

# Skillful Means

## The Challenges of China's Encounter with Factory Farming



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Until relatively recently in human history, regular consumption of meat was limited to the wealthy elite. The poor ate it only on special occasions, since their animals—pigs, sheep, goats, cows, chickens, and other birds—were more valuable alive than dead. But over the past sixty years, vast changes in agricultural production in industrialized countries, including use of chemical-based fertilizers and adoption of large, confined, factory-like facilities that house thousands of animals, have made meat widely available and affordable. In recent decades, this “livestock revolution” has spread to Latin America, Asia, and to a lesser extent, Africa.

Urbanization and increasing affluence have made meat, milk, eggs, and cheese part of millions of people's daily meals. Meat and dairy production are rising by more than two percent each year. Since 1980, global production of meat has more than doubled and in the developing world (also known as the global South) it has tripled. Still, consumption levels are far from equal between the industrialized and developing worlds. People in the global North (industrialized regions) eat, on average, three or four times as much meat as those in the global South. But the gap is narrowing. More than half the world's meat is now both produced and consumed in developing regions.

As the world's population grows, and with it demand for animal protein, enormous and unprecedented increases in the number of farmed animals have resulted. In 2006, more than 60 billion animals were used globally to produce meat and dairy

products, more than nine times the human population: 4.3 billion mammals (cows, domestic buffalo, sheep, goats, and pigs) and 58.4 billion poultry (primarily chickens). That represents a 24 percent growth in mammals used for food production and a 40 percent increase in poultry since 1995. If current trends persist, by 2050 the global livestock population could exceed 100 billion—more than ten times the anticipated human population (9.2 billion).

Food prices rose sharply around the world, up 23 percent overall in 2007 compared to 2006. Grain prices have risen even more, by an average of 42 percent. While this phenomenon has many causes, one is the steady growth in demand for grain to feed farmed animals. Global demand for meat is expected to expand by 35 percent by 2015 and animal agriculture has become part and parcel of the process of globalization.

Meat and dairy production already uses 30 percent of Earth's land surface, 70 percent of agricultural land, and accounts for eight percent of the water humans use, mostly to irrigate feed crops. The global livestock industry is, according to the UN Food and Agriculture Organization (FAO), “probably the largest sectoral source of water pollution,” and one of the key agents of deforestation. In the Amazon, for example, 70 percent of cleared forest is now pasture; feed crops including industrial soy, grown for livestock, cover much of the rest.

Meat and dairy production also have a direct relationship with global climate change: fully 18 percent of global greenhouse gas (GHG) emissions stem from the livestock industry,

**The questions this paper seeks to explore are: Will China will be able to match the meat and dairy consumption of the U.S., given the ecological, economic, public health, and animal welfare realities of the industrial production model? And, when all the facts are on the table, will it want to?**

outstripping emissions from all the world's transportation systems combined. In addition, as much as one-third of GHGs can be traced to agriculture and changes in land use attributed to livestock and crop production. Given its role in climate change, deforestation, land degradation, and water pollution, among other ecological ills, the FAO concluded that the livestock industry "may well be the leading player in the reduction of biodiversity" in the world.

Nonetheless, in 2008, world meat output is expected to grow to 281 million tons. About two-thirds of this rise in output stems from Asia, particularly China, where perhaps nowhere else is the shift from diets based on plant foods to those much heavier on meat more striking or more visible. An emerging economic and political giant, China is now the world's largest producer—and consumer—of agricultural products. As its rapid economic expansion has allowed more and more Chinese to enter the new middle class, meat has moved from the side of the dinner plate to the center. Urbanization is also a factor. Nearly half (46 to 47 percent) of China's people live in urban areas for more than six months a year, and urban Chinese consume more meat and dairy products than do those in rural parts of China.

The 2008 Summer Olympics in Beijing will showcase a country that, only two generations after a devastating national famine, is eating increasingly high on the food chain. In 2002, the number of calories the average Chinese took in from animal products daily was 618, a nearly fourfold increase from the 174 daily calories from animal products documented in 1980.

### **MEAT EVERY DAY: LOVIN' IT**

For many modern, particularly urban Chinese, meat and dairy products have come to signify wealth, status, modernity, freedom, and a welcome escape from the hardscrabble lives their parents and grandparents—or they themselves—led in the countryside. In the past, "children looked forward to the spring festival, partly because it was fun, but also because it was a chance to eat meat," Zhang Xiuwen, a farmer turned Beijing tennis coach, told a UK newspaper. "But," he continued, "now we can eat meat every day if we want. It has become part of our lives."

In the past ten years, consumption of China's most popular meat, pork, has doubled. In 2007, China raised well over half a billion pigs. Since 1980, overall meat consumption in China has quadrupled to its current level, 54 kilograms or 119 pounds a

person each year, and is continuing to rise. That's about half the annual meat consumption per capita in the U.S., which hovers around 220 pounds.

In yuan terms, meat is the second largest segment of China's retail food market. Western-style meat culture has gone mainstream. On warm evenings in Beijing, when couples foxtrot in a public square, they do so beneath an enormous billboard for an American steakhouse chain; U.S. fast food outlets are now commonplace in China's cities; and fast food is a \$28-billion-a-year business in China. By 2008, McDonald's, a major sponsor of the Olympics, had more than 800 restaurants in China, with at least a hundred more set to open by the time the games began. China is the world's second largest advertising market, after the U.S. and, like many retailers, success in China is essential to fast food corporations' bottom lines. The tagline on McDonald's-China's Olympic-themed ads practically declares this fact: "I'm lovin' it when China wins" it reads. McDonald's will operate four outlets in the Olympic venues: one in the Olympic Village, another in the Main Press Center, and two more open to Olympics spectators.

### **STRAINS SHOWING**

China has also opened its doors to investments by major multinational meat and dairy producers, as well as animal feed corporations, including Tyson Foods, Smithfield, and Novus International. Keen to increase output, these corporations and the Chinese government are championing the intensive systems of raising farmed animals that have become commonplace in industrialized countries: small, battery cages for egg-laying hens; metal stalls for pigs; sheds holding thousands of meat or broiler chickens; and feedlots for dairy and meat cattle. While this industrial model of animal agriculture is promoted as an efficient, modern means of production, such operations bring with them significant environmental and social costs—costs that have become increasingly evident in recent years, particularly in the U.S.

A multi-year, multi-disciplinary commission established by the Pew Charitable Trusts and the Johns Hopkins University's Bloomberg School of Public Health recently concluded that the negative effects of U.S. industrial farm animal production are "too great" and the scientific evidence "too strong to ignore." In a preface to the Commission's final report, its executive director, Robert P. Martin, wrote: "The present system of producing food animals in the United States is not sustainable and presents an unacceptable level of risk to public health and damage to

the environment, as well as unnecessary harm to the animals raised for food.”

Even though China is not yet a fully fledged “factory farm nation,” the strains from its fast-growing livestock sector, and burgeoning appetite for animal-based protein, are showing—in massive water pollution, soil degradation, rising rates of obesity and chronic disease, risks to food security and food safety, pressure on small farmers, and declining farm animal welfare. While these realities won’t be obvious to the millions of people cheering the Olympic athletes in China and across the globe, they merit serious exploration and reflection.

Given that every fifth person in the world is Chinese, even small increases in individual meat or dairy consumption will have broad, collective environmental as well as climate impacts (see sidebar). Increasingly, what the Chinese eat, and how China produces its food, affects not only China, but the world, too.

## OVERVIEW

**C**hina has surpassed the U.S. as the world’s top producer of meat chickens and pigs. It also raises two-thirds of the world’s domestic ducks and 90 percent of geese used for meat. While its cattle herd is still relatively small, demand for beef is rising and China expects to increase its beef output by three percent in 2008.

Although China has only 10 percent of the world’s land resources and six percent of its water resources, as well as nearly 20 percent of the world’s population, it produces 20 percent of the world’s corn, 30 percent of its rice, 25 percent of its cotton, 37 percent of its fruit and vegetables, and over half of its pork. China also has become a major exporter of garlic, apples, apple juice, vegetables, and farm-raised fish and shrimp.

Until recently, China has been largely self-sufficient in protein and grain, for both human and farm animal consumption, and most of the meat China produced has

## China, Livestock, and Greenhouse Gas Emissions

**C**hina, home to about 20 percent of the world’s population, is responsible for about 17.3 percent of the world’s emissions of greenhouse gases. In 2008, China surpassed the U.S. to become the world’s leading emitter of carbon dioxide (CO<sub>2</sub>), according to a study by the Netherlands Environmental Assessment Agency. Per capita emissions of CO<sub>2</sub> in China have more than doubled, from 2.1 tons of CO<sub>2</sub> equivalent in 1990 to 5.1 tons today. In examining China’s contribution to climate change, an exploration of its rapidly growing livestock sector is important.

