



GEO.KS311 Strategies to Increase Food Supply: Technology and Sustainability

AQA 8035 · Calculators not allowed · about 40 minutes

Total Marks

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Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1** Describe what is meant by an irrigation scheme in the context of increasing food supply on agricultural land in a drier region.

(Total for Question 1 is 2 marks)

- 2** Explain one advantage and one disadvantage of using large scale mechanisation on commercial farms to increase food supply.

(Total for Question 2 is 4 marks)

- 3** Describe briefly how hydroponics or aeroponics systems can increase food supply in urban or peri urban areas with limited land.

(Total for Question 3 is 2 marks)

- 4** Give two ways that drip irrigation saves water compared with traditional flood irrigation in a semi arid farming region.

(Total for Question 4 is 2 marks)

- 5** Explain how high yield variety (HYV) crops increase total food production on existing farmland when combined with suitable inputs.

(Total for Question 5 is 2 marks)

- 6** Give two concerns commonly raised about the use of genetically modified (GM) crops to increase food supply, stated in general terms.

(Total for Question 6 is 2 marks)

- 7** Suggest two ways in which appropriate technology can help small scale farmers increase food supply without large capital investment.

(Total for Question 7 is 2 marks)

- 8** Compare one environmental advantage and one environmental disadvantage of large scale intensive farming compared with small scale sustainable farming methods when increasing food supply.

(Total for Question 8 is 2 marks)

- 9** Compare the advantages and disadvantages of large scale and small scale approaches to increasing food supply. Support your answer with general examples of the kinds of technology or practice used for each approach.

(Total for Question 9 is 6 marks)

Mark scheme · GEO.KS3 11 Strategies to Increase Food Supply: Technology and Sustainability

Question 1

- **B1** a planned system to supply water to farmland where rainfall is insufficient or unreliable, oe
- **B1** may include features such as canals, reservoirs, pipes, pumps, sprinklers or drip lines to deliver water to crops, oe
- **Answer: An irrigation scheme is a planned system to supply water to farmland where rainfall is insufficient, using canals, reservoirs, pumps, pipes, sprinklers or drip lines to deliver water to crops.**

Question 2

- **B1** advantage, e.g. machinery increases speed of planting, harvesting and processing, oe
- **B1** linked detail for advantage, e.g. this raises output per worker and allows more land to be farmed efficiently, increasing total food supply, oe
- **B1** disadvantage, e.g. high capital cost and need for fuel and maintenance, oe
- **B1** linked detail for disadvantage, e.g. smallholders may be excluded, debt can increase and dependence on imported fuel or parts can reduce local resilience, oe
- **Answer: Advantage: machinery speeds planting, harvesting and processing so output per worker rises and more land can be farmed, increasing food supply. Disadvantage: machinery is expensive and needs fuel and maintenance, which can exclude smallholders, cause debt and create dependence on imported inputs.**

Question 3

- **B1** hydroponics grows plants in nutrient rich water without soil, aeroponics mists roots with nutrient solution while plants are suspended, oe
- **B1** both reduce horizontal land use by allowing vertical stacking or indoor racks, enabling higher yields per square metre in urban settings, oe
- **Answer: Hydroponics grows plants in nutrient rich water without soil and aeroponics mists roots with nutrients while plants are suspended; both allow vertical stacking or indoor racks, producing higher yields per square metre in urban areas with limited land.**

Question 4

- **B1** water delivered directly to plant roots in small controlled amounts, reducing evaporation, oe
- **B1** less surface runoff and deep seepage compared with flooding whole fields, so less water is wasted, oe
- **Answer: Drip irrigation delivers water directly to plant roots in small controlled amounts, reducing evaporation; and it produces less surface runoff and deep seepage than flooding whole fields, so less water is wasted.**

Question 5

- **B1** HYV crops are bred to produce more edible output per plant and to respond well to fertilisers and irrigation, oe
- **B1** linked detail, e.g. with adequate water and nutrients HYVs give higher yields per hectare, increasing total food production on the same land, oe
- **Answer: HYV crops are bred to give more edible output per plant and to respond well to fertiliser and irrigation; with adequate water and nutrients they produce higher yields per hectare, increasing total food production on the same farmland.**

Question 6

- **B1** possible environmental concerns, e.g. effects on non target species or reduced biodiversity, oe
- **B1** socio economic concerns, e.g. seed ownership, dependence on seed companies or loss of traditional varieties, oe
- **Answer: Environmental concerns such as possible effects on non target species and reduced biodiversity; and socio economic concerns such as increased dependence on seed companies, loss of traditional varieties and issues around seed ownership.**

Question 7

- **B1** example 1, e.g. simple treadle pumps or low cost drip kits to improve irrigation, oe
- **B1** example 2, e.g. low cost post harvest storage or solar dryers to reduce losses and extend shelf life, oe
- **Answer: Examples include simple treadle pumps or low cost drip irrigation kits to provide reliable water without**

Question 8

- **B1** advantage of large scale intensive farming, e.g. higher output per hectare and efficient use of inputs can spare other land for nature, oe
- **B1** disadvantage of large scale intensive farming, e.g. heavy use of chemical fertilisers and monocultures can harm soil health and biodiversity compared with small scale sustainable methods, oe
- **Answer: An environmental advantage of large scale intensive farming is that high yields per hectare and efficient input use can help spare other land for nature; an environmental disadvantage is that heavy reliance on chemical fertilisers and monocultures can damage soil health and reduce biodiversity compared with small scale sustainable methods.**

Question 9

- **Level 3** (5-6): A well developed comparison that evaluates advantages and disadvantages of both large scale and small scale approaches, uses accurate, relevant general examples (e.g. mechanisation, irrigation, HYVs and GM for large scale; permaculture principles, small scale appropriate technology, urban hydroponics for small scale), and reaches a justified conclusion about their relative merits.
- **Level 2** (3-4): A clear comparison that describes some advantages and disadvantages of both approaches with appropriate examples, but with limited development or balance; a simple conclusion is given.
- **Level 1** (1-2): One or two relevant points about either large scale or small scale approaches are made with little or no comparison and no real conclusion.
- **Level 0** (0): No relevant content.
- **Indicative content:**
 - Large scale approaches, such as mechanisation, irrigation schemes, use of HYV or GM crops and large controlled environment farms, can produce high total yields, benefit from economies of scale and supply national or export markets.
 - Advantages of large scale include efficiency in labour and input use, the ability to invest in expensive infrastructure and technology, and potential to produce food at national scale to improve food security.
 - Disadvantages of large scale include high capital and running costs, dependency on external inputs (fuel, chemicals, proprietary seed), risk of environmental damage such as soil degradation and reduced biodiversity, and social impacts like displacement or exclusion of smallholders.
 - Small scale approaches, including appropriate technology, agroecology, permaculture principles, community gardens and urban hydroponics, can be low cost, locally controlled, more sustainable and resilient, and better at supporting local food security and biodiversity.
 - Advantages of small scale include suitability for poorer farmers, lower environmental impact, diversification of crops and local empowerment; disadvantages include limited reach and output per site, potential difficulty scaling to feed large urban populations, and sometimes lower short term yields per hectare.
 - A balanced judgement may conclude that both approaches have roles: large scale is important for national supply and for efficient production in some contexts, while small scale is vital for local resilience and sustainability; combinations and careful management can capture benefits of both.