Contents

Series preface ix
About this book x

Section A: The Business of Farming 1

1 The role and importance of agriculture 1
  1.1 The importance of agriculture in national, regional and international economies 2
  1.2 Career opportunities in agriculture 3
  1.3 Institutions concerned with agricultural development in the Caribbean 7

2 Challenges confronting agriculture 15
  2.1 Local and regional challenges 16
  2.2 Issues affecting global agriculture 21
  2.3 Terminology used in food safety, importation and certification 26

3 Alternatives to conventional farming 31
  3.1 Non-conventional farming systems 32
  3.2 The principles of organic farming 35

4 Economic factors of production 41
  4.1 The economic functions of production, consumption and marketing 42
  4.2 The factors of production 44
  4.3 Factors of production related to agriculture 45
  4.4 The ‘law of diminishing returns’ 47
  4.5 Demand, supply and price relationships 51

5 Trade agreements 61
  5.1 The effect of international trade agreements 62

6 Farm financing and support services 68
  6.1 Sources of capital 69
  6.2 Co-operatives 72
  6.3 Incentives given to farming 75

7 Farm organisation and planning 80
  7.1 Farm management and farm records 81
  7.2 Income and expenditure 84
  7.3 Partial and complete budgets 86
  7.4 The relationship between budgeting and decision-making 87

Section B: Crop Production 91

8 Soil and soil fertility 92
  8.1 Soil formation 95
  8.2 The soil profile 96
  8.3 The major components of soil 98
  8.4 The physical and chemical properties of major soil types 104
  8.5 The carbon and nitrogen cycles
Section C: Animal Production

15 Morphology and physiology
  15.1 The digestive system of a bird
  15.2 Ruminant and non-ruminant digestive systems
  15.3 Functions of the digestive system parts
  15.4 The process of digestion
  15.5 Digestion in rabbits
  15.6 The structure of an egg

16 Nutrition
  16.1 Nutrients in animal nutrition
  16.2 The balanced ration
  16.3 Appropriate rations for livestock
  16.4 Feed conversion ratio (FCR)
  16.5 The importance of FCR
  16.6 Systems of grazing
  16.7 The advantages and disadvantages of different grazing systems
  16.8 The importance of forages in livestock feeding
  16.9 Forage conservation

17 Housing
  17.1 Housing requirements for farm animals
  17.2 Housing for broilers, layers and rabbits
  17.3 Bee production and fish farming

18 Animal genetics, breeding and reproduction
  18.1 Breeds of farm animals
  18.2 Uses of different breeds of farm animals
  18.3 Animal genetics
  18.4 Breeding systems in animal production
  18.5 The advantages of cross-breeding
  18.6 The principles of genetic improvement
  18.7 Artificial insemination in farm animals
  18.8 Advantages and disadvantages of artificial insemination
  18.9 Terms used in animal reproduction
  18.10 Egg formation and incubation in poultry
  18.11 Embryo transfer
  18.12 Genetic engineering in livestock production

19 Animal husbandry
  19.1 The care of young chicks and rabbits
  19.2 Management practices associated with rearing broilers, layers and rabbits
  19.3 Rearing a batch of broilers
  19.4 Animal health
  19.5 Pests and diseases of poultry and rabbits: symptoms, prevention and control
  19.6 The economic importance of bees
  19.7 The types of bees in a hive
  19.8 The social activities of bees
  19.9 Pests and diseases of bees
  19.10 Honey and other bee products

20 Animal products technology
  20.1 Animal products and by-products
  20.2 The dressing percentage of farm animals
  20.3 The slaughter of broilers
  20.4 The marketing of eggs and meat
Section D: Horticulture (Double Award only)

21 Horticulture 310
   21.1 What is meant by horticulture? 311
   21.2 The importance of horticultural plants 312
   21.3 The cultivation of horticultural plants 312
   21.4 Harvesting techniques of horticultural plants 316
   21.5 Quality requirements for flowers 316
   21.6 The establishment of lawn and turf grasses 317

Section E: Animal Management (Double Award only)

22 Animal management 321
   22.1 Management practices in the rearing of livestock 322
   22.2 Preventing food spoilage 330
   22.3 Principal cuts of meat 332
   22.4 The quality requirements of meat 332
   22.5 Safety requirements in the processing of food 333
   22.6 Value-added products 333
   22.7 The role of biotechnology in animal production 335

School-based Assessment (SBA) component 339

Answers to multiple choice questions 372

Index 373
This series of textbooks for the Caribbean Examinations Council [CXC] examinations has been developed and written by teachers with many years’ experience of preparing students for CSEC examinations in Caribbean schools. This book can be used for either the Single or Double Award.

