5.1.1. Environmental impact and Sustainability – Food Sources

How plant foods are grown on farms.
Intensive farming is the mass production of (the same) plant crops in large fields, glasshouses or poly-tunnels, or thousands of livestock in large barns and sheds. It is used because it feeds a growing population.

Advantages
- Food is cheaper to produce – less land used, less labour is required.

Disadvantages
- Concerns about animal welfare
- use of pesticides and effects of these on environment an
- Use of artificial fertilisers and effects of these on environ pply

- Possible spread of disease
- Amount of energy used to produce meat and dairy foods
- Effects on local geography and soil quality.

Organic Food- grown without use of artificial or chemical fertilisers.

Advantages:
- Farmers develop fertile soil by adding organic matter e.g. manure.
- Farmers rotate crops so the soil doesn't have all the goodness taken out.
- Pesticide use is severely restricted – farmers encourage wild, natural predators such as ladybirds and other insects to control pests.
- Organic foods are produced as naturally as possible, using organic farming methods

Disadvantages
- Requires much manual labour (people) to remove weeds + manage crops
- Organic agriculture is carried out subject to a set of legally defined standards. Overseen by the Soil Association

There is an increase in sales of organic food because:

- Health reasons: Organic produce contains fewer pesticides; there are some concerns about the health risks associated with chemicals.
- Taste: Organic food is often fresher because it doesn't contain preservatives that make it last longer.
- Environmental: Organic farming practices reduce pollution (of air, water, soil), conserve water, reduce soil erosion, increase soil fertility and use less energy. Farming without pesticides is also better for nearby birds and small animals as well as people who live close to or work on farms. • Animal welfare: Farm animals are reared humanely and not routinely fed antibiotics to suppress disease or promote growth. Organically raised animals are not given antibiotics or growth hormones. Animals are free-range and can graze.

How animal foods are reared
Animals are reared by humans specifically to provide meat + products, e.g. cows - reared for beef and milk + poultry for eggs + meat.
Factory farmed: the animals don't have much room . Livestock (animals, birds and fish) are reared in large numbers often indoors in large sheds/cages/tanks which is intensive farming.
Advantages:
- Animals are kept inside in warm sheds so they don't waste much energy moving around. This means that more of their energy goes into meat, egg or milk production.
- Animals are sometimes given growth hormones, force fed (to speed up growth) making meat production quicker and cheaper
- Cheaper to produce and efficient.

Disadvantages:
- People are concerned that the lives intensively farmed animals live is not nice because animals do not act naturally.
- The meat is sometimes considered to not taste as nice as less intensively or organically reared.

Free-range production:

Advantages:
- Animals have more space and are often free to roam.
- Not given growth hormones to speed up growth
- There are higher animal welfare standards and the animals live nicer lives.

Disadvantages
- Less food is produced in free range conditions.
- Extra land needed for free roaming adds to production costs.
- Animals waste much energy moving around. This means that less of their energy goes into meat, egg or milk production. This makes these products more expensive as the animals take longer to grow.
- Products that are free range are more expensive.

The **Red Tractor** symbol lets consumers know that the producer meets standards of **food safety, hygiene, animal welfare** and **environmental production**. Food can be traced back to its producer. The **RSPCA Assured** symbol can be found on eggs, fish and meat to show that the producers have followed **strict** RSPCA welfare standards which cover every part of an animal's life including **diet, bedding, lighting** and how they are **transported**

Genetic Modification

• Genetically modified crops are foods used in agriculture.
• Their DNA has been modified, using genetic engineering techni
The aim is to introduce a new trait to the plant
which does not occur naturally in the species .
• This may be to increase yield .
• Scientists 'cut and paste' a gene from another organism into a plant's DNA to give it a new characteristic or to allow the plant to exist in a more hostile environment than normal.

Advantages

• Less pesticides are needed
• some crops could then be resistant to disease.
•Crops grow more quickly
There are higher yields of crops for the same amount of fertiliser
•Cheaper to produce (because the yield is higher)
•Longer shelf life so less food is wasted.
•Crops ripen earlier than usual so fresh food can be available locally earlier in the year.
•Crops can be modified so that they contain **extra nutrients** in LEDCs e.g. golden rice has been genetically modified to contain carotene (vitamin A)

Disadvantages

• Some consumers are concerned about GM foods because of the unknown side effects and more research is required.
• It is not possible to tell simply by looking whether a food has been genetically modified or not.
• Another concern is the effects of GM crops on the natural environment – some people believe we should not be changing the natural process of plant and animal reproduction.
• There is the possibility of some people being allergic to specific GM foods because a particular characteristic has been put into them.

