On the resurgent population and food debate[†]

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Since Malthus wrote his famous *Essay on Population*, the world has witnessed great improvements in numerous measures of well-being — life expectancy, infant mortality, incidence of famines and plagues, per capita food consumption as well as real per capita incomes. These improvements have come about during rapid population growth in both industrial and developing countries. Food demand and supply projections suggest that growth of supply will fully meet growth of consumption while grain prices continue to decline. While China may increase grain imports early next century, Central and Eastern Europe is likely to emerge as a major grain exporter and thus help to meet the increase in China's imports.

The past two centuries, and especially the last half century, have witnessed dramatic improvements in the well-being of the world's population, unparalleled in human history. This is especially true of the increases in per capita food consumption. Other measures of well-being, however, such as life expectancy and freedom from famine, have also shown marked progress. Yet, during recent years, claims have been made that the world is (or soon will be) overpopulated. Some have claimed that the growth of world demand for food will soon outpace the growth of supply. The fact that similar claims, made over the past three decades, have all proved to be false seems always to be forgotten.

Reputable studies of prospective food supply and demand conclude that there will be continued improvement in per capita food consumption, especially in the developing countries (see Islam 1995). Yet the projections of doom and gloom continue to make headlines and receive media attention. The potential accuracy of such projections seems irrelevant since notice depends solely on the emphasis on possible disaster while more sober and well documented studies receive little attention in the world's press.

That pessimism makes news is well illustrated by the fact that Thomas

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Malthus is remembered for his comparison of the growth paths of food production and population. Food production, he said, increases arithmetically while population, if unchecked, increases geometrically. Thus, population always has the potential to outrun food supply. At the time this statement was made, his view was that population could only be held in check by vice and misery — starvation, disease or war. But, this is the Malthus of the first edition.[1] He soon revised his views, yet hardly anyone noticed or remembers that he came to agree with those who, before the first edition of his essay, believed that there would be continuing improvement in the well-being of people.[2]

1. Population and well-being since Malthus' first edition

In no other two centuries has the well-being of mankind ever been so enhanced as in those since Malthus' first edition was published in 1798. In fact, we can say that there has been more improvement in well-being since then, as indicated by a large number of conventional measures, than in all of prior history. Choose whatever objective measure you wish — life expectancy, infant mortality, the incidence of famines and plagues, per capita food consumption, per capita real incomes or per capita levels of real consumption, or biological measures such as height or weight or ratios of weight to height — improvements during the past two centuries swamp those of the previous millennia.

While the nineteenth century followed the path laid out in the revised

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[1] The original text was written in 1797. Malthus revised it for editions published in 1803, 1806, 1807, 1817 and 1826. See Malthus (1826).

[2] The principle of population is that, if unchecked, population will grow faster than the means of subsistence. After noting that 'everything depends upon the relative proportion between population and food, and not on the absolute number of people', he adds that he believes 'that countries which possessed the fewest people often suffered the worst from the effects of the principle of population' (p. 330).

The fundamental change in the revised editions was to introduce another check to population growth. The preface to the 1803 and all subsequent editions included the following: 'Throughout the whole of the present work, I have so far differed in principle from the former, as to suppose another check to population growth, which does not come under the head either of vice or misery; and in the latter part I have endeavoured to soften some of the harshest conclusions of the first essay' (p. 9). The new preventive check to population was due to a combination of laws and institutions and self-love or self-interest: 'To the laws of property and marriage, and to the apparently narrow principle of self-love (or self-interest), which prompts each individual to exert himself in bettering his condition, we are indebted for all the noblest exertions of human genius, for everything that distinguishes the civilized from the savage state. A strict inquiry into the principle of population leads us strongly to the conclusion that we shall never be able to throw down the ladder by which we have risen to this eminence; but it by no means proves that we may not rise higher by the same means' (p. 331).

editions, that century saw much less progress than the current century. That was due, in considerable part, to the rapid growth of urbanization which brought with it diseases that caused great suffering and loss of life. The large increase in human migrations that came with the industrial revolution resulted in the spread of disease on a scale seldom seen before. Even so, there were modest improvements in well-being, at least among significant segments of the population (Fogel 1992). But it was the steps taken near the end of the nineteenth century in providing clean water, improving sanitation, combined with the beginnings of knowledge concerning the transmission and prevention of disease, that made possible the spectacular gains in life expectancy that have occurred in the current century.