Greenhouse gases (GHGs) are generated at every stage of livestock production. The UN Food and Agriculture Organization (FAO) attributes to the global livestock industry nine percent of anthropogenic or man-made CO<sub>2</sub> emissions; 37 percent of anthropogenic methane emissions; and 65 percent of anthropogenic nitrous oxide emissions. Methane and nitrous oxide, though lower in concentration in the atmosphere than CO<sub>2</sub>, are far more potent heat-trapping gases. They have, respectively, 23 and 296 times the global warming potential of CO<sub>2</sub>, making their production in large quantities a serious concern.

**Carbon Dioxide:** CO<sub>2</sub> is produced by the use of fossil fuels in facilities that raise and process animals for food, as well as transport them either live to slaughter or export, or dead, to local, national, or international markets. Significant quantities of CO<sub>2</sub> are also released through the production of feed crops for livestock (see further discussion below).

**Methane:** Farm animals contribute to global methane emissions primarily in the form of enteric fermentation (part of the digestion process of ruminants, in which microbes break down fibrous feeds and methane is created as a by-product, and released by belching and flatulence). Globally, enteric fermentation is responsible for about 27 percent of man-made methane emissions. Enteric fermentation in livestock in China contributes roughly 10 percent of global methane emissions from this source. China still ranks behind India and Brazil, which are the top emitters, due to their large ruminant populations.

How much methane ruminants produce is a function of their diet. Animals used in dairy production typically emit more methane per animal than those raised for meat, since dairy animals are fed larger quantities of food to keep milk production high (in some cases, three to four times as much food as is required to sustain them), and, generally, they live longer.

In industrialized facilities, ruminants are fed grain as a quick and efficient means to fatten the animals. While these animals emit less methane per unit of feed, they also consume far more feed than animals raised on pasture and are generally bigger. That means that methane emissions from each individual animal in a factory farm or feedlot can be much higher than those raised in non-industrial settings. As large-scale meat and dairy operations increase in China, methane emissions from enteric fermentation are likely to increase.

Animal manure is also a source of methane emissions. The amount of methane emitted varies, depending on how the manure is stored. Methane emissions are significantly higher in industrial operations, where manure is often stored in lagoons and decomposition of the wastes takes place without oxygen under anaerobic conditions, rather than in facilities where manure is dried and used as fuel or fertilizer. Already, China is the world’s largest source of methane from manure, emitting roughly 3.84 million tons in 2004—over one-fifth of the global total. The majority of these

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## China, Livestock, and Greenhouse Gas Emissions

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emissions come from Chinese pig operations. But as meat and milk production in China increases and becomes more concentrated and industrialized, methane emissions from manure from other farmed animals will also rise.

In 2000, farmed animals in China raised in confined conditions, such as factory farms, generated roughly 1.4 billion tons of manure, an amount expected to increase by 36 percent to 1.9 billion tons in 2030. Over the same period, the population of livestock is expected to increase by two to four times current levels.

**Nitrous Oxide:** Animal wastes also emit nitrous oxide. In China in 2004, estimates put such nitrous oxide emissions at roughly 0.58 million tons, or about 16 percent of the global contribution of nitrous oxide from animal wastes. Again, as the livestock industry in China intensifies, these emissions can be expected to rise in coming years.

**Feed and GHGs:** In addition to the GHGs resulting from the digestion process and wastes generated by animals, production of animal feed contributes heavily to the climate footprint of farm animals. Globally, more than half of the energy used in producing meat, milk, and eggs goes to feed production. Soil cultivation related to animal agriculture emits about 28 million tons of carbon dioxide a year.

Further, indirect CO<sub>2</sub> emissions stem from growing crops for animal feed, specifically production of the chemical- and nitrogen-based fertilizers and petroleum-based pesticides that are widely used. Carbon is also released when forests or other vegetation are cleared to create pasture or cropland for animal feed. While there is considerable uncertainty in calculating the greenhouse gases affiliated with these land-use changes, the FAO approximates roughly 2.4 billion tons of CO<sub>2</sub>

are emitted annually from deforestation for livestock pasture as well as cropland for animal feed. In addition an estimated 100 million tons of CO<sub>2</sub> are released annually from livestock-induced desertification. In addition, grains like corn and soy—processed into commercial animal feed—are often transported long distances, again through the use of fossil fuels, to factory farms and feedlots.

While it is difficult to pinpoint China's contributions to these direct and indirect emissions, it should be noted that China is a big consumer of grain and soy and much of that is diverted to livestock production. According to the EDGAR Greenhouse gas inventory, deforestation in China in 2000 resulted in the release of 7.36 million tons of CO<sub>2</sub>, while deforestation in Brazil accounted for nearly 760 million tons of CO<sub>2</sub>. However, Brazil supplies China with the majority of its soybeans.

In addition, devoting a significant amount of agricultural land and resources to animal feed production has considerable implications for climate change. Globally, roughly 41 million tons of CO<sub>2</sub> is emitted each year in producing nitrogen fertilizers used in feed production. Of that 41 million, China produces over 14 million tons. Roughly 16 percent of the nitrogen fertilizer China manufactures each year is used to produce animal feed.

Chemical fertilizers made in China for use in animal feed production also account for about 20 percent of coal-derived energy in China. Coal is a very greenhouse gas-intensive fuel, in that methane is generated during the mining of the coal, and CO<sub>2</sub> is released when it is burned. Based on demand projections for animal products in 2030, China's fertilizer requirements may increase from 35 million tons in 2000 to 42 and then 46 million tons in 2015 and 2030 respectively. As they do, so will associated GHG emissions.

been consumed within the country. But this is changing. China now imports some meat products, as well as dairy and feed grains from, among others, U.S., Australia, New Zealand, Ireland, and other European Union member states.

In addition to meat, dairy, too, is an expanding industry (an average of 20 percent a year over the past decade), while, since 2000, consumption of milk products in China has tripled. The Chinese government is providing dairies with tax incentives and loans to increase herd size and productivity. But high feed prices and capacity constraints have tamped down growth somewhat. In 2007, China's milk output rose "just" 9.5 percent over 2006 levels. In future years, if demand continues to increase, China could become a major importer of milk.

On a parallel track, the government and Chinese and foreign agribusinesses are seeking to increase China's share of the global meat market. By raising nearly 700,000,000 pigs each year, China has, until recently, had enough supply to meet national demand, and to become the world's fourth-largest exporter of live and slaughtered pigs. In 2007, however, "blue ear," or porcine reproductive and respiratory disease, hit China's pork industry hard. Tens of thousands of pigs died from blue ear, and according to the government, 175,000, perhaps more, were culled in an effort to prevent the disease's spread.

Severe snowstorms in China in early 2008 killed another 800,000 pigs. As a result, pork prices rose more than 70 percent in a year, contributing to the highest level of inflation seen in the Chinese economy since 1996. Historically, pork has had a central role in Chinese cuisine and culture; the Chinese character for "home" even includes a glyph for a pig. China now consumes 92 billion pounds of pork a year, or a fifth of a pound a day for every man, woman, and child.

Concerned about the negative social and economic effects of pork shortages

(pork is a staple in the diet of the workers staffing China's booming export factories), in 2007 the government scaled up its pork imports. It also took other measures to ensure social stability through access to pork. The ministry of education ordered colleges and universities to subsidize pork on campuses instead of raising prices; the civil affairs ministry told municipal governments to subsidize the pork bought by low-income families; and the railroad ministry was directed to give priority to pig shipments. Prime Minister Wen Jiabao even visited a pork counter at a Xian supermarket and called for the government to pay pig farmers to increase production.

Demonstrating the importance of pork in China, and the government's interest in forestalling any negative social or economic effects of pork shortages, the central and local governments maintain a "strategic pork reserve." This consists of hundreds of thousands of frozen and live pigs; while other nations maintain strategic oil or grain reserves, China is the only country with a strategic pork reserve.

