

Population and Food Supply

- ✓ **Key points:**
- ✓ **Important facts**
- ✓ **Today's issues**
- ✓ **Food production technologies**
- ✓ **The Paddock – Harding viewpoints**
- ✓ **Food and Agriculture atlas**

<http://www.fao.org/es/ESS/chartroom/gfap.asp>



“Nowhere do we hear more frequent echoes of early Malthusian arguments than in discussions of the relationship between population growth and **food supply”**

“This power of population is definitely greater than the power of the earth to produce **subsistence for man”**

Malthus - 1798

Since then

- **Many developments unforeseen by Malthus have taken place**
- **World cropland has more than doubled**
- **Yield per unit of land has quadrupled**
- **International trade and communication networks have enabled redistribution of food from areas of surplus to places of food deficit**

Still...(despite all of that)

Today, “the sector of the [world] economy that seems to unravel first is **food**. Eroding soils, deteriorating range lands, collapsing fisheries, falling water tables, and rising temperatures are converging to make it more difficult to expand food production fast enough to keep up with demand”

Important facts...

- **Crops being grown on 3 billion acres of land – approx 10% of earths entire land surface.**
- **About two-thirds under cereal production; wheat and rice at the top of the list.**
- **Cereals provide just over half of the entire human energy food intake (amount of cereal consumed is inversely proportional to level of development).**
- **Significant regional differences in the production and consumption of food.**

Important facts...

- **800 million people have either nutritionally inadequate diet or not enough food to eat.**
- **Another important measure of the current food situation is the food security associated with **carry-over-stocks** (grain in storage).**
- **Although the most recent data indicate adequate supplies of carry-over stocks, great fluctuations can occur from year to year and reserves can be rapidly depleted**

Important facts...

- **The world fish catch has averaged about 85 to 90 million tons in the last two decades.**
- **Perhaps three-fourths of the world fisheries are being fished beyond their sustainable yield.**
- **Nearly a billion people around the world depend on fish as their primary protein source.**
- **Many fisheries are being depleted including the salmon runs in California, Oregon, and Washington.**

Important facts...

- **Global food production increased 2.6 times between 1950 and 1990 (population increased 2.1 times).**
- **Production has not increased much in this decade.**
 - **Production per capita has actually been falling since 1984.**
- **US production about 40 mill. tons lower in 2001.**
 - **“The china is the wild card in the world grain market”**
- **More than any other world region, Africa has seen a significant decline in per capita food production**

Important facts...

FAO

- **“Globally there will be enough food for a growing world population by the year 2030, but hundreds of millions of people in developing countries will remain hungry and many of the environmental problems caused by agriculture will remain serious**
- **“Promoting agricultural growth in rural areas and giving rural people better access to land, water, credit, health and education, is essential to alleviate poverty and hunger.”**
- **“International trade plays an important role in improving food security and further agricultural trade liberalization could boost incomes.”**

Population and Food: The Issues

World Agencies: FAO, WFP

I. Food: Quantity vs. Variety (food type)

“The relationship between more people and increased food needs is intuitively obvious. More subtle, however, is the effect of income increases, which operate through changes on the nature of the diet”

Issues...

✓ Increasing affluence leads to increased mean consumption

“It takes up to 16 pounds of grain to produce just one pound of meat”

Number of people worldwide who will die as a result of malnutrition this year: **20 million**

Number of people who could be adequately fed using land freed if Americans reduced their intake of meat by 10%: **100 million**

Percentage of corn grown in the U.S. eaten by people: **20**

http://www.vegsource.com/how_to_win.htm

**Percentage of corn grown in the U.S. eaten by
livestock: *80***

**Percentage of oats grown in the U.S. eaten by
livestock: *95***

**Percentage of protein wasted by cycling grain
through livestock: *90***

**How frequently a child dies as a result of malnutrition:
*every 2.3 seconds***

Pounds of potatoes that can be grown on an acre: *40,000*

Pounds of beef produced on an acre: *250*

**Percentage of U.S. farmland devoted to beef production:
*56***

**Pounds of grain and soybeans needed to produce a pound
of edible flesh from feedlot beef: *16***

http://www.vegsource.com/how_to_win.htm

Issues...

II. Commercialization of cooking/cooked foods

“The supermarkets and quick-food services have drastically restricted the human diet in the US...and their influence is being felt abroad”

What the impact of McDonald's in

McDonald's in Japan

McDonald's was introduced in Japan in 1971 by Den Fujita, then a University of Tokyo student. He began with five restaurants and a \$1.3 million investment during an economic boom in Japan. By 1985 the business had grown to such an extent that on New Year's Day a McDonald's near the Tsurugaoka Shrine in Kamakura set what was then a single-day, single-outlet, world sales record of \$47,871.² In that same year, McDonald's was ranked number one in total sales among Japan's service companies.³ By 1986, the chain had expanded to 556 restaurants, amounting to a \$766.5 million empire. Every month that year the Japanese consumed 12,000 tons of American beef and 15,000 tons of Idaho potatoes;⁴ in 1991, annual sales rose to \$1.6 billion, with 860 restaurants.⁵ By 1994, when the fieldwork for this study was conducted, McDonald's Japan had expanded to 1,048 outlets, with its branch below the Hanshin Department Store in Umeda, Osaka, at the top in terms of sales.⁶

<http://www.anthropology.wisc.edu/Ohnuki-Tierney/files/1997-mcdonalds.pdf>

Most **stereotypes** of **Japanese people** do not picture them as **fat** or even **obese**. However, this is changing fast as the Japanese are quickly adopting a Westernised diet and lifestyle. It's difficult to imagine any town in Japan without a McDonalds or KFC outlet. The recent popularity of [McDonalds Mega Mac](#) is evidence of this change in diet.