The improvements in well-being that came in the last century were intimately related to the agricultural revolutions in North America and Europe. It was also during that century that the discovery of labour-saving farm implements made possible the transfer of labour from agriculture and into other pursuits that converted cities into productive enterprises and permitted their rapid growth.

All this has been accomplished while population grew at the most rapid rate in the recorded history of the world. It is seldom recognized that world population growth was less than 0.2 per cent annually from about 500 BC to about AD 1400 and did not exceed 0.5 per cent until the middle

Table 1 Expectation of life at birth for six European countries and Massachusetts in the United States: 1840 to 1955

Year	Expectation of life at birth, years	Average annual increase, % per year
1840	41.0	—
1850	41.5	0.05
1860	42.2	0.07
1870	43.5	0.13
1880	45.2	0.17
1890	47.1	0.20
1900	50.5	0.34
1910	54.3	0.38
1920	58.3	0.40
1930	61.7	0.34
1940	64.6	0.29
1955	71.0	0.43

Source: United Nations, *Population Bulletin,* no. 6, table IV.1, 1962.

of the eighteenth century (Kremer 1993). World population grew very slowly through the seventeenth century, with the most rapid rates of economic growth generally occurring in the countries with the highest rates of population growth. Throughout the nineteenth century and until about World War II, population growth rates in the industrial countries were greater than in the developing countries (table 1). Only after World War II did the developing countries have the higher rates of population growth and only then did their per capita income growth exceed that of the industrial countries. From 1850 to 1920 population in the developing countries grew approximately 0.5 per cent annually. Subsequently the rate exceeded 1 per cent, but remained at less than 1.5 per cent until 1950.

The period of rapid population growth in the developing economies began in 1950, when growth exceeded 2 per cent for three decades. It was also between 1950 to 1980 that the rates of growth of real per capita incomes were greater in the developing than in the developed countries and the highest ever achieved in the developing countries or in the developed countries as a group. From 1750 to 1920, population grew more rapidly in the developed than the developing countries and per capita income growth was greater in the developed countries. Contrary to the relationship between population growth and economic growth implicit in the reasoning of those who favour slow or zero population growth, economic growth, as measured by the growth of real per capita incomes, has been highest during periods of rapid population growth.

Maddison (1995) provides estimates of per capita GDP for most major countries, starting in 1820. He provides estimates for eleven Asian countries, which may be used to indicate the experience of the developing countries from 1820 to 1950. Over that period of more than a century, it is estimated that the eleven Asian countries increased their real per capita gross domestic product by only 25 per cent, from $609 to $863, while their population increased by 84 per cent (at an annual rate of less than 0.5 per cent). From 1950 to 1992 the Asian countries' average per capita income rose to $5300, a fivefold increase, while population increased by 128 per cent (an annual rate of almost 3 per cent).

For the twelve Western European countries Maddison estimates that real per capita income increased from $1228 in 1820 to $5513 in 1950, with population increasing by 131 per cent (an annual growth rate of approximately 0.65 per cent). The real per capita income of the United States grew from $1287 in 1820 to $9573 in 1950 at an annual rate of 1.56 per cent, much less than the growth rate in developing economies from 1950 to 1980.

The eleven Asian countries included Taiwan, South Korea and Japan. It may be useful to review the data for the two large Asian countries, namely

China and India. Maddison estimates the two countries had essentially the same real per capita incomes in 1820 — $523 and $531, respectively. And they had almost the same per capita incomes in 1950 — $614 and $597. These data indicate the absence of a significant increase in real per capita income for more than a century. From 1950 to 1992, China and India followed quite different paths, with the Chinese average increasing to $3098 and India's to $1348, most of the difference arising in the past 15 years.[3] But even at India's much slower pace of growth in a period of 42 years, India more than doubled its real per capita income after an increase of a tenth in the previous 130 years. And its population grew much more rapidly in the recent than the earlier period — by a factor of approximately four.

