



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
International General Certificate of Secondary Education  
General Certificate of Education Ordinary Level

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**ENVIRONMENTAL MANAGEMENT**

**0680/04  
5014/02**

Alternative to Coursework

**May/June 2009**

**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.

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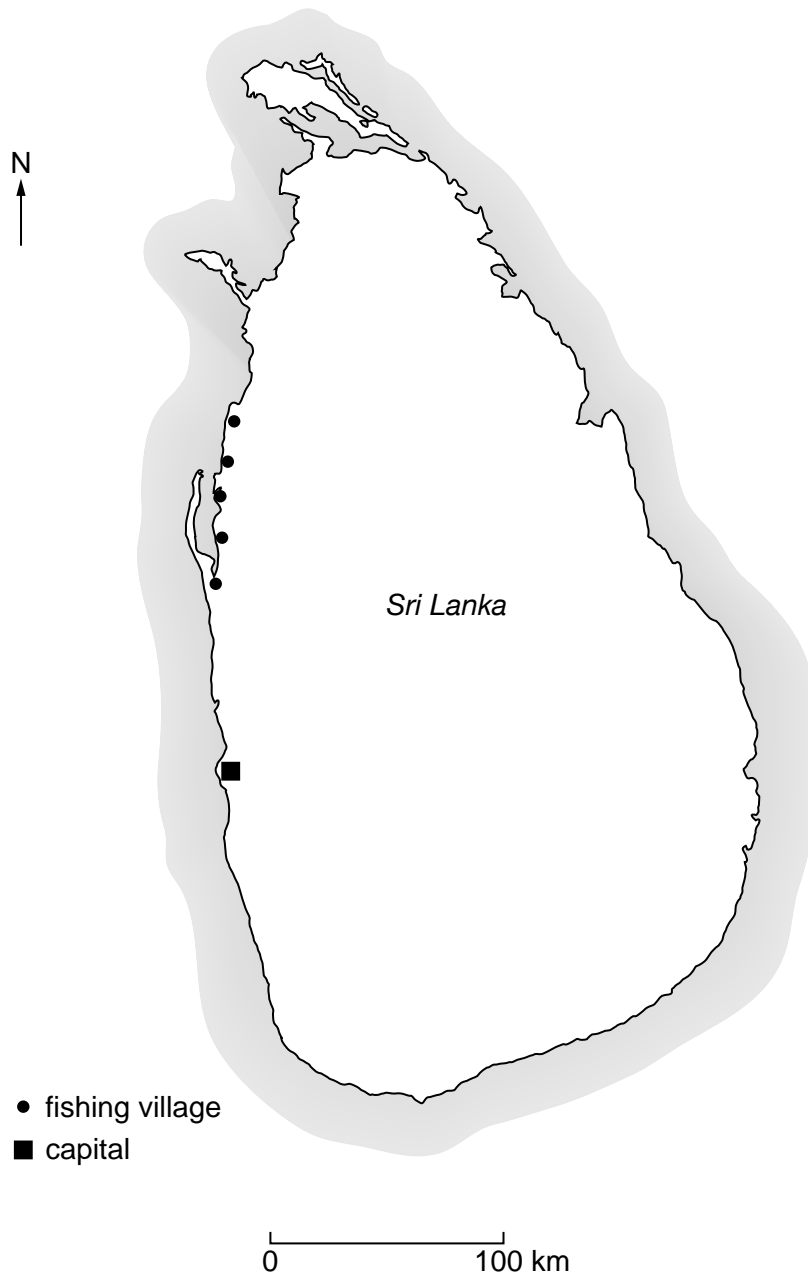
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This document consists of **18** printed pages and **2** blank pages.





**Fig. 1 map of the World**



**Fig. 2 map of Sri Lanka**

- Area: 64 700 sq km
- Population: 21 000 000
- Children per woman: 2.05
- Life expectancy at birth: 74.8 years
- Currency: Rupee (44 Rs = 1 US Dollar)
- Official languages: Sinhala, Tamil, 14 other languages
- Climate: Tropical
- Terrain: mostly plains with mountains in the south central interior
- Main exports: textiles, tea, spices, diamonds, emeralds, rubies, fish, coconut and rubber products

Sri Lanka's main economic activities are in food processing, telecommunication, insurance and banking. Plantation crops used to be the major export but now only make up 15% of all exports. About 800 000 people work abroad, sending more than a billion dollars back to the Sri Lankan economy.

