CHAPTER 7: AGRICULTURE AND RURAL LAND USE

IF YOU LEARN ONLY SEVEN THINGS IN THIS CHAPTER . . .

1. Many of the world's crop products are dictated by the climate of the regions where they are grown.
2. There were three agricultural revolutions that changed history. The First Agricultural Revolution was the transition from hunting and gathering to planting and sustaining. The Second Agricultural Revolution increased the productivity of farming through mechanization and access to market areas through better transportation. The Third Agricultural Revolution involves the genetic engineering of products as well as the increased use of fertilizers for crops and antibiotics in animal products.
3. Von Thunen's Model focuses on transportation. The distance and the weight of crops as well as their distance to market affect which ones are grown.
4. There are two primary methods of farming in the world. Subsistence farming involves producing agricultural products for use by the farm family. Commercial farming involves the sale of agricultural products off the farm.
5. Many of the settlement patterns in the United States have been based on the agricultural possibilities of the areas.
6. Modern agriculture is becoming more industrialized and more specialized than ever. The loss of the family farm is a direct result of the rise of feedlots and mega-farms used to produce enormous quantities of agricultural commodities.
7. To compete with agribusiness in the United States, many family farms are turning to sustainable methods of production, organic agriculture, and catering to the local-food movement.

Agricultural systems and factors

Agriculture is the harvesting of crops and animal products for human and/or animal consumption and for industrial production.

CLASSIFYING AGRICULTURE

The following are not exclusive categories but indicate a scale along which all farming types can be placed.

Arable: the cultivation of crops, e.g. wheat farming in East Anglia.
Pastoral: the rearing of animals, e.g. sheep farming in the Lake District.

Commercial: products are sold to make a profit, e.g. market gardening in the Netherlands.
Subsistence (or **peasant farming**)**:** products are consumed by the cultivators, e.g. shifting cultivation by the Kayapo indians in the Amazonian rainforest.

Intensive: high inputs or yields per unit area, e.g. battery hen production.
Extensive: low inputs or yields per unit area, e.g. free range chicken production.

Nomadic: farmers move seasonally with their herds, e.g. the Pokot, pastoralists in Kenya.
Sedentary: farmers remain in the same place throughout the year, e.g. dairy farming in Devon and Cornwall.

