

GLOBAL FOOD PRODUCTION

Introduction

The Concise Oxford Dictionary definition of a resource is a 'means of supplying a want, stock that can be drawn on; country's collective means for support and defence.' 'Any feature of the environment which can be used to meet human needs' is the description in a geographical dictionary. Solar insolation is the Earth's greatest resource, since everything else is reliant upon it, either directly or indirectly. The link between food and the sun's energy is obvious, and food must be classified as one of the most important resources we have. This **Geofile** looks at various aspects of past, present and future food production.

Current world food situation

At the beginning of the 21st century the gap between rich and poor in the world is wider than ever, not least in terms of amount and quality of food consumed. North America and Europe are experiencing increasing problems of obesity and all its associated health problems. The European Union Common Agricultural Policy imposed 'Set Aside' through the 1990s and during the early 2000s in order to cut down food production and limit surpluses and the expense of storing these. Once the Cold War was over, Europe had less need of large food stores, as war seemed less likely.

In sharp contrast, an increasing number of people in LEDCs are poorer and hungrier than ever before. The much-publicised rise in global food prices in 2008, especially of staples like rice and wheat, quickly sparked riots in Asia and Africa. Even in MEDCs people spend a significant proportion of their income on food, so this issue has rarely been out of the news in the first half of 2008. When prices rise so sharply, people have an unpleasant choice: they either cut down on amount or quality, or they spend more to maintain the same level, limiting their disposable income for other goods, with a knock-on effect on the rest of the economy.

In 2008 there were noticeably increased demands for food aid, but both NGOs (Non-Governmental Organisations, or charities) and even the UN (United Nations), which normally claims to satisfy this need, are affected by higher food costs. If they are simply to maintain current levels of aid, they must raise more funds to take account of increased prices. Yet, as the need increases, so should the aid, providing quite a dilemma. Most of Sub-Saharan Africa, parts of Pakistan, Afghanistan and Colombia are in this difficult situation (Figure 1).

Competition for land

1. Food vs energy crops

A rapidly increasing proportion of the world's farmland is not used for food crops but to produce other resources, sometimes much needed and sometimes inessential. An increasing proportion of usable farmland is being used for non-food crops – biofuels (Figure 2) and other cash crops. Half of Brazil's vehicles are powered by ethanol, biofuel produced from sugar cane. Huge areas are given over to this production, in the North East, which provides 6% of the country's ethanol (though it used to be more) and increasingly in Sao Paulo state, now responsible for 80% of the fuel crop. As Brazil's economic success continues, home demand increases, as do potential exports – the market is set to be huge. New sugar areas are therefore opening up further inland, primarily in Cerrado and Mato Grosso states. Rainforest is sometimes sacrificed for these developments. Brazil is keen to continue to expand this business. At the June 2008 World Food Summit in Rome Brazil's president, Luiz Inacio Lula da Silva, defended his country's use of sugar cane-based biofuels and accused critics of 'hypocrisy' (*The Guardian*, Thursday, June 5, 2008). He accepted that turning land over to biofuels had increased food prices by 3%, but the IMF (International Monetary Fund) and some key food agencies suggest the real figure is 30%!

Biofuel production has taken off so rapidly that it is not likely to stop

Figure 1: Impact of rising food prices on NGOs

Reader letter to the *Birmingham Post and Mail*, Wednesday, June 4, 2008:

'Dear Editor, As the United Nations food summit in Rome takes place, now is a perfect time for world leaders to address the food price crisis. In the many countries across the world where Oxfam works, the negative impact of higher food prices on poor people is evident, with many people now being forced to spend more than half their income on food...

Oxfam estimates that an extra EUR14.5bn is needed to scale up immediate assistance to at least 290 million people who find themselves threatened by the rising food prices. Although this might seem high, it shrinks in comparison to the EUR1 trillion that the US Federal Reserve and the European Central Bank have injected into the financial system in the past six months in an attempt to ward off economic crisis... The cost of failure will not just be measured in lost lives and suffering but also in lost integrity.'

Susan Cockcroft, Midlands Campaigner for Oxfam

expanding. Oil prices being as high as they are in 2008 only adds to the appeal of biofuels. More land is likely to be given over to them and food may come second for some regions, despite the virtual panic in summer 2008 over the price of foods, not only in some LEDCs, where there were riots in the streets, but also in MEDCs. There is controversy over the Amazon Basin's increase in soya bean production, much of which is for biofuels, not food.

2. Food vs flowers

Cash crops may be for food or for other resources, some of which are essential, and some not. Kenya is using some of its best land, previously used for subsistence crops, and now irrigated so even more productive, for flower production for the UK supermarkets. Jobs are provided in the LEDC; in the MEDCs people have access to a well-priced product so demand is relatively

high, increasing Kenya's profits. In fact flower growing in Kenya has overtaken coffee and tourism as a source of foreign exchange. It is second only to tea as an economic resource. Now providing 25% of the EU market in imported flowers, Kenya has overtaken Israel in this respect, but a consequence is that Kenya now imports more staple crops to replace the subsistence harvest lost.

