

Human impacts, biodiversity and food security

Revision notes · Fish farming, non-indigenous species and eutrophication, the benefits of biodiversity and reforestation, and factors affecting food security.

For Edexcel GCSE Biology 1BI0 and Combined Science 1SC0. **Triple only** is not in Combined Science. **Higher tier** is only on the Higher paper.

Human impacts, biodiversity and food security **Spec 9.9–9.11B**

Fish farming **Spec 9.9**

Human interactions with ecosystems can have both positive and negative impacts on **biodiversity**, which is the variety of living organisms in an ecosystem. Fish farming is one example.

Fish farming: positive and negative effects	
Positive	Negative
Provides a reliable supply of food for a growing population	Waste and uneaten food pollute water and can cause eutrophication
Reduces overfishing, which protects wild fish stocks and biodiversity	Disease and parasites can spread from farmed fish to wild fish
Conditions can be controlled, so fish grow quickly	Escaped farmed fish may compete or interbreed with wild fish, reducing their genetic variety
	Fish may be fed on wild fish, and chemicals used to control disease can harm other organisms

Exam tip: For an evaluation, give at least one positive and one negative, and then say which you think outweighs the other and why.

Non-indigenous species **Spec 9.9**

A **non-indigenous species** (also called an introduced or invasive species) is one that has been brought, deliberately or accidentally, into an area where it does not naturally live.

- It may have no natural predators in the new area, so its population can grow quickly.
- It can compete with native species for food and space, so native species decline.
- It may eat native species or carry diseases that native species cannot resist.
- The result is that biodiversity falls, as native species decline or die out.

Positive effects are possible. Some non-indigenous species are introduced to provide food or other products, or to control pests. But the risk to native species means that introductions need careful control.

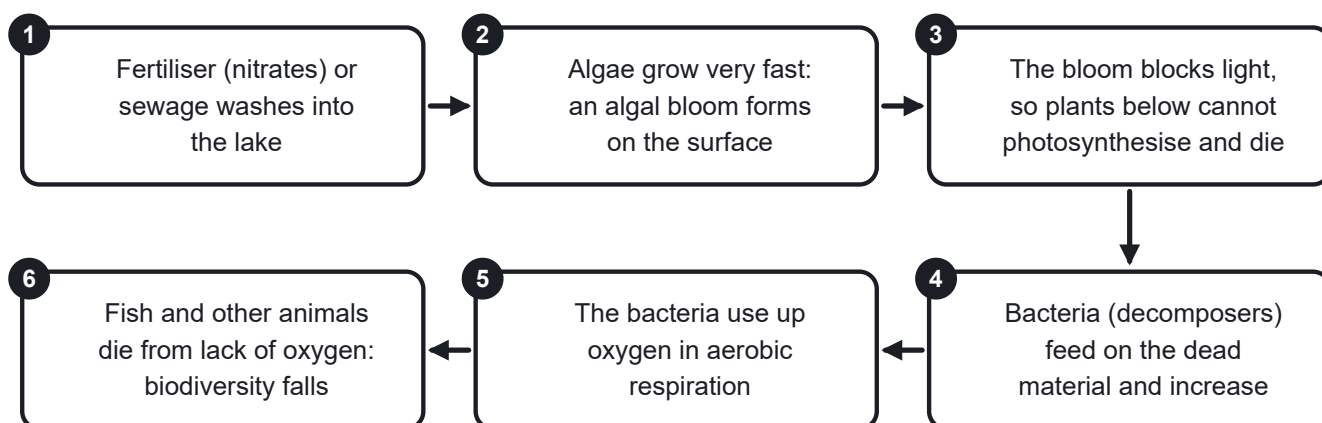
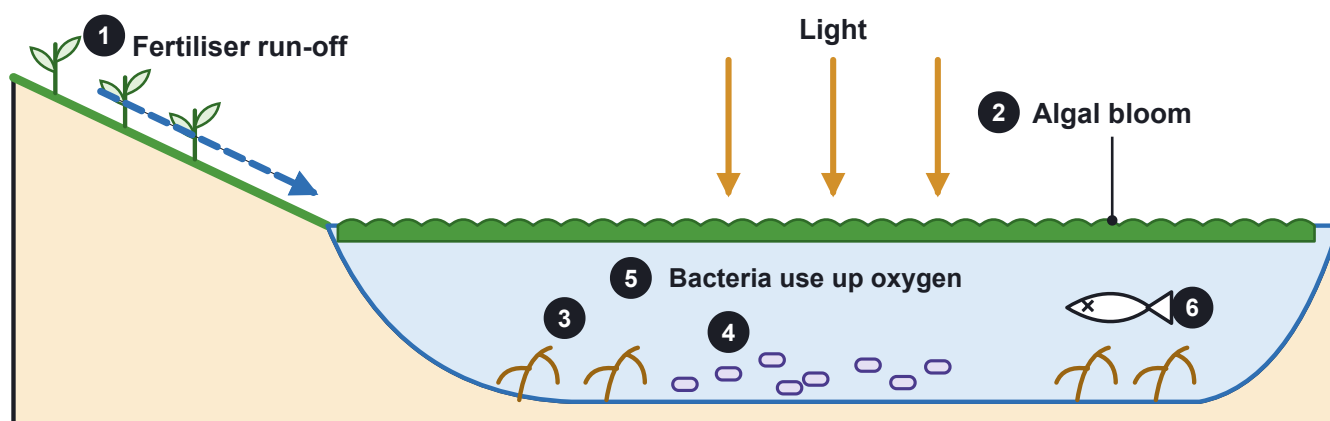
Eutrophication **Spec 9.9**

