

development must necessarily include Marxist philosophy of the natural sciences in the universities and academies of the natural and social sciences.

**[US] Ganesh K. Trichur**

**Contact Information**

Address:

Telephone:

Fax:

Mobile:

Email Address:

Homepage:

Assistant Professor, Political Economy, St. Lawrence University, Canton, NY 1361

I teach global political economy, Asian political economy, and Chinese political economy. Recent publications of mine include:

"Political Islamism and Political Hinduism as forms of social Self-Protection in the Modern World-System", in Khaldoun Samman and Mazhar Al-Zo'by eds. (2008) *Islam and the Orientalist World-System*, Palgrave, NY

"Spectacular Privatizations: Perceptions and Lessons from Privatization of Welfare and the Privatization of Disaster", in Hillary Potter ed. (2007) *Racing the Storm: Racial Implications and Lessons from Hurricane Katrina*, Lexington Books, Maryland.

"The New Imperial Conjuncture and Alternative Futures for the Twenty-First Century Global Political Economy", in *Globalizations* (Routledge) May 2005

"Empire and Its Multitude" (co-authored with Steven Sherman), in *Journal of World-Systems Research*,

## **Political Economy of Food Security in Twenty-first Century China**

**[US] Ganesh K. Trichur**

### **Introduction**

In *The New Imperialism*, David Harvey (2003) argues that the US invasion of Iraq is ‘all about oil’, in the context of the global overaccumulation crisis and the post-1970s ‘financial expansion’ (Braudel 1982). However, alongside the world financial expansion a simultaneous ‘material expansion’ (Arrighi 1994) is taking place in China: this “disruptive, violent, and gargantuan program” of “primitive accumulation” in China, Harvey warns, will spark a rate of economic growth and public infrastructural development capable of absorbing much of the world’s capital surplus. By all accounts, China is engaged in a frenzied process of destructive creation since the late 1970s reform period. ‘Socialism with Chinese characteristics’ entails rapid growth of a market economy system and new forms of policing and state-regulation of Chinese workers, peasants, and migrants. The entire post-reform economy (1978-2003) has experienced an average annual rate of growth of 9.4% per annum. The share of ‘agricultural industry’ in GDP declined from 50% to 15%, while the share of manufacturing industry increased from 30% to 52%, and the services-share rose from 20% to 33%; and the percentage of Chinese living in urban areas increased from 20% to 40% (in a country of 1.3 billion some 500 million today live in urban areas). Over the same period, the value of foreign trade (exports and imports) grew by 15.2% per annum (from \$20.64 billion to \$851.2 billion). In 2003 China consumed 55% (820 Mt) of global cement output (1.5 billion tons) for construction projects, and automobile consumption increased by 81% increase over 2001-2 (Shi Guang 2004). China is the world’s second-largest importer of oil; it currently consumes half of the world’s cement, 33% of world-steel, 25% of the world’s copper, and 20% of the world’s aluminum, much of it traveling through the Straits of Malacca, Sunda, Lombok, and Makassar (Jung-En Woo 2007: 57-69). Such Chinese competition for surplus capital will have calamitous effects for the military and private sectors of the US economy, which currently feeds off capital inflows to support its own unproductive consumption. Surely the US would be tempted “to use its power over oil to hold back China, sparking a geopolitical conflict at the very minimum in central Asia and perhaps spreading into a more global

conflict” (Harvey 2003: 208-9). The increase in oil prices from some \$86/barrel in 2002 to nearly \$100/barrel in 2008 really appears here to stay, and to exert a brake on the Chinese growth process.

In this essay, however, I want to ask whether the US can perhaps “hold back China” in another important manner, insofar as China obliged it to feed 1.3 billion people (20% of the global total) even as urban and industrial expansions aggravate losses of cultivable farmland, and higher disposable incomes drive dietary transitions especially in the rich coastal provinces. Intensifying application of synthetic fertilizers appears to lead to declining productivity of farming inputs. Finally, China’s agro-ecosystems are steadily deteriorating along with growing water shortages and spreading environmental pollution (Smil 2004: 122). The combination of these circumstances may well make China uncomfortably food-dependent in a world economy spearheaded by a US-led ‘globalization project’ that has redefined food security. By challenging Article XI in the 1986 Uruguay Round of the GATT on the grounds of the superior efficiency of free world markets in food, the US argued, “*Self-sufficiency and food security are not one and the same*”. In this “global conception” of food security, “the ability to acquire the food you need when you need it – is best provided through a smooth-functioning world market”, and this would entail that “the permission to restrict or inhibit exports of agricultural food products to relieve critical food shortages be removed from Article XI”. Inextricably enmeshed in the global market, will China also become food-dependent? The question of food security has historically produced different counter-movements as a backlash against both liberal and neoliberal globalization. In this essay, I want to ask whether China’s rapid modernization and reproduction on an expanded scale may irretrievably undermine the social and eco-systemic foundations of its agrarian past, and thereby stultify sustainable growth prospects for a food-secure future. Additionally, what are the forms of what Karl Polanyi calls social ‘self-protection’ emerging in China against the effects of self-regulating markets in food and land?