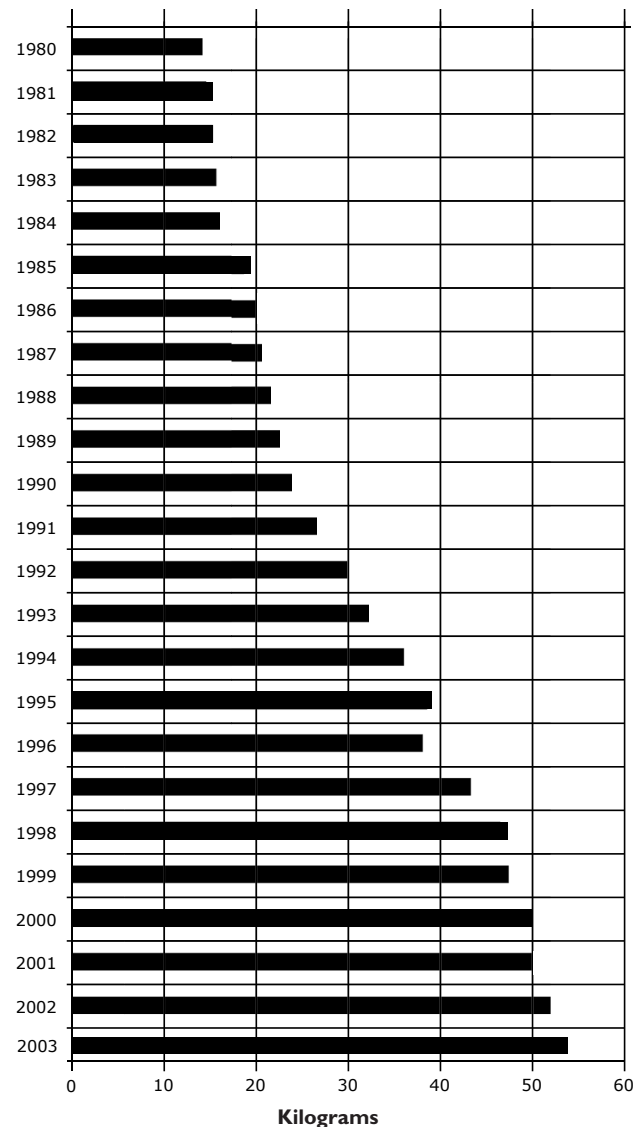
To scale up pork production, the Chinese government is now applying subsidy, insurance, and vaccination programs. Despite these measures, output in 2008 is estimated to rise by only one percent from 2007 levels. China is expected to import pork again in 2008, about 150,000 tons of it.

## EATING MEAT IN REVENGE

"When I was a child, every person was allotted one pound of pork a month," recalls Peter Li, who grew up in Jiangxi province in southeast China and is now a professor of political science at the University of Houston in Texas. "We could not eat more than that. You could not get it. Now, though, more people have access to more meat and want to eat a lot of it." In becoming an agricultural powerhouse, and a leading protein producer, China is overcoming a bitter historical legacy. The Chinese, Li suggests, are now "eating meat in revenge" for past disastrous government actions, and that the Chinese government is concerned that if it cannot supply meat in sufficient quantities, social unrest may ensue.

Between 1959 and 1961, a period known in China as the "Three Years of Economic Difficulty," or "Three Bitter Years," a cataclysmic national famine took the lives of at least 30 million Chinese. The famine wasn't the result of a natural disaster like floods, storms, drought, or an earthquake, but rather policies adopted by Mao Zedong's government that led to the stockpiling of grain in government warehouses amid massive food shortages throughout the countryside. In the midst of the Great Leap Forward and the continuing collectivization of agriculture, the Communist Party newspaper *The People's Daily* announced in late 1959 that "the peasants must practice strict economy. Live with the utmost frugality and eat only two meals a day, one of which should be soft and liquid."

## Meat Consumption Per Capita in China, 1980–2003



Source: FAO

Most Chinese forty years or older remember growing up hungry and without the food security many young Chinese now take for granted. Under the leadership of Deng Xiaoping from the late 1970s on, collective agriculture ended in China, diets diversified, farm income grew, and poverty rates fell. The amount of land dedicated to grain fell, as more land was dedicated to non-grain crops and livestock.

Even as China remained largely self sufficient in food into the twenty-first century, economists, environmentalists, and food and agriculture policy-makers have wondered, given its huge population, "Who will feed China?" Now, as China's meat consumption continues to grow, a new version of the question is being posed: "Who will feed China's pigs?"

Grain requirements for farmed animals are expanding rapidly in many parts of the world. It takes between two and ten times the amount of grain to produce the same number of calories through livestock as it does through eating grain directly. China, for instance, now allots 28.5 percent of its grain for livestock feed, up from 13.3 percent in 1980. The U.S., the original “fast food nation,” uses roughly half its grain for animal feed. In industrialized countries, intensive animal agriculture came to dominate during a roughly fifty-year period after the Second World War when both grain and fuel were relatively cheap. Many economists now judge that era at an end. Agribusiness in the U.S. and elsewhere is feeling the effects of rising oil and feed costs; in the U.S., a leading poultry producer, Pilgrim’s Pride, has shut processing facilities, citing high feed costs. China is not immune: in 2008, animal feed costs rose by 25 percent over 2007 levels.

## SCALE MODELS

Advocates of large-scale production assert that intensifying livestock operations is essential if the world’s increasing human population is to be fed. But a growing number of analysts, joined by policy-makers in the U.S., Europe, and within the UN system, argue that it is precisely this industrial model of agriculture that risks creating more food insecurity, and more dire ecological conditions, than it can remedy.

Yet it is this model of production that is being replicated in China, with the support of multinational agribusiness corporations, eager to help provide meat and dairy to a population of more than 1.3 billion people. Most analysts agree that the Chinese government considers intensification necessary to meet the demand for animal products; in its calculus, food security means meat. China’s population is more than four times that of the U.S., so the industrial animal agriculture industry in China could grow to an enormous size.

In China today, most of the larger-scale livestock facilities, approximately 80 percent, are located in densely populated areas, near major cities and, therefore, big markets for meat and dairy. Different components of the industry tend to be concentrated in specific regions of the country: poultry in the southeast; pork in central China, centered in Sichuan, the leading pig-producing province; and dairies in the north. Most animals raised for meat or dairy are still produced on small- and medium-sized farms, but, “the proportion of factory farming [in China] is rising gradually” says Gu Xianhong, a professor at the Chinese Academy of Agricultural Science’s Institute of Animal Sciences. According to him, 90 percent of China’s pork, 85 percent of beef, 65 percent of mutton, 82 percent of poultry meat, and 94 percent of eggs come from mixed farming systems, in which both animals and crops are raised, and the animals’ manure fertilizes the fields.

Research by Peter Li in 2005, however, found that China by the end of 2003 already had 53,210 factory-style farms of more

than 500 pigs, dairy cows, beef cattle, and sheep.<sup>1</sup> Li categorized operations as intensive based on the number of animals being raised, the use of commercial feed, and frequent use of disease-controlling drugs. Some small- and medium-sized operations also house animals in cramped conditions and routinely use antibiotics and other drugs common to intensive livestock operations. Commercial feed and other modern farming practices from gestation crates to early weaning had been used widely on these farms.

Li’s research also indicated that factory farms in China are still vastly outnumbered by household-run backyard farms raising, for example, one to nine pigs. At the same time, though, China’s large farming operations account for a disproportionate amount of animal products. Li estimated that in 2003, four percent of China’s poultry operations produced 84 percent of its “broiler” chicken products. Also in 2003, 28 percent of pork output was generated by just four percent of pig-raising facilities.

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The FAO foresees global consumption of meat rising to 300 million tons by 2015. Poultry will comprise half, and 40 percent of production will be in Asia, principally China. A recent study jointly undertaken by the International Institute for Applied Systems Analysis in Austria, the Chinese Academy of Sciences, China Agricultural University, and the Center for World Food Studies at the Free University in the Netherlands, sought to project per capita consumption of animal products in both rural and urban China in 2030. The research looked at current trends, and from those estimated the “need” for a rapid expansion of intensive systems of production.

By 2030 the study projected that intensive pig operations will need to increase 3 to 3.5 times; broiler poultry operations, 4.5 to 5 times; and 2 to 2.5 times for egg operations from 2000 levels.

It is Li’s analysis that it will be difficult to convince the Chinese government or people to move away from the intensive model, not least because of the perception that this is the West once more telling the East what to do and trying to stop the government from feeding its people a diet long taken for granted in the West—where, Chinese government officials have pointed

<sup>1</sup>The data Professor Peter Li used to draw his conclusions came from official animal farming data, i.e., China Animal Husbandry Industry Yearbook Compilation Committee, *China Animal Husbandry Industry Yearbook*: 2004. (Beijing: Agriculture Press, 2005), pp. 225–232.



out, consumption levels of chicken, beef, dairy products, corn, and wheat are substantially higher on a per capita basis than in China.

Some in the West have publicly chastised China for its rising grain usage, even though most analysts agree this has yet to affect world markets significantly. Senator Charles Grassley of Iowa recently suggested that the Chinese “go back and eat rice” if they don’t like American corn being used for ethanol production.

## FULL SPEED AHEAD?

Whether China will be able to intensify production on a level akin to that of the U.S. or expand its share of the world protein-export market are open questions. Among the challenges: concerns abroad and at home about Chinese food safety standards; ecological limits; rising prices of grain and oil, both essential inputs for large-scale industrial animal agriculture; and public health.

Li says that the Chinese government is aware of the issues, but that it is torn in two directions: on the one hand, the need to regulate use and abuse of natural resources; on the other, to produce a large quantity of food. So far, the government has favored the latter. The process of intensification of animal agriculture in China appears to be accelerating. Consequently, smaller-scale farmers are finding it harder to compete, as government policies, rural labor shortages, rapid development of farmland, and growing market consolidation favor larger producers.