A textbook is used in different ways at different times.

- Readers may be starting a topic from scratch and need to be led through a logical explanation one step at a time.
- Students with a working knowledge of a topic may need to clarify a detail, or reinforce their understanding. Or, they may simply need to believe that they do have a good grasp of the material.

The specially created format is the same for all books in the series. Diagrams and pictures are placed on the page in such a way that they can be consulted as the reader wishes, but interrupt the text as little as possible.

- Short answer questions (called In-Text Questions, even though they are not placed in the main body of the page) allow the student to test his or her grasp of the topic. A student who can answer an ITQ gains confidence; a student who cannot knows to go back over the topic and try again.
- Important technical terms are highlighted in the margin where they are first used. This emphasises their importance and makes an index-based search easier to do.

Teachers throughout the region have emphasised that inclusion of SBA material is important for these books. Each CSEC syllabus specifies the type of SBA exercise that is expected. This subject may be studied at Single Award or Double Award level; the SBA requirements differ. Accordingly, a chapter offering detailed advice for both is included.

Dr Mike Taylor
Series Editor
About this book

This book isn’t just words on a page. Here are some important features. Each will help you, if you take advantage of it.

▸ There are two columns. The bigger column has the text and some really large diagrams; you can read straight down it without interruption. The smaller column has other diagrams which the text mentions. Look at them carefully as you need them. You may find that looking at a diagram for a few seconds is worth a few minutes of reading.

▸ The first time that an important new word occurs, it is repeated in the smaller column. If you want to check what a word means, you can find it quickly.

▸ There are questions called ITQs (In-Text Questions). When you have read the nearby text, try to answer the question, in your head or on paper. If you can, you’re on the road to understanding. If you can’t, just go back and read that bit again. Answers to ITQs are at the end of each chapter, so you can tell how good your answer was.

▸ At the end of each chapter there are some examination-style questions. Your teacher will suggest how you can use them. Some are multiple choice questions, and the answers to these can be found at the end of the book.

▸ Whether for the Single or the Double Award, you have to present an SBA involving practical work and the production of a record of what you have done, including a financial analysis. The last chapter has a detailed explanation of what is expected, an explanation of how you might set about the practical work and what is important in it.

▸ There is a detailed index. Don’t be afraid to use it to find what you want!
By the end of this chapter you should be able to:

- understand that agriculture is important in national, regional and international economies
- list the various career opportunities and levels of training in the agricultural sector
- know and understand the functions of local, regional and international institutions concerned with agricultural development in the Caribbean.

**Concept map**

**Role of agriculture**

**Economic importance**
- Regional
  - employment
  - food security
- National
  - contribution to GNP
- International
  - foreign exchange
  - trade liberalisation

**Career opportunities**
- Local
- Regional
- International
- Ministry of Agriculture
- CARICOM
- CFNI
- CDB
- CARDI
- UWI
- CASE
- ECIAF
- GSA
- EU
- IICA
- FAO
- OAS
- IDB
- CIDA

**Agricultural development**
- food production
- education
- agro-processing
- sales and marketing
- certification
- management
- food inspection
- services
- engineering
- certification
- quality control
- food inspection
1.1 The importance of agriculture in national, regional and international economies

The word agriculture comes from the Latin *agri cultura*, meaning ‘cultivation of the field’. It covers all the arts, skills, sciences, industries and services used by humans to obtain food from the land. This includes the cultivation of crops and the rearing of livestock, together with the related industries supplying seeds, chemical fertilisers, machinery, finance and technology. In addition, agriculture involves marketing and processing.

Often ‘agriculture’ is used to mean the same as ‘farming’ and ‘husbandry’. But farming and husbandry have more to do with specific activities such as dairy farming, crop husbandry, organic farming, livestock husbandry, mixed farming and exotic farming.

