

2024 Bi H2 Q12

Section: Sustainability and Interdependence

Topic: Plant and Animal Breeding

Question Summary

This question analyses selective breeding in cattle for milk yield. It involves calculating the range of yields, explaining differences in F1 and F2 generations, and describing how intensive farming can reduce welfare and increase disease risk.

Worked Solution

- (a)(i) Range = highest value - lowest value = $25.4 - 18.2 = 7.2$ litres.
- (a)(ii) Range bars on the graph show the variability of data within each generation. Shorter bars indicate less variation, suggesting more uniform offspring.
- (b)(i) The F2 generation shows a reduced mean yield because of recombination and segregation of alleles. Some offspring lose the combination of alleles that produced high yield in the F1, causing regression towards the mean.
- (c)(i) Intensive farming increases the chance of parasite transmission because animals are kept at high densities, making physical contact and contamination more likely.
- (c)(ii) Poor welfare can be indicated by stereotypical behaviour

(for example, pacing, overgrooming), weakened immune response, reduced fertility, or physical damage from confinement.

Final Answer

- > (a)(i) 7.2 litres
- > (a)(ii) Range bars show variability in milk yield
- > (b)(i) Reduced mean in F2 due to recombination and allele segregation
- > (c)(i) High density -> increased parasite spread
- > (c)(ii) Poor welfare indicated by abnormal behaviour or low fertility

Revision Tips

- Selective breeding aims to combine desirable alleles in offspring.
- F2 generations often show more variation due to genetic recombination.
- Intensive farming improves yield but risks welfare and disease spread.
- Range is a simple measure of variation - calculate by subtraction.

