UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER					

ENVIRONMENTAL MANAGEMENT **5014/21**

Alternative to Coursework **May/June 2010**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Ruler

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Study the appropriate Source materials before you start to write your answers.
Credit will be given for appropriate selection and use of data in your answers and for relevant interpretation of these data. Suggestions for data sources are given in some questions.
You may use the source data to draw diagrams and graphs or to do calculations to illustrate your answers.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use

This document consists of **17** printed pages and **3** blank pages.

© UCLES 2010
UNIVERSITY of CAMBRIDGE International Examinations
[Turn over

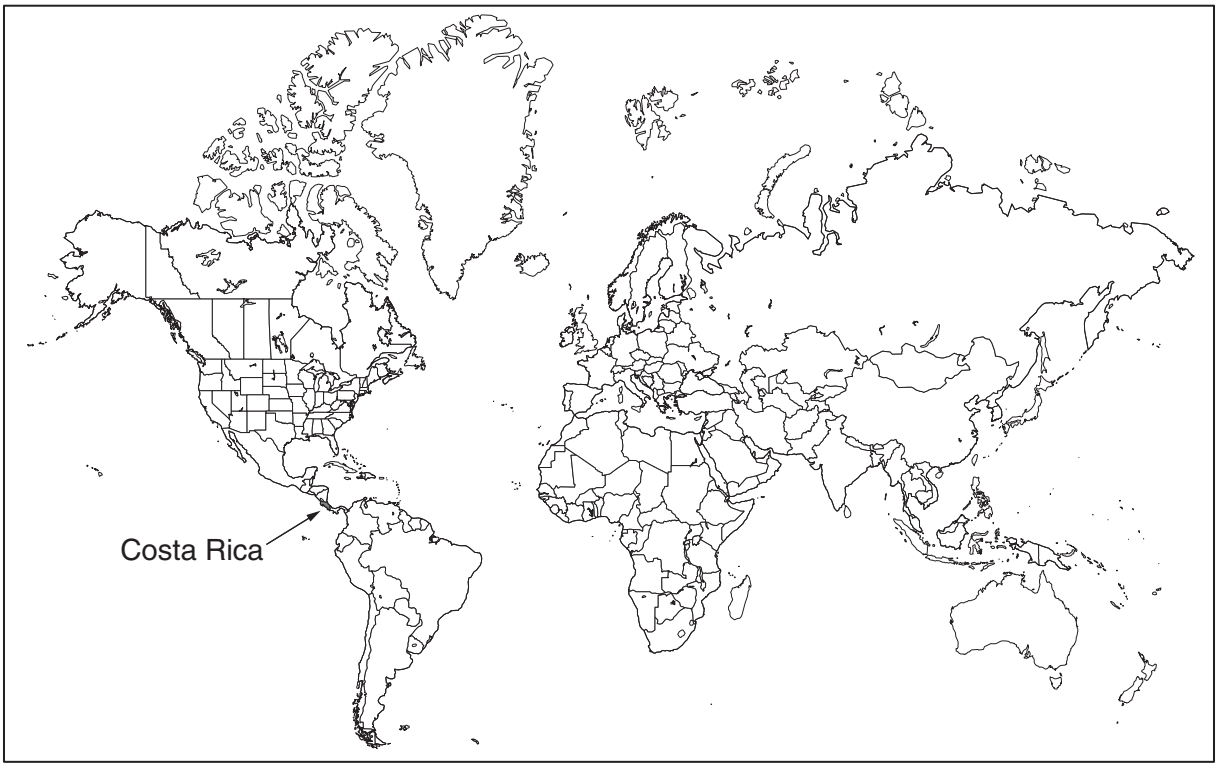

Fig. 1 Map of the world with Costa Rica shown

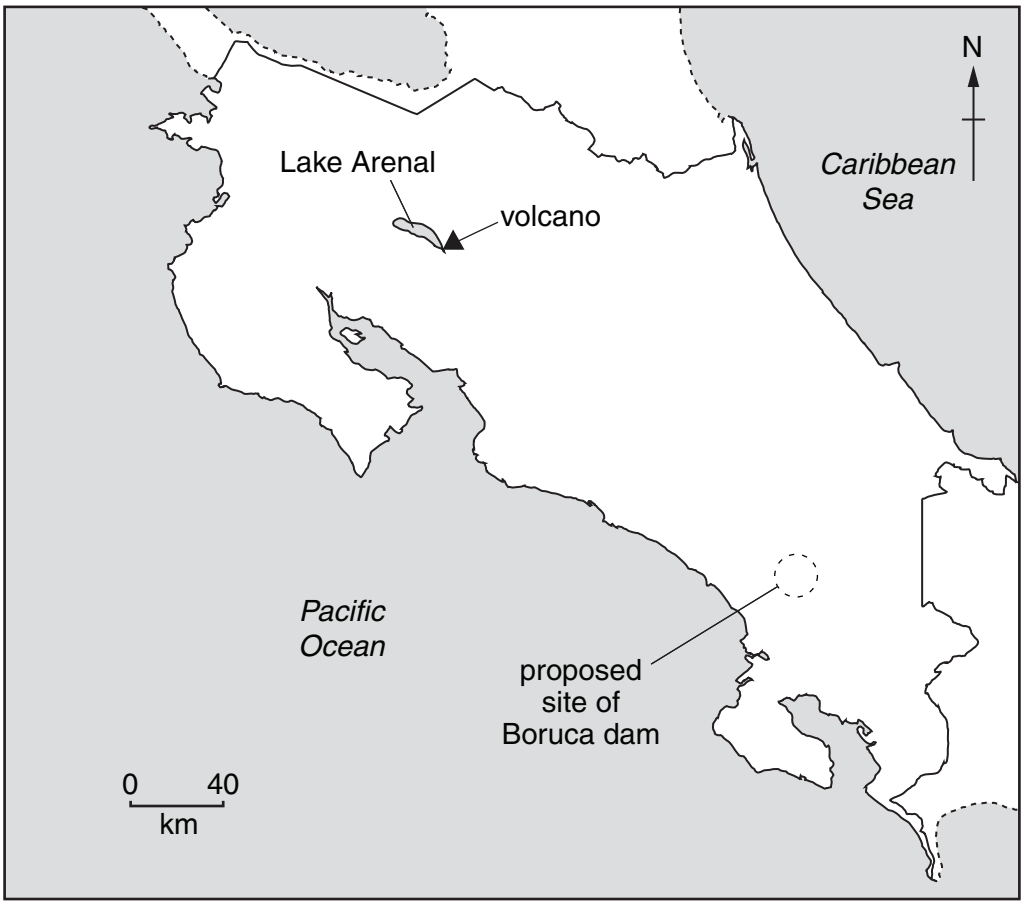

Fig. 2 Map of Costa Rica

- Area of Costa Rica: 51 100 sq km
- Population: 4 215 914
- Children per woman: 2.17
- Life expectancy at birth: 77.4 years
- Currency: Costa Rica Colon (CRC) (520 CRC = 1 US Dollar)
- Languages: Spanish, English
- Climate: tropical; dry season (December – April); rainy season (May – November); cooler in highlands
- Terrain: coastal plains separated by mountains, including several active volcanoes
- Main exports: bananas, pineapples, coffee, melons, sugar, seafood, electronic components, medical equipment

Costa Rica has a stable economy that depends on tourism, agriculture and electronics exports. Poverty has remained around 20%. Recently, immigration of mostly unskilled labour has placed heavy demands on the social welfare system. Agricultural products that are not exported include corn, rice, beans, potatoes, beef and timber. Industry includes food processing, construction materials, fertilizers and plastic products.

For Examiner's Use

1 **(a)** Look at the information about Costa Rica.

Suggest **two** reasons why some agricultural products are not exported.

.....

.....

..... [2]

(b) The export products are all of high value. Explain how this benefits Costa Rica.

.....

.....

..... [2]

(c) Pineapples are a crop grown in the coastal plains of the country. More than 3 million tonnes are exported all over the world.