In 2006, according to China’s National Development and Reform Commission (NDRC), the government budgeted ¥2.8 billion for breeding farms and large-scale facilities to raise pigs, and to promote pork production and ensure a supply; along with ¥70 million and ¥5.6 billion to construct poultry facilities and new livestock farms respectively. In addition, the government is increasing subsidies up to ¥1 million for breeder-chicken facilities.

The government is also planning to allocate more funds to the livestock sector in regions hard hit by the 2008 snowstorms and the May 2008 Sichuan earthquake. The snowstorms killed an estimated 70 million farm animals, and, along with the earthquake, damaged livestock breeding facilities in Hunan, Jiangxi, Guizhou, Hubei, Guangxi, Anhui, Sichuan, Shaanxi, and Gansu provinces. In the Sichuan earthquake, more than 90,000 people lost their lives or are still unaccounted for. In addition, three million pigs and 12.5 million birds being raised for eggs and meat, mostly in backyards, were killed. It is estimated that 30 million people were affected by the quake—losing, in some cases, homes, farmland, livestock, grain storage facilities, and farm machinery; rice fields and rice seeds were damaged. Losses to the agriculture sector from the earthquake have been estimated at \$6 billion; in some villages, 70 percent of livestock died.

As a result of the earthquake, Sichuan is likely to see more intensive animal agriculture and fewer small farmers, according to an executive with the CP Group, China’s largest agribusiness

corporation. New farming developments will likely be medium- and larger-scale farms, as the government plans tougher construction standards for rural buildings, which will cover farms as well. This will favor larger, factory farm sheds, housing 1,500 pigs or 10,000 chickens each.

## CORPORATE INVOLVEMENT

As with many aspects of its economy, China’s government has welcomed foreign investors and partners in the animal agriculture sector, both producers and retailers. KFC was the first Western fast food chain to gain a foothold in China, opening its first restaurant in 1987. Its parent company, Yum Brands, now



Cattle raised on concrete floors in eastern China. Peter Li/HSI/CIWF

operates 2,500 KFCs and Pizza Huts around the country, with \$2 billion annual sales. More than other fast food giants, Yum has tailored its menu to Chinese tastes, serving—in addition to fried chicken—fish, porridge, and egg dishes. The company estimates that within a decade, 40 percent of its profits could come from its Chinese operations, and may eventually have 20,000 outlets total in China, nearly 10 times as many as today.

“We’re in the first inning of a nine-inning ball game in China,” David Novak, Yum’s Chief Executive Officer, recently told Reuters. McDonald’s expects to have 115 drive-through quick-serve restaurants in China by the end of 2008.

China is also investing in multi-national protein producers—including those from the U.S., Europe, and elsewhere in Asia. As with fast food companies, for many, succeeding in the enormous Chinese market is essential to future profits. In February 2008, U.S.-based Tyson Foods, the world’s biggest meat corporation, announced a deal with privately owned Jinghai Poultry Industry Group to produce and process chickens to be sold under the Tyson brand label. Through the joint venture, construction of a new poultry operation in Haiman City near Shanghai will be completed that initially will process 400,000 birds a week. When at full capacity, it will expand to producing one million birds

## Biofuels, Animal Feed, Food Prices, and the Climate

The ethics of using corn, palm oil, and sugarcane to produce biofuels for use in industrialized countries has, rightly, been questioned—given the implications for global food prices, hunger, as well as the environment. Fuel crops compete with food crops for land and resources. They often require the clearing of additional grassland or forests that displace other species. Such clearing also not only releases carbon dioxide (CO<sub>2</sub>) into the atmosphere, fueling global warming, but also reduces the carbon-capturing capacity of the ecosystem.

A look at the data, however, indicates that much more of the global grain harvest is directed to animal feed than to production of biofuels. Between 2007 and 2008, the FAO estimates that 100 million tons of “cereals,” or four percent, will be used for biofuels, of which 95 million tons is corn. By comparison, 756 million tons of cereals, or 35 percent will be used for animal feed (a two percent increase over 2006–2007 levels). In 2007, 12 percent of the world’s corn was used for ethanol, while 60 percent was used to produce animal feed.

The largest portion of the global cereal harvest is still consumed directly by people: just over one billion tons, or 47 percent, a year. But, UN FAO reports, per capita consumption of rice and wheat has declined, due mainly, its researchers say, to increased consumption of animal foods, principally in China. As more people in the world who can afford to adopt a Western-style diet heavy on animal foods, competition over grain to feed farmed animals and to feed people directly is likely to increase.

each week. In July 2008, Tyson signed a preliminary agreement to buy 60 percent of the Shandong Xinchong Group, based near Qingdao in Shandong province and the fifth largest poultry producer in China. In 2007, Xinchong had sales of \$289 million. It has plans to process 125 million chickens a year after a new plant is completed later in 2008.

In July 2008, the state-owned China National Oils, Foodstuffs and Cereals Corporation (COFCO), China’s largest food importer/exporter and a Fortune 500 company, bought a five percent share in Smithfield Foods, the largest hog producer in the U.S. In 2007, Smithfield began exporting pork products to China. The company has sales of \$11 billion a year, but not a fully clean bill of health. Manure from the company’s hog facilities has polluted creeks and rivers in the U.S. state of North Carolina, and it has been accused of intimidating unions, hiring illegal immigrants, and violating labor laws.

COFCO, which currently produces half a million pigs a year, wants to increase that number to 10 to 15 million annually within three to five years. One of the intentions of the investment in Smithfield is to gain its support in making COFCO the largest pig producer in China. According to Zhang Xin Yue, a COFCO spokesman, the company aims to get the American corporation’s expertise to produce “healthy hogs” on a large scale in China. In order for its standards to meet those of the U.S., potentially opening a lucrative export market, COFCO has allotted ¥12 billion (\$1.74 billion) for what it calls the “Ecologically Healthy Live Hogs Breeding Program.” As part of the initiative, pigs will be allotted 16.5 square feet of living space each. That may be an improvement over what the pigs have now, but it still doesn’t offer them much room to move.

The International Finance Corporation (IFC), the private sector arm of the World Bank, has also invested in the development and expansion of factory farm operations in China. In 2003, the IFC provided \$61 million for the expansion of the Jilin Huazheng Agribusiness Development Co., a pork producer in Gongzhuling City, Jilin Province. In 2006, the IFC provided \$2.76 million of the Beijing Deqingyuan Agriculture Technology Co. Ltd.’s \$12.6 million expansion of its egg production facility west of Beijing. Currently, the company’s 500,000 layer hens produce 200,000 eggs a day. The new investment will allow it to add another 800,000 birds in layer sheds to produce an additional half a million eggs each day.

As intensive production systems expand, China’s animal feed industry, which already has a value of \$40 billion, is expanding, too, by 15 percent a year. Feed sales in China are expected to rise to \$50 billion by 2010. In rising consumption and production levels, Chinese and international companies see a market opportunity. U.S.-based Novus International, a major feed supplier, earlier in 2008 announced the opening of a new 23,000-square foot facility near Shanghai, with machinery made in the U.S. and China.

And, similar to the pattern in the U.S., animal agriculture in China is becoming more vertically integrated, with large corporations increasingly owning not just factory farm facilities, but also slaughterhouses and feed companies. China’s largest feed manufacturer, New Hope Group, for instance, has invested \$137 million in infrastructure at Chengde in Hebei province that will process one million “slaughter pigs” by 2015. Joint China–international ventures are also underway. In Hunan province, “feed-to-meat” integrator Hunan Tanrenshen plans to spend \$342 million on expanding production to 10 million pigs a year, in a partnership with U.S. pig breeder Whiteshire Hamroc.

A recent market analysis of China’s meat sector concluded that trends were toward

. . . larger-scale operations which increasingly rely on automation in production, packaging and transportation—a process which ultimately will create significant meat supply



companies. Although still in its earliest stages, this trend will develop as growers become actively involved in supplying to the fast-growing supermarket and hypermarket chains rapidly expanding outside China's largest cities.

Realization of such a scenario could, though, the researchers concluded, be curtailed by rising concerns within China about food safety in the market for meat.

## FOOD SAFETY

The rush to meet the growing demand for animal products in China, joined to a rapid expansion of supply, intense competition, often inadequate quality controls, and persistent outbreaks of disease among farmed animals, has led to a number of food safety scares. Internationally, incidents in China of "blue ear," SARS (severe acute respiratory syndrome), and recurring cases of avian influenza (see sidebar on previous page), have rattled food markets. A proposal for China to export processed chicken to the U.S. has met sharp resistance from U.S.-based food safety advocates, who have expressed concern about food-borne diseases like E. coli and salmonella, contamination, and unsanitary conditions inside Chinese facilities. "Say 'no thanks' to Chinese chicken imports" is the heading on an online petition on the issue directed to the U.S. Congress.