1 Fishing is an important activity for people living in coastal villages. Villages often have lagoons near them. The lagoons are areas of brackish water separated from the sea by narrow strips of sand or shingle. Brackish water is not as salty as sea water. The government has set up trial fishponds to grow milkfish and shrimp in brackish water. There is a world-wide demand for shrimp and the milkfish are for local consumption. Many villagers want to start their own fishponds.

(a) Suggest why fish is an important part of the diet for village people.

.....  
..... [1]

(b) Suggest why more fishponds would be an advantage to

(i) the villagers .....

.....

(ii) the government .....

..... [2]

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- (c) Some villagers visited the trial fishponds to find out how to build their own ponds for growing either milkfish or shrimp. They returned with a building plan as shown in Fig. 3. This needs to be altered to fit their lagoon.

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- (i) Complete the outline of the village lagoon by drawing in your building plan on Fig. 4. [3]

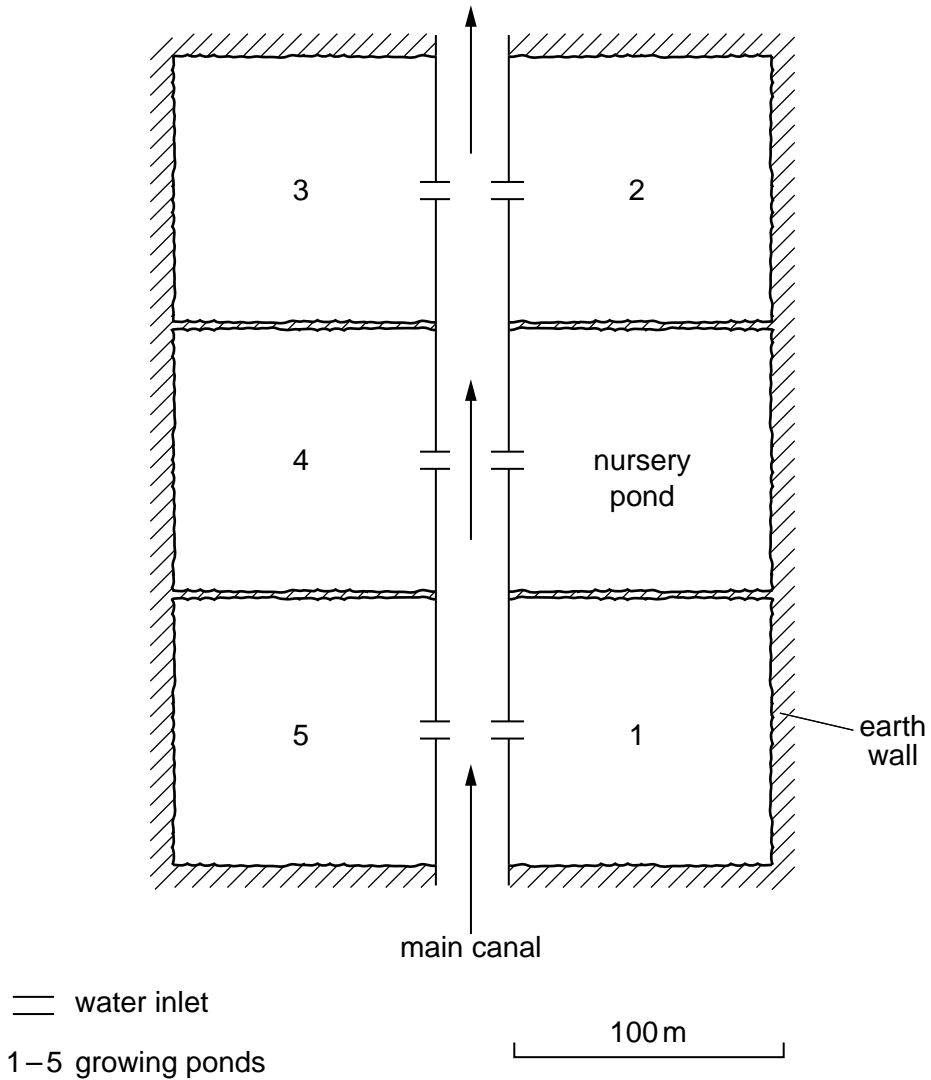
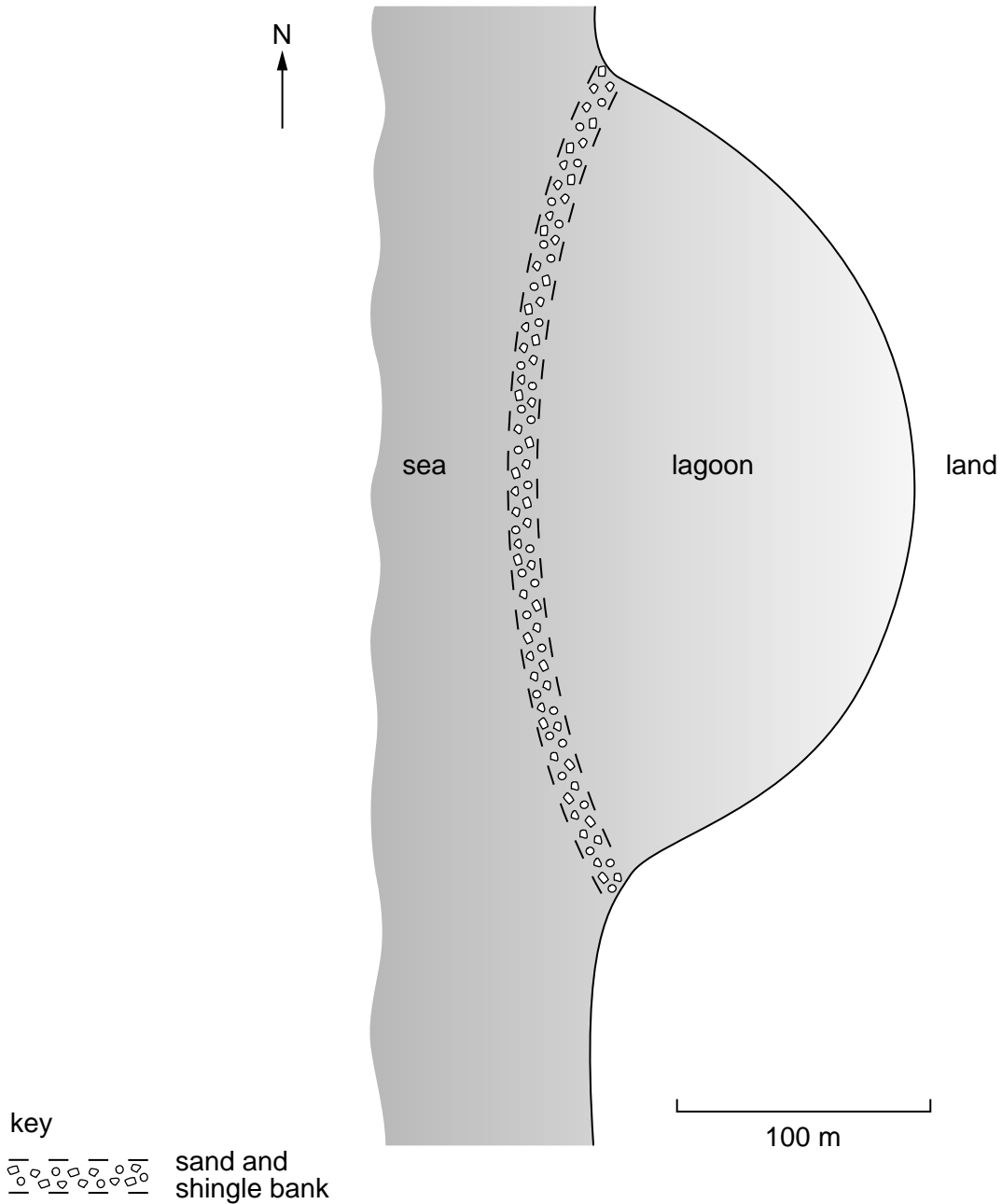


Fig. 3



**Fig. 4**

- (ii) The building costs have been estimated at Rs 200 000. The shrimp are worth Rs 80 per kilogram.

How many kilograms of shrimp must be produced to pay back the building costs?  
(Show your working).

.....

..... [2]

Before building can start, the villagers were told to check the water was not too acidic by measuring its pH. The milkfish and shrimp only survive and grow well with a pH of between 7 and 8. The results of the tested water samples are shown in Fig. 5.