FACTORS AFFECTING AGRICULTURE

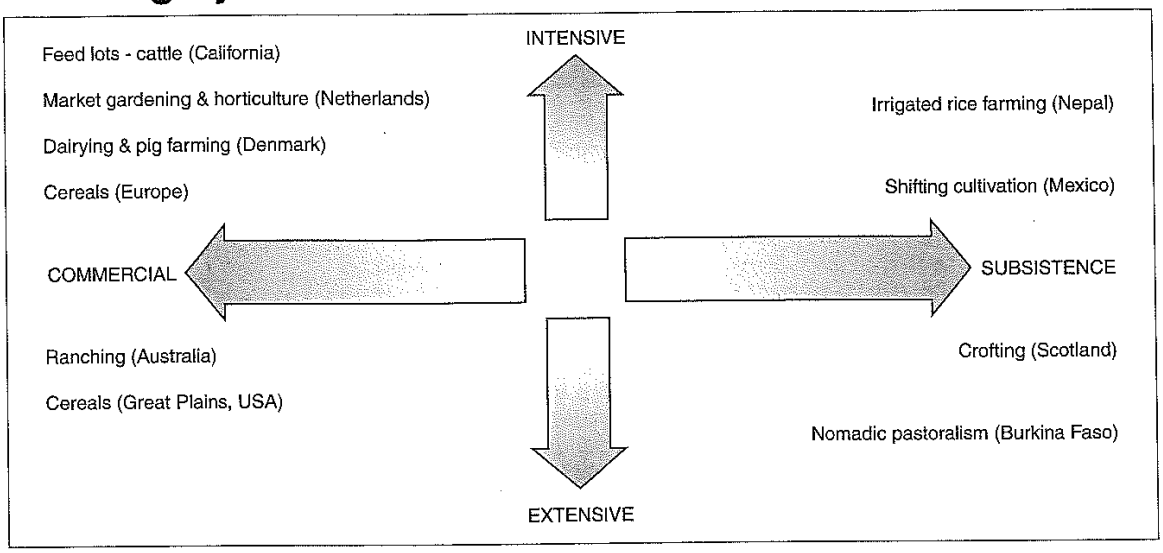
Physical factors

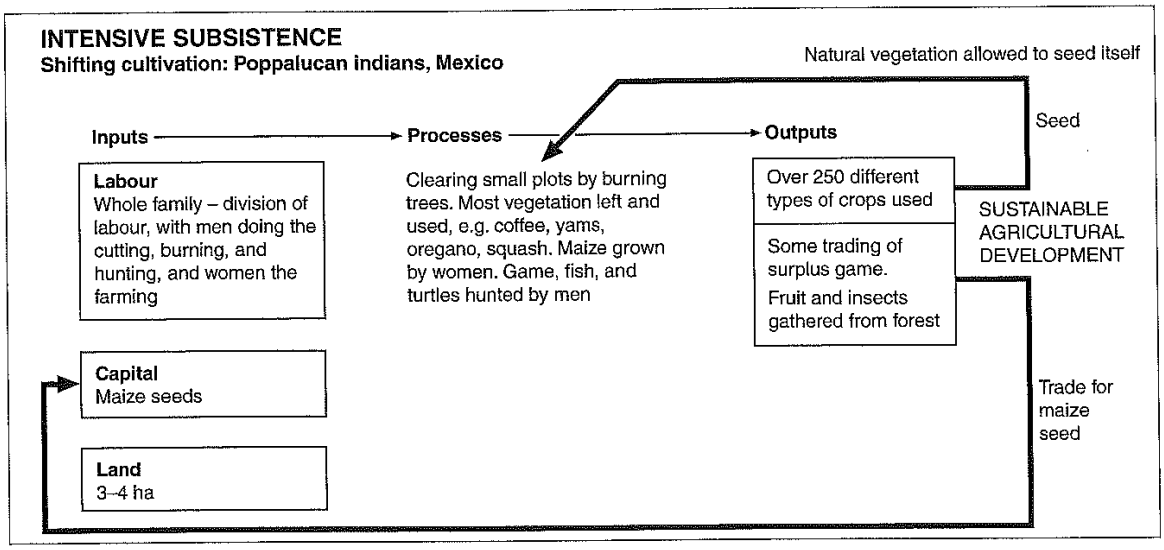
Climate	Precipitation • type • frequency • intensity • amount Temperature • growing season (> 6°C) • ground frozen (0°C) • range of temperatures
Soil	Fertility • pH • cation exchange capacity • nutrient status Structure Texture Depth
Pests	Vermin, locusts, disease, etc.
Slope	Gradient
Relief	Altitude
Aspect	Ubac (shady) or adret (sunny)