In the first section, I relate late-imperial China’s (1700-1911) food policies to environmental legacies and grain seizures and look at some contrasting versions of food and environmental relations during and after late-imperial China. Next, I look at some evidence on contemporary relationships between inequalities and food security. In the third section I consider the relationship between food security and state policies towards internal migration in the context of what Solinger (1999) calls the “marketization” of contemporary China. In the final section, I evaluate the implications of the question raised by Lester Brown (1995) on whether China can feed itself. (The conclusion is somewhat open ended).

## **I. Historical food security and environmental legacies**

Following O'Connor, we may see the late Imperial Chinese state – during the Ming Dynasty 1368-1643; and the Qing Dynasty 1644-1911 – as both “the basis for the reconstruction of nature, and [of Chinese] relationships to nature”, even as it was – along with capital – “deeply implicated in the crisis of nature” (O'Connor 1998: 155).

Bin Wong (2000: 213) argues that an “approximate balance every year” at least until the 18<sup>th</sup> century, characterizes the relationship between China’s growing population and an expanding food supply. However, grain seizures by poor households occurred in almost all Chinese provinces during the 18<sup>th</sup> and 19<sup>th</sup> centuries. A key to understanding this turnaround lies in food grain policies in late Imperial China, which combined a vibrant history of local and long-distance trade in food grains, embedded in Smithian dynamics of commercial capitalism (Wong 2000). Since at least the Song dynasty (960-1279 AD) to the 18<sup>th</sup> century, local and long-distance grain trading networks integrated different regions using extensive waterways along the Yangzi River; these food grain networks co-existed with specialized production of cash crops and handicrafts. These grain trade routes contracted – when increased demand for grain closer to the sources of surpluses reduced grain exports to distant places – and disrupted when wars and rebellion broke out. Grain seizures occurred in almost all Chinese provinces during the 18<sup>th</sup> and 19<sup>th</sup> centuries: they entwined with the political protests that toppled the Manchu regime (Wong 1982: 781-82); and they attended the demise of the imperial system and posed one of the challenges faced by the leaders of the Chinese revolution (Wong 2000: 227). I argue that these grain seizures were a form of what Polanyi calls “social self-protection” by affected peasant communities. The structural conditions for grain seizure as a form of self-protection by communities arose out of competing claims between local and long-distance trade. Apart from full-blown subsistence crises, grain seizures took place both when rich households (*fuhu*) hoarded grain and raised export prices, and when grain exports from regions with good harvests raised prices in these regions. The Qing state actively encouraged long-distance grain trading by merchants who moved grain from surplus to deficit areas, in response to regional price differentials. It redistributed grain tribute from fertile Yangzi provinces to regions facing immediate shortages. It used “ever-normal granaries” (government granaries located in county seats) to buy and sell grain to stabilize seasonal supply fluctuations. The state also promoted community and charity granaries stocked by contributions from the wealthy and levies on the land. These state efforts reinforced “customary” circulation; that is, the pattern of loans, aid, and reduced-price sales that the rich made to the poor outside a “free” market nexus. It opposed hoarding by the rich and maintained granaries as a safeguard against years of poor harvest. “The expectations of those seizing grain were therefore grounded in assumptions about grain circulation shared by the state. Indeed, the failure of granaries to provide grain prompted riots”. Nevertheless, the state ‘rarely tolerated people’s blocking the commercial circulation of grain’, though it sometimes approved popular demands for lower grain prices (as in 1726). Official reaction to grain seizures reflected the state’s twin

commitments to stable local prices and to transfers of grain from areas with low prices to those with higher prices (Wong 2000: 215-16; 226-8). The conflicting pull of these two commitments increased over the 18<sup>th</sup> and 19<sup>th</sup> centuries with the expansion of commercial circulation. However, over the course of the 19<sup>th</sup> century, the central government could not effectively coordinate long-distance grain circulation and at the same time build up local grain reserves: “Grain mobilization for military campaigns gradually displaced efforts to manage civilian food supplies” (Will and Wong 1991: 75-92). Compared to the late-imperial State’s efforts to coordinate an empire-wide coordination of food policies, the 19<sup>th</sup> C. devolution of intervention in food-supply conditions to provincial and county levels, represented a political retreat. As a result, provincial officials making food-supply decisions on their own increasingly confronted the central state; a ‘weak agrarian protectionism’ at the provincial level made food-supply integration across provincial borders more difficult (Wong 2000: 226).

