

2023 Bi H2 Q13

Section: Sustainability and Interdependence

Topic: Food Supply, Plant Growth and Productivity

Question Summary

Interpret a graph of UK barley area and yield (1930-2000), read a yield value, and use livestock production data and feed-conversion ratios (FCR) to calculate feed requirements and discuss food security.

Worked Solution

(a) Describe changes in area used to grow barley (1950-2000)

From the graph, the barley area shows an overall decrease from mid-century to 2000. Using approximate read-offs: around 1950 the area is about $1.9\text{--}2.1 \times 10^6$ ha, and by 2000 it is about $1.0\text{--}1.2 \times 10^6$ ha. There are fluctuations in between, but the long-term trend is a reduction of roughly $0.8\text{--}1.0 \times 10^6$ ha.

(b) Barley yield when area was 750×10^3 ha

Reading from the graph at the point where area is about 750 thousand hectares gives a yield of about 6.0 tonnes

per hectare (approx.).

(c) Percentage increase in mass of cattle produced (2000-2020)

Given: 2000 = 960×10^6 kg; 2020 = 1104×10^6 kg.

Increase = $1104 - 960 = 144 \times 10^6$ kg.

Percentage increase = $(144 / 960) \times 100 = 15\%$.

(d) Total mass of feed required for poultry in 2020

Poultry production in 2020 = 2348×10^6 kg.

From the bar chart, poultry FCR is about 4 (feed : liveweight).

Feed required = $2348 \times 4 = 9392 \times 10^6$ kg.

(e) Why eating poultry/pigs reduces impact on food security vs cattle

Poultry and pigs have a lower FCR than cattle, meaning they require far less feed to produce the same mass of meat. Lower feed demand reduces pressure on cropland used to grow feed grains, improving overall food security compared with cattle, which have a much higher FCR.

Final Answers

(a) Overall area decreases from about 2.0×10^6 ha (1950) to about 1.1×10^6 ha (2000) (values approx).

(b) $\sim 6.0 \text{ t ha}^{-1}$.

(c) 15% increase.

(d) 9392×10^6 kg of feed.

(e) Lower FCR for poultry/pigs -> less feed needed -> reduced cropland/inputs -> better food security than cattle.

Revision Tips

- Yield vs area: yields can rise with better varieties, fertilisers, and management even as area falls.
- FCR: lower values mean greater efficiency - less feed per kg of meat produced.
- Food security: efficient conversion of plant biomass (feed) into animal protein reduces pressure on arable land and inputs.

Area of land

Area of land

Year

Yield

Year