World food demand means that traditional farming systems are adapting to produce larger yields. Mechanisation and increased use of chemicals have enabled this in some regions, but elsewhere it is sheer human ingenuity which is responsible for increased yields. However, even these two strategies together may not be enough.

Producing more food

1. China

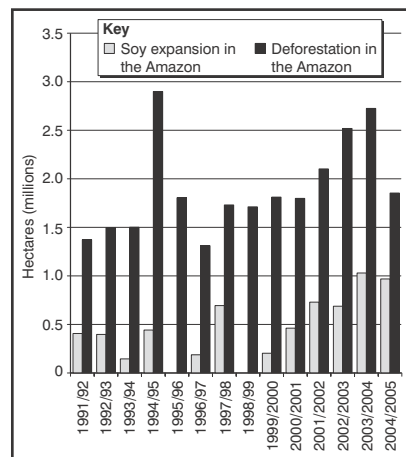
China's lower Yangtze valley is known as the 'land of fish and rice'. Land between the Three Gorges dam and the sea is amongst the richest in the world, as soils are mainly derived from alluvium from the vast natural flooding of the valley floor. The warm humid climate makes this the most important farming region in China – its rice harvest provides 70% of China's needs and, impressively, 40% of total world rice requirements! In this flat, watery landscape upstream from Shanghai, every available area of land, however tiny, is under cultivation. Two or even three crops can be grown each year. In most areas there is no large equipment, though this is rapidly on the increase. Wheat is a favoured winter crop when temperatures are too low for rice. The Yangtze, its tributaries, the hundreds of lakes across the valley floor and thousands of ponds are full of fish, a major source of protein. Qing Pu village fish farm consists of 50 ponds, containing five species and producing 29,000 tonnes of fish every year. There are thousands of fish farms like this all over southern China.

On the other hand, large areas of arable land are being destroyed annually by Chinese economic development. It is almost like cutting your own throat – every year China loses a million acres to new factories and real estate development, so boosting the

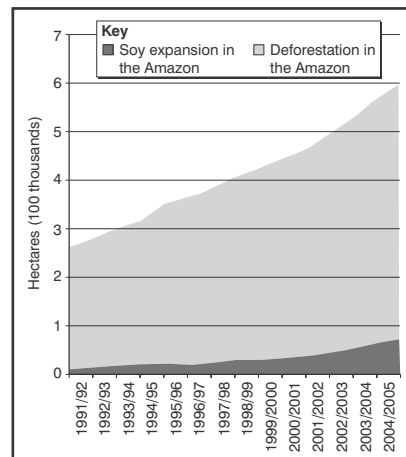
Figure 2: Crops grown for biofuels – soya beans in Amazonia and elsewhere

The rapid expansion of soya bean cultivation in the Amazon may be having a larger impact on climate than previously believed. This crop reflects more of the sun's radiation than rainforest does, so the ground surface does not become as hot. This reduces convectional rainfall. 'Ironically, the drive for "green energy" in the developed world is having the perverse effect of encouraging the destruction of tropical rainforests' (<http://newsscientist.com/article.ns?id=mg18825265.400>).

Soya expansion and deforestation in the Brazilian Amazon, 1990–2005



The impact of soya expansion in the Amazon 1990–2005



economy, but this is land that produced some of the highest yields of food in the world, and China's population is still growing. People continue to leave the land for secondary and tertiary jobs in cities. Rice production is being replaced by clothing factories – an annual crop of three tonnes of rice has become 120,000 pairs of trousers, mainly for export – another dilemma? Either farmers will have to become more productive or imports will have to rise – and this could take food from more needy people in LEDCs.

2. GM crops

The *New York Times* of 5 June 2008 reported that Monsanto, the world's leading company in genetically modified food, had pledged to deliver seeds that would double yields of maize, soya beans and cotton by 2030 yet would also need 30% less water, land and energy to grow (Figure 3). The amount of land given over to GM crops is increasing rapidly. In 2006, 252 million acres in 22 countries were under such crops; a year later 23 countries had 282 million acres.

Some negative realities

Increasing world food supply is not as simple everywhere. World leaders at the World Millennium Summit (part of Agenda 2000)

agreed to halve the number of people in extreme poverty (i.e. living on \$1 a day or below) by 2015, but this now looks extremely unlikely. Indeed, if anything, the situation has worsened, a function of population increase, as well as difficulties intensifying production in more fragile physical environments. Moreover, human factors have often been negative: many African states are held back in their development by political instability, war, lack of infrastructure and investment, plus a low skill base in their populations. Production is even further handicapped by debilitating diseases like AIDS and malaria.