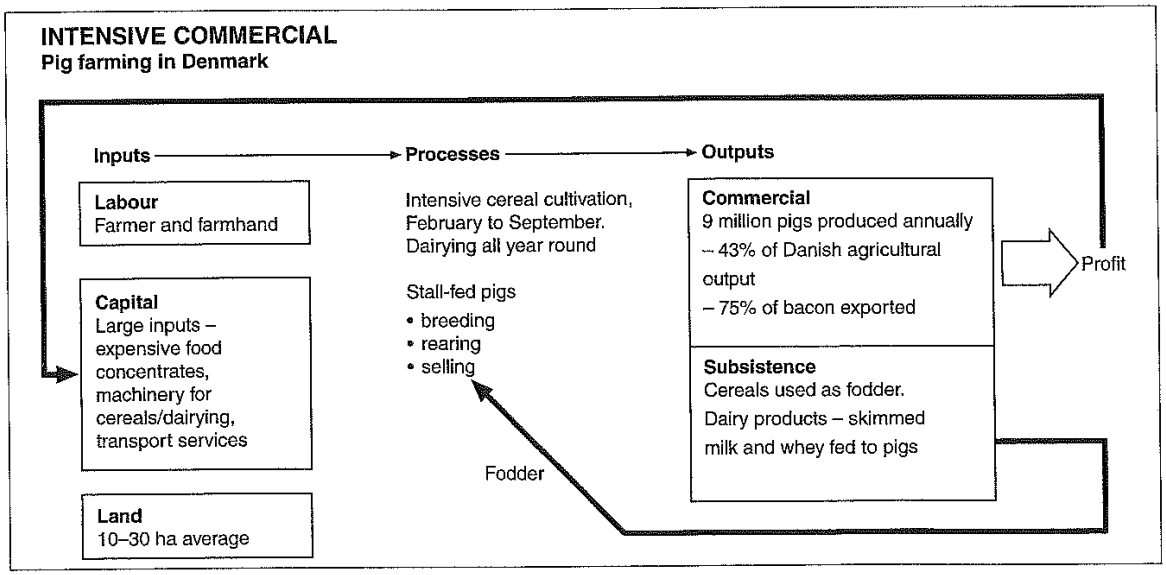
Human factors

Political	Land tenure/ownership • ownership, rental, share-cropping, state-control Organisation • collective, co-operative agribusiness, family farm Government policies • subsidies, guaranteed prices, ESAs, quotas, set-aside War • disease, famine
Economic	Farm size • field size and shape Demand • size and type of market Capital • equipment, machinery, seeds, money, 'inputs' Technology • HYVs, fertilisers, irrigation Infrastructure • roads, communications, storage Advertising
Social	Cultural and traditional influences Education and training Behavioural influences Chance