A measure of improvement in well-being that merits serious attention is change in life expectancy as well as various measures of infant and child mortality. Mortality, or life expectancy, was roughly constant throughout history until 1650 when, according to Bogue (1969, p. 566), the average expectation of life was 25 years or less. The infant mortality rate was about 30 per cent. Data from Roman tombstones indicate that life expectancy was about 20 to 30 years during the period of the Roman empire, giving some support to the view that for a millennium there had been little or no change in life expectancy. Data for six European countries and Massachusetts indicate that, as of 1840, life expectancy in high-income countries was 41 years (Bogue 1969, p. 567). Some 60 years later life expectancy had increased to 50.5 years, an increase of less than ten years. In the next 55 years — to 1955 — life expectancy increased to 71 years, an absolute increase twice that achieved in the previous 60 years.

Swedish data are available on infant mortality, starting in 1750 (Bogue 1969). Until the beginning of the nineteenth century infant mortality exceeded 20 per cent, in some years going as high as 25 per cent. Infant mortality did not go below 15 per cent until 1850 and reached 10 per cent only at the beginning of this century. At the present time the available data indicate that there is now only one country with infant mortality rates exceeding 15 per cent (the Swedish level as of 1850) and many developing countries are now at or below 5 per cent (which was reached in

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[3]In 1978, the year before the start of the Chinese economic reforms, the per capita GDPs were $1352 for China and $972 for India – a difference of only 39 per cent in China's favour. In 1992 the different was 130 per cent in China's favour. India's population grew by 36 per cent over the period while China's grew 22 per cent. Even if we assumed that the additional population contributed nothing to GDP and we subtract their consumption, the difference in population growth rates would account for less than about 15 percentage points of the increase in the ratio of Chinese to Indian per capita incomes.

Sweden about 1940).[4] The average infant mortality rate for all low-income
countries is now less than 6 per cent.

The rapid world population growth after World War II was due almost
entirely to a sharp decline in mortality, rather than to an increase in
fertility. In fact, fertility has declined almost everywhere. It seems incon-
gruous that there has been so much concern about rapid world population
growth during the last half of this century, since it has been due primarily
to improvements in health and thus the length of life, something that
mankind struggled for centuries to achieve. I can think of nothing that
reduced suffering more than reducing infant mortality, from when one out
of every three children died before a year of age to the present when most
mothers in the world are confronted with a continuously declining loss
rate, now smaller than one in twenty.

2. Population an unimportant factor in determining well-being

The evidence is now overwhelming that the rate of population growth is a
relatively unimportant factor in determining the well-being of a nation's
people. As I wrote earlier:

> population is but one among many factors that determines well-being
> and that it is far from the most important factor. National policies that
> adversely affect the efficiency with which the human and natural
> resources of a country are utilized are far, far more important than
> population growth. (Johnson 1990, pp. 29–30)

I would not rule out that, within reasonable limits (say 1 to 2 per cent
annual growth rates), population growth may have a positive influence on
per capita income growth. This view is supported by Kremer (1993) who
argues that technological change has been a function of population size
and thus population growth has not had a deleterious effect on per capita
economic growth. He does not, for this reason, argue for pronatalist
policies. Nor do I. But he does conclude:

> that economists should conduct further research to measure the growth
> and welfare effects of population growth under nonrival technology,
> rather than simply following conventional wisdom and concentrating on
> the negative effects of population growth. (p. 713)

Recent evidence from world developments should have created doubts

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[4]See World Bank (1996, p. 198).

that population growth rates have been a major factor in determining per capita incomes. Evidence points strongly to the importance of policies and institutions and the unimportance of population growth rates. The economic experience of the socialist countries offers a real world test. Different rates of economic growth were achieved in socialist and market economies that were once part of the same countries. The role of population growth can explain little or nothing of the differences in per capita income growth that occurred in North and South Korea, East and West Germany, Czechoslovakia and Hungary and Austria. Or, for that matter, in China, before and after 1979, when major economic reforms were undertaken. It may be noted that population growth rates were lower in the socialist than in the market economies in Europe, but this seemed not to matter. Olson (1996) has argued persuasively that policies do matter, that most countries have not come close to achieving maximum efficient use of their resources. The recent large body of empirical work on the effects of openness to world markets, political stability, and education on economic growth support that conclusion. See, for example, Levine and Renelt (1992) and Barro and Sala-i-Martin (1995).[5]

