

Name: _____

Date: _____

Class: _____

IB ESS

5.2 Terrestrial Food Production Systems and Food Choices

Significant ideas:

The sustainability of terrestrial food production systems is influenced by socio-political, economic and ecological factors.

Consumers have a role to play through their support of different terrestrial food production systems.

The supply of food is inequitably available and land suitable for food production is unevenly distributed, and this can lead to conflict and concerns.



Sustainability of Terrestrial Food Production Systems

1. Outline subsistence and commercial farming/agriculture

Subsistence - farming for self-sufficiency to grow enough for a family

Commercial - large scale production of crops and livestock for sale

2. Complete the table to compare subsistence and commercial farming:

	Commercial	Subsistence
Size/scale	large	small
Use in MEDC vs LEDC	MEDC	LEDC
Level of mechanization	high	low
Legal regulation	high	low



3. Compare the sustainability of commercial and subsistence farming systems.

Energy

Which is more sustainable? (tick)

Commercial Subsistence

Explanation:

Use of manual labour or draft animals prevents a heavy dependence on fossil fuels. Commercial farming uses a finite resource which is producing a lot of pollution.

Irrigation

Which is more sustainable? (tick)

Commercial Subsistence Also require water which can be used unsustainably

Explanation:

Some agricultural systems have very heavy water demands and require large-scale irrigation which may cause localized water supply problems and a drop in the water table.

Indigenous crops/livestock

Which is more sustainable? (tick)

Commercial Subsistence More likely to select indigenous crops or livestock

Explanation:

Farming systems sometimes grow crops or keep animals that are not indigenous to the area and this can create the need for irrigation, glass houses and imports of feedstuffs.

Fertilisers and pesticides

Which is more sustainable? (tick)

Commercial Subsistence

Explanation:

Crop rotation, biological pest control and other environmentally sound practices cause fewer problems for subsistence farming. Growing the same crop on the same land in commercial farming requires chemicals.



Antibiotics

Which is more sustainable? (tick)

Commercial Subsistence

Explanation:

Keeping animals in close quarters (often inside) causes the spread of disease and this requires large amounts of antibiotics, often used routinely. Free range animals (subsistence) tend to be healthier + need less antibiotics.

Pollinators

Which is more sustainable? (tick)

Commercial Subsistence

Explanation:

With more biodiverse subsistence farm, pollinators have different habitats and there are usually enough insects to pollinate crops. Many commercial crops require honey bee hives to be brought in as pollinators.



4. Outline how the following methods could be used to increase the sustainability of food production systems:

Altering human activities

Change our attitude towards food and our diets

- eat different crops, increase consumption of insects - big protein source that reproduces rapidly and in large numbers, eat less meat, improve education about food.

Improving food labels

Raise awareness of food production efficiency. Better labels increase consumer's awareness of where the food was grown (food miles) and the amount of energy used to produce it (if tomatoes are local but require a heated greenhouse that decreases the sustainability).

Government control and monitoring

The Commission on Sustainable Agriculture and Climate Change is working towards the integration of sustainable agriculture into national and international policies - research, development, land rehabilitation, economic incentives and infrastructures all to develop sustainable farming.

Creating buffer zones

strips of land containing native species of vegetation that are adjacent to or surround agricultural land. They support biodiversity, support insect predators that limit crop pests, reducing pesticide use and preserve species lost from farmed areas. Limit run-off of fertilizers and pesticides into surrounding water and control air and soil quality.

Plants trap sediments and their roots hold soil particles together which reduces the effect of wind erosion.



Food Distribution and Choices

1. Explain what is meant by malnutrition.

- Bad nutrition as a result of an unbalanced diet. Nutrients may be;
- Lacking - undernourishment, usually a lack of calories
 - Excessive - overnourishment, usually too many calories → obesity.
 - Unbalanced - the wrong proportion of micro-nutrients

2. According to researchers, there is enough food produced to feed everybody on the planet, yet many people in the world still live in food poverty. Using the headings below, explain why food distribution is not equal:

Climate

and local ecological conditions determine what will grow where on Earth. We can adapt with irrigation or greenhouses but some countries are too dry or cold for food production.

