

**AY2026 Entrance Examination for the Master's Program,  
Graduate School of Bioagricultural Sciences, Nagoya University**

Subject chosen	International Agricultural Sciences	For this subject  Total pages ( 2 ) Page number ( 1 )
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Answer the following three questions.

**【Q1】**

Choose and explain four of the following eight terms.

- 1) Shifting cultivation
- 2) Rainfed upland cropping
- 3) NERICA
- 4) Green revolution
- 5) Agricultural crop depredation
- 6) World Food Programme (WFP)
- 7) Smart agriculture
- 8) Cash crops

**【Q2】**

Regarding the agricultural extension in developing countries, one of the most important consideration is whether the agricultural technologies to be disseminated are appropriate farmer's needs and suitable for their capacity. Farmer's needs for agricultural technologies change as economic and social development progress from low-income countries (least developed countries), via lower middle-income countries and upper middle-income countries to high-income countries (developed countries). Describe the trends of the changes using the keywords listed below.

**Keywords:** food crop, commercialization, laborsaving, health

**【Q3】**

Farmlands are classified mainly into upland fields that are planted with various upland crops and lowland rice fields. Discuss the advantages of lowland rice fields over upland crop fields in terms of land utilization and soil management.

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**[Q4]**

Read the following passage and answer questions 1) to 3).

When two or more types of crops are grown simultaneously in the same field during a single cultivation period, production efficiency and yields vary depending on the crop species or varieties combined and/or the cultivation method. The table below shows examples of yield per plant when gramineous and leguminous crops are grown in monoculture or intercropped at different altitudes in a tropical country.

Altitude(m)	Copping pattern	Yield per plant (g/plant)	
		Crop A	Crop B
350	Monoculture	25.7	4.5
	Intercropping	27.7	5.4
700	Monoculture	27.9	15.0
	Intercropping	30.5	14.0

Planting density

Crop A---Monoculture: 6.25 (hill /m<sup>2</sup>), Intercropping: 4.67 (hill /m<sup>2</sup>)

Crop B---Monoculture:12.5 (hill /m<sup>2</sup>), Intercropping: 6.25 (hill /m<sup>2</sup>)

- 1) Calculate the relative yield of crop A and crop B for each cultivation area at different altitudes.
- 2) Calculate the land equivalent ratio (LER) for each cultivated area at different altitudes.
- 3) Based on the results of Q1 and Q2, explain the effects of intercropping.
- 4) Intercropping is a form of mixed cropping. Homegardens are a good example of mixed cropping in the tropics. Describe the characteristics of crop cultivation in homegardens.

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【Q1】 Question intent: Test understanding of terms related to tropical agriculture, international cooperation, and regional development.