Intensification of food production is possible in some regions, in particular Zimbabwe. Once known as 'the bread basket of Africa'

Figure 3: GM soya bean experiment by Monsanto in the USA



Figure 4: Food supply needs to rise by 50%, warns Ban Ki-moon

UN WORLD SECURITY CONFERENCE

UNITED NATIONS Secretary General Ban Ki-moon yesterday urged the international community to ‘act together now’ in the name of ‘our common humanity’ in order to deal with the current global food crisis. Addressing the UN’s World Food Security summit in Rome on the opening day, Mr Ban pointed out that the world’s population will reach 7.2 billion by 2015, making it essential that action be taken now.

It is the ‘poorest of the poor,’ those that spend two-thirds of their income on food, who have been and will continue to be hardest hit by the current rise in world food prices, said Mr Ban, adding: ‘I have seen this for myself. In Liberia recently, I met people who normally would buy rice by the bag. Today, they buy it by the cup. In Cote d’Ivoire [Ivory Coast], the leaders of a country recovering from conflict and trying to build a democracy told me how they feared that food riots could undo all their hard work. We fear the same in other countries: Afghanistan, Haiti and Liberia to name but a few.

According to Mr Ban, the world needs to produce more food, increasing production by 50% by the year 2030 to meet the rising demand. Praising those countries which have opted to help farmers pay for basic agricultural ‘inputs’ such as seeds and fertiliser, Mr Ban said that ways must be found to support such initiatives, ‘politically and financially’. To that end, he said, he had set up a high level task force that is intended to come up with a comprehensive framework for action.

Mr Ban was, however, critical of one form of action, saying: ‘Some countries have taken action by limiting exports or by imposing price controls. As I have said before, I say again now: beggar-thy-neighbour food policies cannot work. They only distort markets and force prices even higher. I call on nations to resist such measures and to immediately release exports designated for humanitarian purposes.’

Hosted by the UN’s Food and Agriculture Organisation (FAO), the Rome World Food summit is addressing the complex question of guaranteeing world food security in the context of the current, rapid rise in food prices.

Irish Times 4 June 2008, via News UK website

because it was so highly productive before the political and economic disasters of the Mugabe government, which destroyed the 4,000 large-scale, high-yielding farms, replacing them with 300,000 small-scale, poorly producing subsistence plots. Yields are now so dramatically reduced that people are dying from starvation.

The 6pm BBC Radio 4 news on Monday 9 June 2008 reported an impending food crisis developing in Ethiopia, not on the scale of the 1980s famines, but nevertheless affecting some farmers. Climate change is blamed for 2007’s low and erratic rainfall, leaving the country with virtually no stores. Moreover, in an attempt to encourage local farmers, the government restricted imports of food, leaving even less for distribution to the needy. Children are the most vulnerable. Ironically, rain was falling by summer 2008 and the fields were green, but these were the next year’s crops, no use for the immediate crisis.

By 2050 world population is projected to increase to 9 billion, while as much as 50% of the world’s arable land may be unusable. To feed everyone food production will have to rise by 110% this is impossible without a radical rethink of production techniques, dietary needs and trading systems. Some possible ideas are set out below and certainly do not cover every possibility. To be successful, any programme of change will have to be broadly based and flexible.

1. Biofortified crops

Harvest Plus is an international research effort to improve the nutritional quality of staple foods. The results could help millions of people in LEDCs who do not get enough vitamins and minerals in their diet, a condition known as micro-nutrient deficiency, which leads to problems with growth, the immune system and cognitive development. It is almost like a hidden hunger.

Biofortification of crops is therefore a promising area of research where crop varieties are bred with increased vitamin and mineral content, which should help reduce this malnutrition. It cannot solve quantity of food supply, but it might solve quality – in other words, give poor people a much better level of

Figure 5: Food fact box

- 183 countries had delegates at the June 2008 food summit.
- 854 million people in the world are undernourished.
- 100 million of those people have suddenly been pushed into food crisis in 2008, due to world events.
- £13 billion will be needed annually to avert this food crisis, according to UN Secretary General, Ban Ki-moon.

nutrition from what they do eat, even if it is not quite enough in terms of calorie intake. Perhaps it also has a place in MEDC diet since, although wealthier people eat plenty of calories, the nutritional content of their diet is often less than ideal.

The International Rice Research Institute (IRRI) in the Philippines (which developed many of the rice, maize and wheat high-yielding varieties that fuelled the Green Revolution) is breeding strains of rice with high iron and zinc concentrations. Meanwhile, the Tropical Agriculture Research Centre in Colombia has developed cassava, a locally important root crop, fortified with beta-carotene (Vitamin A). Other research centres are experimenting with wheat and maize incorporating various vitamins and minerals.