Farming systems





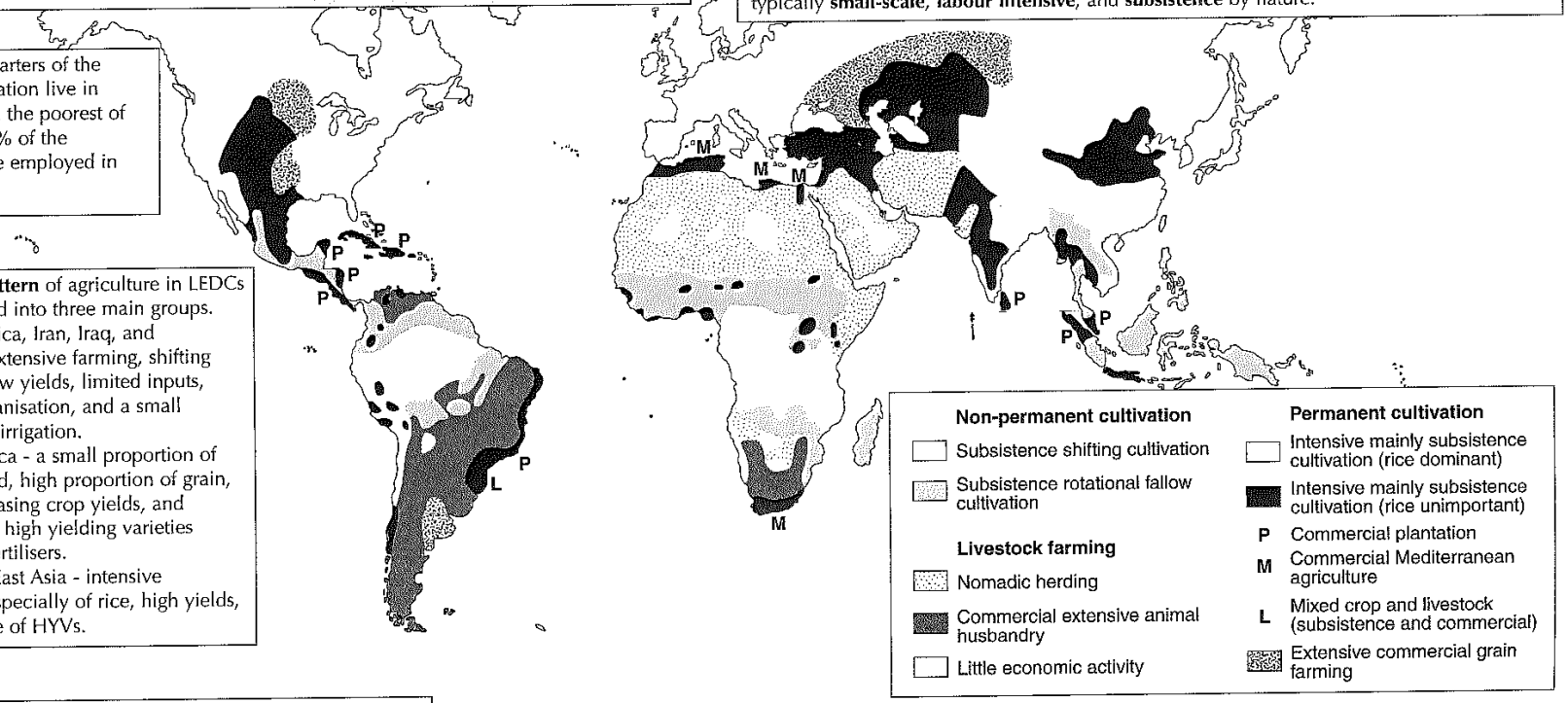


Farming in LEDCs

The importance of agriculture
Agriculture remains the main source of **employment** for most people in LEDCs. However, its importance has declined in recent decades due to the growth of manufacturing and to decreased food prices. Nevertheless, it remains a vital part of many economies due to employment, **export earnings** and **food supply**.

Farming systems in more developed countries (MEDCs) and LEDCs are very different. Agriculture in MEDCs has more in common with manufacturing industry than it has with farming in LEDCs. For example, much of it is run by companies, and is **capital intensive** (costs lots of money), highly **mechanised**, **large-scale**, **market-orientated** (geared to consumer demand), and **government involvement** is crucial. By contrast, agriculture in LEDCs is typically **small-scale**, **labour intensive**, and **subsistence** by nature.

Over three-quarters of the world's population live in LEDCs, and in the poorest of these over 70% of the population are employed in agriculture.



The **global pattern** of agriculture in LEDCs can be divided into three main groups.
1 Tropical Africa, Iran, Iraq, and Cambodia - extensive farming, shifting cultivation, low yields, limited inputs, limited mechanisation, and a small proportion of irrigation.
2 Latin America - a small proportion of cultivated land, high proportion of grain, low but increasing crop yields, and limited use of high yielding varieties (HYVs) and fertilisers.
3 South and East Asia - intensive cultivation, especially of rice, high yields, and much use of HYVs.

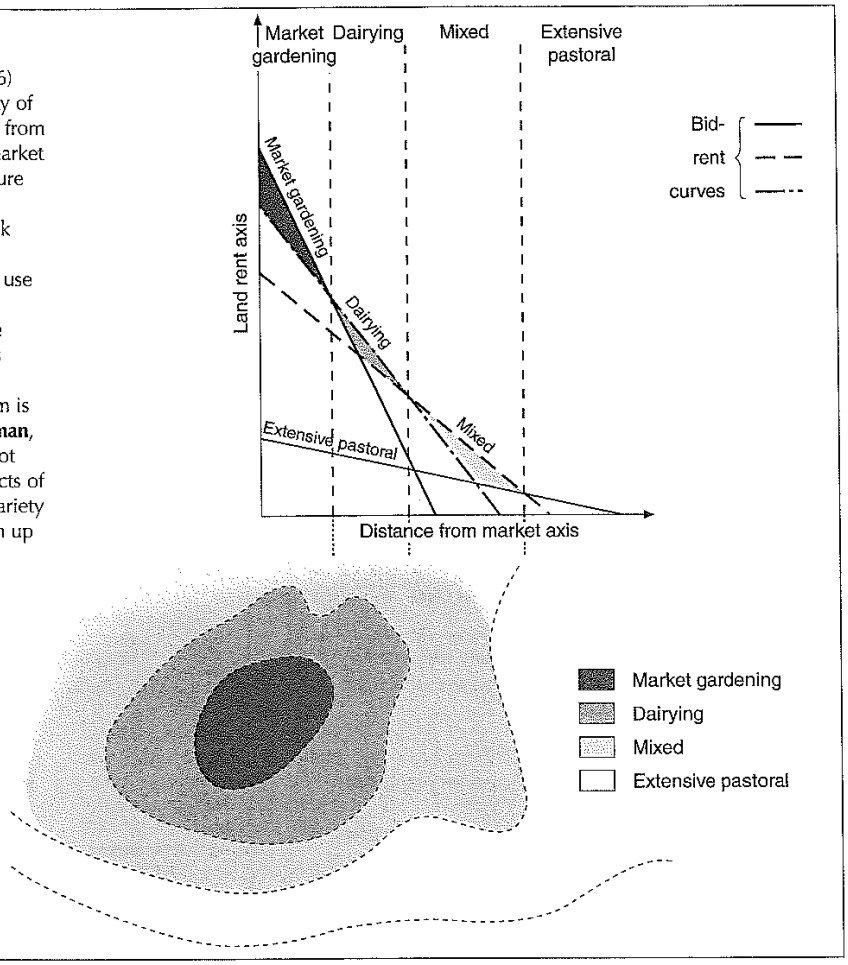
In LEDCs there has been a decrease in production per head in many countries. Reasons include:
- deteriorating environmental conditions
- poor farming practises
- over-population
- under-population, as in Rwanda, where there were not enough people to harvest crops from the fields
- the neglect of the agricultural sector by the government.