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Site in lagoon	pH
A	7.5
B	7.4
C	6.8
D	7.4
E	7.5

Fig. 5

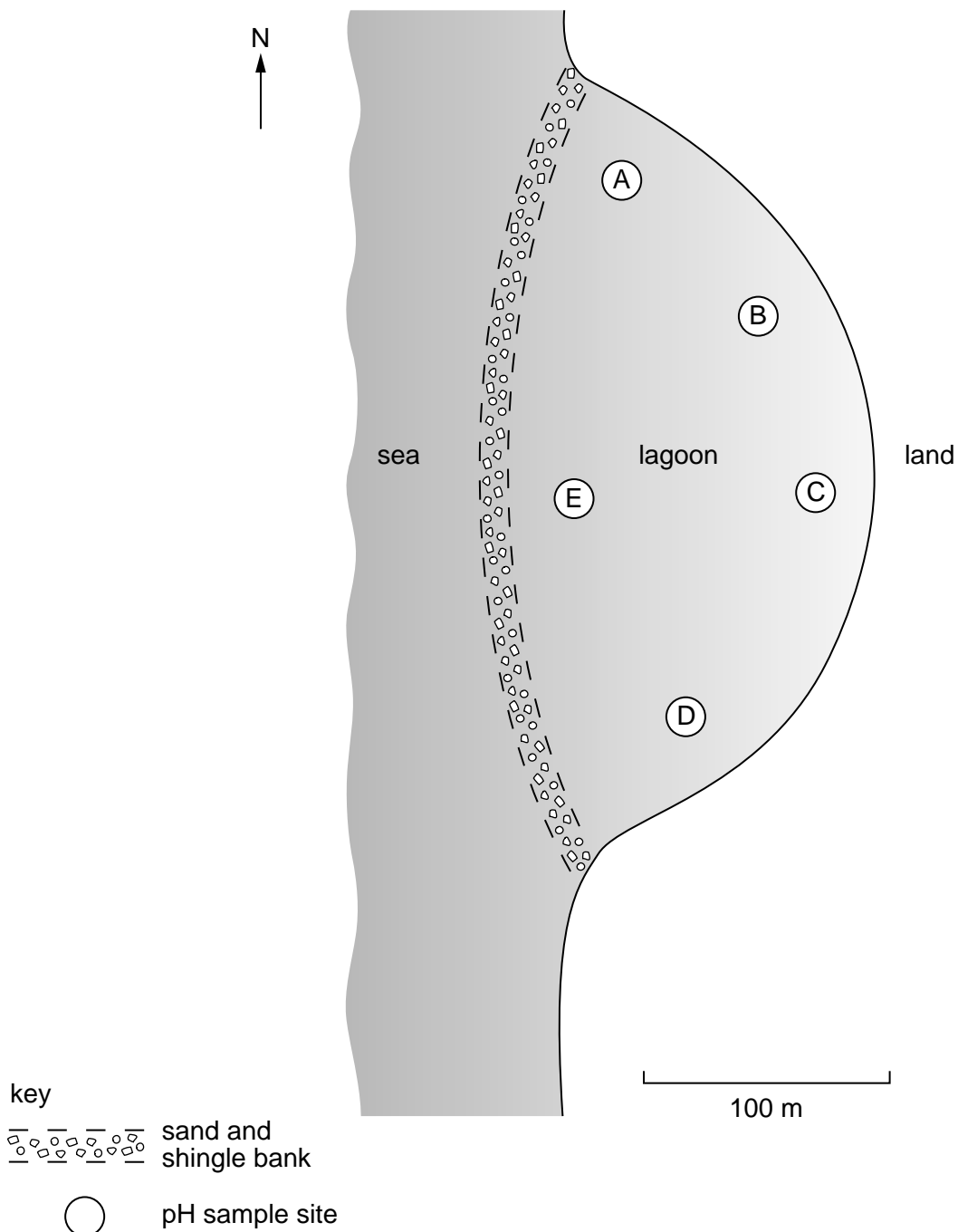


Fig. 6



The villagers showed their results to some older people in the village who remembered that a large quantity of coconut husks had been buried in part of the lagoon.

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This is what three villagers said

'we must go  
and dig up the coconut  
husks'.

'we must  
take more pH  
samples'.

'we  
should not build  
any fishponds'.

(iii) What would you advise the villagers to do? Explain as fully as you can.