Traditionally, agriculture has been recognised as the art of tilling the soil and a way of life for families in rural communities. With modern technology and a rising world population, agriculture today is seen as an art, a skill, an applied science, a multi-faceted discipline, a business and a vocation, focused primarily on food production.

**Foreign exchange earnings**

Agriculture is very important to the economies of all Caribbean countries, both regionally and internationally.

When Caribbean agricultural goods and services are sold to other countries, foreign exchange is earned. For example, the export of bananas and coffee earns foreign currency. However, when foreign agricultural goods and services are imported, Caribbean currency is converted to foreign exchange; importing agricultural machinery from abroad is therefore a loss to the local community.

**Contribution to Gross National Product**

The Gross National Product (GNP) is a measure of the current value of goods and services from all sectors of the national economy. Agriculture is a vital sector of the national economy and contributes to the GNP.

**Food security**

Food security means being self-sufficient in food. Most Caribbean countries are now boosting their local food production and reducing food imports.

In the Caribbean, food security is affected by:

- low agricultural productivity, resulting from inefficient use of water and other inputs
- a decline in earnings from traditional crops resulting from the loss of trade preferences
- a dependency on imported food resulting from the inability to produce food locally at competitive prices
- increased poverty in many countries because of a loss of agricultural jobs.

Food security can be promoted by initiatives to improve food production and marketing, expand trade opportunities, increase income and improve nutrition.

**Employment ratio of imported food to local produce**

The agricultural sector can provide employment for many people. There is a wide range of job opportunities, such as farming, agricultural education, marketing, engineering and farm management. Improved agricultural production improves the employment prospects of a region – if more food is grown locally then more jobs...
are created. Importing food from abroad reduces the number of local agricultural jobs.

There is also concern about the quality of some of the food imported into the Caribbean. It is thought that some imported food may be responsible for an obesity problem within the population.

**National and regional plans for agricultural development**

Agricultural plans are policy documents, prepared by governments, private firms or international organisations, setting out plans for agricultural development. Normally, local or national plans are prepared by the government of each Caribbean country for a five-year period. The plan for each country identifies the areas of agriculture which need attention and may specify the current status, constraints, strategies and resources required for the development of each area. Carefully prepared plans can bring about agricultural development and national development.

Regional plans for agricultural development are produced through the cooperative efforts of Caribbean countries, based on the agricultural needs of the region. Specific goals, objectives, constraints, strategies, resources and evaluation procedures help to put the plans into practice.

**Trade liberalisation**

Trade liberalisation helps global competitiveness. A fair trade in goods and services develops through removing tariffs and non-tariff barriers. A tariff is a tax levied by a government on imports (or occasionally exports) for purposes of protection, support of the balance of payments, or the raising of revenue. Global trade liberalisation initiatives encourage greater efficiency in marketing and trade by restructuring trade policy regimes to reduce the level of protection from competition.

Trade liberalisation does not just depend on the removal of barriers and the negotiation of better access conditions. It requires rules which define the framework for each government in the formulation of their trade policies. This should result in each country being encouraged to improve productivity in agriculture and making greater efforts to improve the quality of agricultural products.

### 1.2 Career opportunities in agriculture

Careers in agriculture include:

- food production
- sales and marketing
- services
- food inspection and quality control
- agro-processing
- engineering
- education
- journalism
- management and administration
- certification.

Some career areas extend beyond the agricultural sector: sales and marketing, services, engineering, management and administration can all be associated with many other industries.
**Food production**

The most specialised careers in agriculture are associated with the production of crops and the raising of livestock (see Table 1.1).