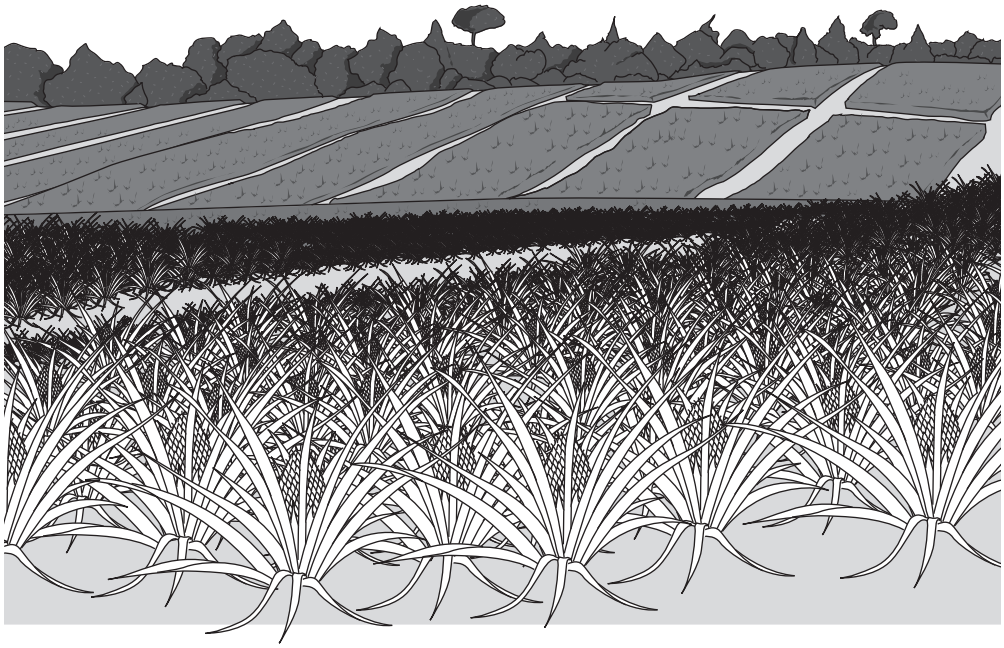

Fig. 3 Pineapples in Costa Rica

For Examiner's Use

(i) Pineapples are always planted in rows one metre apart. The planting density can be changed by altering the spacing between each plant along the rows.

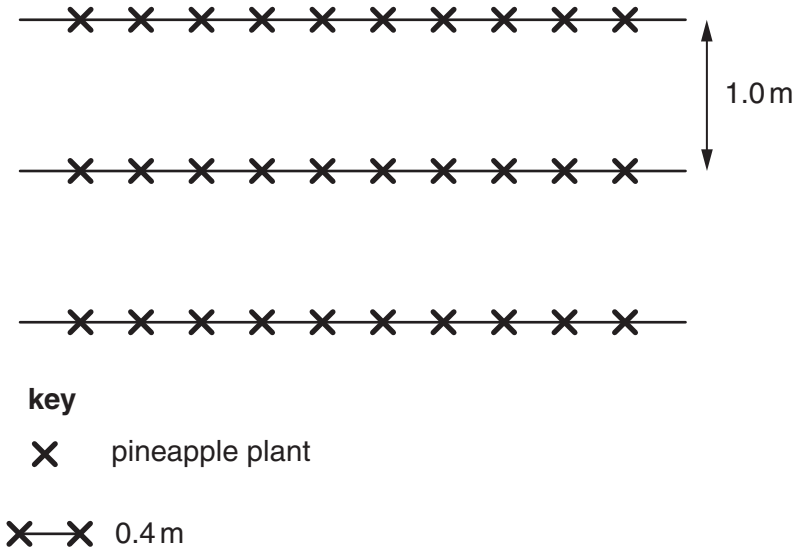

Fig. 4 Pineapple planting

The farmer intends to double the planting density. Show what this would look like in Fig. 5.

Fig. 5 [2]

For Examiner's Use

(ii) Planting density has an effect on pineapple yield.