Wong however maintains that “Protecting their access to food when it was threatened by competing claims, however, was *not primarily a struggle of men against nature*, but a deliberate confrontation between men ... lacking food and those controlling it. Poor harvest merely exacerbated an already contentious situation” (Wong 2000: 210: emphasis added). Mark Elvin (1998) poses a somewhat antithetical question: Why was China’s impressive pre-modern economic growth “so often pushed beyond the limits of a sustainable and enriching co-existence with the rest of the natural world?” Elvin argues that longer-term patterns of Chinese history after 6 AD deeply intertwine with its environmental history under the Sui-Tang Empire, the Five Kingdoms and the Northern Song. Continual military competition in a war-dominated Chinese universe accentuated economic and environmental strains in pre-imperial China. Militarism became the driving force behind the agrarian-urban transformation. The linkage between hydraulic schemes and military logistics, both the supply of food and its cheap transport by water, was a commonplace in official thinking during the first millennium A.D. The social power of families and individuals rested on and partly reflected the successful competitive appropriation and development of natural resources (Elvin 1993:18).

If technology in much of pre-modern China continued to improve at something like an “adequate” rate, it slowed down in late-imperial times alongside a continually growing population. A chilling bleakness permeates the environmental descriptions of the late imperial period in China. Economic, environmental and social stress is evident everywhere, and apart from its market network, there is not much margin in difficult times. It was a world of intensive rice-farming, with multiple cropping based on dryland winter crops that could provide half the year’s harvest in a good harvest-year, but the extra cost in labor was draining the paddies as dry as possible before planting, just as the polder walls had to be rebuilt each year to stop flooding (Elvin 1998: 738; 752-3). Because of empire-wide

diffusion down demographic-pressure gradients, “the only equilibrium that might have been possible – leaving overseas migration to one side – was thus an empire-wide one”. A “late-imperial high-level equilibrium trap” emerged out of the growing scarcity of technically accessible resources. However, the intensification of a market-orientated economy ‘created pressures to cash in natural resources at a faster rate’: by 1900, most of China was stripped of the forest cover that three millennia earlier had covered it in almost unbroken succession from the tropical rainforests of the far south to the conifer forests on the northern mountains (Elvin 1993:29). Elvin’s most recent work on ‘the retreat of the elephants’ refers to the long retreat, from the northeast to the southwest of the elephants of China. This retreat ‘maps *in reverse*, both in space and time, the growth of the Chinese farm economy’. The space dominated by elephants was the *complement* of the space dominated by humans. It also symbolizes the gradually accelerating transition, “from an environmental richness counterbalanced by perpetual dangers from wildlife, to a sedentarized human dominance accompanied by a relative security from wild animals”; and an eventual scarcity of all types of wilderness (Elvin 2004:17-29).

Despite Elvin’s gloomy assessments of Chinese agricultural practices, traditional Chinese agriculture is widely regarded as “a paragon of organic agriculture” (Sun Han). Smil points to different traditional Chinese agro-systems, based on varying usages of nitrogen nutrients to the soil. However, long run climatic changes, limits on multicropping, inadequate water supplies and the necessity to grow other non-food crops (above all fibers) reduced the ‘carrying-capacity’ in excess of 10 people per hectare of arable land. Consequently, the early 20<sup>th</sup> century mean agricultural carrying capacity for South China was 7 people/ha, and it was depressed further by northern dryland farming to a national average carrying capacity of 5.5 people per hectare in the early 1930s, and this carrying capacity of land remained the same in the 1950s because little change occurred in China’s nitrogen supply. Further, after centuries of converting natural ecosystems into farmland, there was little good quality cultivable land left (Crook 1988). Only marginal gains were possible. Both the extensive and the intensive mode of China’s traditional farming had reached the limits of their performance. In the early 1950s, traditional organic farming produced not more than 90 kg of plant protein per hectare of farmland. The only way to break through the nitrogen barrier was to turn to *inorganic fertilizers* based on synthetic ammonia. This was clearly not forthcoming until 1972 (following the historic Nixon-visit) when Beijing ordered 13 ammonia-urea complexes from the US, that enabled China to break through the ‘nitrogen barrier’.