.....  
.....  
.....  
.....  
..... [3]

There are mangrove swamps near the village where small mangrove trees grow close together in shallow sea water. They are a good habitat for fish to spawn and grow. Some villagers want to build more fishponds by clearing the mangrove swamp to make another brackish lagoon. Other villagers think this will not be a sustainable development.

Arguments FOR

- more money from exports
- more jobs
- less reliant on fishing
- mangroves are of no value

Arguments AGAINST

- mangroves protect the coast
- loss of spawning grounds
- reduced fishing catches
- more labour needed to maintain fishponds

(d) (i) Explain why this further development might not be sustainable.

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.....

..... [5]

Milkfish breed in the sea; the fertile eggs hatch into fry. Some fishermen specialise in catching the fry and keeping them alive in special containers. Sometimes not enough fry can be caught to stock all the fishponds.

(ii) What research do you think should be carried out to support the continued development of fishponds?

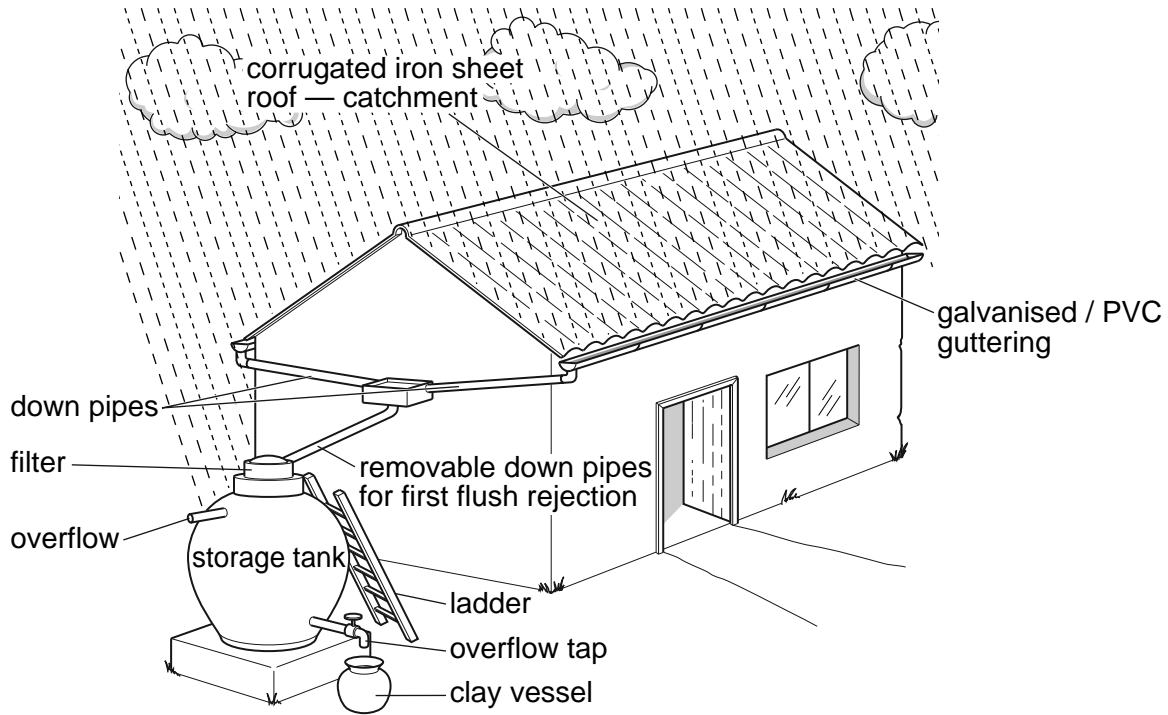
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- 2 Sri Lanka has plenty of surface rivers but few natural lakes. To help store water in the drier months water tanks have been built all over the island. Due to an increasing population there is often a shortage of water suitable for drinking. The government is encouraging rainwater harvesting as shown in Fig. 7.

**Roof rain water harvesting system—very low cost model**



**Fig. 7**

- (a) (i) This system has removable down pipes to reject the first flush of rainwater. Explain why.

.....  
 .....  
 ..... [2]

- (ii) A fine filter is used. It stops mosquitoes entering the storage tank. Explain how this helps keep the people healthy.

.....  
 ..... [1]

- (iii) Give another reason why a fine filter is used.