Planting density (thousands of plants per ha)	Yield (tonnes per ha)
20	36
30	52
40	69
50	80
60	90
70	95
80	95

Plot the data on a graph (Fig. 6). [4]

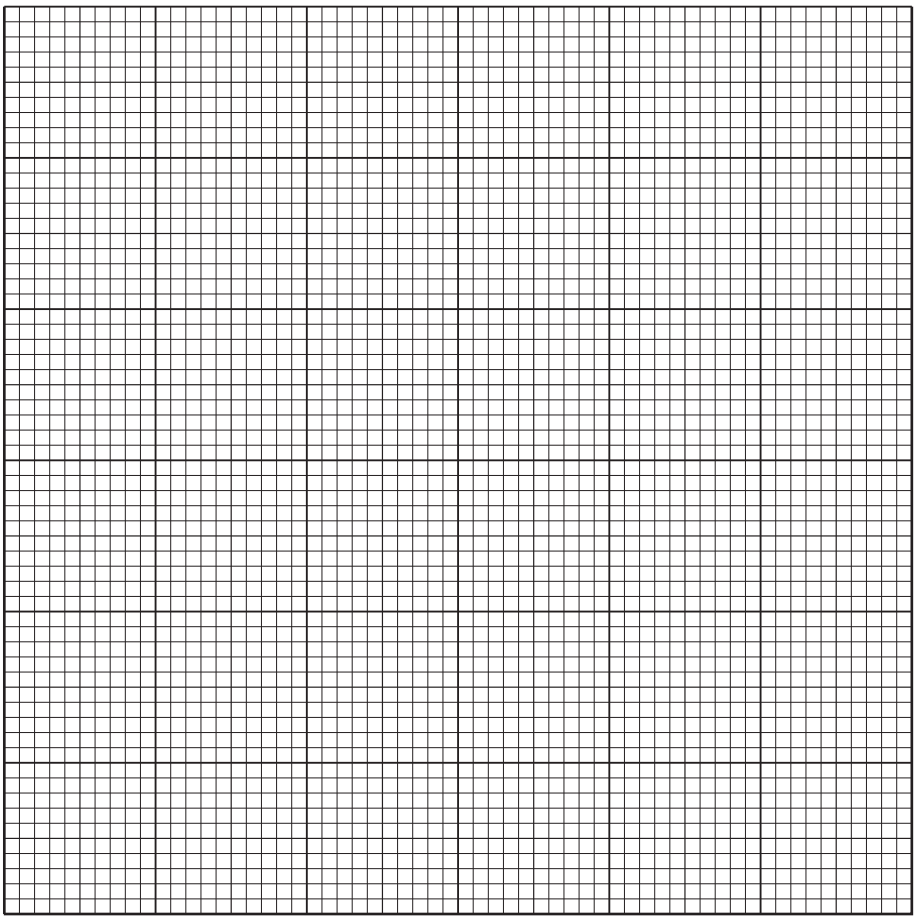

Fig. 6

(iii) From your graph, estimate the yield at a planting density of 35 thousand per hectare.

..... [1]

For Examiner's Use

(iv) Give **two** reasons why a pineapple farmer would not use a planting density of 80 thousand per hectare.

.....

.....

.....

..... [2]

(d) (i) Fig. 7 shows the percentage reduction of soil erosion for different planting densities compared with that of bare soil.