If China’s increasing dependence on the Haber-Bosch synthesis of ammonia is inevitable, the negative economic, environmental and nutritional consequences are not preordained. Since China’s entire food system offers some of the world’s most convincing examples of *widespread inefficiency and waste*, “even a relatively modest effort to eliminate these failures would go a long way toward securing adequate food for coming

generations” (Smil 2004: 120-22).

## II. Inequalities

The “retreat of the elephants”, observed by Elvin as a metaphor for China’s entrenched environmental insecurities appears matched only by China’s tremendous post-1978 “retreat from income equality” (Riskin et.al., 2001) which is one of the ‘the root causes of present-day hunger and malnutrition’ (Zhu Ling 2001 in Riskin 2001). A slow rate of diffusion of non-agricultural activities over the population, and hence the inequality of opportunity to gain from off-farm employment, remains the main culprit behind this other retreat. The gap between the richest 3% and the poorest 10% in China rose from a multiple of less than 8 in 1988 to almost 12 in 1995. If the Gini coefficient of inequality rose by 1 percentage point *per year* between 1988 and 1995, inequality of *rural* household income per capita rose by 23% over the seven years (1988-1995) and inequalities in *urban* household income per capita rose even faster, by 42%. Inequality between *coastal and interior regions* has widened sharply. The average income premium received by urban and rural residents in eastern coastal regions relative to that received in the more backward west rose from 58% in 1988 to 76% in 1995.

Inadequate food supply for the poor is still a phenomenon that exists in present-day China, largely a result of ineffective coordination of ‘food intervention’ and ‘income intervention’. Zhu Ling argues that are poverty, social inequality, and inadequate education’.

Prior to the 1978 economic reforms, despite the urban-rural income gap, personal income in both rural and urban China, was relatively equally distributed. Urban residents could avoid hunger despite low wages because of state subsidies to basic consumer goods and services. The urban food-supply system was the most distinctive kind of food intervention. Originating from an urban-biased industrialization strategy, an urban rationing system applied to urban citizens so that only registered urban citizens (through the *hukou* or household registration system) were entitled to purchase food at subsidized prices using coupons for grain, vegetable oil, meat, eggs, milk, bean curd). No such subsidized welfare system applied to the rural sector, and two-thirds of the rural population (350-400 million people) suffered from food shortages during the Maoist regime despite the fact that Mao’s mass-line strategy struck deep roots in rural society.

There appears to be a trend decline in rural poverty (from 250 million in 1978 to 65 million in 1995) and a trend rise in urban poverty. If the Reform Period (1978-1995) in China has seen a general increase in incomes everywhere, income inequalities have also sharpened: The *rural Gini coefficient* of inequality increased from 0.21 to 0.34; the *urban Gini* increased from 0.16 to 0.28; and the *ratio of real urban PCY to real rural PCY* increased from 2.36:1 to 2.79:1. *Inter-Provincial income disparities* also widened. The poor are still concentrated in the countryside, and rural poverty is far more serious than urban

poverty. The nutrition status of Chinese improved broadly during 1982-1992 –demonstrated clearly by the diversification of food consumption. The Chinese Nutrition Association of 1988 recommended a daily energy intake per person of 2400kcal. During 1982-1992, average dietary pattern of the Chinese gradually approached these recommended dietary allowances. However, during the same period, the heights and weights of urban children, both boys and girls, registered much bigger increases than those of rural children. The poor areas of southwest and northwest China have most of the country's chronically malnourished children. Nutritional deficiencies are concentrated among rural low-income groups, and "poverty plus disease" is a chronic predicament of low-income groups. Low income explains inadequate energy intake among the rural poor. What are the State's food policies in this regard? Zhu Ling argues that relief grain neither reaches the poorest, nor is it given to people who are the most energy-inadequate. Mutual assistance among farmers is the principal means to address food shortage among the poorest. In the remote mountain regions, barter trade takes place. The agricultural production reforms (the rural household responsibility system in place today) at the end of the 1970s equally distributed land-use rights among rural households within almost every village community. This has greatly increased rural food security (Zhu Ling 2001). While the efficiency of food production and distribution has improved in rural areas, there is currently no rural social security system, and there is no effective state delivery of grains to the poorest and the neediest, especially in times of harvest shortfalls and in times of natural disasters. With the lifting on the ban on free marketing of farm products, and the gradual elimination of urban subsidies, the predicaments of urban and rural dwellers in urban areas, are however increasingly convergent (Solinger 1999; Zhang Li 2001).

