 | 0.15 | 1.04 | 14.3 |
| Goat milk, whole, fresh | 1.321 | 165.580 | 0.8 | 197.64 | 86.56 | 228.3 |
| Turkey meat | 0.400 | 642.398 | 0.1 | 10.93 | 8.82 | 124.0 |
| Natural honey (hives) | 7.406 | 40.565 | 18.3 | 20.95 | 50.54 | 41.5 |
traditional households. As a result, specialized producers reduce the time it takes for swine to reach slaughtered weight by 20–80 days. The shift from traditional households to specialized operations has increased the demand for quality grain and oilseed-based feeds, reinforcing the growth in the number and capacity of Chinese feed mills.

Growth rate of agricultural production

All the indices at the country, regional and world levels are calculated by the Laspeyres formula according to the FAOSTAT. The indices are calculated from production data presented on a calendar year basis. Production quantities of each commodity are weighted by 1999–2001 average international commodity prices and summed for each year. To obtain the index, the aggregate for a given year is divided by the average aggregate for the base period 1961–1965. Since the FAO indices are based on the concept of agriculture as a single enterprise, amounts of seed and feed are subtracted from the production data to avoid double counting them. Deductions for seed (in the case of eggs, for hatching) for livestock and poultry feed is applied to both domestic and imported commodities. They cover only primary agricultural products destined to animal feed (maize, potatoes, milk, etc.). Processed and semi-processed feed items such as bran, oilcakes, meals and molasses have been completely excluded from the calculations at all stages. In this way, the FAO indices may differ from those produced by the countries themselves because of differences in concepts of production, coverage, weights, time reference of data and methods of calculation.

The largest increase in agricultural production was detected for China and India (Figure 7). Agricultural production index in Spain was similar to the World average and steadily increasing, while agricultural production has decreased in many Eastern European countries since 1980s. Similar trends were reportd by Majewski, (2008) and Bronisz, Heijman, (2008) for Poland and Kovács Katona, (2007) for Hungary.

Crop production data refer to the actual harvested production from the field or orchard and gardens, excluding harvesting and threshing losses. Production therefore includes the quantities of the commodity sold in the market and the quantities consumed or used by the producers. When the production data refers to a production period falling into two successive calendar years and it is not possible to allocate the relative production to each of them, it is usual to refer production data to that year into which the bulk of the production falls. The largest increase in crop production was detected for China and India (Figure). Agricultural production index in Spain and in the Netherland was similar to the World average and steadily increasing, while crop production has decreased in many Eastern European countries since in the second part on the examined period of 1961–2006.

Overall per capita meat consumption in China, however, is still lower than in many EU member states. Most of China’s livestock are still raised by traditional rural households that devote the bulk of their labour to crop production. Households generally keep livestock to provide food, draft power, and manure for the family. The largest increase in livestock production was detected for China (Figure 8). Livestock production index in Spain was similar
to India and steadily increasing in the examined period. Livestock production has decreased in many Eastern European countries since 1980s.

Food production index refers to the total amount of the commodity available as human food during the 1961–2006 period (Figure 10). Data include the commodity in question, as well as any commodity derived from them as a result of further processing. Food from maize, for example, comprises the amount of maize, maize meal and any other products derived available for human consumption. Food from milk relates to the amounts of milk consumed as well as the fresh milk equivalent of dairy products.

The largest increase in food production was detected for China and India (Figure 10). Food production index in Spain was similar to World average and steadily increasing, while food production index has decreased in many Eastern European countries since 1980s. The economic value of grassland products are well known, but Nábrádi, (2007) highlighted the fact that certain utilization potentials is far from being complete.

The largest increase in non food production index was detected for China and the Netherlands (Figure 11). Production index for non food commodities in Spain was similar to the mean of EU countries, while production index for non food commodities has decreased in many East European countries since 1980s.