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Job description</th>
<th>Qualifications needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labourers</td>
<td>Unskilled workers who work for farmers; involved in ploughing, planting, harvesting, looking after animals.</td>
<td>A basic knowledge of tools and machinery is useful to gain employment. An NVQ level 1 qualification could be helpful.</td>
</tr>
<tr>
<td>Farmers</td>
<td>Farmers cultivate their land, grow crops, raise livestock and sell their produce. They liaise with advisors and are aware of new developments and methods of production so that they can make efficient use of land and resources.</td>
<td>Farmers need a basic knowledge of agriculture, the use of tools and machinery and the ability to keep records and to control their finances. They need training to secondary level, studying to NVQ level 2 or CXC in Agricultural Science.</td>
</tr>
<tr>
<td>Overseers/Managers</td>
<td>Have responsibilities for specific areas on large farms. They may do the same work as farmers, but will be in charge of teams of labourers and may specialise in crop production or raising animals.</td>
<td>Overseers and managers need the same skills as farmers, together with the ability to deal fairly with the workforce (the labourers).</td>
</tr>
<tr>
<td>Extension officers</td>
<td>Extension officers are advisors who inform farmers about the latest developments in machinery, equipment and farming techniques. They work with researchers to tell them what farmers need to be more productive. They provide a means of communication between researchers and farmers.</td>
<td>Diploma, Associate Degree or Bachelors Degree in Agriculture.</td>
</tr>
<tr>
<td>Research workers</td>
<td>These include: engineers developing new farm machinery; chemists developing new fertilisers and pesticides; biologists researching new breeds of animals and new types of crop plants. Research is carried out in laboratories and institutes, employing other staff such as laboratory technicians.</td>
<td>Usually a research worker will have a university degree in a science subject, e.g. Biology, Chemistry, Physics or Engineering. Laboratory staff are trained to secondary level and have good grades in CXC science subjects.</td>
</tr>
<tr>
<td>Veterinarians</td>
<td>Vets care for sick animals and are also responsible for testing for diseases in animals. Veterinary nurses help the vets in their work.</td>
<td>Vets need a university degree in Veterinary Medicine. Veterinary nurses need qualifications: at least CXC in science subjects.</td>
</tr>
<tr>
<td>Agricultural engineers</td>
<td>Plan, supervise and manage the building of agricultural projects, including drainage schemes, food processing plants and structures for housing livestock. Many work for government agencies or are involved in research which involves designing new agricultural equipment.</td>
<td>A university degree in Engineering.</td>
</tr>
<tr>
<td>Viticulturists</td>
<td>Specialists in managing vineyards; require a knowledge of grapes, their growing conditions, when to harvest and prune. Can be involved in research developing new techniques for culturing vines and breeding new varieties.</td>
<td>Need a basic knowledge of agriculture, with specialist knowledge of grapes. Qualifications vary from diploma level to a university degree in Horticulture or an agricultural subject, depending on level of responsibility.</td>
</tr>
</tbody>
</table>

**Table 1.1** Some careers in food production.

**Sales and marketing**

Agricultural produce is sold in shops, supermarkets or on market stalls (see Figure 1.2). It usually has to be transported from farms to the wholesalers and from there to retailers and other outlets. All this involves loaders and drivers.

At the wholesalers, produce may be stored for some time, providing employment for storekeepers, clerks and security officers.

Managers, cashiers and sales personnel become involved when produce reaches the shops.

*Figure 1.1* Agricultural scientists carrying out some field tests on plants.
The role and importance of agriculture

Services
The jobs associated with servicing any industry include technicians, drivers, electricians, plumbers and mechanics. Very few of these jobs require specialist knowledge of agriculture, although some mechanics and technicians may develop expertise in dealing with agricultural machinery.

Food inspection and quality control
These are very important aspects of food production, both for fresh produce and for processed food. Lack of inspection and poor quality control procedures result in inferior produce and health hazards. Careers in these areas require training and qualifications to at least NVQ or equivalent level. Qualified people may be employed in agro-processing or by government agencies.

Agro-processing
Agro-processing involves turning agricultural produce into products (preserved fruits, jams, wines and sauces), which can be marketed locally, nationally or exported. The employment opportunities are numerous. They range from unskilled labour (in processing and packaging plants) to biochemists and quality assurance officers who have professional qualifications.

Engineering
Agriculture depends on mechanisation to become more efficient. Transport of produce and animals from farms to processing plants is essential and increasingly processes are becoming mechanised. Harvesting of many crops is done by machinery, rather than by hand. Ploughing, sowing, spreading fertilisers and spraying with pesticides can all be done mechanically, thus saving time and reducing the cost of labour.

Engineers are employed to develop and maintain machines. New techniques in processing and preserving food require machines which are designed and manufactured by engineers.

Education
Education is vital to agriculture at all levels – from schools to colleges and institutes, through to university. In schools, pupils are made aware of agriculture and the environment (see Figures 1.3 and 1.4). Figure 1.4 on page 6 shows a land laboratory in a school. This is an area where many different types of crops are grown.