### **III. Migrants and food insecurities**

How do questions of food security relate to the massive internal migration that constitutes one of the durable dynamics of the Chinese great transformation? Solinger (1999) points to the "unlikely alliance" of bureaucrats and urban citizens against rural migrants in a context of sweeping marketization of land and food relations since 1978. I argue that this is one of the key forms of social self-protection (Polanyi) taking place in urban China. In the 'sunset of planned society', the floating rural migrant population appears as a specter in the eyes of urban citizens and state bureaucracies. It continues to serve as 'a target for the release of the many frustrations and anxieties' experienced by urban residents (Solinger 1999; Li Zhang 2001). Markets and migrants threaten both the privileged position the urban *hukou* gave city dwellers and the sense of certainty about daily provisioning they had long taken for granted (Solinger 1999: 100). A potentially more dangerous form of social self-protection – dangerous for State stability – against

unregulated markets is the spurt in agitations by ruralites *and* urbanites, though the possibility of a *fusion* of urban and rural interests against unchecked markets may still be somewhat far away. Official inequities – in the form of arbitrary exactions from the peasants – led to 200 scattered rural uprisings in 1992-93.

During both late-imperial dynastic rule (1700-1911) and the Republican Government (1912-1949), migration was “actively encouraged or at least permitted rather than restricted”. By contrast, PRC rulers (1949-1978) followed the Soviet example of the *propiska* (an exclusive permit for living in cities) system with internal passports for urban people alone, to segregate urban from rural people, in order to facilitate transfers of adequate food to feed the industrial workers in the urban factories. It also invented a special registration system, the *hukou*, which through a State Council Directive in 1955, fixed people permanently to particular places, based on their birthplace or their husband’s residence. Residence status thus became an ascribed, inherited status that determined an individual’s entire livelihood and welfare, based simply on where the registration was located. In June 1955, the State Council promulgated “Temporary Methods for Supplying Urban Grain Rations” so that only urban residents were eligible for the state’s grain. In November 1955, the “Criteria for Demarcation of Urban and Rural Areas” drew a strict boundary between urban and rural areas and prohibited migration from rural to urban areas. A set of directives in 1958 denied food grain to anyone in the city not in possession of valid registration documents. Unauthorized transience remained impossible until ‘the Great Leap Forward’ (1958-1960) with its hunger for peasant laborers precipitated one of the worst famines in Chinese history.

If the reforms of 1979 finally abandoned the collectivized system of rural command farming, marketization in China materialized in the 1980s against the backdrop of “the stickiness of the socialist state”. The State created multitudinous movers – a “floating population” (*liudong renkou*) – out of the surplus and redundant labor in the communes. Land contracts for individual peasants accompanied the dissolution of the rural communes (Solinger 1999: 45-6; 149; 195). In the late 1980s, most of the surplus labor from rural China (90%) migrated from central and western China and headed towards the coastal cities of the east. This “coastward surge” directly derived from state policies and foreign investments that privileged coastal growth. Unfavorable State policies towards agriculture sustained a persistent rural scenario of low agricultural incomes from low ratios of land per person (surplus labor). It also provided strong incentives to leave the countryside. Nevertheless, most peasants were not forced to leave home, once the *household responsibility system* gave every household a plot of land.

Market reforms nevertheless systematically undermined the bastions of control that had barricaded the cities for so long. On the one hand the reforms engendered an urgent hunger for low-paid and flexible labor in rapidly mushrooming construction projects; and it gave big cities a chance to satisfy their gaping demands for fresh food as well as for

different services. Migrants fostered possibilities for breakneck economic growth even as markets ‘freed the state from its charge of provisioning all of the city’s residents’. By the mid-1980s, peasants were allowed to enter cities provided they were ‘equipped with funds and if eating their own grain’; and the state offered peasants ‘urban registration for those with self-supplied grain’ (Solinger 1999: 48-9).