Jia Youling, China's chief veterinarian at the ministry of agriculture, indicated that as recently as June 2008 some livestock and fish farmers were still using banned growth-enhancing drugs, food coloring, and other chemicals, while feed additives with high concentrations of metal were polluting water and crops. In particular, he pointed to small-scale farms as lacking the means to manage waste and pollution; that they were unsanitary and didn't adequately immunize animals from infections—such as blue ear among pigs. China, Jia suggested, was a "disaster area" for animal-human transmissible diseases. He added that 60 million people were at risk in 12 provinces from *Schistosomiasis*, caused by water polluted by snails. Between 2004 and 2005, bird flu caused some ¥95 billion (\$US13.8 billion) in losses, and 20 human deaths; in 2005, 38 people died from *Streptococcus suis* (the bacteria that caused blue ear in pigs) in Sichuan province.

Concern over the safety of China's meat supply led Tyson to ship 25,000 pounds of "lean protein" (beef, chicken, pork) to China for U.S. athletes to eat at their training center during the Olympics. The use of growth-promoting drugs among livestock producers was highlighted when the caterer for the American team, Frank Puleo, found a chicken breast 14 inches long in a Chinese supermarket. "We could never have given it to athletes," Puleo said. "They all would have tested positive [for steroids]."

Food safety is not, according to Li's research, a major concern among animal producers in China. A chicken slaughterhouse owner told Li that no one tested for drugs in chicken meat; if

## Timeline of Avian Flu in China

**1996:** H5N1 found on geese farm in Guangdong Province.

**February 2004:** H5N1 reported in poultry in 16 provinces in China.

**July 2004:** Recurrence of H5N1 in poultry.

**May 2005:** China reports first outbreak of H5N1 in wildlife affecting several species near Qinghai Lake.

**June 2005:** Two H5N1 outbreaks in domestic poultry.

**August 2005:** H5N1 reported in Tibet Region.

**October 2005:** More outbreaks in poultry in several parts of country.

**November 2005:** China reports first three cases of humans infected with H5N1, 20 million birds are culled.

**January 2006:** Tenth case of human infection of H5N1 confirmed in China. Outbreaks reported in domestic poultry.

**May/April 2006:** Findings of H5N1 in wildlife.

**June 2006:** H5N1 findings in wildlife and domestic poultry.

**August and October 2006:** Reports of H5N1 in domestic poultry.

**March 2007:** Outbreaks in domestic poultry.

**September 2007:** Further outbreaks in domestic poultry.

**January 2008:** Outbreak in domestic poultry.

**February 2008:** 30th case of human infection from H5N1 confirmed in China; new outbreak in Tibet.

**April 2008:** H5N1 found at poultry farm in Tibet.

**June 2008:** H5N1 found in Guangdong province in live markets.

they did, he explained, and banned hormones or other drugs were found, all the meat would be rejected. Chickens are routinely given drug-laced feed until the end of their lives—so they survive the truck journey to slaughter. Because the internal market is large and increasing all the time in size and intensity of demand, Chinese farmers are not yet unduly worried about potential downsides in continuing to dose their animals. The meat from such chickens, however, would not be accepted by KFC or McDonald's in China, nor would it be viewed favorably by export markets.

A recent investigation into factory-farmed egg-laying chickens by two Chinese scholars revealed other unsettling realities. Some of these, such as the crowding and stress on production, are similar to operations in industrialized countries. Battery farming, write Jiang Gaoming, a professor at the Chinese Academy of Sciences' Institute of Botany, and Tang Aimin, chair of the China Scientific View of Development Research and Development Center, "ignores the birds' real needs, and crams seven or eight of them into each square meter. Additives, antibiotics, and drugs are used in great quantities . . . not to mention hormones that are harmful to human health." The farmers, they report, say they don't plan to eat the chickens themselves, just to sell them to city-



An intensive duck farm in southwest China. Peter Li/HSI/CIWF

dwellers. Factory farm workers are also at risk of exposure to particulate matter, gases such as ammonia and hydrogen sulfide, and are subject to respiratory diseases.

Jiang and Tang found that, despite the application of drugs, a significant number of the birds died—an average of a thousand a year in a facility housing 20,000 to 30,000 layer hens. Their research suggests that 80 percent of those birds are sold to small factories for "sausage" or used by roast chicken vendors on many of China's city streets; others become feed for other farmed animals, specifically pigs. Some birds suspected of having avian flu also end up in the food chain, after farmers refuse government orders to cull them, often fearing they won't receive the promised compensation.

The problem is "major," write Jiang and Tang, and threatens the health of consumers. "We suffer the consequences of

these unnatural farming methods." Their solution? An end to intensive production. "Chickens must be free of their cages and given space to roam . . . and live their natural lives," Jiang and Tang conclude. "Only then should China's people feel safe to eat chicken."

**Intensification means, according to the FAO, that "the livestock sector enters into more and direct competition for scarce land, water, and other natural resources." Such is the case in China.**

Chinese consumers themselves are also expressing concerns about food quality and safety, including the use of pesticides and chemical fertilizers and their residues in their food, as well as the presence of "veterinary" drugs and other feed additives used to increase farmed animals' size and make them grow faster. A household food survey conducted in Beijing in 2007 found that "far more households reported choosing food products according to quality and safety attributes than according to price." The younger generation in China is more aware of the health and environmental problems related to food production. But, as Professor Li notes, they never experienced hunger; for most Chinese over forty, food quantity remains a priority.

Animals confined in the cramped conditions prevalent on factory farms are more vulnerable to infections and, therefore, require more antibiotics and other veterinary drugs to reach slaughter weight. In the immediate aftermath of the first large-scale occurrences of the deadly H5N1 strain of avian influenza, confined systems were recommended over backyard production as the best means of avoiding or containing livestock disease.

But more recent analyses have come to a different conclusion: that the factory farm systems themselves—the crowding and reliance on drugs—provide a fertile breeding ground for avian flu and other animal diseases. In 2007, the FAO warned against a wholesale adoption of factory farm methods, stating that: "Excessive concentration of animals in large scale industrial production units should be avoided and adequate investments should be made in heightened biosecurity and improved disease monitoring to safeguard public health." Li's research also found that in China concentrated farming systems have been hardest hit by H5N1, not backyard producers.

## THE PRICE OF GRAINS

In 2008 alone, drought in Australia, snowstorms in China, the allocation of land for biofuels in the U.S, and a growing demand for meat and dairy products led to big increases in the prices of global grain and other foodstuffs. Grain prices in 2007 were 42 percent higher than in 2006.

Rising food prices have unnerved consumers around the world and in many poor countries there were angry demonstrations, shortages of staple foods, and growing need for emergency food relief. In China in 2008, prices for fish, beef, chicken, eggs, and pork, all increased. Whether higher food prices will be a permanent feature of China's, and the global economy, isn't yet clear. But the underlying trends suggest the price of food, as well as food security, will be ongoing, global concerns. Many analysts suggest that the era of cheap food may well be over; in future, those with low incomes and little ability to produce their own food will be most at risk of hunger, malnutrition, or famine.

A growing challenge to large-scale producers of farmed animals—and intensification of the livestock sector—is the availability and price of grain. Until now, China hasn't imported significant quantities of corn. But that is likely to change as China's livestock sector expands and intensifies. In factory farm operations, animals are confined in pens, cages, or stalls, without access to pasture, the remains of the harvest, or fresh air or sunlight. They reach slaughter weight (in the case of a "broiler" chicken, after about 40 days, for a pig, about six months) on commercially produced feed manufactured from industrial corn and soy.

Globally, 85 percent of soy produced goes to animal feed, and only about six percent is consumed directly by humans. China today is the world's largest importer of soy, receiving a net 33 tons of it in 2007–2008. Brazil is China's largest source, followed by the U.S. Controversially, much of Brazil's soy is harvested from plots that are often illegally cleared in the Amazon rainforest, where industrial soy is now a major driver of deforestation and biodiversity loss and soil erosion, both in the forest and in Brazil's savannah, the Cerrado.

Corn imports could soon follow. According to James Rice, head of China operations for Tyson Foods, 2008 will be the last year that China is self-sufficient in both corn and protein. "When China becomes a net buyer of anything, it causes the price to go up," Rice recently told the *Chicago Tribune*. "Look at steel and oil. The big question is, what happens when China starts to buy corn?"

## THE ENVIRONMENT

In its report on the livestock sector and global warming, the FAO declared: "The livestock sector emerges as one of the two or three most significant contributors to the most serious environmental problems, at every scale from local to global." In industrialized nations, scientific and public concern about the environmental impacts of factory farms is rising, encompassing both pollution of local water and air and its role in global warming. Intensification means, according to the FAO, that "the livestock sector enters into more and direct competition for scarce land, water, and other natural resources." Such is the case in China.

"Domestic animal and poultry waste has become a major source of environmental pollution," according to Wu Weixiang, associate professor at Zhejiang University's College of Agriculture. Many of China's large-scale animal facilities are located near waterways. Increasingly, links are being made between these facilities and pollution of ground and surface water as well as soil contamination.