.....  
 .....  
 ..... [2]

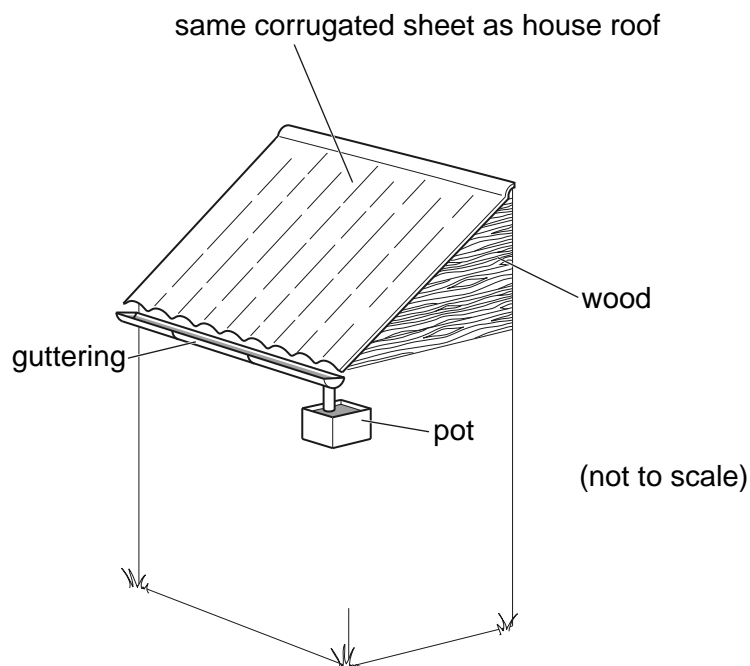
(iv) Give **two** reasons why the storage tank is not placed underground.

.....

.....

..... [2]

(b) Some students wanted to find out how much rain a roof could collect. They built four 1 m<sup>2</sup> rain collectors as shown in Fig. 8 and placed them apart on the ground. They also placed a rain gauge in the middle of their study area.



**Fig. 8**

(i) Why did the students use more than one rain collector?

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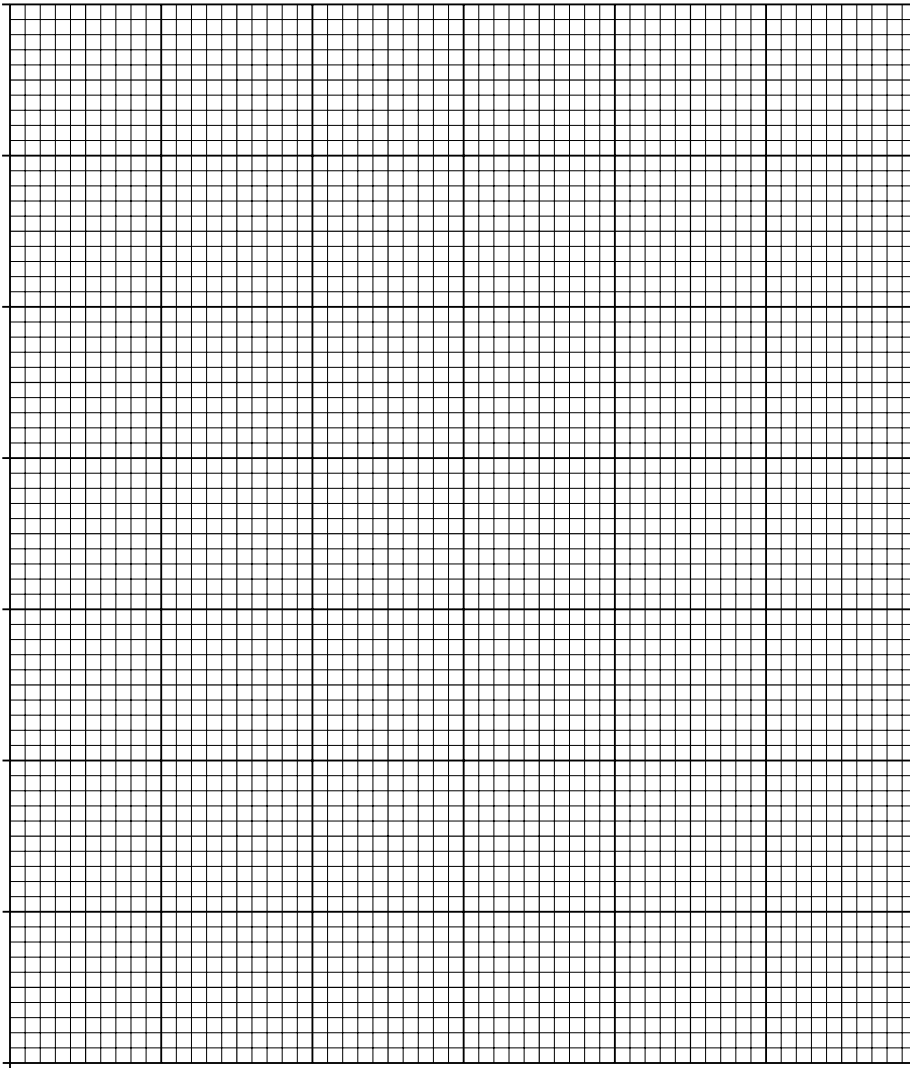
..... [1]