On the other hand, market reforms undermined the “urban public goods regime” constructed during the Maoist period, a regime that had created the institutions framing urban citizenship: it provided urbanites with administratively allocated, guaranteed jobs; underpriced transportation and water; cheap food and electricity at stable cost; and stable law and order in the city. The market reforms undermined these benefits, and migrants provided the scapegoat for the new urban resentment against the ills of the new markets. Urban dwellers feel that migrants are a threat to their iron rice bowl and their situation of living in ease and comfort (Solinger 1999:106). A common complaint refers to dwindling supplies of subsidized grain. City-dwellers see ‘floaters’ as free riding on urban grain supplies. As late as 1990 subsidies for urban food supplies alone were around 32% of local state expenditure, although urban subsidies were reduced throughout the 1980s. Deregulated grain prices in 1992 reduced national subsidies by 15 billion Yuan. By 1990, large cities experienced frequent water supply cutoffs; and over 180 cities nationwide were short of water. Migrants allegedly depleted food stocks and created inflation in food prices (meat, vegetables, and food grains). The blame for the food shortages and the attendant inflation falls on the three million peasants in the Pearl River Delta.

Solinger argues that not only had *organized urban agitation* begun to appear in the mid-1980s; in addition, since urbanites are becoming more like migrants in their search for work, there appears to be “a growing *convergence* of sorts in the job situations of migrants and urbanites” as Chinese urban society undergoes a profound metamorphosis. The “specters of rebellion and upheaval or nightmares of an overwhelming of the structural foundations of the cities”, Solinger concludes, “may ultimately press the political elite to drop the official barriers against peasants’ full and legitimate assimilation into the formal urban world” (Solinger 1999: 284-89). It may also force the State to underpin the demand for reforms raised by urbanites and ruralites alike (Perry and Selden 2004).

#### **IV. The debate over food security in China:**

In this final section, I consider the implications of the Brown-Smil debate over food security in China. Lester Brown’s main conclusion – that China faces the prospect of continuously falling grain harvests – is not correct. In 1994, China’s harvest fell by 2.5% (to below 400Mt) compared to a record output of 1993; but in 1995, 1996, and again in 1998, grain output reached record levels of 467Mt, 485Mt, and 456Mt, which were far

ahead of the population growth. If Brown's scenarios verge on the apocalyptic, his five trends regarding food supplies in China are worth engagement.

I: *Rising Demand for Food*: Brown points out two long-term consumption trends in China. The first is that China's consumers – 13 million people are added every year to the population – are moving up the food chain, i.e., food demand is rising. China's rising incomes will intensify demand for feed grain to produce meat and fish, leading to global increase in food prices and to global shortage of staple cereals. However, average per capita food availability, at 2700 kcal/day since 1985, is a rate about 5% behind the Japanese mean food supply. Second, major *qualitative changes* in dietary habits, like advancing westernization of urban diets – a trend *decline* in consumption of coarse grains and tubers combined with a trend *rise* in intakes of fine milled wheat, rice, and traditional non-staples (plant oils, eggs and fruit, pork purchases, and alcoholic beverages) – will increase the demand for wheat, meat, sugar, alcohol, and oils. This will not only double grain demand during the next generation; it will also increase the pressure on grain harvests from shrinking farmlands and scarce irrigation water, and increasing environmental pollution. Future rates of consumption increases will slow down, but given the low rate of Chinese urbanization (urban population is 33% of China's total population) and great urban/rural disparities of food intakes, the pattern will not stabilize soon. Jun Jing (2000) and David Watson (1997) also note the dramatic changes in the dietary patterns of 300 million Chinese children (20% of the world's children) – who increasingly prefer fast-food restaurants – due to inter-generational differences in what Guo Yuhua calls “dietetic knowledge systems”. Sharply cut off from any knowledge of their fathers and grandfathers' worlds of food shortages, the new consumerism of China's “little emperors” is sharply at odds with Chinese traditions and food systems. China has many of the health problems associated with a rapidly industrializing country.

Against Brown's observations, Smil argues that China's population may stay well stabilize around 1.4-1.5 billion after 2030 (UNO 2002), which is below the 1.6 billion assumed by Brown. China's food balance sheets show no decline in per capita food availability between 1997 and 2000, and shifts in diet consumption continued within this overall stable supply. “There does not seem to be any insurmountable biophysical reasons why China should not continue feeding itself during the next two generations” (Smil 2004: 137). Despite a production level in 2001 equal to the early 1990s, when population was 11% smaller, there have been no grain shortages. Lower demand accounts for only a small part of this discrepancy. China's enormous grain stocks explain most of it: China has anywhere between 250Mt to 500Mt of stored grain. According to the FAO (2002), between 1998-1999 and 2000-2001, China's corn, wheat and rice imports totaled 2.8Mt while exports of these cereals reached nearly 30Mt.

