

Date : October 11, 2025
Total Marks : 100
Writing Time : 150 minutes (2.5 hours)
Reading Time : 15 Minutes (prior to examination time)

SECTION A

PART I: Multiple Choice Questions [30 marks]

Choose the correct answer and write down the letter of your chosen answer in the Answer Booklet against the question number e.g. 31 (d). Each question carries ONE mark. Any double writing, smudgy answers or writing more than one choice shall not be evaluated.

1. The latest rice variety released by the department of agriculture is:
 - a) DQ-11
 - b) Yusi ray maap
 - c) Bajo Ray Naap-1
 - d) Samtenling ray kaap-1
2. The scientific name of broccoli is:
 - a) *Brassica juncea*
 - b) *Brassica oleracea*
 - c) *Brassica sinensis*
 - d) *Brassica lupa*
3. Bhutanese consume rice thrice a day. What is the protein content percent in rice?
 - a) 1-2%
 - b) 6-7%
 - c) 9-10%
 - d) 15-16%
4. The Seed Act and the Seed Rules and Regulations are the two main policy documents for the seed sector in Bhutan. The former was enacted in ____ and the later was revised in ____.
 - a) 1996, 2018
 - b) 2001, 2018
 - c) 2000, 2025
 - d) 1999, 2009
5. Which weed was introduced with good intention but turned out to be invasive in Samtse Dzongkhag?
 - a) *Lantana camara*
 - b) *Chromolaena odorata*
 - c) *Hypoestes phyllostachya*
 - d) *Parthenium hysterophorus*
6. Which biocontrol agent has been studied and introduced in Bhutan as a natural enemy to control *Parthenium hysterophorus* populations?
 - a) *Zygogramma bicolorata*
 - b) *Trichoderma harzianum*
 - c) *Trichoderma parthenium*
 - d) *Trichoderma indica*

7. Which of the following mushroom species is most widely cultivated commercially in Bhutan due to its adaptability to local climatic conditions and high market demand?
- Agaricus bisporus*
 - Ganoderma lucidum*
 - Pleurotus ostreatus*
 - Lentinula edodes*
8. The quinoa varieties released by MoAL Bhutan, such as *Ivory123*, *Amarilla Sacaca*, and *Amarilla Marangani*, were evaluated under different sowing dates at the Agriculture Research and Development Centres. Which of the following statements accurately describes the findings of these evaluations?
- All four quinoa varieties showed optimal performance when sown in early spring, regardless of elevation.
 - The sowing time significantly influenced the grain yield, with earlier sowing in higher elevations leading to better yields.
 - Sowing time had no significant impact on the grain yield of quinoa varieties across different elevations.
 - Only *Amarilla Sacaca* showed adaptability to Bhutan's agro-ecological conditions, while the others failed to establish.
9. The Department of Agriculture has released over 100 vegetable varieties. Which of the following vegetables has the highest number of released varieties?
- Tomato
 - Cabbage
 - Radish
 - Bean
10. Hygroscopic fertilizers should not be mixed as these form cakes on mixing. The most hygroscopic fertilizer is:
- Urea
 - Ammonium Nitrate
 - Calcium ammonium nitrate
 - Ammonium sulphate
11. Approximately, what quantity of fertilizers is imported by Bhutan in a year?
- 2500 MT
 - 5000 MT
 - 7000 MT
 - 9000 MT
12. According to the IALC 2025, the reported paddy production in the country is about _____ MT.
- 44000
 - 43000
 - 42000
 - 41000

13. The interference exerted by a plant onto its neighbors by way of releasing chemical substances is termed as
- Antipathy
 - Encephalopathy
 - Enteropathy
 - Allelopathy
14. Defficiency zinc is observed in:
- Only new leaves
 - Only old leaves
 - Both young and old leaves
 - Terminal buds
15. According to the Cost-sharing Mechanism Guideline of the Ministry of Agriculture and Livestock 2025, the cost-sharing (Government: Subsistence Farmer) applied for promoting new variety of crops
- 90:10
 - 80:20
 - 60:40
 - 70:30
16. By the end of 13 FYP, the Ministry of Agriculture and Livestock targets to increase the country's rice production to:
- 60,000 MT per year
 - 54,000 MT per year
 - 48,000 MT per year
 - 42,000 MT per year
17. Polyculture exemplified by "The Three Sisters" refers to:
- Intercropping maize, beans, pumpkin benefiting each other
 - Intercropping maize, groundnut, tomato benefiting each other
 - Intercropping wheat, beans, squash benefiting each other
 - Intercropping maize, beans, squash benefiting each other
18. Rainfed agriculture accounts for approximately what percentage of farmed land in South Asia?
- 30%
 - 75%
 - 60%
 - 80%
19. Who is regarded as the father of Extension?
- Simon Kuznet
 - F.H Knight
 - Ragner Frisch
 - Seaman A. Knapp.