3. Will we like negative population growth rates?

We are likely to see a real world test of whether negative rates of population growth lead to more rapid growth of real per capita incomes in the near future. All the countries in Western and Central Europe now have fertility rates below the replacement level and will face absolute declines in population over the next decade or two unless fertility increases or

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[5]Please note that I do not argue that the rate of population growth has no effect on the rate of per capita economic growth. I do not know for sure what the effects have been or are under all circumstances and conditions. What I believe is that there are many factors that affect people's welfare and that, even if population growth has a negative effect on per capita real income growth, it is very small and much less important than factors such as investment in schooling or the extent of governmental intervention in markets. I do say that one cannot and should not derive a negative relationship between population and economic growth rates from neo-classical growth models. True, diminishing returns to labour cannot be avoided, but the relationships between population and economic growth are far more complex than implied by diminishing returns alone or any of the other variables normally included in such models. Factors such as innovation and discovery, total investment including investment in human capital, increasing returns to scale and the rate at which new methods of production are adopted appear to be positively related to population density and numbers. Because population growth can be, and probably is to some degree, endogenous in its relationship to real per capita incomes, empirical analyses that indicate a positive relationship between the two variables must be interpreted with caution. But the same must be said for the few empirical studies that have found a negative relationship between population and real income growth rates.

immigration is substantially increased (World Bank 1996). Given the changes in age distribution that accompany declining populations, I anticipate that the population problem that will attract the public's attention in these countries is that of too low a rate of fertility rather than one that is too high.

Those who place emphasis on natural resource scarcity and environmental degradation will have difficulty accepting the conclusion that negative population growth can have adverse long-term consequences. What needs to be recognized is that many environmental problems are ameliorated or solved as real per capita incomes increase. I am referring here to the important environmental problems in the developing countries of unclean water and unsafe disposal of human excrement. But other forms of environmental damage are also reduced with higher incomes. Air pollution abatement, the creation of parks and the reduction of deforestation all rise in volume once the level of real per capita incomes reach a relatively low threshold level (World Bank 1992, p. 54; Antle and Heidebrink 1995).

4. Recent world food developments

The increases in world grain prices during 1996 followed an extended period of slow growth in world grain production. This led to some degree of alarm concerning the continued improvement in per capita food supplies in the developing countries. An outlandish argument has been made that China may starve the world due to an actual decline in grain production and rapid increase in grain use over the next three or four decades (Brown 1995). Given the proclivity of the world's press to revel in disaster, this argument has received considerable attention. But before turning to my own view of what the future may hold, let us briefly summarize the developments of the past three or so decades.

Table 2 presents data on the daily per capita supply of calories for major world regions for 1961–63 and selected years to the most recent period for which FAO data are available. For the developing regions as a whole the daily caloric supply increased by 28 per cent in approximately three decades. The average availability is well above the average daily requirements for the developing countries, though this in no way assures that all or even most persons in a given region have an adequate diet. This is particularly true in Africa which has seen little increase in calories over the three decades. The improvement in calories' availability in developing regions has none the less been associated with a significant decline in the percentage of the population classified as malnourished. The percentage so classified declined from 36 in 1969–71 to 20 in 1988–90 and is projected to

Table 2 Daily per capita supply of calories for major world regions, 1961–63 and selected years to 1988–90

	1961–63	1969–71	1979–81	1988–90
Developing, all	1940	2117	2324	2473
Africa	2117	2138	2180	2204
Latin America	2363	2502	2693	2690
Near East	1825	2029	2245	2442
Other, ROW	2116	2292	2425	2626
Developed, all				
North America	3054	3235	3330	3603
Europe	3088	3239	3371	3452
Oceania	3173	3287	3157	3328
Former USSR	3146	3323	3368	3380
Other, ROW	2545	2722	2812	2975

Source: FAO, *Production Yearbook*, various issues.

decline to 11 by 2010 (Alexandratos 1995, p. 33). The absolute number of individuals malnourished fell from 941 million in 1969–71 to 781 million in 1988–90 and is projected to decline to less than 650 million by 2010 (Alexandratos 1995, p. 33). Moreover, it is generally recognized that poverty rather than the absence of food has been and will continue to be the primary cause of malnutrition.