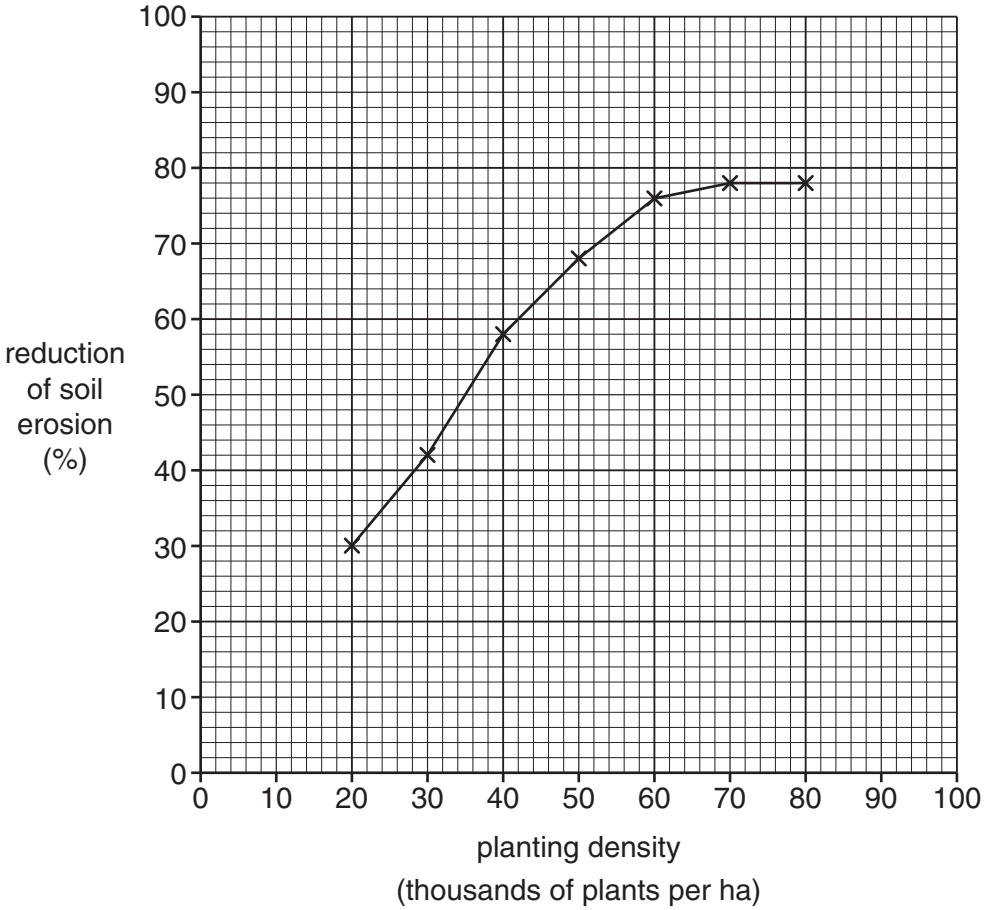

Fig. 7 Percentage reduction of soil erosion

Describe the pattern (trend) shown in the graph (Fig. 7).

.....

.....

..... [2]

For Examiner's Use

(ii) Using your own knowledge, and the information shown in Fig. 6 and Fig. 7, suggest **one** planting density a farmer should use.

Planting density .....

Reason .....

..... [2]

(iii) What is soil erosion?

..... [1]

(iv) Describe the causes of soil erosion.

.....

.....

.....

.....

.....

..... [4]

© UCLES 2010

(e)

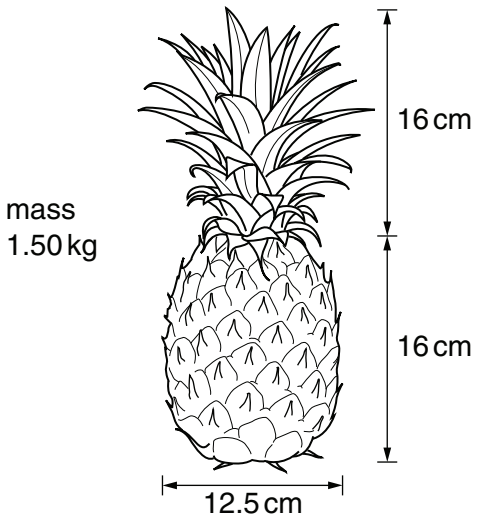

Fig. 8 Pineapple

Some students wanted to investigate the effect of different planting densities on the size of pineapples at harvesting. They proposed three different plans.

Plan One
Select one field of high density and one of low density. Walk into each field and pick two pineapples. Measure the diameter of each fruit.

Plan Two
Select five fields, each with a different density. Pick five pineapples from each field. Measure the diameter of each fruit.

Plan Three
Select five fields, each with a different density. Pick five pineapples from each field. Measure the diameter, height and mass of each fruit.

(i) The students decided **not** to carry out Plan One. Explain why.

.....

.....

..... [2]

For Examiner's Use

(ii) In the space below draw a table to record the measurements for Plan Two.

For Examiner's Use

[3]

(iii) Give **two** reasons why the students decided to carry out Plan Three.

.....

.....