Even on the island of **Okinawa**, famed for its good health and longevity and which has 55 centenarians per 100,000 people, the next generation of Okinawans are the fattest in Japan.

Food experts there put the blame squarely on the number of fast food outlets (Okinawa has more fast-food outlets per head than anywhere else in the country due to the American occupation) and many fear the "**Okinawan Crisis**" will spread to the rest of Japan as the younger generation abandons the traditional fish and soy products for meat and fast food.

In Okinawa, the generation that grew up eating American style fast food are now reaching middle age and many of them are overweight and at risk from diabetes. Almost 30 per cent of Okinawan men die before reaching 65, and nearly half of men in their forties are obese. Read more about the Okinawa Crisis. <http://japansugoi.com/wordpress/okinawa-crisis-more-obese-japanese-japanese-diet-under-threat/>

Food Production Technologies

Fertilizer

- **“In 1847 Justus von Liebig, a German agricultural chemist, established the technological foundation for the use of chemical fertilizers when he demonstrated that all nutrients needed by plants for growth could be added in chemical form”**
- **However, escalating use in large quantities mainly occurred in the last 35 years.**
- **Decreasing returns as the amount of fertilizer is increased.**

Fertilizer...

- World fertilizer use increased from 14 to 146 million tons between 1950 and 1989.
- Subsidies for fertilizer use in LDC starting in the 1970s; subsidies being reduced or eliminated.
- Fertilizer prices have risen considerably during the last two decades, making their use in LDCs ever more difficult.
- What are the environmental impacts of fertilizers?

Spatial:

Find world maps of fertilizer use - per capita use, expenditures, yield...e.t.c

Herbicides and pesticides

- **Some estimates suggest that as much as half of the world food production is lost, mainly to hungry animals and insects.**
- **Chemicals used as counter measures remain in the environment; and some are concentrated as they move up the food chain – DDT is one example.**

“DDT (Dichlorodiphenyltrichloroethane) is one of the most hazardous groups of chemicals called Persistent Organic Pollutants (POPs), also known as “ The Dirty Dozen.” These very toxic chemicals, including DDT are long lasting due to their non-degradability, can travel to distant places and being fat soluble, accumulate in animals and human bodies. Even in extremely small amounts, POPs cause adverse impacts on human health and environment. To save public health, especially the health of the children, the manufacturing and use of POPs has been banned in the world under the Stockholm Convention on Persistent Organic Pollutants (POPs), enacted in 2001.”

Irrigation

- **Many of the countries that are densely populated are found in the drier climatic regions.**
- **Much of the increase in irrigated land has taken place in the last 40 years.**
- **Between 1950 and 1985 the amount of irrigated land tripped – a major factor in the impressive growth of world food production.**
 - **65% of Pakistan’s farm land under irrigation – produces 80% of food (India 30% under irrigation – produces 55% of food).**
 - **“50 percent of China’s cropland s are irrigated, producing 70 percent of all the food produced in that nation”**

irrigation....

- The irrigated area grew most rapidly during the 50s and the 60s with an annual rate of 4 percent.
- Growth less than 1% a year since the 1980s.
- “The reason for taking irrigated land out of production is primarily associated with what the FAO calls the three ‘silent enemies’ ”
 - Alkalinazation
 - Salinization, and
 - Waterlogging

Irrigation...

➤ Alkalinization:

➤ “The reason for taking irrigated land out of production is primarily associated with what the FAO calls the three ‘silent enemies’ ”

➤ Alkalinazation

➤ Salinization, and

➤ Waterlogging

salinization refers to a build up of salts in soil, eventually to toxic levels for plants. (3,000 - 6,000 ppm salt results in trouble for most cultivated plants.) Salt in soils decreases the osmotic potential of the soil so that plants can't take up water from it. When soils are salty, the soil has greater concentrations of solute than does the root, so plants can't get water from soil. The salts can also be directly toxic, but plant troubles usually result primarily from inability to take up water from salty soils.

<http://www.montysplantfood.com/docs/salinization.htm>

Another problem associated with excessive irrigation on poorly drained soils is **waterlogging**. This occurs (as is common for salinization) in poorly drained soils where water can't penetrate deeply.

<http://oregonstate.edu/~muirp/waterlog.htm>

Strains of plants

“Since the beginning of the Agricultural Revolution, improvements in crop and livestock have made notable contributions to increasing the quantity and improving the quality of the human diet.”

“Farmers have gradually kept and improved a few major plant species, while myriads of others have long since disappeared from the diets of most of the world people.”