The data on the increase in life expectancy, and the decline in infant and child mortality in developing countries since 1960, signal a significant improvement in the availability and effective use of the food supply. Increased access to clean water and improved sanitation have contributed as much as, or perhaps more than, increased availability of food to the decline in infant and child mortality. But whatever the relative contributions, these changes have benefited millions of the world's poorest people.

We are frequently reminded that world per capita grain production peaked in 1984 and has failed to regain that level (Islam 1995). It is not true, however, that world per capita *food* production failed to increase during the 1980s. The 4.6 per cent growth in food output per capita was only slightly below the 5.7 per cent for the prior decade. But in the developing regions, per capita food production increased by 13 per cent in the 1980s, *significantly more than* the 8 per cent increase for the previous decade. The growth of per capita food output for the developing countries in the 1980s was dominated by the three most populous countries — China, 28 per cent; India, 20 per cent; and Indonesia, 32 per cent.

Taking grain alone, production in the developing countries did increase during the 1980s — by 9 per cent. The slowdown in world grain produc-

tion occurred in the industrial countries of Western Europe, North America and in the former socialist countries. During the 1980s the European Union, the United States and Japan followed policies designed to limit the production of grain.

Even if world grain production grew slowly during the 1980s and early 1990s, the supply of grain grew more rapidly than did the world's demand for grain during the period.[6] We know this because international market prices for wheat, maize and rice have fallen since the 1970s, even relative to the prices of traded manufactures (figure 1). Why did grain production grow at a significant rate under these adverse conditions? It is something of a miracle that world per capita grain production was approximately maintained.
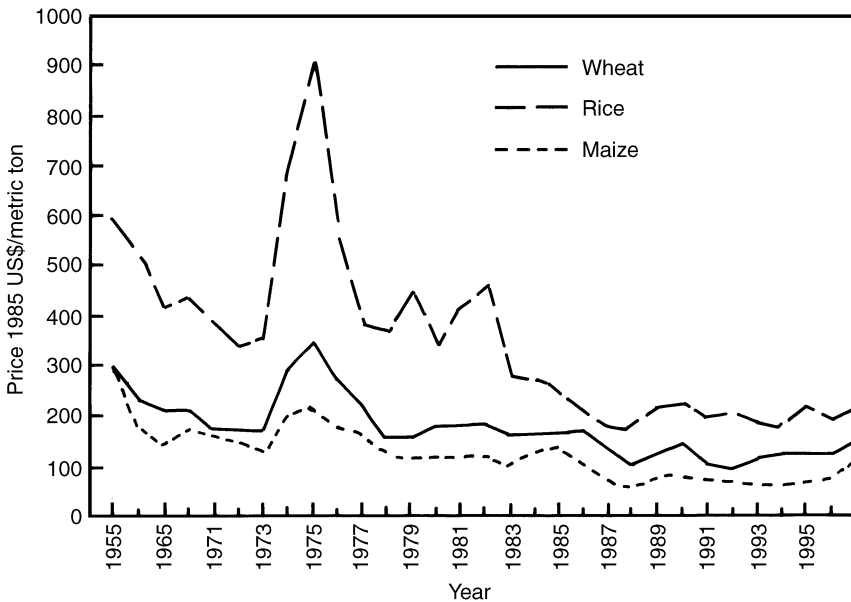

Figure 1 The trend of grain relative to manufactures prices in international trade
Note: Wheat prices are calendar year averages for Canadian Western Red Spring export prices, in store, St Lawrence. Rice prices are calendar year average prices for Thai 5 per cent broken, Board of Trade posted price, fob Bangkok. Maize prices are calendar year average prices for US No. 2, Yellow, fob Gulf Ports. Deflator is the G-5 Manufacturing Unit Value Index.
Source: International Economics Department, the World Bank.