They collected the following data.

Rain collected (litres)

Day	Site A	Site B	Site C	Site D
Day 1	19	17	14	18
Day 2	31	29	25	30
Day 3	10	8	6	9
Average	20	18	15	19

(ii) Plot the data on a graph.



[4]

(iii) Which rain collector harvested the least water?  
Suggest **two** possible reasons for this.

.....  
.....  
..... [2]

(iv) The roof area of a house is 40 m<sup>2</sup>. How much water is likely to have been collected on day one?

.....  
.....  
..... [2]

(v) Why did the students use a rain gauge as well as the rain collectors?

.....  
 .....  
 ..... [1]

Look at the climate data in Fig. 9.

Month	Temperature °C	Average precipitation mm	Number of wet days
January	27	173	10
February	28	66	4
March	29	48	4
April	32	58	5
May	33	69	5
June	33	28	2
July	33	51	2
August	33	107	6
September	33	107	6
October	31	221	13
November	29	358	17
December	27	368	16

**Fig. 9**

(vi) In which months is the harvested water most needed? Give a reason for your answer.

.....  
 .....  
 .....  
 ..... [3]

The demand for electricity in Sri Lanka is increasing. Several rivers are suitable for HEP (hydro-electric power) schemes.

The Upper Kothmale HEP scheme will bypass 7 waterfalls before reaching the dam. It is expected to generate 150MW of power. At least 600 families will be forced to move.

Some scientists think this scheme will help development for many years. Other scientists think the scheme will fail after a few years.

**(c) (i)** What makes some rivers suitable for HEP?

.....  
..... [1]

**(ii)** Why are HEP schemes described as environmentally friendly by some scientists?

.....  
..... [1]

**(d)** Some scientists predict that this scheme will hold 15% less water each year.

**(i)** Why can this happen?

.....  
.....  
..... [2]

**(ii)** If the loss of water remained constant at 15% each year, for how many years would the HEP scheme be able to generate electricity?

.....  
..... [1]

**(iii)** The government has been given a low interest loan at 1.5% over 40 years to complete the HEP scheme. Explain why this may reduce development after ten years.

.....  
.....  
..... [2]

(e) One of the villagers who is being forced to move said,

'The new houses are superb; living in one of these houses will be a dream come true'.

Another villager said,

'Where will you keep your two cows and grow vegetables to sell?'