II: *Rising Environmental Constraints (loss of arable land, water-crises, and yield-crises)*: One estimate of cumulative long-term costs to the Chinese economy through

rising rates of erosion, salinity, and farmland losses, puts it at 6Mt of grain per annum (Huang and Rozelle 1995). During 1957-1990, China lost 15% of its farmland (0.5Mha on average per year since 1980) mostly from rising intensity of farmland use in the coastal provinces and average farmland availability declined from 0.18 to 0.08ha/person. Water shortages are an ubiquitous urban reality; and every northern and northwestern province experiences chronic water shortages. In North China, it affects an area whose size is 10% larger than the area of France (over 600,000 square kilometers). Smil (1997) estimates that the economic costs of eco-systemic degradation in China is equivalent to at least 10% of the annual GDP, with roughly 20% of that cost attributable to losses of agricultural production. Flooding serious enough to reduce crop yields by at least 30%, affects 4-9Mha of farmland annually. This makes China severely dependent on irrigation water. Densely inhabited Northern China (covering 1/3 of the country with 40% of the total population) grows 40% of staple grains but receives only 25% of the total precipitation. Large-scale irrigation of the North China plain through shallow tube-wells (1960-1980) led to excessive exploitation of aquifers and growing ground subsidence. The Huanghe supplied 33% of irrigation water on the plain, but the stream exhausted itself long before it reached the sea, through a combination of recurring droughts and higher agricultural, urban, and industrial demand. Irrigation has increased the elevation of the Huanghe's riverbed (the river supplies 33% of irrigation water on the North China plain) above the surrounding countryside (in Henan and Shandong provinces). Peninsular Shandong and southern Shanxi face the greatest water shortage. In Shanxi, the expansion of surface coal mining and large coal-fired power plants increase the strains arising out of inadequate drinking water. Rising fertilization rates bring lower yield responses and a higher demand for urban and industrial water uses competes with limited supplies for irrigation. Risks of flooding are continuous, since 10% of China's territory, inhabited by 66% of its population produces 70% of all agricultural output – but is below the flood level of major rivers.

Smil's response is that with low fertilities in place since the 1980s, China will experience one of the world's fastest demographic transitions, more sedentary lifestyles, and concern about healthy diets. These developments portend an appreciable decline in the overall demand for food. Between 1990 and 2000, intakes of rice and wheat fell by 13%, and grain availability far exceeded grain storage capacities. Grain prices steadily declined. Total area sown to cereals declined by 7%; a widespread drought reduced the harvest to just over 400Mt, and the 2001 harvest, after further reduction of the planted area, was even a few megatons lower.

III: *Effects of Long-term climate change will affect agricultural yields:* As the largest coal-consumer in the world, China extracts 1.2 billion tons of coal per year and produces more sulfur dioxide and particulate matter than that produced by all western Europe. Its factories discharge more than 80% untreated wastewater and though new TVEs absorb

surplus rural labor they discharge enormous amounts of untreated waste. Further, the rising intensity of automobile traffic in the rich coastal provinces leads to newer and more concentrated episodes of photochemical smog and thereby to rising concentrations of tropospheric ozone. The long-term effects of climate change are greater aridity to the east and north-west parts of China and higher temperatures in North China along with lower rice yields in the South, lower corn yields in the East, and lower soybean harvests everywhere except in the Northeast.

Smil's argument is that the officially estimated available arable farmland of 100 Mha is a substantial underestimate since it does not include *agricultural ponds and orchards*, which since 1980 are the two intensive land uses that significantly contribute to China's balanced diet. If we include ponds and orchards, China's farmland is anywhere between 140-160Mha. China's per capita farm availability is at least twice or thrice as large as that of its East Asian neighbors (South Korea, Taiwan, and Japan). Official estimates suggest that China has 33Mha of uncultivated but reclaimable land categorized as wasteland, whose eventual development would result in appreciable food production gains and environmental benefits. The fruit and nut production potential of large-scale wasteland cultivation is substantial, as are the environmental benefits for China's agro-ecosystems. Moreover, China's (undoubtedly substantial) *reported farmland losses* are exaggerated. Mean annual loss has been 500,000ha/year since 1980, but these losses are *not* an estimate of loss of food production capacity. A large part of the reported loss (over 50% in some years) has been due to the restoration of land converted to fields during the Maoist era back to their environmentally appropriate use as orchards, grasslands and fish ponds – a change that has enhanced agro-eco-systemic diversity (Smil 2004: 130). Regarding the many obvious signs of water shortages in China, Smil is much more optimistic than Brown. If existing Chinese practices do *not* reflect the growing scarcity of the resource, realistic water fees should take care of the problem, because there is a high potential for water savings. Nickum (1998) concludes that China's "water crisis" is *localized*, and is economic and institutional rather than a matter of a disappearing resource. Since there are adequate *multi-cropping possibilities* in China (in South China in particular though not so in northeastern China), with proper rotations and further intensification, the multi-cropping ratio may be raised to 1.6-1.65, without damage to affected agro-ecosystems. Large parts of the Chinese interior receive well below the national mean *nitrogen applications* in relation to an average multi-cropping ratio of 1.5. China has considerable room to increase its average nitrogen applications – and even greater opportunities to combine them with appropriate quantities of phosphorous and potassium.