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[6]I refer to supply and demand in terms of the shifts in the functions over time. The decline in real grain prices occurred because the rightward shift of the supply function was greater than the shift in the demand function.

Nor should it have been too much of a surprise that world grain stocks, excluding China, declined. There was, first of all, a concerted effort on the part of the US and the EC to reduce government-held and subsidized stocks. And, second, given the declining trend of prices, there seemed little prospect that private stockholding would be profitable. The real annual cost of holding stocks is high — close to 20 per cent of the value of the grain — so price would have to double to provide a normal return on holding grain over four years.[7] It is difficult to understand why quite minor deviations from the long-term trends in real prices have caused so much excitement. What nearly everyone failed to notice was how low prices of grain have been since the mid-1980s and especially in the first four years of this decade.

5. Prospects — future supply and demand for food

The supply of food over the next two to three decades will increase at least as fast as the demand for food and probably somewhat faster, leading to a continuation of the long-run decline in real grain prices. The basis for this belief is strong evidence that the rate of growth of demand for food in the three decades from 1990 to 2020 will be significantly less than the growth from 1960 to 1990. The primary reason for this slower demand growth is that the population growth rate is now slower than it was for the previous three decades and demographers predict that there will be a further reduction in the growth rate for the period to 2020. The population projection is the medium UN projection. Over the past quarter century, the UN medium projection has been a remarkably accurate predictor of the 2000 world population.

Table 3 presents a projection of world grain use over 1990–2020 in terms of annual rates of growth, with comparisons to actual developments for 1960–1990. The only difference between the two periods affecting the growth of grain use is the reduction in population growth rates. The annual rate for 1960–1990 was 1.9 per cent per year; the UN medium projection is 1.3. The income elasticity of consumption is assumed to be unchanged in the 'B' projection as is the growth rate for per capita income. The resulting projections of grain use indicate a decline by a fourth in the annual rate of growth. The worst is over.

The world food supply can more than keep pace with world food demand in the years ahead according to the conclusions of three indepen-

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[7]It is clear from figure 1 that the recent increases in international grain prices are modest blips on the long-term declining real price trend. The real price of wheat, for example, in early 1996 was *lower* than any annual price from 1970 through 1985.

Table 3 Growth rates of key variables and alternative projections of growth of world grain utilization, 1990–2020

	Actual 1960–1990	Projected 1990–2020	
		A[b]	B[c]
Population (per cent)	1.90	1.30	1.30
Income per capita (per cent)	1.8	n.a.	1.8
Income elasticity[a]	0.31	n.a.	0.31
Per capita growth of grain use (per cent)	0.56	0.15	0.56
Total growth of grain use (per cent)	2.46	1.55	1.86

Notes: [a]Since price changes were ignored, this is the elasticity of world per capita use of grain for all purposes with respect to world per capita income. Estimates for 1960–90 are trend, rather than annual point to point rates.
[b]Projection A takes the projected average rate of per capita grain use growth from the three studies surveyed by Islam (1995).
[c]Projection B adopts the rate of per capita grain use growth observed over 1960–90.
Sources: 1960–1990 for growth rates: World Bank, *World Development Report 1992* and FAO, *Production Yearbook*, various issues.

dent studies presented in early 1994 at a conference at the International Food Policy Research Institute (IFPRI). These were studies done by researchers at FAO, the World Bank and IFPRI. There was a remarkable degree of consistency in the results, which are summarized in a book edited by Islam (1995). The studies indicate a range in the growth rate of grain use for 1990 to 2010 of 1.4 to 1.6 per cent per year and the midpoint is included in table 3 as projection 'A' as applying to 1990 to 2020.

In so doing, I assume that the third decade will have the same rate of population growth and income growth and variables affecting use as the first two. Because population will grow more slowly in the last decade, the 'A' projection is likely to be on the high side. As indicated, most of the increase in consumption will be due to population change.