In parts of Africa, declining farmyields are widespread. At the heart of the problem is the fact that population growth exceeds agricultural production. Potential solutions are mostly related to intensification such as double cropping (two crops a year), irrigation, increased use of fertilisers, and greenhouses. But such developments are neither widespread nor even. For example, there is a very uneven pattern of fertiliser use with a large increase in Asia (especially China, India, and Bangladesh) but not in Africa.

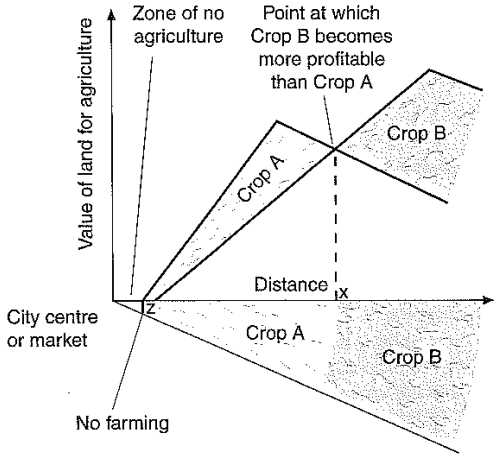
Agricultural models

VON THUNEN'S MODEL

Johann Von Thunen's model of **locational or economic rent** (1826) suggests that land use and intensity of production declines with distance from a central market. High intensity market gardening, dairying, and horticulture predominate close to urban areas while extensive grain and livestock farming are located furthest away. Woodland was an important land use when Von Thunen developed his model and was found close to the urban area. Although his model is criticised for its simplicity and its assumptions (that farmers' sole aim is to maximise profits, i.e. **rational man**, and that physical conditions do not vary, i.e. an **isotropic plain**), aspects of his model can be observed at a variety of scales, from the individual farm up to land use in Europe. It is also important whenever transport is poorly developed, especially in developing countries.



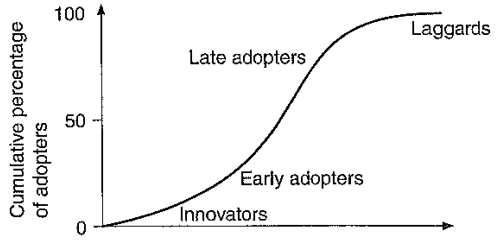
SINCLAIR'S MODEL

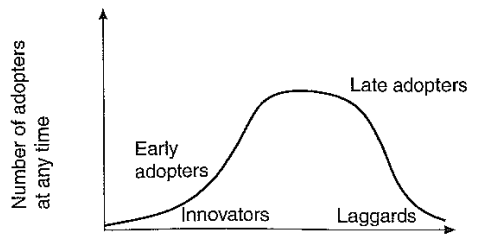


Sinclair's model suggests the opposite to Von Thunen: i.e. that the value of land for agriculture is at its lowest closest to urban areas. This is because the land is more valuable for **speculative developments**, e.g. for commercial, industrial, or residential uses. Beyond a certain distance, the land is used for agriculture as it loses its value for development.

HAGERSTRAND'S MODEL

Hagerstrand showed how **new innovations** and **techniques** were likely to be used only by a few people at first (innovators) before being adopted rapidly, although a few laggards would resist change. This meant the adoption of any technique followed an S-shaped curve.