Figure 1.2  An agricultural market stall.

Figure 1.3  An agriculture teacher and her students examining a mango tree.
Agricultural Science is a core subject in junior secondary schools, laying a foundation for further agricultural training. In senior secondary schools, different agricultural courses are offered. Some students prepare for Agricultural Craft subjects; others prepare for the Caribbean Examination Council (CXC) Agricultural Science qualifications.

Vocational courses, such as associate degrees in Agriculture and Forestry, are offered at the Eastern Caribbean Institute of Agriculture and Forestry (ECIAF) in Trinidad and Tobago and at other institutions in Jamaica, Guyana and St Lucia. In Trinidad and Tobago, the Ministry of Agriculture, through the Extension Services, offers a wide range of short courses for farmers. The University of the West Indies (UWI) offers degree courses in many agricultural and associated topics. There are also opportunities for postgraduate training leading to higher degrees. There are job opportunities for well-trained teachers, together with support staff, in all these institutions.

Journalism

Journalism in the agricultural sector can suit those who write clearly and have an interest in agriculture and the environment. Journalists contribute to agricultural journals and magazines, government documents, information leaflets and instructions. Photography and graphic design also provide rewarding careers. Qualifications vary, but experience and a detailed knowledge of the subject matter are essential.

Management and administration

Businesses and organisations require good management, so managers and administrators are needed in all sectors of agriculture. Small farms can be run by a farmer, but large farms employ managers to take charge of the organisation of labour and resources. There will be employment opportunities for administrators and managers in all other aspects of the industries and institutions associated with the agricultural sector. For example, wholesale and retail outlets, schools and colleges need administrative staff at all levels, including secretaries and accountants.

Certification

Qualifications are important in any career and can lead to employment at a higher level. Many schools and colleges organise courses leading to qualifications in the agricultural sector. On completion of the course and following an examination, these institutions issue certificates, diplomas or degrees stating the level of expertise reached. In schools, examinations are organised by the Caribbean Examinations Council. In other institutions, the examinations are organised by the college or university. All these examinations are set and judged by experts with a good knowledge of their subject. To gain employment in this area, years of experience of teaching the subject are required.
1.3 Institutions concerned with agricultural development in the Caribbean

Local institutions

Local institutions, both governmental and non-governmental, are essential for any modern agricultural economy. The quality of the support mechanisms determines the quality of the agricultural output. More importantly, it creates a sound foundation for new initiatives, growth and expansion in the agricultural sector.

Each Ministry of Agriculture is divided into several divisions which work in collaboration with affiliated agencies, farmers’ organisations and commercial agribusinesses to provide support services to farmers and agriculturalists for agricultural development.

In Trinidad and Tobago, the Ministry of Agriculture, Land and Marine Resources consists of 11 divisions (see Table 1.2, overleaf), each having responsibilities for different aspects of agriculture, planning and training.

What are the functions of the Forestry Division of the Ministry of Agriculture? (see Table 1.2)

What are the functions of the Extension, Training and Information Division? (see Table 1.2)

Practical activity:
Visit your local regional administration office and find out how it helps the farmers in your area. You could ask for advice on irrigation schemes, or how to prevent and control diseases in crops grown locally.

Figure 1.5 An agricultural research station dealing with livestock improvement.