Eutrophication happens when too many nutrients, such as nitrates from fertilisers or sewage, run off into lakes and rivers.

1. Nitrates from fertilisers or sewage are washed into the water.

2. Algae in the water grow very quickly because of the extra nutrients, forming a layer on the surface (an algal bloom).
3. The layer blocks light, so plants and algae lower down cannot photosynthesise and die.
4. Bacteria (decomposers) feed on the dead material and their numbers increase.
5. The bacteria use up oxygen in the water for aerobic respiration.
6. Fish and other aquatic animals die from lack of oxygen, so biodiversity falls.

Common mistake: The fish do not die because the algae poison them. The main cause is the decomposers feeding on the dead plants and algae, which use up the oxygen.



Eutrophication: extra nitrates cause an algal bloom, plants die, decomposers use up the oxygen and fish die.

Benefits of maintaining biodiversity Spec 9.10

It is important to maintain biodiversity both locally and globally.

- Ecosystems with high biodiversity are more stable, because species depend on each other (interdependence) and the loss of one is less likely to cause others to fail.
- Biodiversity gives humans food, materials and medicines, and may supply useful resources not yet discovered.
- Species help to maintain the conditions we depend on, such as pollination of crops and cycling of materials.
- Local biodiversity benefits the local people and wildlife. Global biodiversity protects species from extinction.

Conservation of animal species

Endangered animal species can be protected by conservation programmes, such as protecting their habitats, captive breeding programmes, and laws to prevent hunting. This helps to maintain biodiversity.

Reforestation

Reforestation means replanting trees in areas where forest has been cut down. It has benefits for biodiversity and the environment:

- It restores habitats, so the variety of species can increase.
- Trees absorb carbon dioxide by photosynthesis, which helps to reduce the amount of carbon dioxide in the atmosphere.
- Tree roots help to hold soil, which reduces soil erosion and flooding.

Reforestation takes a long time, and the land may be needed for farming, so there can be conflict between the needs of people and the needs of wildlife.

Food security Spec 9.11B Triple only

Food security means having enough food to feed a population. Several biological factors make it harder to achieve.

- **Increasing human population:** more people need more food, which puts pressure on land and resources.
- **Increasing animal farming and increased meat and fish consumption:** energy is lost at each trophic level, so producing meat and fish needs much more land and crops than eating plants directly. Wild fish stocks can be overfished.
- **New pests and pathogens:** these can spread quickly and destroy crops and farm animals, reducing the amount of food produced.
- **Environmental change caused by human activity:** for example climate change, pollution and loss of habitats can reduce crop yields or the area of land that can be farmed.
- **Sustainability issues:** for example using land to grow crops for biofuels instead of food, and the cost of agricultural inputs such as fertilisers, pesticides, fuel and animal feed, which can make farming unaffordable.

Exam tip: Link answers back to the factor in the question. For example: more meat eaten, so more land needed to grow animal feed, so less food available for people.

Quick check

1. Name the three human interactions you must be able to explain for this topic.
2. Why do fish die in eutrophication?
3. Give two benefits of reforestation.
4. What is meant by a non-indigenous species?

Quick check answers

Human impacts, biodiversity and food security

1. Fish farming, introduction of non-indigenous species, eutrophication.
2. Bacteria feeding on dead plants and algae use up the oxygen in the water.
3. Any two of: restores habitats, absorbs carbon dioxide, reduces soil erosion.
4. A species introduced to an area where it does not naturally live.