

- 1 Some integrated farming systems involve making best use of all available resources without the use of large inputs of energy in the form of fossil fuels.

A study looked at what happened to the light energy that was the major energy input to farms in the Zhujiang delta in China. The farms are based on a dyke-pond system as shown in Fig. 6.1.

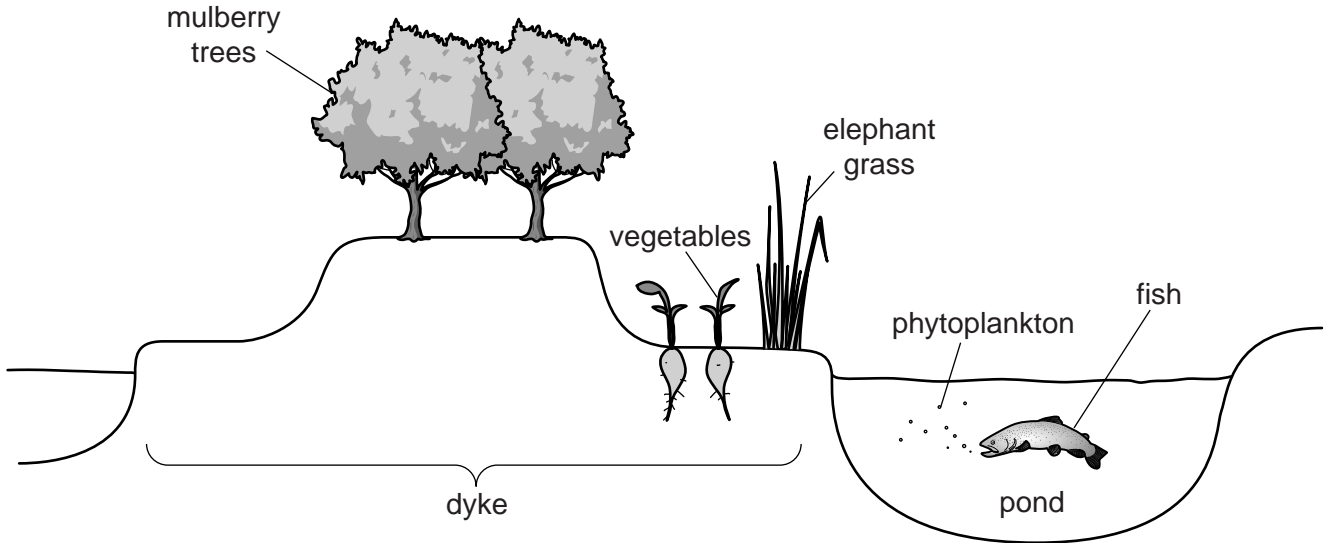


Fig. 6.1

Elephant grass, vegetables and mulberry trees are grown on the dykes in between the ponds. The elephant grass is grown and then cut to feed the fish. Vegetables and fish are used for human consumption. Silkworms feed on the mulberry trees. Phytoplankton are the main producers in the pond and are eaten by the fish.

- (a) (i) Explain the meaning of the term *producer*.

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- (ii) Use the information provided in the passage on page 18 and in Fig. 6.1 to **complete** a food web for the farm. Some of the producers have been drawn for you.

mulberry trees

vegetables

phytoplankton  
in the pond

[5]

- (b) In the study the researchers discovered that the vegetables absorbed  $1560 \text{ MJ m}^{-2}$  per year of light energy. The energy which was transferred from the vegetables to humans was  $3 \text{ MJ m}^{-2}$  per year.

Explain what happens to the energy that is absorbed by the vegetables but is not transferred to humans.

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- (c) Suggest the advantages to a farmer of including ponds stocked with fish in an integrated farming system.

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**[Total: 13]**

- 2 The government in Denmark encourages people to recycle their household waste. Table 6.1 shows the mass of household waste collected for recycling in Denmark in 2000, 2004 and 2008.

**Table 6.1**

type of waste collected from households	mass of household waste collected for recycling / thousand tonnes		
	2000	2004	2008
paper and paper packaging	181	221	207
glass	83	88	65
plastic	2	4	4
metal	17	25	410
green kitchen waste	45	53	38
garden waste	505	495	527

- (a) Many governments aim to recycle at least 50% of all household waste. In 2008, 2558 thousand tonnes of household waste was produced in Denmark.