- 1) This is a farming method mainly used in tropical regions, in which deforestation is cleared by cutting down trees and setting fire to the land. After a specific period of farming, the land is moved to another area, left fallow, and allowed to recover naturally. Traditional slash-and-burn farming generally preserved forests well, but with the increase in population, the disorderly clearing of land and slash-and-burn farming by large numbers of settlers has extended the vegetative period and shortened the fallow period, robbing the forest of its ability to recover, and is one of the causes of tropical deforestation. As a result, the recovery of soil fertility is delayed, and the decline in crop productivity in the next slash-and-burn cultivation is becoming a problem.
- 2) Field crops depend on rainfall. Crops need water to grow, and they usually absorb moisture from the soil through their roots. In field crops that rely on rainfall, if rainfall is irregular or scarce, the soil dries out, and the crops suffer from a lack of moisture, causing stems and leaves to wilt and, in severe cases, even die. Rain-fed farming is thus weather-dependent, and a lack of rainfall can hinder growth. The amount of rainfall is the biggest factor governing rain-fed farming. Rain-fed agriculture is possible in areas with rainfall of around 350 mm/year and a DPG of 75 days. As rainfall increases, the variety of crops that can be cultivated also increases.
- 3) The new varieties, named "New Rice for Africa" (hence NERICA), are an interspecific cross between African rice (*Oryza glaberrima* Steud.) and Asian rice (*Oryza sativa* L.). Dr. Monty Jones at the West Africa Rice Development Association (WARDA, now AfricaRice) succeeded in crossing the two species. Since the first NERICA varieties were released in 1996, 18 upland rice cultivars (NERICA 1~18) and 60 paddy rice cultivars (NERICA L1~60) have been released by the AfricaRice as of 2010. NERICAs combine the local-stress adaptation such as insects, diseases and drought, of African rice with the high yield potential of Asian rice, which has been given considerable attention as a useful crop as part of an attempt to increase rice production in Africa.
- 4) The Green Revolution was a demonstration that high yields per unit area, comparable to those in temperate zones, were possible in the tropics if high-yielding varieties of rice and wheat developed by the International Rice Research Institute (IRRI) and the International Maize and Wheat Improvement Center (CIMMYT) were used and proper care was taken in securing and fertilizing the crops.
- 5) When crops are grown in paddy fields or fields, crop nutrients such as nitrogen, phosphorus, and potassium are absorbed from the soil and carried out of the field along with the harvest. Soil nutrients will gradually be depleted if crops are grown without chemical fertilizers, a practice known as depleting farming. To prevent deprecation, it is necessary to replenish the depleted crop nutrients with chemical fertilizers, organic fertilizers, etc.
- 6) It is the United Nations' only food-aid agency, procuring food by collecting donations and support from developed countries and carrying out activities—primarily in developing nations—such as providing food assistance and developing transportation infrastructure necessary for delivering that aid. Its main activities include distributing food to people suffering from severe food and nutrition shortages caused by natural disasters or conflicts; providing food assistance through school meals and school-based distribution aimed at children's growth and education (Food for Growth); offering food in return for labor or vocational training (Food for Work / Food for Training); and implementing programs such as Purchase for Progress (P4P), which support small-scale farmers in improving their productivity. These initiatives are deployed mainly in developing countries.
- 7) Smart agriculture refers to a new form of farming that uses robotic technology and information and communication technology (ICT) to promote labor-saving, greater precision, and high-quality production. Examples of smart agriculture include robot tractors, smartphone-operated water management systems for

rice paddies, and the use of drones for pest control and monitoring crop growth.

8) A cash crop (also known as a commercial crop) is an agricultural crop that is grown to be sold on the market for profit, rather than for the farmer's own consumption or use.

**【Q2】** Question intent: Test understanding of agricultural technology extension in developing countries.

At lower stages of the economic and social development, there are great needs for agricultural technologies for quantitative expansion of staple food crops. As the economic and social development progress, agriculture begins to be integrated into the commodity economy, and thus technologies for commercialization of agricultural products as well as productivity improvement become more important. As further progress in economic and social development increases the cost of labor, technologies for laborsaving and labor productivity increase would be required. Technologies for improving the quality of vegetables, fruits, livestock products, etc. will be needed as diet and living standards improve. In the developed countries where advanced and specialized technologies are required, the needs for technologies for processes and sells of agricultural products, environmentally- and health-conscious new crops and cultivation techniques increase.

**【Q3】** Question intent: Test understanding of land utilization for agricultural practices in developing countries.

- 1) Function of irrigation as reservoir and function of flood buffering by drainage.
- 2) Soil erosion control by making rice terraces on sloping land.
- 3) Promoted nutrient uptake by soil reduction and maintained soil fertility by atmospheric N fixation by algae and nutrient supply through irrigation water.

**【Q4】** Question intent: Test understanding of different kinds of cropping system in developing countries.

- 1) Alt 350m : Crop A --- 0.81, Crop B --- 0.60  
Alt 700m : Crop A --- 0.82, Crop B --- 0.47
- 2) Alt 350m : 1.41; Alt 700m : 1.28
- 3) The relative yield (RY) of A, a grass crop, did not differ significantly between areas cultivated at different altitudes, but B, a legume crop, tended to have higher relative yields in areas cultivated at lower altitudes. Reflecting this, the land equivalent ratio (LER) was higher in areas cultivated at lower altitudes. Despite these differences, the LERs were 1.41 and 1.28, regardless of the difference in altitude, confirming that multiple cropping results in higher yields than monoculture.
- 4) Homegardens are generally multi-tiered, with fruit trees and other woody crops placed on the higher floors, under which are shrubby fruit trees and spice crops, and further under which are vegetables and ornamental plants. The three-dimensional use of space through mixed cropping not only increases productivity per area but also preserves a complex agricultural ecosystem with a diverse range of cultivated plants, contributing to stable and sustainable production.