Although per capita incomes and food expenditures in China are still low, food security is not a problem for most of the regions in China. Data in figure refers to the total amount of food available for human consumption expressed in kilocalories. Caloric content is derived by applying the appropriate food composition factors to the quantities of the commodities. In XX century, famine and food insecurity were common in China, but food consumption and food availability have soared since beginning of examined period (1961–2007). China is still a poor country, but it has a rising urban middle class with world-class consumption standards. Farm families, which still make up the 50% of the population, grow much of the food they consume. Food insecurity is not a problem for most of provinces, and per capita food supply, is above the world average in beginning

**Figure 10:** Food production index in some selected countries
Source of data: www.fao.org/statistics/

Indices for meat production are computed based on data for production from indigenous animals, which takes account of the meat equivalent of exported live animals but excludes the meat equivalent of imported live animals. For index purposes, annual changes in livestock and poultry numbers or in their average live weight are not taken into account. The largest increase in food production was detected for China and India (Figure 10). Food production index in Spain was similar to World average and steady increasing, while food production index has decreased in many Eastern European countries since 1980s. The economic value of grassland products are well

**Figure 11:** Production index for non food commodities in some selected countries
Source of data: www.fao.org/statistics/

**Figure 12:** Food consumption in some selected countries
Source of data: www.fao.org/statistics/

**Figure 13:** Vegetable consumption in some selected countries
Source of data: www.fao.org/statistics/
of XXI century. Per capita food supply is about 3000 kcal/capita/day, which is 500 kcal/capita/day less than in the member state of EU, except for Bulgaria, where the food supply was reduced sharply (Figure 12).

Cereals (mostly rice and wheat) and vegetables make up about 70% of per capita food consumption in China, which is higher share than in the EU. Per capita consumption of cereals and vegetables in China exceeds the world averages, but consumption of fruits, sugar, sweeteners, fats and oils is lower. Per capita vegetable consumption is about 2400 kcal/capita/day, which is similar to data of EU member states (Figure 13).

Per capita protein consumption is increasing sharply in China (Figure 14). Data in figure refers to the total amount of protein available for human consumption resulting from the multiplication of the quantity of food available. Protein content is derived by applying the appropriate food composition factors to the quantities of the commodities and is expressed in grams. Per capita protein consumption is about 80 g/capita/day, which is 10–30 g/capita/day less than the number in EU countries. These differences in food consumption between China and EU reflect a combination of lower per capita incomes and preferences in China. As consumers grow wealthier, consumption of all foods will grow, but consumption of meat, fruits, fish, fats and oils will grow the fastest (Figure 15).

China is one of the largest customers for agricultural products. The level of agricultural imports is still modest. Country tends to import bulk commodities and items used as intermediate inputs in labour-intensive manufacturing. At the same time, China is a major exporter of high-value, labour-intensive food products, such as manufactured foods, animal products, fish, vegetables, and fruits. The agricultural exports go largely to Asian markets. Until the 1980s, there was relatively little value-added in China’s food sector, as consumers prepared most meals at home using rice, noodles, raw vegetables, and meat produced at home, purchased from state-run foodstuff stores, or purchased directly from farmers. Since then, foods processing and retailing industries has grown fast, as consumers demanded more quality and convenience. Modern supermarkets are the most widespread retail outlet for food, but they are being challenged by emerging hypermarkets, most of which are owned by foreign chains. Hypermarkets are introducing China to modern supply chain management techniques designed to improve efficiency in wholesaling and distribution. These developments might open new channels for high-value food imports. The demand for quality, uniform farm products in high volumes may transform agricultural production processing and retailing in China.