Food processing

Primary processing: foods are processed straight after harvest or slaughter (when livestock are killed), to get them ready to be eaten or ready to be used in other food products. This will include stages for fruit and vegetables e.g. sorting (grading); trimming; throwing away misshapen or damaged foods; washing; wrapping if the food is delicate; adding identification labels and storing.
Foods are processed to make sure they are safe to eat and to extend shelf life

Caught food

Humans have hunted for wild animals, birds and fish. Now, certain species of animals and birds are reared in large numbers on farms for sport (to hunt). This is **wild game** and includes deer (venison), rabbits, hare, wild boar, pheasants, quail, guinea fowl, grouse, salmon, brown and rainbow trout and seafood e.g. mussels
Fish is caught by trawlers using nets and they may be processed on board (factory trawlers). There are different methods of trawling e.g. drag, bottom trawling or dredging.

Advantages

•Where fish are factory processed at sea they are frozen and freshness is guaranteed

Disadvantages

•Some methods of trawling is destructive because the seabed is stripped of corals which are the natural habitat of marine life
•Trawlers trap unwanted animals like dolphins or turtles in their nets
•Over fishing is when more fish are caught than be replaced by natural production

More sustainable methods are:

•long line fishing using a fishing line with baited hooks secured between 2 buoys meaning fewer fish are caught
•Hand catching or hand diving e.g. scallops
•Rope grown e.g. mussels

The numbers of fish are of certain species and size that can be caught have numbers controlled by quotas set by the EU. When fish are **farmed,** they are raised in tanks or enclosures in rivers or lakes or in cages in the sea e.g. salmon, carp and trout.

Gathered food

This is also called foraging. Foods that can be gathered are edible mushrooms, wild herbs, fruits and seaweed. Plants need to be at the right stage in their life cycle to be harvested and this is when they are at their best i.e. flavour, colour, texture, freshness and nutritional value.

Secondary processing: primary processed foods are either used on their own or mixed with other foods and turned into other food products. Examples of processed foods are:
Wheat into flour (milling)
Milk on collection: chilling, pasteurisation, homogenisation. This can then be used for cheese preparation, cream, butter and yogurt.
Fruit and vegetables e.g. freezing; preserving (jam, marmalade, chutney, sauces, pickles, canned)

5.1.2 Environmental impact and Sustainability – Food and the Environment

Key words

Climate change: changes in the earth's temperature that can lead to unusual and extreme weather conditions	**Greenhouse gases:** form an insulating layer the earth's atmosphere which traps heat and raises the earth's temperature.	**Non-renewable energy:** Energy produced from fossil fuels that cannot be renewed once they have been used e.g. oil	**Fossil fuels:** e.g. coal, oil and gas that were created over millions of years by fossilised plants and animals	**Food miles:** the distance travelled by foods and ingredients.

Production
Production of meat and diary foods produces the most greenhouse gases from:
- Fertilisers
- Animals producing gases and waste products
- Intensive farming
- Burning forests to create pasture land for livestock

Fertiliser production and use pollutes land, water and air

Processing + Manufacture
Uses a lot of on renewable energy and water. Refrigeration uses a lot of non renewable energy and produces a lot of greenhouse gas emissions

Packaging
- Packaging protects food from microbe contamination. It preserves food and provides information for the consumer.
- A large percentage of household waste is food packaging – some can be recycled but some cannot.
- Many plastics are not bio degradable and has to be disposed of in landfill sites and by burning.
- Production of packaging uses lots of energy from non-renewable fossil fuels – causes production of greenhouse gases.

Transportation
- Many foods and ingredients come from different countries/regions and are transported many miles = **Food miles** and a large amounts of non-renewable fossil fuels used. This causes pollution and the release of greenhouse gases.
- Many people drive to food shops to buy their food.
- More food is imported/exported by air/ship
- Supermarkets transport food by road from distribution centres
- Air, sea and land transport uses a lot of non-renewable energy (oil) and causes pollution

All use non-renewable energy (gas and oil) and produce **greenhouse gases** e.g. CO_2, methane, nitrous oxide

Greenhouse gases trap heat and warm the planet. This causes **climate change** which leads to:
- Higher or lower temperatures than normal
- Drought (lack of water)
- Flooding
- Extreme storms

Climate change causes:
- crops fail, livestock die, soil blows away, forest fires damage farmland and kill livestock
- soil and soil nutrients washed away; land polluted by sewage, stones and rubbish; livestock drown; landslides damage farmland.
- damage to crops, farmland, buildings, livestock killed.
- pollination of crops by insects affected; insects, moulds etc. will grow in large numbers; species of plants die out and get replaced by others; livestock may die.
- crops damaged; livestock affected; water and soil polluted.