Figure 1.6 A demonstration – farmers are shown how to carry out a procedure.
<table>
<thead>
<tr>
<th>Name of Division</th>
<th>Functions</th>
</tr>
</thead>
</table>
| Planning Division                | • identify goals and objectives  
• determine the Ministry’s vision and mission  
• formulate plans and policies  
• collaborate with other Ministries and agricultural organisations                                                                                     |
| Project Implementation Unit      | • identify major agricultural projects  
• determine the order of priority and cost projects  
• implement agricultural projects systematically  
• co-ordinate the implementation process and keep records                                                                                               |
| Land Administration Division     | • provide advice and information on agricultural state lands  
• handle lease assignments and transfers  
• collaborate with the Lands and Surveys Department  
• monitor the terms and conditions of leased lands through visits and record-keeping  
• repossess and re-advertise state lands for lease                                                                                                     |
| Research Division (see Figure 1.5, overleaf) | • conduct laboratory tests and analysis of soils, pests, diseases and livestock feeds  
• provide technical advice, information and solutions to farming problems  
• conduct trials on improved crop varieties and exotic farm animals  
• issue import permits and quarantine plants and animals for observation, treatment and certification                                                                 |
| Agricultural Engineering Division| • provide advice and information on agricultural machinery and equipment  
• advise farmers on designs of farm ponds, livestock buildings, irrigation and drainage projects and access roads                                                                                           |
| Agricultural Services Division   | • propagate and sell planting materials (plants, seeds, cuttings, tubers, rhizomes) to farmers  
• cultivate and sell farm produce: wet cocoa beans, bananas, citrus, mango, avocado, sapodilla and pommecythere  
• produce and sell honey, queen bees and starter colonies                                                                                               |
| Forestry Division                | • propagate and sell forest plants (teak, Caribbean pine, mahogany, cedar) to farmers  
• manage forest reserves, parks, forested recreational areas and wildlife  
• maintain demonstration areas of agro-forestry and silviculture  
• undertake reforestation of watersheds and deforested areas  
• issue permits for hunting and keep records of animals caught  
• provide technical advice and information to farmers on forestry establishment and management  
• sell forest trees to sawmillers and supervise harvesting operations                                                                                   |
| Fisheries Division               | • conduct registration of fishermen and aquaculturalists  
• process applications for the importation, registration and transfer of commercial fishing vessels and engines  
• issue permits for the import/export of fish (ornamental and food) and seafood  
• provide technical advice, assistance, information and training courses for fishermen and aquaculturalists                                                                 |
| Extension, Training and Information Division (see Figure 1.6, overleaf) | • organise and conduct technical training on a wide range of agricultural courses at the Farmers’ Training Centre, Centeno  
• provide technical advice and information to farmers  
• publish and supply technical information bulletins and factsheets on crops and livestock  
• conduct extension training at all agricultural county offices                                                                                           |
| Animal Production and Health Division | • provide surveillance of livestock farms for the diagnosis, treatment, prevention and control of animal diseases  
• conduct laboratory tests and post-mortem examinations (necropsy) of farm animals  
• control vampire bats against the transmission of paralytic rabies in livestock  
• develop and implement preventive medicine programmes for animals  
• provide technical advice, information and artificial insemination of cattle  
• produce and sell farm animals, goats, cattle (culled, injured) to interested persons                                                                 |
| Regional Administration Divisions (North/ South) | • process applications for farmers’ identification and agricultural incentives at agricultural county offices  
• provide advice, information and assistance on access roads and designs of farm ponds, irrigation, drainage and livestock buildings  
• monitor and control destructive agricultural pests and diseases  
• provide technical assistance in managing apiaries and bee abatement (nuisance, swarms)  
• sell seeds produced locally at Chaguaramas, Trinidad                                                                                                    |

*Table 1.2* The functions of the divisions of the Ministry of Agriculture, Trinidad and Tobago.
Regional institutions

There are many institutions in the Caribbean concerned with agricultural development. Some give advice and support, whilst others provide specialised training for careers in the agricultural sector.

The Caribbean Community (CARICOM)

The Caribbean Community (CARICOM) is an organisation of 15 Caribbean nations and dependencies. It promotes economic integration and co-operation.

CARICOM carries out these functions:
- co-ordinates economic policies and development planning
- sets up special projects for less-developed countries
- operates as a regional single market for many of its members (Caricom Single Market)
- handles regional trade disputes.

The Caribbean Food and Nutrition Institute (CFNI)

The Caribbean Food and Nutrition Institute (CFNI) aims to describe, manage and prevent nutritional problems facing Caribbean countries. It runs training courses, conducts research programmes on food and nutrition and maintains a library.

Research areas include:
- reduction of under-nutrition in children
- prevention and control of diet-related chronic diseases
- control of iron deficiency anaemia
- improvement of household food security.

The Caribbean Development Bank (CDB)

The Caribbean Development Bank (CDB) assists Caribbean nations in financing projects for its members. Its purpose is to contribute to the economic growth and development of member countries and to promote economic co-operation and integration.