- (i) Calculate the percentage of household waste that was recycled in 2008. Give your answer to the nearest whole number.

Show your working.

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- (ii) The mass of waste paper and paper packaging collected for recycling decreased slightly between 2004 and 2008.

Suggest a reason for this slight decrease.

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- (iii) Name **one** other type of recyclable waste, shown in Table 6.1, which shows a similar trend to paper and paper packaging.

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- (b) The recycling of paper and paper packaging uses fewer resources than making paper from trees.

Describe how paper is recycled.

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- (c) Most waste that is not recycled is put in landfill sites or burnt. Greenhouse gases are produced at landfill sites and by burning.

Explain the likely consequences of an increase in the concentration of greenhouse gases in the atmosphere.

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[Total: 12]

3 Some students studied water pollution in a stream near their school.

They took samples of water at six sampling points along the stream and carried out a chemical analysis on the water samples. They also counted the numbers of five different invertebrates at the same sampling points. The students used a four point scale to record the numbers they found in each sample.

Their results are shown in Table 6.1.

**Table 6.1**

sampling points	chemical analysis		types of invertebrates				
	nitrate concentration	oxygen concentration	rat-tailed maggot	mayfly nymph	stonefly nymph	tubifex worm	water louse
1	low	high	+	+++	+	+	+
2	high	very low	++	–	–	+++	++
3	high	very low	++	–	–	+++	++
4	very high	very low	++	+	–	+++	++
5	very high	low	+	++	–	++	++
6	low	high	+	+++	+	+	+

**key**

- none
- + 1 to 10
- ++ 11 to 100
- +++ too many to count

(a) Using **only** the information from Table 6.1,

(i) state the invertebrates that survive in polluted water

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(ii) state the invertebrate that is most sensitive to a decrease in the oxygen concentration of the water.

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- (b)** The students noticed there were many algae and aquatic plants growing in the stream at sampling points **4** and **5**.

Use the results in Table 6.1 to explain why there are many algae and aquatic plants growing in these parts of the stream.

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- (c)** The students decided there were advantages in sampling invertebrates to assess the level of pollution in the stream, compared with carrying out a chemical analysis of the water.

Suggest the advantages of carrying out a survey of invertebrates when studying the pollution of freshwater ecosystems, such as streams and rivers.

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- (d)** The students found that the stream was polluted by sewage from a nearby house.

Outline how sewage should be treated before entering a stream.

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- (e) The stream contained many plastic items that had been thrown away. Most of the plastic was non-biodegradable.

Describe the likely environmental problems caused by non-biodegradable plastics in streams and rivers.

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**[Total: 13]**



4 Plastic bags cause many problems in the environment.

(a) Plastic bags were banned in Bangladesh in 2002.

Outline the effects of non-biodegradable plastics on the environment.

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Some countries have not banned plastic bags. There have been many studies to analyse possible alternatives to plastic bags.

Table 5.1 shows the results of a study comparing the environmental impact of producing plastic bags and paper bags.

**Table 5.1**

environmental impact of production	plastic bags	paper bags
waterborne chemical waste/g per bag	1.1	2.7
airborne chemical waste/g per bag	0.025	1.25
energy used/kJ per bag	594	2511
trees used per bag	0	0.0014
oil used/dm <sup>3</sup> per bag	0.022	0

- (b) (i)** Compare the environmental impact of making plastic bags with the environmental impact of making paper bags.

You should use data from Table 5.1 in your answer.

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- (ii)** Heavy metals and acids are the most common waterborne chemical wastes from the production of paper bags.

Describe the effects of these waterborne chemical wastes on the environment.

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(c) Table 5.2 shows the results from a study comparing recycling of plastic bags and paper bags.

**Table 5.2**

	plastic bags	paper bags
bags recycled/%	0.6	19.4
energy used to recycle/kJ per bag	17	14 444

(i) Compare the energy used to **make plastic** bags with the energy used to **recycle plastic** bags.

You should use data from Table 5.1 and Table 5.2 in your answer.

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(ii) Pollution by heavy metals and acid is one concern about the making of **paper** bags. There are additional concerns about the making and recycling of **paper** bags.

Discuss these additional concerns.

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**[Total: 14]**