Land suitability

Not all land is suitable for the production of crops - this could be due to accessibility, fertility of soil, terrain, amount of rainfall, type of soil.

Cash cropping in LEDCs

The export driven economies of many LEDCs may lead to crops being generated for cash (cash crops) rather than feeding the local population. e.g. Green beans from Kenya sold in MEDC when local population goes hungry.

Food waste in food production systems

As much as half the food that is produced each year is wasted due to poor agricultural practises, inadequate infrastructure for transporting food and poor storage facilities.

3. Compare reasons for food waste in LEDCs and MEDCs.

In LEDCs wastage tends to occur at the farmer-producer end of the chain. Inefficient harvesting, inadequate local transport and poor infrastructure mean that food is frequently handled inappropriately and stored under unsuitable conditions. In MEDCs produce is often wasted through retail and consumer behaviour with exacting marketing standards for appearance.



4. People and societies make choices about the food they eat, and this is not always limited to what the land can produce. Outline how the following factors influence the food choices of people and societies:

Cultural and religious beliefs

Some religions proscribe certain foods eg. Islam and Judaism proscribe eating pork. Hindus do not eat beef. Our traditions determine what foodstuffs we prefer.

Politics and legislation

Governments can subsidize or put tariffs on some food to encourage or discourage their production eg. the EU manipulates production in this way.

Socio-economic factors

Market forces determine supply and demand in a free-market economy. eg. if there is a short supply of a product prices rise, farmers may go into this crop, supply increases and prices fall again so farmers may stop growing it.

5.

a) Outline the ways in which population growth in society will decrease the availability of land for food production.

As populations grow more land will be needed for housing, infrastructure, schools, hospitals etc. The more land is used for urban development, the less land is available for agriculture.

Between 1967 and 2007, the area of land used for agriculture increased by only 8%.

EXTENSION:

b) Outline how population growth could **increase** food production.

(Hint: consider the technocentric/cornucopian environmental value system)

As the population grows we will need to maximise food production by:

- improving the technology of agriculture
- altering what we grow and how we grow it
- reducing food waste with improved storage and transportation.



Food Yield, Trophic Levels and Societies

1. Explain why producing food from livestock is generally less efficient than producing food from crops on the same land.

Energy is lost by respiration and waste production at each level within a food web. Livestock, as they are on a higher trophic level than crops, are less efficient as only 3% of the feed they consume turns into edible tissue.

2. Explain why harvesting food from lower trophic levels may be more **cost** efficient.

Food is manufactured and sold by weight so it is possible to calculate the energy contained in the food per unit volume. You can also calculate the energy used to produce that food to calculate the energy balance. Energy output: input is 1.9 for cereal much higher than sheep at 0.25.

3. Outline reasons why members of a society may tend to harvest from higher trophic levels despite the limitations in efficiency.

Taste and cultural demands play a role and animals provide a source of protein. Animals can convert into food vegetation that would not be available to humans directly (eg grass). Products from livestock are diverse (eg milk, meat, blood, wool, hide) and in many cultures the livestock are used as working animals.



Comparing Food Production Systems

1. Conduct your own research into two specific terrestrial food production systems, preferably one that is present in your own country and one that isn't, if possible.

Compare these food production systems using the table below.

	Food production system 1:	Food production system 2:
	Commercial farming in the Canadian Prairies	Subsistence farming in the lower Ganges valley
Inputs	land, energy, labour, machinery, administrative and organisational costs, fertilisers, pesticides, seeds	labour (high), water, manure, seeds
Outputs	wheat grain, straw bales, waste product	rice, fish (sometimes)
System characteristics (e.g. diversity, sustainability)	Originally monoculture but moving more towards mixed crops which is more sustainable	Higher diversity (cereals + other vegetables grown in the dry season, mostly sustainable)
Environmental Impact	Soil degradation is considerable, habitat destruction has led to the loss of biodiversity, high use of fertiliser	High water usage, methane emission
Socio-economic details (e.g. subsistence or cash crop, for export or local use...)	most product is sold in other parts of Canada or abroad	Hard labour, product stays in family / community