The annual increase in world per capita grain use in the consensus 'A' projection is very small — in the range of 0.1 to 0.2 per cent but this figure is largely irrelevant. What is relevant is the rate of increase in the developing countries. The annual growth is projected to be 0.5 per cent for a total increase of 16 per cent.

Concern has been expressed that further improvements in agricultural output may be subject to greater technical constraints than has been true in the past. Two comments seem relevant here. The first is that the rate of growth of demand for food will be significantly slower over the next three decades than for the past three. Consequently, even if it proves somewhat more difficult to increase output in the future than in the past, this does

not mean that either real farm prices must increase or that supply will grow more slowly than demand.

The second is that, so far, there is no evidence of a slowdown in the rate of growth of per capita food production in the developing countries. The growth of per capita food production in the developing countries in the 1980s was 13 per cent, significantly higher than the 8 per cent in the previous decade (FAO 1991). Some observers place great emphasis on the fact that world per capita grain production has declined since 1984. People do not live by grain alone and, as the diets of people of the developing countries have improved, other foods have been given increased emphasis in diets. In any case, per capita *grain* production in the developing countries increased by 9 per cent during the 1980s (FAO 1991).

6. Implications for world trade

World trade in grain showed little growth after 1980, following a doubling during the 1970s. Since 1980 world trade has moved in a range of approximately plus or minus 20 million tons from a rough average of 200 million tons. Even when the USSR imported 40 million tons annually in the late 1980s, world grain trade could not break out of a narrow range. I see little prospect for a significant growth in world grain trade during the next decade.[8] Trade will not be supply constrained but will continue to be constrained by demand growth.

Much attention has been focused on the possibility of very large grain imports by China. While outlandish claims such as that by Brown (1995) suggest that imports might be as much as 200 million to 300 million tons, responsible projections put the level of imports at 40–45 million tons over the next two or three decades (Lin, Huang and Rozelle 1996; Huang, Rozelle and Rosegrant 1995; Koo, Low and R.G. Johnson 1996).

Scenarios leading to both higher and lower levels of grain imports have been developed by Lin, Huang and Rozelle. Some of the higher ones would, however, require serious policy errors by the Chinese government. While such policy errors cannot be ruled out, given recent counterproductive grain market and price policies, large grain imports would be likely to finally convince policy-makers that it was at long last necessary to do something to increase agricultural productivity rather than just talk about doing something, as has been the case recently. Agricultural research has been an important factor in the success of Chinese agriculture over the

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[8] The three studies project increases in world grain trade of from 80 million to more than 100 million tons for 1990–2020 surveyed by Islam (1995, pp. 86–7).

past 15 years. If the government neglects it, as it did during much of the 1980s, grain imports could increase significantly. But there is evidence that the benefits of agricultural research are being recognized and there have been modest increases in funding in recent years.

An increase in China's annual grain imports to 40 or 50 million tons could be readily supplied, even at real prices as low as or lower than those of the early 1990s. In fact, there is a possibility that the traditional grain exporters will see rather little expansion in demand for their exports. This will be the case if grain production in the territory of the former USSR returns to the amount of grain *in the fields* to the level of the late 1980s when the grain harvest ranged from 180 million to 200 million tons (clean basis).[9] Reduction of waste in harvesting, transportation, and marketing and in seed use, combined with increased yields of forage crops (hay, silage and feed roots) and improved efficiency in feed conversion into meat and milk could increase the available supply of grain by at least 55 million tons (Johnson 1993, pp. 27–8).