The green revolution

THE PROBLEM

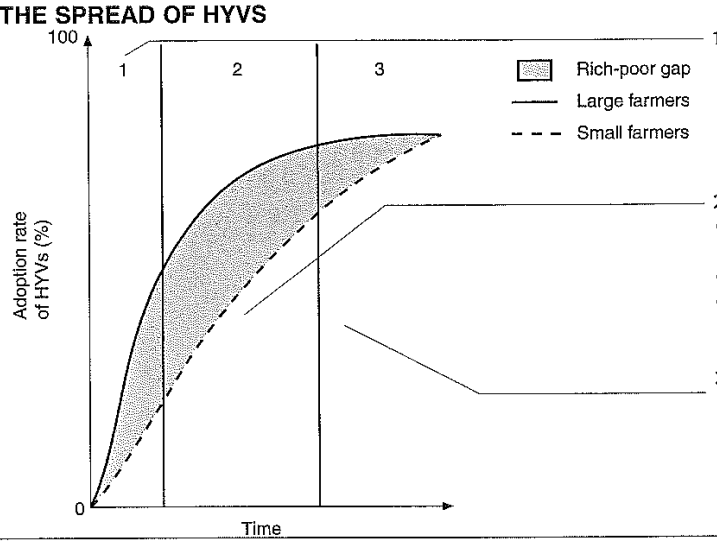
Population growth is more rapid than the growth of food production. In India, for example, by 2000 AD the population will reach 1 billion people and food production will need to increase by 40% to match demand. But much of India's land is of limited potential.

THE SOLUTION?

The **green revolution** is the application of science and technology to increase crop productivity. It includes a variety of techniques such as genetic engineering to produce higher yielding varieties (HYVs) of crops and animals, mechanisation, pesticides, herbicides, chemical fertilisers, and irrigation water.

HYVs are the flagship of the green revolution. During 1967-8 India adopted Mexican Rice IR8 which yielded twice as much grain as traditional varieties. However, it required large amounts of water and fertiliser. Up to 55% of India's crops are now HYVs and 85% of the Philippines' crops are HYVs. By contrast only 13% of Thailand's crops are HYVs.

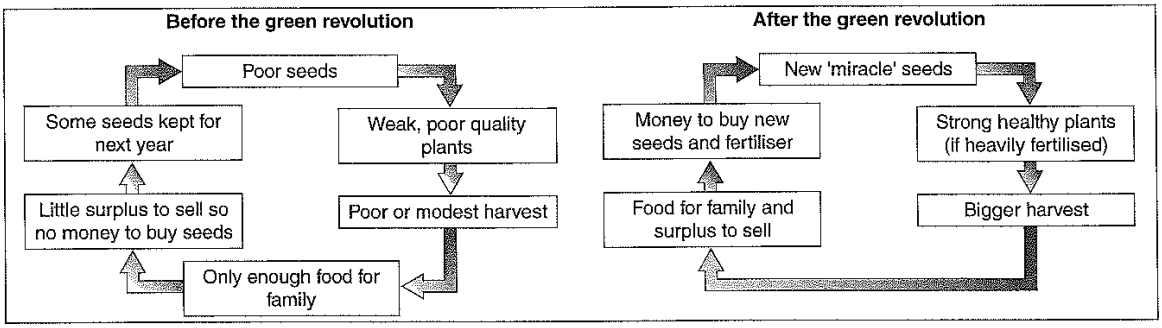
THE SPREAD OF HYVS



1 Rapid adoption by farmers with plentiful land and/or money. Rich farmers buy seeds, irrigation pumps, fertilisers, pesticides, HYVs. By contrast small farmers cannot benefit at first.

2 Adoption by smaller farmers caused by:
- government-backed agricultural development projects
- new seeds targeted for more environments
- continued population pressure creating extra demand for more food.

3 Spread of new techniques to most farmers. Widespread adoption.



THE CONSEQUENCES

The main benefit is that more food can be produced:
- yields are higher
- up to three crops can be grown each year
- more food should lead to less hunger
- more exports create more foreign currency.

However, there are many problems:
- not all farmers adopt HYVs - some cannot afford the cost
- as the cost rises, indebtedness increases
- rural unemployment has increased due to mechanisation
- irrigation has led to salinisation - 20% of Pakistan's and 25% of Central Asia's irrigated land is affected by salt
- soil fertility is declining as HYVs use up all the nutrients; these can be replenished by fertilisers, but this is expensive
- LEDCs are dependent on many developed countries for the inputs.