In China's three most polluted freshwater lakes—Dianchi in Yunnan province, Chaohu in Anhui province, and Taihu in Jiangsu province—much of the nutrient residue found in the water, including nitrogen and phosphorous, comes from farmed animal wastes, according to Xu Cheng, a professor at China Agricultural University. Xu's research indicates that China's livestock produce 2.7 billion tons of manure every year, nearly three and a half times the industrial solid waste level. He estimates that China

## Recent Food Safety Scares in China

### 2005:

*Streptococcus suis* found in pigs in Sichuan province and linked to death of 38 people.

### September 2006:

Approximately 300 people in Shanghai die from pork containing the illegal feed additive clenbuterol.

### 2007:

Melamine in animal feed traced to wheat- and rice-protein concentrates in China found to contaminate over one hundred pigs in California; wheat gluten imported from China containing melamine found in U.S. commercial pet food linked to death of hundreds of companion animals; pet food by-products containing melamine, also traced to China, fed to chickens being raised for meat in U.S.

### February 2008:

Insecticide-tainted dumplings from China sicken over 175 people in Japan, leading to mass recall of Chinese products from Tianyang Food Processing, in Hebei Province, and prompting further investigation.



has 20,000 large- and medium-sized livestock operations, only three percent of which have facilities to treat animal wastes.

Since most larger facilities are located near cities, much of the manure the animals produce is not applied to fields; what isn't used as fertilizer is often discharged directly into waterways. Even when manure is used on crops, the soil in regions with many large animal facilities is already saturated with nutrients, leading to large amounts of run-off that makes its way into rivers, streams, lakes, and even coastal waters. The South China Sea, for instance, now contains a large "dead zone" virtually devoid of marine life; run-off from pig production in the southeast province of Guangdong, where densities of a hundred pigs or more per square kilometer are common, is a major factor. The animal wastes are degrading seawater, threatening mangroves and coral reefs, and causing "red tides," or massive algae growth.

The government is to ban the siting of large pig-producing units along the Pearl River in Dongguang City area due to concerns about pollution and environmental degradation. But

**The Chinese government is looking abroad, not only to global food markets but to Africa, Latin America, and other parts of Asia where agricultural land may be more readily available than it is in China, to produce food for people and feed for livestock.**

such action to contain the environmental damage from livestock facilities is not yet the norm in China. In his research, Li came across a village downstream from a duck farm in Chongqing, on the Yangtze River in the southwest of the country, where the river had run black for a decade due to run-off. People complained for years, but only in 2008 did the government force the owners to relocate their 40,000 ducks. The number of ducks is significant since, Li found, only "major animal farms" (those with 10,000 or more animals) are subject to any kind of regulation. Facilities with fewer, but as many as 8,000 to 9,000 animals, of which there could be several in a single village, are not regulated.

While strong and detailed environmental regulations do exist that would curb at least some of the water pollution caused by factory farms, there is inadequate enforcement. The relative power of provincial authorities often means the central government's regulations go unheeded, and industrial development is given priority over environmental considerations. Public concern, however, about water pollution is growing. In a survey conducted in the lead-up to the Beijing Olympics published in the *New York Times*, while 86 percent of Chinese surveyed were content with their country's direction, 66 percent said water pollution was a problem.

China's ability to keep expanding its food production capacity also may be slowed by competition for increasingly limited resources, such as land and water, from non-agricultural sectors, including urban development, heavy industry, and manufacturing. In 1980, 13 percent of China's water resources were used by industry and households; by 2000, the percentage had risen to one-third, leaving agriculture with two-thirds and the arid north of China increasingly thirsty and prey to water shortfalls.

China has only one-third of the world's per capita average of available arable land, and because of urban expansion the country has lost about eight percent more since 2000. The 470,000 square miles remaining is just 7,000 square miles above the minimum needed to ensure China's food security.

The grain harvest, principally rice, in Guangdong province, now known as the "world's factory," has dropped by 25 percent as industrialization has gathered pace and farmland has given way to development; between 1999 and 2003, the amount of farmland in Guangdong declined from 48 to 30 million mu (a Chinese land measurement in which 1 hectare is the equivalent of 15 mu or 2.471 acres). To meet its grain requirements—34 million tons annually—Guangdong now imports nine million tons a year, 70 percent from other provinces, and another 30 percent from overseas.

Moreover, official figures state that 10 percent of China's farmland is contaminated with pollution from chemical plants and steel factories, with 12 million tons of grain affected each year. "Land pollution has directly led to declining food quality," says Sun Tiehang, an ecologist and member of the Chinese Academy of Sciences. Despite a new national directive to hold companies accountable, weak enforcement of environmental regulations, especially in rural areas, authorities indicate, have meant that "some environmental problems have become the main factors endangering the health and property security of farmers."

In northern China, overgrazing and overfarming have led to the loss of nearly a million acres of grassland each year to desert. The resulting dust storms have hit Beijing, Korea, Japan, and even crossed the Pacific Ocean and blanketed the west coast of North America. Currently, a quarter of China is desert, an area that is expanding by nearly 2,000 square miles a year, north and west.

Global warming is also creating challenges. Every year, 50 million hectares (125 million acres) of farmland and 400 million people are affected by bad weather. In 2006, the warmest in China since 1951, floods, drought, and a typhoon took nearly 3,000 lives and cost ¥212 billion (or \$27 billion) in damage. The intensity of these weather patterns is expected to increase in the coming years.

## LOOKING FOR LAND ELSEWHERE

The rising prices of commodities and inputs, labor shortages and the higher cost for that labor, as well as restrictions on and resistance to the development of land—all in tandem with



Breeding sow in a medium-sized farm in eastern China. Peter Li/HSI/CIWF

shrinking supplies of groundwater, pollution, urbanization, and desertification—present challenges to China, whose population previously ate plant-centered diets and whose system of collectivized agriculture was focused on the production of food grains rather than livestock or horticulture.

Since the time of the famine, ensuring a sufficient food supply has been a national priority in China. As a result of these constraints on its capacity to be self-sufficient in food production, the Chinese government is looking abroad, not only to global food markets but to Africa, Latin America, and other parts of Asia where agricultural land may be more readily available than it is in China, to produce food for people and feed for livestock.

Chinese companies are already producing agricultural products for Chinese consumption in Congo, Cambodia, Laos, and Indonesia. Five billion dollars have been earmarked by the Chinese government to grow food and cash crops in Liberia and other African countries over the next half-century, including high-yield, disease-resistant rice and cassava. Chinese agricultural experts, and in some cases Chinese farmers, are advising on, and growing and harvesting, the crops.

It is rumored that China has acquired the right to farm 250,000 acres of corn in southern Zimbabwe, according, some analysts say, for China's reluctance to criticize the government of President Robert Mugabe, even though he and his associates have been judged responsible for serious rights violations, torture, and extrajudicial killings immediately before and after Zimbabwe's disputed 2008 elections. In Mozambique, China is seeking large land leases in the Zambezi and Limpopo valleys. China's state-owned Eximbank extended \$2 billion in "soft loans" (below market interest rates) to the government of Mozambique to build the Mpanda Nkua dam on the Zambezi River in Tete province, leaving open the possibility of financing more dams that would create contracts for Chinese companies to do the work.

At the same time, the Chinese government has requested leases for Chinese-run "mega farms" and cattle ranches in the two valleys, and lifted its 400 percent tariffs on imports of Mozambican agricultural products, including rice. A "memorandum of understanding" on the land leases was reportedly signed between the two governments in June 2007. It included provisions for 3,000 Chinese citizens, possibly rising to 10,000 in future years, to move to Mozambique to run the farms, overseeing local laborers. However, according to the Africa Policy Forum, the specter of Mozambique becoming an "agricultural colony" of China caused "such an uproar that the Mozambique government was forced to dismiss the whole story as false." Nonetheless, rumors that it will be revived abound in Mozambique.

In the meantime, other activities are moving forward. China has pledged \$800 million to modernize Mozambique's agricultural sector, with the aim of raising rice production by five times to 500,000 tons a year in the next five years, even though only a few Mozambicans, mainly among the elite, eat rice. With funds from agricultural exports to China, the Mozambican government can buy Chinese-made goods, including food and other commodities, on the world market. China is supporting the establishment of an advanced crop research institute and over a hundred Chinese agriculture specialists are currently in the country.

## PUBLIC HEALTH

In recent decades, the standard diet for millions of Chinese has changed radically. The percentage of energy in the average diet in China derived from fat increased by 10 percent in the decade between 1996 and 2006. Diet-related chronic diseases now kill more Chinese than any other cause. Data from China's Ministry of Health show that in the 1930s, 97 percent of the calories in the average Chinese diet came from grains and vegetables, compared to 63 percent in 2002.