20. Bhutan's One Country One Priority crop is:
- Rice
 - Maize
 - Citrus
 - Quinoa
21. How does alternate wetting and drying (AWD) in paddy contribute to decarbonization efforts specifically in Bhutanese rice systems?
- By increasing water use and thus higher methane release
 - By completely eliminating need for fertilizers
 - By significantly reducing methane emissions through periodic soil aeration
 - By increasing nitrous oxide emissions only
22. Considering the research-extension linkage in Bhutan, what is the main bottleneck limiting effective technology adoption by smallholder farmers?
- Limited relevance of research outputs to local agroecological contexts and weak participatory approaches
 - Excessive farmer demand for mechanization equipment
 - Overdependence on imported hybrid seed
 - Lack of extension officers at national level only
23. Which of the following pests poses a systemic threat to Bhutan's cardamom plantations due to its ability to evade chemical control and impact rhizome health?
- Stem borers
 - Leaf hoppers
 - Aphids
 - Cardamom thrips
24. Which greenhouse gas emission from rice cultivation can be more effectively reduced by synchronizing fertilizer application with crop nutrient demand in Bhutan's context?
- Nitrous oxide
 - Methane
 - Carbon dioxide
 - Sulfur hexafluoride
25. Which data analysis tool is most effective for synthesizing farmer field survey data to inform policy decisions on fertilizer subsidies in Bhutan?
- Multivariate regression analysis accounting for socio-economic and agroecological variables
 - Simple frequency counts only
 - Graph plotting without statistical tests
 - Ignoring outliers without rationale
26. Nitrogen fertilizer-use efficiency in rice can be increased by using:
- normal urea
 - Blue green algae
 - Zinc-coated urea
 - Sulphur-coated urea and urea super granules

27. Wheat is a:
- a) C3 plant
 - b) C4 plant
 - c) both
 - d) None of the above
28. A farmer practices Sugarcane-cotton-Wheat. The cropping intensity of his farm will be:
- a) 100%
 - b) 200%
 - c) 300%
 - d) 150%
29. Higher yield in maize is obtained in areas where the atmospheric temperature during the growing season is:
- a) High during the day and low during the night
 - b) High during both day and night
 - c) Low during the day and high during the night only
 - d) Low during both day and night
30. How many irrigation schemes are being implemented centrally by the department of agriculture in its 13?
- a) 23
 - b) 24
 - c) 25
 - d) 26

PART II – Short Answer Questions [20 marks]

This part has 5 Short Answer Questions. Answer ALL the questions. Each question carries 4 marks.

1. What do you understand by Agriculture Extension? Explain the Agriculture Extension System in Bhutan **(4 marks)**
2. Define Food Security. How does it differ from food self-sufficiency? **(4 marks)**
3. A substantial portion of our workforce is ageing, with almost 60% of those employed in agriculture being 55 years of age or older. How can you, as a young agriculture officer implement plans and programs to address the challenge of ageing farming population? **(4 marks)**
4. What is allelopathy? Explain the two ways allelopathy is observed. What do you understand by Sorghum effect? **(4 marks)**
5. The Gelephu Mindfulness City offers opportunity to enhance the organic farming for rest of Bhutan. Explain three areas of intervention that you feel are necessary to gear up to meet the requirement of the organic GMC **(4 marks)**

SECTION B: CASE STUDY [50 marks]

Choose either Case I or Case II from this Section. Each case carries 50 marks. Mark for each sub-question is indicated in the brackets.

Case I – Agricultural Research and Resource Allocation in Bhutan

Agricultural research in Bhutan remains predominantly *adaptive*—tailored to local conditions by modifying technologies and practices developed elsewhere. Basic research has yet to take root in the country. During annual resource allocation reviews, the Department of Agriculture faces recurring scrutiny regarding the measurable impact of its research initiatives. Consequently, research receives a disproportionately small share of resources, creating a cycle that constrains innovation. In contrast, high-visibility “big rock” interventions—such as nationwide chain-link fencing programs, the Million Fruit Tree Plantation, and large-scale irrigation schemes—consistently secure priority funding due to their perceived immediate socio-economic benefits.

1. Bhutan has thus far focused on adaptive research. Critically analyse, using global and regional examples, whether initiating basic research is viable for Bhutan at its current stage of agricultural development. In your answer, weigh the long-term strategic advantages and disadvantages of concentrating exclusively on adaptive research, and address whether a hybrid model could optimise outcomes in Bhutan’s unique agro-ecological and resource context. **(20 marks)**
2. Assume you are a newly appointed agricultural researcher in Bhutan. Design a 3-year research strategy that both complements ongoing adaptive research and gradually builds capacity for basic research. Justify your approach using measurable indicators and outline a persuasive argument for policymakers on why reallocation of funds toward research is not only necessary but cost-effective in the long run. **(10 marks)**
3. “Big rock” projects command political and public support because they yield visible, immediate results. Critically evaluate whether prioritising such projects should remain the Department’s dominant approach for achieving national targets of food self-sufficiency and rural income enhancement. In your response, consider potential trade-offs in innovation capacity, climate resilience, and long-term productivity. **(20 marks)**

Case II – Advanced Technologies in Bhutanese Agriculture

The Ministry of Agriculture and Livestock (MoAL) is piloting the integration of artificial intelligence (AI), drones, and other advanced technologies to strengthen crop monitoring, pest control, and resource optimisation. Early trials in selected dzongkhags demonstrate potential benefits, including precision application of inputs, early disease detection, and real-time market forecasting. However, these initiatives face considerable hurdles: high capital and operational costs, limited domestic technical expertise, regulatory ambiguities, and heavy reliance on imported hardware and software systems.

1. Assess the transformative potential of AI and drone technologies in Bhutan's agricultural sector by drawing parallels with successful and failed cases in comparable mountainous and smallholder-dominated economies. Critically examine limitations Bhutan's agriculture development vision. **(20 marks)**
2. Emerging technologies often exacerbate inequalities between large commercial farms and smallholder producers. Using quantitative reasoning and comparative case evidence, analyse whether large-scale investment in AI and drones could widen Bhutan's agricultural divide. Suggest specific safeguards, incentive mechanisms, or policy interventions to mitigate this risk. **(20 marks)**
3. Bhutan must decide the degree to which advanced technologies should be mainstreamed into agriculture. Propose a multi-criteria decision-making framework based on the MoAL's 13th Five Year Plan and Gross National Happiness principles. Justify your prioritisation of criteria and indicate how trade-offs should be managed. **(10 marks)**

TASHI DELEK