Strains of

- More recently, a number of “revolutions” have resulted from discoveries in the plant genetics, discoveries which have led to the development of higher-yielding cereals”
 - Also better able to withstand:
 - cold,
 - heat,
 - diseases
 - More responsive to fertilizers
(higher yield per unit of land & input)

Strains of

These developments also referred to as the
Green Revolution

➤ Important beneficiary countries:

➤ Pakistan

➤ India

➤ China

➤ Philippines

➤ Thailand

➤ Mexico

Strains of...

“The story of English wheat is typical. It took nearly 1,000 years for wheat yields to increase from 0.5 to 2 metric tons per hectare, but only 40 years to climb from 2 to 6 metric tons per hectare.”

“Although the term Green Revolution originally described developments for rice and wheat, high-yielding varieties (HYVs) have since been developed for other major food crops important to developing countries, including sorghum, millet, maize, cassava, and beans.”

Strains of...

“The adoption of HYVs occurred quickly. By 1970, about 20 percent of the wheat area and 30 percent of the rice area in developing countries were planted to HYVs, and by 1990, the share had increased to about 70 percent for both crops.”

“These changes more than doubled cereal production in Asia between 1970 and 1995, while population increased by 60 percent”

Strains of...

“The Green Revolution led to sizable increases in returns to land, and hence raised farmers’ incomes.”

“This stimulated the rural nonfarm economy, which in turn grew and generated significant new income and employment of its own.”

“Real per capita incomes almost doubled in Asia between 1970 and 1995, and poverty declined from nearly three out of every five Asians in 1975 to less than one in three by 1995.”

Criticisms of the Green Revolution

“Critics of the Green Revolution argued that owners of large farms were the main adopters of the new technologies because of their better access to irrigation water, fertilizers, seeds, and credit. Small farmers were either unaffected or harmed because the Green Revolution resulted in lower product prices, higher input prices, and efforts by landlords to increase rents or force tenants off the land. Critics also argued that the Green Revolution encouraged unnecessary mechanization, thereby pushing down rural wages and employment.”

<http://www.ifpri.org/pubs/ib/ib11.pdf>

GM foods and Cloning

- “...the newer methods of genetically modifying foods represents a new phase in crop alteration.”
- GM has become a source of considerable controversy, as has the successful cloning of farm animals
- “Though there are perhaps 110 million acres of genetically altered crops growing today, led by corn, cotton, and soybeans, opponents have grown both more vocal and more numerous in recent year”
- American farmers use nearly a billion pounds of pesticides annually (which can be significantly reduced through the use of Bt - *Bacillus thuringiensis*- crops)

Strains of

- **“A new strain of ‘golden’ rice, rich in beta carotene, has the potential for decreasing the vitamin A deficiency in children who consume large quantities of rice as their staple diet”**
- **No labeling requirements for GM foods so far**
- **The debate so far has focused on crops but “...in the medium to long term the animal genomics debate is likely to be every bit as sensitive and interesting to researchers, as the debate on crops”**

The Paddock-Harding Viewpoints

“A locomotive is roaring full-throttle down the track. Just around the bend an impenetrable mudslide has oozed across the track. There it lies, inert, static, deadly. Nothing can stop the locomotive in time. Catastrophe is foredoomed. Miles back up the track the locomotive could have been warned and stopped. Years ago the mud-soaked hill could have been shored up to forestall the landslide. Now it is too late.” William and Paul Paddock (1976).

What are the Padocks talking about?

What locomotive (what does it represent)?

Paddock-Harding

➤ The Paddocks suggested that “...the most reasonable solution to the situation is to employ the concept of a **triage** as a means of allocating America’s food surplus to the ‘hungry nations’ “

Concept is commonly used in medicine:

- 1) Patient will die regardless of intervention
- 2) Patient will survive without treatment
- 3) Patient will live if proper treatment is given

Paddock-Harding

➤ **“The argument may be morally questionable”**

“Despite the Paddocks’s dire warnings, the world population has grown by close to 2.5 billion since 1976, and a vast majority of humanity is better off now than it was then”

➤ **What is your opinion on the Paddocks’s concept of the triage?**

Paddock-Harding

➤ Garrett Harding, an eminent biologist

“Popularized a view of the rich and poor countries in an analogy using **lifeboats**. The rich countries are viewed as lifeboats filled almost to capacity. The addition of more people threatens to sink them, hence drowning everyone”

➤ Introduced the phrase “**tragedy of the commons**” – 1995.

➤ “Picture a pasture open to all. It is to be expected that each herdsman will try to keep as many cattle as possible on the commons.....

Paddock-Harding

➤ “When applied to population growth, the **tragedy of the commons** is clear enough....Since most couples in the world today are not faced with the entire costs of their fertility decisions, many of them have more children than they otherwise would. The costs of those children, then, must be borne by others, so the parents like the herdsman in the example, are exploiting the commons for their own gain, even if it makes the nation worse off. “

➤ What is your opinion on Harding’s theory of a **lifeboat?**

Population and Food Supply

✓ **Food and Agriculture atlas**

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