Many in China's middle-class, defined in one measure as those in households earning \$10,000 a year, eat meat every day, sometimes at every meal. Guo Meng, a 20-year-old university student in Beijing, is one of them. Interviewed by the *Chicago Tribune* at a McDonald's in the city's Huajiadi neighborhood, not long ago an area where peppers were grown, Guo said: "I eat sausage in the morning, a meat dish and a vegetable dish for lunch, and the same for dinner. If there's no meat, I won't feel full, but if there's no vegetable, no problem."

China is increasingly characterized by stark inequalities in terms of food. The FAO reports that 12 percent of China's population is undernourished. But even as economic growth makes it possible for many more Chinese to eat a diet much higher in animal protein than their parents or grandparents could, and even as China's government seeks to augment the national diet by creating the conditions for animal products to

be more widely available, a direct result appears to be declines in some fundamental indicators of public health.

By 2006, about 60 million Chinese were obese, according to the government-affiliated State Food and Nutrition Consultative Commission. This was mainly due to an increase in consumption in the diet of fat and junk food and a decrease in the amount of grains and vegetables, which had, the committee said, resulted in greater incidences of diabetes as well as high blood pressure (this condition affects 160 million Chinese, nearly double the number in 1991).



Piglets in a farm in northeast China. Peter Li/HSI/CIWF

For many years, the traditional Chinese diet has been held up in other parts of the world as health- and longevity-promoting. For example, in a two-decades-long research project conducted by U.S.-based Cornell and U.K.-based Oxford University and the Chinese Academy of Preventive Medicine, researchers studied the eating habits of rural Chinese. They discovered more than 8,000 statistically significant associations between various dietary factors and disease—not least, according to the study’s director, Cornell professor T. Colin Campbell, the fact that “people who ate the most animal-based foods got the most chronic disease. . . . People who ate the most plant-based foods were the healthiest and tended to avoid chronic disease.”

A Harvard University School of Public Health study, commissioned by the World Bank, determined that significant consumption of red meats is likely to increase the risk of coronary disease and some cancers and that, in many settings, replacing some staple carbohydrates in diets with soy products, vegetable oils, and nuts may offer more health benefits than animal products. In 2004, the World Health Organization’s Global Strategy on Diet, Physical Activity and Health emphasized the need for policy measures that lead to greater availability and accessibility of a range of low-fat, high-fiber foods, including vegetables, fruits, whole grains, and nuts. Both the WHO and the FAO have acknowledged a link between consumption of animal fats and obesity, cardiovascular disease, and certain cancers.

The results of another study in China, this one conducted in 2008 by Barry Popkin, professor of nutrition at the University of North Carolina, found that one in four adults in China is “overweight” and 80 percent of Chinese are dying due to non-communicable diseases such as heart disease and cancer. The study noted that, contrary to conventional wisdom that obesity in China is a scourge of the more affluent, low-income people in rural areas were more likely to be overweight than richer city-dwellers. This pattern, while new in China, mirrors what has occurred in industrialized countries, where wealthier people now tend to have better, more balanced diets and are less likely to be overweight or obese than those with lower incomes.

In Popkin’s analysis, the main factors contributing to the increase in Chinese obesity were a move away from a traditional, balanced diet to one high in oil and meat, along with lifestyle changes—such as driving cars instead of riding bicycles, more sedentary work, mechanized agriculture, and watching television. The study concluded that obesity rates in China could double by 2028. Popkin recommended that, to reverse this trajectory, the government subsidize soy products, vegetables, and fruits, while taxing fats and sugars. Also worrying for China’s future public health is the fact that childhood obesity is on the rise. Nearly one-fifth of Chinese children under seven are overweight, according to a study by the Chinese National Task Force on Childhood Obesity.

Another public health concern gaining increased attention by U.S. researchers and health professionals is the widespread use of antibiotics by the industrial livestock industry, which has been linked to the precipitous rise in human antibiotic resistance; antibiotic residues remain in the animal products people eat. Antibiotic use can also increase the risk of animal-to-human disease. Half of all antibiotics used each year in the U.S. are used by the animal agriculture industry. The WHO has expressed alarm at the indiscriminate use of antibiotics in farmed animals in Asia and its effects on treating human disease.

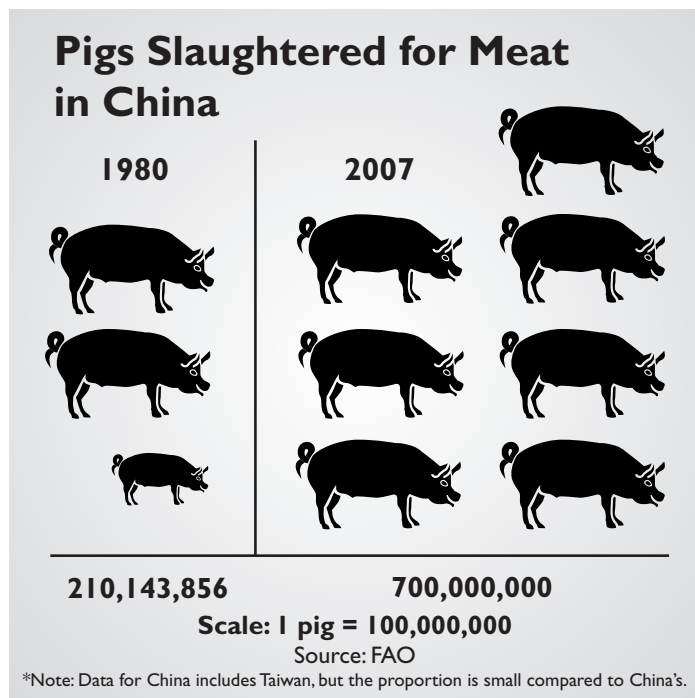
According to the WHO, more than 90 percent of some bacteria in Asia can no longer be treated effectively with “first-line” antibiotics like penicillin. Some experts see a link between the overuse of antibiotics in livestock and human deaths in China in 2005 from the *Streptococcus suis* bacteria that caused “blue ear” in China’s pigs. The bacteria, which rarely jump the species barrier and are generally treatable when they do, may have become antibiotic-resistant.

## ANIMAL WELFARE

Animal welfare, as understood in the West, is a relatively new concept in China, which has a long tradition of eating a wide range of animals, and Western ideas concerning the “rights” of animals are viewed with suspicion. Nevertheless, among the younger generation of Chinese, there is an increased interest in companion animals and a rising population of domestic dogs. More Chinese



under 40 years old are becoming aware of the health and environmental problems associated with intensive animal agriculture; a growing number of universities have student animal groups and some also have vegetarian associations.



In March 2008, Chinese rock singer Zheng Xie, lead singer of the band Giant Beanstalk and founder of the pro-vegetarian outreach group, “Don’t Eat Friends,” performed in Beijing, and planned for a 10-city concert tour to raise awareness of veganism and animal rights in China.

Issues of animal rights are now covered occasionally in the Chinese media and some in China are seeking to revive Chinese Buddhist traditions of vegetarianism, and to link consumption of meat and dairy products with some of China’s most pressing ecological problems, particularly water pollution. In a recent article advocating for vegetarianism on both ethical and ecological grounds, Jiang Jingsong, a Ph.D. affiliated with Tsinghua University’s Institute of Science, Technology, and Society, argued that to many Chinese, not eating meat “for the sake of the environment and animal welfare” raises the specter of the “enforced vegetarianism of poverty” and the “inadequate, monotonous, and unbalanced diet that poverty brings.”

But, Jiang notes, Beijing University’s vegetarian society was founded in 2000 and several Chinese universities now have similar groups. Vegetarianism in China has, “a bright future,” Jiang writes, and as an “up-and coming youth movement” in China it may counter the trends of ever-higher meat consumption and greater concentration of the livestock industry.

By any measure—such as the ability of animals to exhibit natural behaviors, live within a suitable habitat, experience freedom or the companionship of the same species, have

enough space to turn around, lie down, or flap their wings—the welfare of farmed animals in intensive confinement systems is poor. China’s factory farms are no exception. And while the rights and welfare of farmed animals are not high on the government’s, or agribusiness’ agenda in China, it is not wholly absent, either, according to Professor Gu Xianhong, given emerging market realities.

“Recently, more and more consumers and policy-makers [have expressed] concern about how animal products are produced on farms,” Gu says. “They demand that the animals should be produced safely and humanely by observing sustainable development, environmental protection, food safety and animal welfare standards.” Among Chinese farmed animal researchers, an emerging field is examining how improved welfare in production facilities, along with better conditions for transport and at slaughterhouses, could enhance meat quality, reduce death rates, and, as a result, help farmers increase their income.

The Chinese government has begun a feasibility study that allows pigs being raised for pork to play with toys. Tan Lei of the Pig Raising Research Center, which is affiliated with the Chinese Academy of Sciences, told *China Daily*: “A piglet is sometimes as sensitive as a baby. Ten days after birth, they are able to express such feelings as agitation, depression, and distress by biting the pigsty bars or their own tails.” In confined conditions, the pigs sometimes fight, causing skin wounds that can cause diseases. Toys, Tan says, can help. “Our experiment has shown that pigs without toys are sluggish and lazy. But those that play with toys are much happier and energetic. They sometimes chase me and even rub their noses against my legs to show their intimacy.”