Locally produced foods
Offer fresher and better sensory characteristics than foods that have travelled for miles
- Low impact on environment as they travel less distances e.g. PYO farms and delivery boxes
- low food miles;
- often cheaper to buy;
- available in season, fresh and plentiful
- supports local farmers

Food waste
Millions of tonnes of food wasted every year. The reasons -
Consumers: poor meal planning; buying more food than needed; serving too large food portions; poor food storage; not understanding use-by and best before dates; not using left-over foods; limited cooking skills and knowledge about food; food shops only selling 'good looking' fruits and vegetables and wasting edible but misshapen ones.
Retailers: Set rigid standards for size, shape, appearance of fresh foods and disposal of them. This is a problem because wasted food is dumped in landfill site produces large amounts of the greenhouse gas methane.

Carbon footprint is how much CO_2 gas and other greenhouse gases are released into the atmosphere when food is produced. Meat, dairy food and egg production has the highest carbon footprint. Fruit, vegetables, nuts, beans and cereal production has the lowest carbon footprint.
Carbon footprint is produced by these stages of food production: growing/rearing; farming; processing; manufacturing; packaging; transportation; storage; refrigeration; cooking; disposal of waste food and packaging.

Key words

Food security: The ability of people to buy sufficient, safe, nutritious and affordable food to meet their dietary needs for a healthy life

Sustainability: Producing food in a way that can be maintained over a long period of time.

Fairtrade: Foundation set up to ensure that food producers in developing countries get paid fair prices for their crops and have decent working and living conditions.

Food security

Aims to make sure everyone has the ability to buy enough safe, nutritious and affordable good quality food to meet the.. needs.

Food security is a worldwide problem:

• many people do not have enough food and there are fewer resources available to grow food, e.g. land available to grow food; water; energy; fertile soil.

Food security is threatened by:

• environmental pollution, climate change, economic problems, crop failures and human activities that cause pollution, using water and non-renewable energy, producing greenhouse gases. Wasting food and an increasing world population.

Sustainability of food

Food production needs to be sustainable:

• farmers need to be paid properly for their hard work and products; different varieties of plants and animals need to be protected from disease or becoming extinct;

• the welfare of livestock, plants and people in the community who grow the food needs to be protected;

• food production should not damage natural ecosystems and should reduce wastage; local communities should be encouraged to work together to produce food and protect the environment.

Much of the food we eat is grown in other countries in large amounts. It is often grown in developing countries, that have very little money coupled with poor living and working conditions. Crops are grown and exported (known as **cash** crops) and there is not enough space, available land, time or resources to grow enough food to feed the local population. Many crops grown are processed into highly priced products in countries like the UK yet the farmers producing the crops are paid very little. If the crops fail no payment is received.

The **Fair Trade Foundation** set up to ensure that food producers in developing countries get paid fair prices for their crops and have decent working and living conditions. The Fairtrade foundation helps to make sure that farmers and their workers in developing countries get paid better and fairer prices for their crops and their labour, and have decent working and living conditions. Sustainable food production is also encouraged and promoted by the foundation to improve the local environment in which the food is grown.

Examples of products are: cocoa, tea, coffee, pineapples, bananas.

Case study – Sustainable fishing

Humans have caught fish and seafood (shellfish e.g. mussels, scallops; crustaceans e.g. prawns and crab) to provide themselves with protein. Fisheries are important for local communities to provide employment but there are pressures for the catching of fish to be more sustainable.

The problems:

Damage to habitats and ecology: Some modern fishing trawlers drag large nets along the sea bed removing the plants and animals living there. It takes years for this ecology to re-establish.

By-catch: many fish are too young or small to eat so are thrown back (dead); the sea becomes polluted and the biodiversity (number of different species) of the sea is reduced.

Over-fishing: The natural fish breeding areas are destroyed and there is not enough food for the remaining fish to eat because the food chain is affected. There are not enough adult fish to breed so the numbers (stocks) have become seriously reduced.

Sustainable solutions:

•Conserve fish numbers so they can breed normally

•Limit the number of fish caught by giving quotas (maximum catch size)

•Increase the size of the fishing nets to allow small fish to escape

•Use sustainable fishing techniques e.g. line fishing or hand diving

What can consumers do to produce meals sustainably?

•Read food labels carefully for storage instructions and provenance

•Buy local where possible

•buy sustainably sourced foods e.g. fish – check information and logos on packaging

•Plan carefully to avoid food wastage

•Use the cooker hob rather than the oven as it uses less energy

•If possible, buy Fair Trade products