2. Increasing production of GM crops

Soaring food prices and grain shortages (often caused by the amount of grain that is now fed to livestock) have created a new urgency for the world’s farmers to produce more food. Resistance to genetically-modified crops has been considerable because they contain genes from other species, including animals, which seems unnatural and is certainly a large step away from mixing plant genes in the HYVs (high yielding varieties) of the Green Revolution of the 1960s onwards. People have been naturally suspicious of these crops, but recently resistance to the development and use of these new strains seems to be declining. Perhaps the prospect of greater hunger in the world than we have already come to accept and the possibility of it affecting MEDC food supplies – global food shortages are already affecting our pockets – have placed a different perspective

on the rights and wrongs of changing nature. Experts say that reliance on these **transgenic** crops is likely to grow.

One positive aspect of greater use of GM crops is finding new strains which can be grown in areas which are currently unproductive or produce unreliable harvests, for example crops that withstand the increasing effects of climate change – plants tolerant of heat, drought and salinity (high salt content in soils or irrigation water) will become invaluable as growing conditions in parts of the world become ever more difficult whilst demand for food continues to increase. Ideally, characteristics could be bred into plants tailored to particular difficult environments. Some solutions could come through conventional plant breeding and finding new uses of existing plants, but increased use of GM strains, despite all objections to them, seems inevitable.

3. Finding new uses for existing plants

Jatropha, a plant few in the West have even heard of, has been hailed as a toxic ‘wonder plant’. A weed originating in Africa, it has seeds that can be refined into biofuel. Never a food crop as it is very poisonous (three of its seeds ingested could kill you!), this plant’s appeal lies in the fact that it can survive three years of drought and still produce a crop. Neither does it need good quality soil. Critics say it does not yield enough to be commercially viable, and finding buyers for a little known crop is difficult. However, it uses land which is unusable for food crops at this stage in our technology, so why not use the most difficult land to produce it?

4. Solving the food crisis through fairer trading systems

World agriculture today is dominated by unsustainable policies, technologies and trading systems. Agricultural subsidies distort the market – we need to change the economic rules. Fair trade has made an improvement to individuals across the less developed world, but it needs to be rapidly expanded. Greater investment in creating food production systems that feed the poor locally is one opportunity, for instance changing reliance on expensive and environmentally damaging chemical fertilizers

to more locally-accessible and environmentally-friendly inputs. The dominance of multinational companies does little to serve the poor.

5. Promoting healthy ecosystems

‘The modern business-dominated agricultural industry promotes the degradation of nature – and that, in turn, means less and worse food ... The current model of market-driven food production is leaving people hungry!’

Gonzalo Oviedo <http://news.bbc.co.uk/1/hi/sci/tech/7430996.stm2/6/08>

In the last 50 years food production has more than doubled to meet demand, but consequences have been that 60% of all ecosystems are now degraded and species are becoming extinct at an alarming rate, causing a huge loss in genetic diversity. Currently four plant species – wheat, rice, maize and potatoes – provide more than half our crop consumption. 90% of our animal protein comes from twelve species only. We have already lost 75% of the genetic diversity of agricultural crops. As traditional crops and livestock breeds die out, so do the traditional skills involved in their production.

Studies have shown that there is a practical benefit in maintaining biodiversity, both in our crops and livestock as well as in our landscape as a whole – yields are better in the long term. Hay production in Britain is higher in meadows with a greater number of species. Crop yields in Australia have been shown to be higher in regions with a greater number of species in the local ecosystem. A healthy environment may mean more food in the long term and a greater ability to survive the increasing number of natural disasters that climate change is likely to bring. Financial investment in healthy ecosystems, especially in LEDCs, is much too low and needs to be raised significantly.

Conclusion: Future production?

‘All agree there is a food crisis. But the argument is how to deal with it’ (*The Independent* 4 June 2008, p 21). Simply put, the world needs more food and there is a limited range of strategies by which this might happen and in many areas likely success is limited by environmental fragility and climatic unreliability. The June 2008 World Food Summit highlighted this.

The world can make use of its vast range of environments to grow a huge range of crops and produce a variety of animals. The success of today’s agricultural systems depends on the development of new technologies to secure them as climate changes with the inevitability of global warming. Population increase remains probably the most threatening factor, since, even with technological advances, there must eventually be a ceiling on global food production. Some productive environments will become more limited as climate changes, leading to a drop in production of some commodities; other farming systems will simply move polewards and people will just have to adapt to growing certain crops and producing particular animals in different latitudes. The case remains that people need to be adaptable and produce the maximum food supply sustainably in all climate zones wherever they are located today and tomorrow. As long as the agricultural systems work, it does not really matter exactly where they are located.

FOCUS QUESTIONS

1. In 2008 the world suddenly seems to have felt pressure on food production and prices. Explain why this is so.
2. Using examples, explain why it is easier to increase food production in some parts of the world than others.