Trade and sustainable development

In the late 1990s, the market prices of some commodities rose above world prices in China as government supported prices (Brown, 1995). In the years leading up to WTO accession, China has liberalized trade considerably, but still maintained many barriers to agricultural trade (Carter and Rozelle, 2001, 2002, Huang and Rozelle, 2002). In accordance with its membership in the WTO, China lowers tariffs, weaken state trading monopolies, increase the openness of import license and quota allocation, and require publication of trade regulations, thus weakening most of the policy instruments the government has used to restrain agricultural imports. In the first few years after WTO accession, China allowed limited quantities of grains, cotton, vegetable oils, wool, and sugar to enter the country at low tariffs of 1–9 percent. At the same time, WTO entry opened more markets for China’s labour-intensive exports, potentially moving China’s trade patterns in a direction that will make more efficient use of human and natural resources. After the country’s WTO accession, government fined other means of protecting and subsidizing farmers to maintain a degree of food self-sufficiency and social stability. Government subsidies are minimal in China, but spending on both price-distorting subsidies and infrastructure, education, and other subsidies, which are not tied to prices, have risen considerably. Increased competition after the WTO accession pushed China’s food marketing system to squeeze out inefficiencies and reduce farm-retail margins. The country’s goal of food self-sufficiency has led policymakers to restrain imports of land-intensive grains, the production of
which has a high opportunity cost. China’s agricultural trade has grown relatively slowly, in comparison with booming merchandise trade (Duncan, 2001, Gilbert and Wahl 2002). The rapid development of transportation and marketing infrastructure has also played a role in integrating the national economy. Transportation and logistics costs account for an estimated one-fifth or more of retail prices, which is much higher than in developed countries. Marketing costs will need to be reduced to allow farmers in China to compete for markets on coastal and overseas area of China (Hsu et al. 2002, Fan and Chan-Kang, 2005). Inadequate port facilities and lack of warehousing and cold storage facilities can also impede both domestic and international trade. China is a major exporter of maize, chicken meat and preserved food, fruit and vegetables (Table 4). Tea, garlic frozen and dehydrated vegetables are also important export items for China. The country is responsible for more than 40% of world total export in respect of canned mushrooms, apple juice, carded and/or combed hair.

Table 4: Share (%) and volume (million USD) of most important export commodities in China between 2004–2006 Source of data: www.fao.org/statistics/

| Export item                  | China      | World      | (%)  |
|------------------------------|------------|------------|------|
| Crude Materials              | 1 673,758  | 23 314,415 | 7,18 |
| Maize                        | 1 088,732  | 10 999,423 | 9,90 |
| Meat of Chicken Canned       | 520,930    | 999,423    | 10   |
| Vegetables Preserved         | 520,774    | 999,423    | 10   |
| Tea                          | 421,613    | 999,423    | 10   |
| Garlic                      | 420,556    | 999,423    | 10   |
| Vegetable Frozen             | 402,201    | 999,423    | 10   |
| Vegetables Dehydrated        | 353,055    | 999,423    | 10   |
| Beans, dry                  | 323,759    | 999,423    | 10   |
| Waters, Ice                 | 315,484    | 999,423    | 10   |
| Pork                        | 306,307    | 999,423    | 10   |
| Canned Mushrooms             | 303,122    | 999,423    | 10   |
| Apple juice, single strength| 302,792    | 999,423    | 10   |
| Hair Carded/ Combed         | 301,551    | 999,423    | 10   |
| Rice Milled                 | 289,719    | 999,423    | 10   |
| Groundnuts Shelled           | 250,811    | 999,423    | 10   |
| Tobacco, unmanufactured     | 243,237    | 999,423    | 10   |
| Chicken meat                | 236,391    | 999,423    | 10   |
| Cigarettes                  | 235,277    | 999,423    | 10   |
| Apples                      | 234,996    | 999,423    | 10   |
| Paste of Tomatoes           | 229,868    | 999,423    | 10   |
| Silk Raw                    | 228,235    | 999,423    | 10   |
| Prepar Groundnuts           | 221,952    | 999,423    | 10   |
| Cake of Soybeans            | 182,556    | 999,423    | 10   |
| Dried Mushrooms             | 177,315    | 999,423    | 10   |
| Confectionery               | 176,534    | 999,423    | 10   |
| Vegetable Preservatives     | 167,827    | 999,423    | 10   |
| Vegetable Fresh Or Dried    | 157,638    | 999,423    | 10   |
China has been a major importer of corn and cotton. China is a net importer of bulk commodities, primarily soybeans, cotton lint and palm oil. In some years, during the 1990s, China emerged as a major market for imports of oilseeds, vegetable oils, and oil meal. China uses most other agriculturally related imports as intermediate inputs for manufacturing. China uses imports of fabrics, hides, and skins in its export-oriented garment, footwear, and leather product industries. Net imports of fertilizers help boost China’s domestic crop production, reducing the need for food imports. Meat and other agricultural imports have grown at a steadier rate.