..... [2]

© UCLES 2010

2

For Examiner's Use

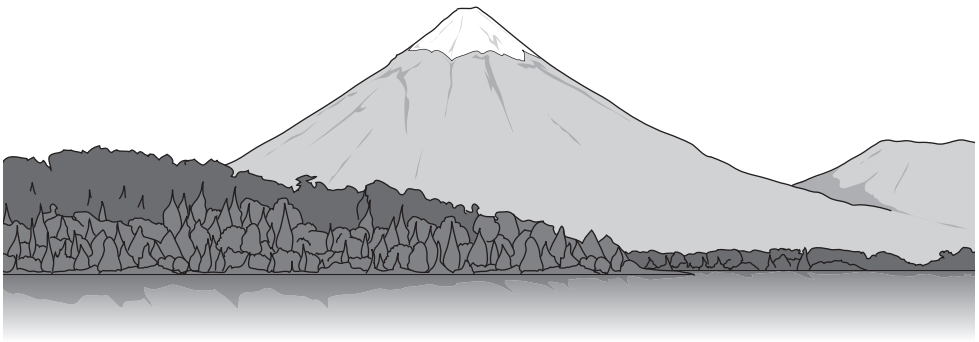

Fig. 9 Lake and volcano

Lake Arenal was made three times its original size by building a dam. One thousand local people were moved from the land after the dam was built. The dam generates hydro-electric power (HEP) and supplies about 10% of the country's electricity.

(a) **(i)** The government spent 4 million US dollars to relocate the local people. What is the cost for each person?

..... [2]

(ii) Explain why the government decided to pay so much to relocate the local people.

.....

..... [1]

(b) Explain why a large lake is an advantage for HEP generation.

.....

.....

..... [2]

For Examiner's Use

(c) Since the lake has been enlarged the fish populations have increased. Some tourists come to the lake to fish for snook and a species of flying fish, known as machaca. Every tourist must get a permit to fish in the lake.

Suggest why the government requires tourists to have a permit.

.....

.....

..... [2]

(d) Cattle farming takes place on some parts of the land surrounding the lake. The cattle can graze over large areas and the land is never ploughed.

Some students wanted to find out if cattle farming caused any damage to the lake ecosystem. They took water samples from an area without cattle and some from an area with cattle to test for nitrate and phosphate levels. The results are shown in Fig. 10.

Area without cattle			Area with cattle		
Sample	Nitrate *ppm*	Phosphate *ppm*	Sample	Nitrate *ppm*	Phosphate *ppm*
1	55	9	6	45	10
2	40	8	7	40	8
3	45	9	8	45	8
4	40	10	9	48	9
5	40	8	10	42	8
Average	44.0	8.8	Average	44.0	8.6

(ppm = parts per million)

Fig. 10

For Examiner's Use

(i) Do you think cattle farming is affecting the lake ecosystem? Use the information in the table to help give reasons for your answer.

.....

.....

..... [3]

(ii) The students highlighted one of their measurements. Which one? Why?

.....

..... [2]

(iii) Why should the students repeat their sampling?

..... [1]

(e) Describe what would happen to Lake Arenal if the level of nitrate and phosphate increased.

.....

.....

.....

..... [3]

For Examiner's Use

(f) A farmer has a piece of land by the lake with easy access to a road. The farmer wants to put up fences and grow pineapples. The pesticide bromacil has to be used to grow pineapples successfully. When the pesticide enters the soil it takes 60 days for half of it to be broken down.

Two small trial fields (A and B) were planted as shown in Fig. 11.