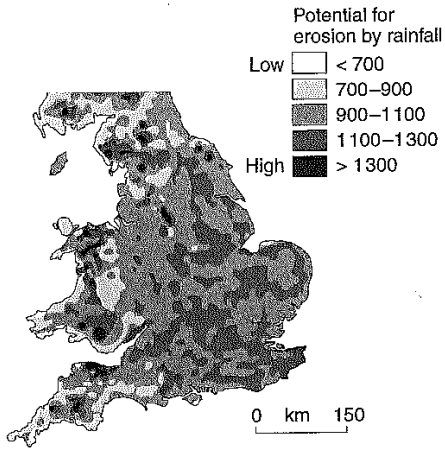
Changes in South India: the effects of the green revolution

Use of fertiliser	+138%
Human labour	+111%
Paddy rice	+91%
Sugar cane	+41%
Income	+20%
Subsistence food	-90%
Energy efficiency	-25%
Casual employment	-66%

Agriculture and environmental issues

SOIL EROSION

- Over one-third of arable land in the UK is at risk of soil erosion
- Sandy and sandy-loam soils with a slope angle of more than 3° are particularly vulnerable
- Soil losses are up to 250 t/ha in the South Downs, 160 t/ha in Norfolk and 150 t/ha in West Sussex.



The potential for soil erosion has increased considerably in recent years for a number of reasons:

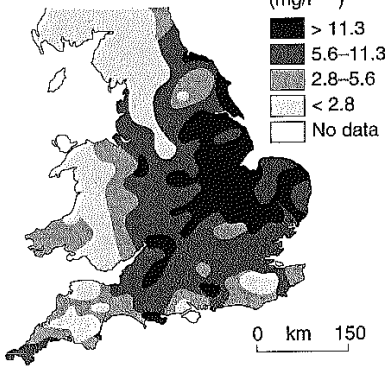
- Spread of arable land use into pastoral areas
- Hedgerow removal
- Ploughing and draining of peaty soils
- Afforestation leaves bare ground between young trees
- Increased recreational pressure in rural areas.

NITRATE POLLUTION

Increased levels of nitrates in ponds and streams can cause eutrophication, i.e. nutrient enrichment.

Up to 5 million people in England and Wales are supplied with water with high rates of nitrates. This is linked with:

- high rates of stomach cancer
- blue baby syndrome, due to oxygen starvation in the bloodstream



Solutions include:

- A change in land use to pastoral farming
- Less intensive arable agriculture
- Less use of fertiliser
- The use of cover crops in winter to absorb fertiliser.

The use of nitrate fertilisers rose from 200 000 tonnes in 1945 to a peak of 1.6 million tonnes in the 1980s. It will cost between £50 million and £300 million each year to purify water that has become enriched with nitrates.

BSE

BSE (a disease in cows) and CJD (a disease in humans) belong to a rare group of diseases called spongiform encephalopathies. Most cases of CJD have occurred in places where BSE is more common. In 1996 10 cases of CJD were diagnosed.

The first case of BSE in Britain was in 1986. Most of the infection in cattle took place in the late 1980s and it peaked in 1992. BSE came into cattle when they ate meat that was infected with scrapie, a disease common in sheep. Cows that were fed on infected sheep tissue developed BSE. As these cows were then slaughtered, crushed, and fed back to other cows, some of these became infected.

Why did it affect the UK?

- Cattle carcasses in the UK were burnt at a relatively low temperature.
- Cattle in the UK derive up to 5% of their food from meat and bone meal.
- The government only offered a 50% grant for farmers to destroy infected animals. It is believed that this encouraged farmers to pass off sick animals as healthy and lengthened the period that humans were fed potentially infected beef.

As soon as other EU countries suspected that British animals might be spreading BSE they banned it. France and Ireland destroyed all animals in any herd that contained even one case of BSE. This did not occur in the UK. Up to 85% of beef herds and 40% of dairy herds remain unaffected by BSE.

To cost of BSE to Britain could be as high as £15 billion.

About 850 000 cows are killed every year. These are mostly cattle that have come to the end of their working lives and are used for products such as sausages, pate, pies, and glue.