Table 4: Share (%) and volume (million USD) of most important import commodities in China between 2004–2006 Source of data: www.fao.org/statistics/

| Import item (million USD) | China | World |
|--------------------------|-------|-------|
| Soybeans | 6 315,951 | 17 015,679 | 37,12 |
| Cotton lint | 2 238,191 | 8 544,179 | 26,20 |
| Palm oil | 1 535,137 | 10 007,041 | 15,34 |
| Rubber Nat Dry | 1 295,229 | 6 292,221 | 20,58 |
| Cattle hides Wet salted | 1 021,268 | 3 005,250 | 33,98 |
| Soybean oil | 992,921 | 5 240,037 | 18,95 |
| Wool, greasy | 932,084 | 1 901,282 | 49,02 |
| Wheat | 877,680 | 19 303,825 | 4,55 |
| Crude Materials | 756,036 | 24 464,482 | 3,09 |
| Maize | 703,111 | 13 007,403 | 5,41 |
| Food Prep | 624,780 | 22 929,641 | 2,72 |
| Cigarettes | 544,246 | 14 813,945 | 3,67 |
| Beverage, Distilled alcohol | 364,333 | 14 609,140 | 2,49 |
| Chicken meat | 351,018 | 8 087,774 | 4,34 |
| Barley | 347,722 | 3 181,765 | 10,93 |
| Sugar Raw Centrifugal | 305,236 | 6 052,539 | 5,04 |
| Tobacco, unmanufactured | 296,850 | 7 722,938 | 3,84 |
| Cassava dried | 277,256 | 564,338 | 53,70 |
| Meat-Cattle Boneless (Beef & Veal) | 230,142 | 13 227,710 | 1,74 |
| Food Prep, Flour, Malt Extract | 204,838 | 2 544,559 | 8,05 |
| Milk Whole Dried | 200,690 | 3 810,424 | 5,27 |
| Rice Milled | 169,342 | 5 876,337 | 2,88 |
| Cassava Starch | 167,812 | 312,620 | 53,68 |
| Tallow | 161,546 | 903,034 | 17,89 |
| Flax fibre and tow | 154,279 | 410,456 | 37,59 |
| Skins With Wool Sheep | 149,941 | 631,082 | 23,76 |
| Natural rubber | 141,195 | 1 012,066 | 13,95 |
| Offal of Pigs, Edible | 136,657 | 855,967 | 15,97 |
| Infant Food | 135,597 | 1 880,482 | 7,21 |
| Milk Skimmed Dry | 127,016 | 3 495,073 | 3,63 |
| Rapeseed oil | 126,079 | 1 684,645 | 7,48 |
| Fatty Acids | 124,982 | 1 872,066 | 6,68 |
| Wool Degreased | 124,361 | 948,078 | 13,12 |
| Beer of barley | 119,196 | 6 909,857 | 1,73 |
| Whey Dry | 116,658 | 1 021,914 | 11,42 |
| Skin Furs | 113,927 | 1 434,432 | 7,94 |
| Apples | 109,747 | 3 814,235 | 2,88 |
| Food Wastes | 107,191 | 3 854,641 | 2,78 |
Summary

Home and international trade promotes growth in China and that growth reduces poverty. Reducing trade barriers promotes more efficient resource use. Greater efficiency of agricultural production in China means that societies can produce more of the commodities people want, within their limited resources, raising overall social welfare. The poor farmers are able to improve their levels of nutrition, health and education, creating a virtuous circle of rising productivity and poverty reduction. Agricultural development policy has balanced the effects of trade liberalization and improved food security. Trade liberalization was useful for large and more export-oriented firms and it has lead to scale incentives and size concentration. Trade liberalization itself do not hold guarantee that everyone will benefit from transition, but agricultural development policy assisted the poor and vulnerable members of society. Trade liberalization in China has not marginalized small farmers and does not created unemployment, but reduced poverty. Agricultural import from developed countries has undermined the economic and social welfare of poor rural areas, but assisted the development of producing and processing firms in rural area.

Food-consumption levels have grown and will continue to grow as the population grows richer. Income growth and urbanization are likely to boost food demand considerably and change the consumer preferences. Demand for meat, fish, vegetable oils, and dairy products will also grow fast. The country’s transition from rural semi-subsistence to urban lifestyles will have profound impacts on consumption patterns, shifting demand from self-grown rice, wheat, and vegetables to fish, meat, processed foods, and restaurant meals. Consumers will also pay more attention to food quality, and they may demand foods with specific attributes.

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