Of nearly equal importance is the reduction in the internal demand for grain due to the decline in livestock output. In the USSR, the demand for meat and milk was boosted by large consumer subsidies. In the late 1980s such subsidies equalled 10 per cent of GNP.[10] The production of meat has already declined sharply — by more than 40 per cent — and the adjustment is not yet complete, especially for beef (ERS 1996, p. 20). The former USSR has sharply reduced its grain imports and perhaps as early 1997, the area will become a net exporter of grain if crops continue to develop well. As real incomes recover, there will be some recovery in meat and milk

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[9]While returning to the same level of grain production as occurred in the late 1980s may seem to be an easily reached objective, it needs to be noted that, under the socialist system, grain may have been produced where it will not be profitable to do so in a market system. For example, the geographic pattern of grain prices deviated significantly from those in a market system – prices did not reflect differential costs of transportation and market but were influenced by costs of production. This meant, for example, that prices of grain in Kazakhstan were higher than in the Ukraine. Once the grain market is a competitive one, the grain sown area will probably decline and some yield increases will be required to achieve the same level of grain output as in the late 1980s.

[10]In the USSR retail prices of meat and milk products in the late 1980s and early 1990s covered less than half the cost of bringing these products to the retail store. Consequently, when the subsidies were removed, there was a sharp decline in the profitability of livestock production and output fell sharply. Consumer subsidies also existed in the socialist economies of Central Europe, though generally at not quite as high rates as in the USSR. Livestock production has also fallen in the Central European economies with an effect on their grain utilization. Future consumption of livestock and poultry products will be significantly less than in the 1980s, possibly declining by as much as a third once livestock production returns to profitability and consumers bear the real costs of what they consume.

demand, but it is probably optimistic to assume that total meat consumption will recover to much more than two-thirds of its level of approximately 20 million tons in the late 1980s. I have estimated that system change would increase grain availability by 55 million tons and the reduction in feed use due to decreased livestock consumption would amount to 35 million tons (Johnson 1993). If these are realistic estimates, then the territory of the former USSR would shift from being a net importer of nearly 40 million tons of grain in the late 1980s to a net exporter of 40 million to 50 million tons, perhaps soon after the turn of the century.[11]

The productivity gains from system change have so far been less than I have assumed but the decline in consumption of livestock products has been significantly greater. Consequently, grain imports have nearly disappeared sooner than most observers expected. The significant grain exports may also emerge sooner than expected. I can think of nothing that could contribute more to the development of a profitable agriculture in the former USSR than the emergence of substantial grain exports in the early years of the next century.

Consequently, in viewing the future of international trade in grain and food, it is inappropriate to concentrate attention on China to the exclusion of another area that has a great potential for influencing international trade. Major changes affecting grain trade are taking place in Central and Eastern Europe and these changes are large relative to what I consider to be reasonable projections of China's grain imports.[12]

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[11]If this were not enough bad news for the traditional grain exporters, there is a reasonable prospect that the former socialist countries of Central Europe will have significant grain exports within the decade. A recent study (ERS 1996) projects that these countries will export almost 12 million tons by 2005 (p. 13). This is a shift from a net import position of several million tons in the late 1980s.

[12]This paper has not reflected any of the difficulties of projecting future supply and demand for grain due to known and possible inaccuracies in China's agricultural data. The cultivated area and yield used in all of the projections have been based on data currently published by the government, even though it is now admitted that instead of the cultivated area being about 95 million hectares it is about 125 million hectares. If one accepts the official grain output estimates, this means that grain yields have been overestimated by about 30 per cent, leaving a larger margin for further increases in yield than has been assumed to be likely. On the other hand, there is some reason to believe that grain output has been underestimated in recent years, perhaps by as much as 10 per cent (Johnson, 1994; OECD 1996, p. 163). My conclusion that grain output may have been underestimated is based on the results of the rural household surveys. To add further uncertainty, the data on meat production and on meat consumption differ by as much as 50 per cent. If one accepts the meat production data, per capita consumption was more than 35 kilograms in 1994 while the per capita consumption data indicate an average of no more than 17 kilograms though this estimate may include only meat consumed in the home (State Statistical Bureau of China 1995).

7. Concluding comments

My message is a simple one. There is little prospect that the factors affecting world food supply and demand can either stop the decline in real market prices for grain or result in more than a modest increase in world grain trade. While China may emerge as a significant importer of grain, it is at least as likely that Central and Eastern Europe will emerge as major net grain exporters, competing with the traditional exporters. Although the probable future path of real world grain prices represents good news for urban consumers, farmers in the developing countries will be under continuous pressure to adjust to the declining prices.

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