5.2 Agriculture and food

Name: _____ Class: _____ Date: _____ **Total: 25 marks**

KEY WORDS subsistence farming • commercial farming • intensive farming • extensive farming • food waste • agroforestry

Objective

Build the skills to answer exam questions on **agriculture** and **food systems** : types of farming, their inputs and outputs, environmental impacts, food waste and more sustainable food production.

You must be able to:

- compare commercial and subsistence, intensive and extensive farming systems
- explain environmental impacts of food production, including greenhouse gases
- explain why diets and food waste affect sustainability
- evaluate more sustainable farming methods

1 Key knowledge and worked examples

■ Agriculture and food

system	meaning	example
subsistence	food mainly for the farmer's family	small mixed farm in rural Africa or Asia
commercial	food grown for sale	large farms, plantations
intensive	high inputs (fertilizer, machines, labour) per area; high yield per area	greenhouses, feedlots, rice paddies
extensive	low inputs over a large area; low yield per area	cattle ranching on open grassland

Impacts: forests cleared for farmland (habitat loss); fertilizer runoff (eutrophication); pesticides harm non-target species; irrigation uses about 70% of freshwater; soil degradation; greenhouse gases: CO_2 from machines and land clearing, methane (CH_4) from cattle and rice paddies, nitrous oxide (N_2O) from fertilizer. Food systems cause about a quarter to a third of all greenhouse gas emissions.

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Diets: meat needs more land, water and energy per unit of food than plants, because energy is lost at each trophic level. Beef has the highest footprint.

Food waste: roughly one-third of food produced is lost or wasted – on farms, in transport and storage, in shops and in homes.

More sustainable methods: integrated pest management (biological control, fewer sprays); organic farming; agroforestry (trees with crops); crop rotation with legumes; precision farming (sensors put fertilizer and water only where needed); less food waste; more plant-based diets.

Answer shapes: name the input or practice, the effect on the environment, and a named example or number.

2 Practice

2.1 Distinguish between intensive and extensive farming. [2]



2.2 Explain **three** ways food production adds greenhouse gases to the atmosphere. [3]



2.3 Explain how integrated pest management (IPM) can reduce the environmental impact of farming. [3]



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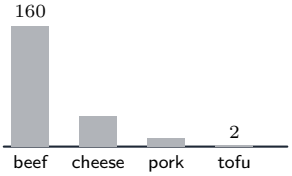
3 Exam-style questions

3.1 The table shows the land needed to produce 100 g of protein (approximate global averages).

food	land (m^2)
beef (beef herd)	160
cheese	40
pork	11
tofu	2

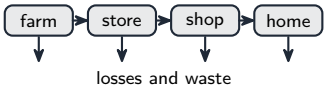
(a) Calculate how many times more land beef needs than tofu for the same protein. [1]

(b) Explain why animal products need more land than plant products. [3]



3.2 About one-third of all food produced is lost or wasted.

(a) Suggest why food is lost at different stages in low-income and high-income countries. [2]



(b) Evaluate **one** strategy to reduce food waste. [3]

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3.3 A government must choose between expanding intensive farming and supporting agroforestry to feed a growing population.

Discuss the two options. [8]



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Solutions

Marking: **M1** a correct method, **A1** the correct answer, **B1** an independent mark.

Each answer shows the steps, then the **result**.

2.1

intensive: large inputs of labour, capital, fertilizer per unit area, giving a high yield per area; extensive: few inputs spread over a large area, giving a low yield per area

2.2

cattle digestion and flooded rice paddies release methane; nitrogen fertilizer releases nitrous oxide from soil; clearing forests for farmland, and fuel for machines and transport, release CO_2

2.3

uses natural predators (e.g. ladybirds eat aphids) and crop rotation to keep pests low; pesticides are sprayed only when pests pass a threshold, so less is used; fewer non-target species are harmed, less pesticide runs into water, and resistance develops more slowly

3.1

(a) $160 \div 2 =$ **80** times

(b) animals are fed on plants (grazing or feed crops); energy is lost at each trophic level, mostly in respiration, so only about 10% is passed on; so far more plant food, and land, is needed for the same protein from animals

3.2

(a) low-income: losses early, in harvest, storage and transport (poor storage, no cooling); high-income: waste at the end, in shops and homes (buying too much, strict "best before" dates, cosmetic standards)

(b) e.g. better storage and cold chains: cuts losses where most food is lost in poorer countries; costs money and energy; judgement: high benefit for small cost when supported by government or aid

3.3

award up to [8]: intensive: high yields per area, so less new land is cleared; feeds cities and earns exports; but high fertilizer, pesticide and water use; eutrophication, soil degradation, greenhouse gases; dependence on bought inputs; agroforestry: trees hold soil, add organic matter and nitrogen (legume trees), store carbon and support biodiversity; but lower yields of the main crop, slower returns, needs knowledge and labour; conclusion: a mix, matched to land type and farmers' needs, with justification

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