The first villager said,

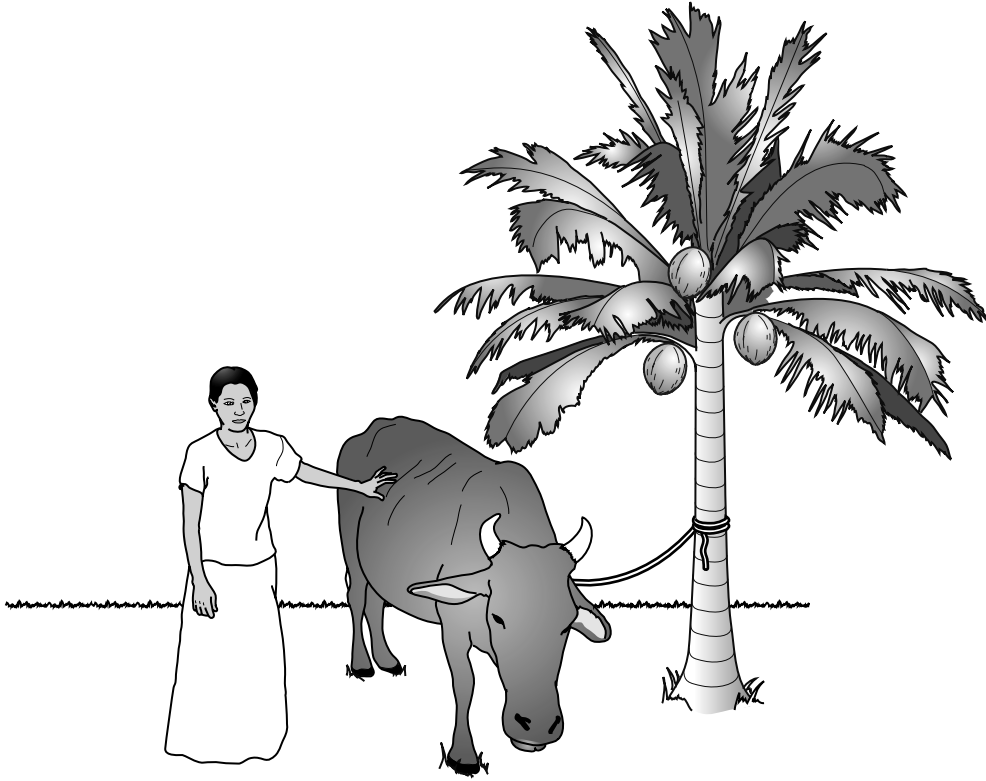
'I will fit the cows into my new home and I will find other means of earning a living in town'.

Suggest how this new way of life might have advantages and disadvantages for the villagers.

(i) advantages .....  
.....  
.....

(ii) disadvantages .....  
.....  
..... [4]





**Fig. 10**

Coconuts are an important export crop and 90% of Sri Lanka's production comes from small farms about 2 hectare in size. The coconut trees are planted at 140 trees per hectare. Other plants can be grown between the trees and livestock are tied to the trees (Fig. 10). The annual income for one small farm is shown in Fig. 11.

Farm produce	Annual income Rs
vegetables	300
coconuts	3 400
pasture plants (peas, beans, some grasses)	1 800
cattle	31 500
chickens	8 000
total	45 000

**Fig. 11**

(a) (i) What percentage of total annual income comes from cattle?

.....

..... [2]

(ii) The pasture plants always include leguminous species (peas, beans, some grasses). Explain how this increases the productivity of the farm.

.....  
.....  
..... [2]

(iii) In 1997 the coconut mite started to infect the trees and the coconuts could not be sold. Explain why most farmers decided to keep their trees.

.....  
.....  
..... [2]

(b) A farmer divides his farm into four equal plots as shown in Fig. 12. The farmer knows the following:

- tea bushes can be picked all year
- chickens find most of their own food
- cows can feed on pasture plants and coconut wastes
- vegetables can be grown in small plots

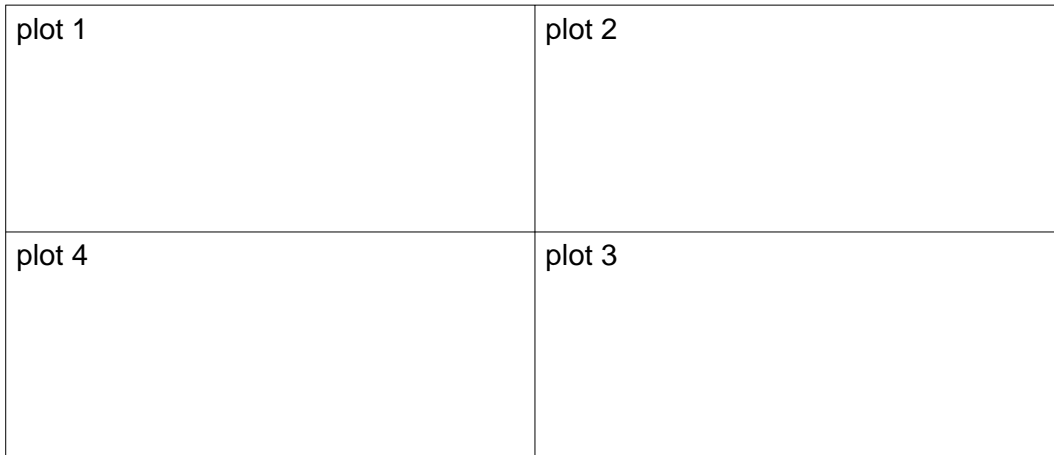


Fig. 12

Describe, in detail, how the farmer could maintain income and productivity on the farm.

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