Finally, there is enormous room for reducing waste along the whole food chain, and *minimizing post-harvest losses*. Minimizing these losses to 8-10% (a rate still somewhat higher than is common in Western countries) would result in gains of more than 30Mt/year of grain a year, a total 1.5 times higher than China's exceptionally high cereal imports in

1995, and enough to provide an adequate diet for 75 million people! Modern grain stores are necessary since during years of bumper harvests millions of tons of grain stay in the open (Smil 2004: 135-6). Efficiency of animal feeding needs to rise, as does the efficiency of China's distilleries. China also needs to minimize food wastage.

I want to stress that the weight of China's past has elements that that may well combine in ways that supersede some of the environmental handicaps that Brown and others emphasize so much. As Smil (2004: 213) admits, if "the combination of biophysical constraints, burdens of history, and peculiarities of culture and politics" are an important legacy of the past, they do not necessarily "preordain the future". I have pointed to different instances of "social self-protection" in China to underscore the existence of contending trends, and hence of realistic choices that the State may make. If China shifts to more traditional diets, food security will not be a long-term constraint on its growth. China should divert its enormous accumulation of foreign exchange reserves (over \$1000 billion in January 2008) into rural investments, public health care, and environmental management. The current fascination with the automobile is a sure recipe for long-run environmental disaster. The policy of urban bias and discrimination against its migrant rural multitudes opens much more serious questions of long-term social stability. In this paper I have tried to highlight different but related dimensions that impact upon food availability and food security. These are clearly not impossible goals, and China has a track record of fulfilling them. To continue to do so requires a broader environmentally sustainable vision that spans the entire East Asian region.

## REFERENCES

1. Arrighi, Giovanni (1994), *The Long Twentieth Century*: Verso
2. Braudel, Fernand (1982), *The Wheels of Commerce*: California
3. Brown, Lester (1995), *Can China Feed Itself?*: Worldwatch Institute
4. Elvin, Mark (2004), *Retreat of the Elephants*: Yale University Press
5. Elvin, Mark (1998), "The Environmental Legacy of Imperial China". *The China Quarterly*
6. Elvin, Mark (1993), "Three thousand years of unsustainable growth in China": *East Asia Journal*
7. Harvey, David (2003), *The New Imperialism*: Oxford
8. Jing, Jun (2000) ed., *Feeding China's Little Emperors: Food, Children and Social Change*: Stanford University Press
9. O'Connor, James (1998) *Natural Causes: Essays in Ecological Marxism*: Guilford Press, NY and London
10. Polanyi, Karl (1944) *The Great Transformation*: Beacon Press

11. McMichael, Philip (2004) *Development and Social Change*: Pine Forge Press
12. Riskin, Carl, et.al (2001), *China's Retreat from Equality*: M.E. Sharpe
13. Selden, Mark and Elizabeth Perry eds. (2003), *China: Change, Conflict and Resistance*: Routledge
14. So, Alvin et.al (2004), *China's Development Miracle*: M.E. Sharpe
15. Shi Guang (2004), "Health Reform Policies in China"
16. Smil, Vaclav (2004), *China's Past, China's Future: Energy, Food, Environment*: Routledge
17. Solinger, Dorothy (1999), *Contesting Citizenship in Urban China: Migrants, Markets and the State*: University of California Press
18. Sun Han et.al., (1987), *Feeding a Billion: Frontiers of Chinese Agriculture*. Michigan State University Press
19. Watson, James (1997), ed., *Golden Arches East: McDonald's in East Asia*: Stanford
20. Wong, R. Bin (2000), *China Transformed: Historical Change and the Limits of European Experience*: Cornell University Press
21. Woo, Meredith Jung-en (2007), "The New East Asia" in *New Left Review*: 47 Sep/Oct 2007: 57-69
22. Zhang, Li (2001), *Strangers in the City*: Stanford University Press