Another reason for some attention being paid to the welfare of animals in food production is standards set by

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importing countries, particularly those in the EU. Because most of the pork sold in China’s domestic market doesn’t meet the animal welfare standards in some European countries, according to Gu, a market opportunity is lost.

As part of an attempt to engage the issue of farmed animal welfare in China, U.S. and European-based organizations Compassion in World Farming (CIWF), the Royal Society for the Prevention of Cruelty to Animals (RSPCA), the World Society for the Protection of Animals (WSPA), and the Humane Society International (HSI) collaborated on a two-day

conference in Beijing in March 2008 entitled “The Importance of Animal Welfare Science to Sustainable Agriculture,” hosted by the Chinese Academy of Social Sciences’ Rural Development Institute. About one hundred academics, scientists, industry representatives, and members of the European commission and the World Organization for Animal Health (OIE) shared experiences and perspectives on improving farm animal welfare in Europe and the U.S., and related research within China.

Although participants interviewed after the conference agreed it had been a good gathering, they also indicated that attention to the issue of farmed animal welfare in China is in its very early stages and that most indicators point to China following the path laid down by the U.S.: quickly developing an intensive, industrial system of animal agriculture. Some within the government and academic institutions who recognize the problems inherent in the model, believe that the challenges of factory farming in China might be finessed or overcome.

“If we can manage [the] intensive confinement system well, based on [the] normal physiological function and ethological demand of animals,” says Gu, who spoke at the conference “and also by making more animal excretion [available] to organic fertilizer to reduce the pollution, I think the impact posed by this system is solvable and not severe.”

Some conference participants from the U.S. and Europe also had the chance to address student animal- and vegetarian-focused groups at several Beijing-area colleges and universities. They reported a strong, positive reception among the students to the message of improved farmed animal welfare. Some skepticism within the Chinese government about the topic of the conference was evident; the department of agriculture, which was to have hosted the conference initially, eventually declined to do so. Such inter-disciplinary dialogues in future may address a seemingly more controversial topic: China’s adoption of the factory farm model itself, not just improving the welfare of animals already confined in intensive systems.

## CONCLUSION & RECOMMENDATIONS

In her memoir of living and cooking in China, Fuschia Dunlop writes of what her Chinese friends describe as a transition from “eating to fill your belly” (*chi bao*) to “eating plenty of rich food” (*chi hao*) to “eating skillfully” (*chi qiao*).

China, will, as it rapidly industrializes, globalizes, and seeks to modernize its system of food production, need to find skillful means to avoid the pitfalls of industrialized countries as they took this path a half-century ago. China’s development is taking place at a pace without precedent in human history. It is encountering realities in a span of years that, in the West, only became evident after decades.

For instance, water pollution from industrial animal facilities did not attract significant notice in the U.S. and Europe until

**The government, with participation from policy-makers, academics, civil society, and advocates, should develop a Chinese solution to a Chinese problem: How to ensure food security for the population without compromising social, economic, and environmental stability.**

relatively recently; in China, which has a far smaller proportion of factory farms than industrialized countries, this issue is already a subject for academic research and media discussion. Similarly, the public health consequences of the Western diet, such as obesity, diabetes, heart disease, have only in the last decade or so become part of the policy agenda. In China, a mere two generations after the famine, obesity is at near epidemic proportions.

Governments and citizens of industrialized nations are beginning to re-examine seriously industrial animal agriculture, as its immense costs to the environment—including the climate, public health, small farmers, food security, and farmed animals—become more difficult to ignore. Intensive systems are touted by agribusiness as ensuring food safety, but numerous animal-borne diseases have hit factory farms, including in China.

They are also pointed to as a means of reducing the substantial contribution of the livestock sector to global warming; but, in fact, the farmed animals in these systems are responsible for a greater share of emissions than non-industrialized farmed animals. Another rationale for intensification is food security; however, the water and fossil fuels required to run factory farms, transport the animals, and produce and ship the grains they are

**Monetary and other fiscal or policy incentives ought to be directed to producers of vegetables, fruits, legumes, and grains for direct human consumption.**

fed, divert vast resources from producing food for people, and are factors in the rapid rise of food prices around the world.

Whether this system can, or should—on ecological, economic, health, or ethical grounds—be replicated on a global scale is a very real question, not only for China, but also for emerging economic giants like India and Brazil, where the intensive model of animal agriculture is also gaining speed. The Pew Commission on Industrial Farm Animal Production writes this in its final report:

There is reason to wonder, however, whether these dramatic gains [in meat production], particularly those of the last 50 years, can be sustained for the next 50 years as the world’s human population doubles, climate change shifts rainfall

patterns and intensifies drought cycles, fossil fuels become more expensive, and the developing nations of the world rapidly improve their standards of living.

The facts and challenges outlined in this paper, in both their breadth and specificity, represent choices that must be made on international, national, regional, and personal levels. It is recommended that the following actions be taken:

- China's government should undertake a multi-sectoral analysis of the multiple facets and impacts of industrial animal agriculture for China, now and in the future, from climate change to arable land, from water pollution to chronic disease, from the use of grain to the welfare of farmed animals. On this basis, the government, with participation from policy-makers, academics, civil society, and advocates, should develop a Chinese solution to a Chinese problem: How to ensure food security for the population without compromising social, economic, and environmental stability. The model provided by the West has proved itself outdated and unsuitable to a world with growing populations, shrinking resources, greater concern for equity, and a climate under severe stress.
- The Chinese government ought to redefine its conception of short- and long-term food security so it doesn't give priority to a meat-centered diet. Meat in China ought to be, as it used to be, a condiment and not the mainstay of a meal. This doesn't mean consigning a majority of Chinese citizens to the "enforced vegetarianism of poverty," but rather orienting the agricultural economy toward supplying varied, nutritious, safe, plant-centered foods to all Chinese, regardless of social status, income, or where they live. (Such a recommendation is also highly relevant for industrialized countries as well.)
- Government subsidies that now support the expansion of industrial-scale livestock operations, owned by Chinese or foreign companies, should be ended. Monetary and other fiscal or policy incentives ought to be directed to producers of vegetables, fruits, legumes, and grains for direct human consumption.
- The "externalities" on which animal agriculture is dependent—such as riverine and marine water pollution, contamination of soil and groundwater, and land degradation—should be paid for, in full, by the industry and/or specific facilities that cause them. This might entail setting prices for ecological services at market rates or mandating mitigation technologies for all facilities already in operation or planned.

- Political openness, especially in policy-making, ought to be encouraged so that voices questioning intensive animal farming and promoting sustainability and a healthy lifestyle can be heard. Increased sharing of information and experiences of industrial animal agriculture should take place among policy-makers, academics, and civil society groups in China and other countries, both developing and developed. The process and outcomes ought to be shared with Chinese citizens, through information and awareness-raising campaigns, as well as outreach to the media.

**As never before, the world is being confronted by the limits of ameliorative technology to correct systems that functionally cannot operate within the context imposed by climate change, finite ecosystems and resources, and the end of peak oil.**

- A forum or other means for ongoing exchange between Chinese government officials and international environmental, food security, and animal welfare NGOs (Non-governmental Organizations) that call for phasing out or avoiding fully industrialized farming ought to be established.
- The growing environmental movement in China ought to include the issue of intensive animal agriculture within its analysis, awareness-raising, and advocacy activities, and collaborate with civil society groups working on related issues. NGO groups working in both the North and South on environment, climate change, food security or sovereignty, food safety, rural livelihoods, and animal welfare should find means (including via the Internet) to exchange experiences, insights, and information with Chinese colleagues.

As never before, the world is being confronted by the limits of ameliorative technology to correct systems that functionally cannot operate within the context imposed by climate change, finite ecosystems and resources, and the end of peak oil. Factory farming is one of a cluster of such systems that require a radical rethinking beyond and above simply tinkering with the component parts. The risk, as more and more international bodies and government institutions are recognizing, is entire systemic collapse. China doesn't have to be either a victim of these changes or make them worse. The inevitability of China's development provides a set of challenges and opportunities for innovation on a scale and at a speed that could allow it to develop its economy, provide food security, leave a clean environment for its citizens, and forge a new vision of sustainability.



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This case study on China is part of a longer policy paper examining the links between the globalization of industrial meat production, climate change, and other serious environmental, economic, and social issues. In addition to China, the final publication will include case studies on Brazil, Ethiopia, and India. It will be available in autumn 2008 in English, with executive summaries in other languages at Brighter Green's website: [brightergreen.org](http://brightergreen.org). Links to additional resources Brighter Green has compiled on the globalization of industrial animal agriculture are available at [brightergreen.org/links.php](http://brightergreen.org/links.php).

Brighter Green welcomes feedback on this case study or any other aspect of its work.

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