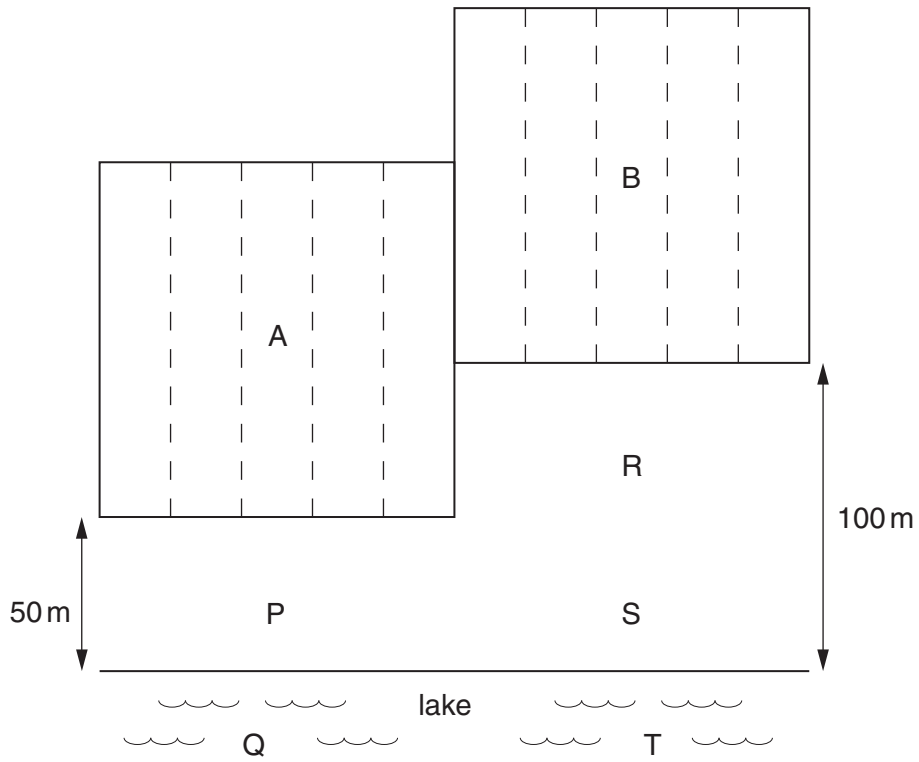

Fig. 11

Both fields were planted at the same time and with the same planting density. Equal quantities of bromacil were used. A test was carried out by government scientists to measure for the presence or absence of bromacil.

	Sample sites				
Days from planting	P	Q	R	S	T
60	✓	✗	✓	✗	✗
120	✓	✗	✓	✓	✗
180	✓	✓	✓	✓	✗
240	✗	✗	✗	✗	✓
300					

✓ = bromacil present ✗ = bromacil absent

Fig. 12

For Examiner's Use

(i) Describe the pattern of results shown by the pesticide tests.

.....

.....

.....

..... [3]

(ii) Complete Fig. 12 for readings you would expect at sites P–T after 300 days. [1]

(iii) Explain why the government scientists refused to allow the farmer to grow pineapples after this trial.

.....

.....

..... [2]

For Examiner's Use

3 The government has been considering a proposal to build the Boruca Dam for 30 years. Some statements made about the proposal are:

- The dam would provide 100% of the country's electricity
- 5 000 people will need to be relocated
- The dam should generate electricity for 60 years
- 25 000 hectares of farming land will be flooded
- Foreign companies want to loan the government money to build the dam
- The dam will silt up and produce less electricity in the future
- The government will be paying back loans for 50 years.

(a) (i) Select **one** statement and explain why it would be an advantage to Costa Rica.

Statement .....

Advantage ..... [1]

(ii) Select **one** statement and explain why it would be a disadvantage to the economy of Costa Rica.

Statement .....

Disadvantage ..... [1]

(iii) Select **one** statement and explain why it would be a disadvantage to local people.

Statement .....

Disadvantage ..... [1]

For Examiner's Use

(b) A foreign company wants to help build an aluminium smelting works close to the Boruca Dam. This could use up to 85% of the power produced. It takes a large amount of electricity to produce aluminium from its ore, bauxite.

Costa Rica has bauxite deposits but, unfortunately, not enough can be extracted to make the works profitable.
The rest of the bauxite would have to be imported by sea from its mining operations in other countries.

BAUXITE + ELECTRICAL ENERGY = ALUMINIUM + OXYGEN

(i) Explain why the aluminium smelter is an example of sustainable production.

.....

..... [1]

(ii) State the other arguments in favour and state the arguments against the building of the aluminium smelter. In your view, which are the stronger?

.....

.....

.....

.....

.....

.....

.....

..... [5]

BLANK PAGE

BLANK PAGE

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

University of Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

© UCLES 2010