Its main functions are to:
- assist members in the co-ordination of their development programmes with a view to achieving better utilisation of their resources, making their economies more complementary, and promoting the orderly expansion of their international trade
- mobilise additional financial resources for the development of the region
- finance projects and programmes contributing to the development of the region
- provide technical assistance to regional members
- promote private and public investment in development projects
- stimulate and encourage the development of capital markets within the region.

The University of the West Indies (UWI)

The University of the West Indies (UWI), Faculty of Science and Agriculture, offers a wide range of courses leading to qualifications (from diplomas to postgraduate degrees). Qualifications can be obtained in Natural Sciences, such as Life Sciences and Chemistry, and aspects of agriculture, such as Animal Science, Food Production, Economics and Extension Services. In addition, research units investigate specific problems relating to crop and livestock production.
The Caribbean Agricultural Research and Development Institute (CARDI)

CARDI conducts research and demonstrates appropriate technologies to farmers. CARDI provides technical assistance in areas such as:

- crop production, integrated pest management (IPM) and farming systems
- livestock and forages
- environmental and soils management
- technology services, e.g. the supply of quality plant products and genetic products and services
- market research and statistical services
- business development and consultancy.

The College of Agriculture, Science and Education (CASE)

CASE, in Jamaica, is a multidisciplinary tertiary level educational institution offering diplomas, associate degrees and Bachelor degrees. Of particular relevance are its Bachelor degree courses in Business Studies, Environmental Science and Agri-production and Food Systems Management. There are associate degree courses in General Agriculture, Agricultural Education, Natural Science and Business Studies. There are also courses leading to diplomas in Agriculture and teaching qualifications.

The Department of Animal Science helps to increase productivity of livestock, and the Department of Plant, Soil Sciences and Engineering provides training in Agronomy, Plant Science, Soil Science, Horticulture, Land Surveying, Plant Protection and Crop Production. The diploma in Agriculture was designed to train skilled practitioners in specific areas of agriculture, who would put their training into practice on farms and in other agricultural enterprises. An Associate of Science degree trains students to be highly competent farmers and ‘agri-preneurs’. This qualification enables graduates to enter most jobs that require a knowledge of agriculture.

The Eastern Caribbean Institute of Agriculture and Forestry (ECIAF)

ECIAF provides courses that last two years and lead to diplomas in Agriculture, Forestry and Agricultural Education. Completion of a diploma enables students to gain employment in agriculture, forestry or education, or to enter other courses in higher education if they wish to.

The Guyana School of Agriculture (GSA)

The GSA provides training to certificate and diploma level in agriculture. The one-year course leading to a certificate in Forestry trains students to become forestry technicians and teaches them the principles of sustainable forestry. A two-year certificate course equips young people for careers in farming. The diploma courses last for two years and lead to careers as Agricultural Science teachers or agricultural field assistants. These courses are in Agriculture, Animal Health, Veterinary Public Health and Livestock Production and Management.

Practical activity:

Imagine that you are an entrepreneur and wish to establish a forestry business. Work out which institutions you would need to consult in order to finance it and find suitably qualified staff.

What is the role of the University of the West Indies in agricultural development in the Caribbean?
International institutions

The Caribbean nations are part of the global economy – agricultural development therefore depends on international institutions as well as local and regional organisations.

The European Union

In October 2008, the 27 members of the European Union (EU) and 15 Caribbean nations signed an Economic Partnership Agreement (EPA). It included measures to stimulate trade, investment and innovation, and to promote sustainable development, build a regional market among Caribbean countries and help eliminate poverty. The effect will be to open up markets for produce from the Caribbean countries by removing tariffs and encouraging trade liberalisation. The agreement is important for the economies of Caribbean countries and encourages fair trade for commodities such as sugar, coffee and bananas.

The Inter-American Institute for Co-operation on Agriculture

The Inter-American Institute for Co-operation on Agriculture (IICA) is an institution for agricultural research and graduate training in tropical agriculture. It was founded in response to changing needs in the Americas and has evolved into an agency for technical co-operation in the field of agriculture, promoting agricultural development and rural well-being.

The IICA supports and encourages:
• agro-energy and bio-fuels
• biotechnology and bio-safety
• rural communities
• trade and agribusiness
• trade negotiations
• institutional modernisation
• technology and innovation
• environmental management
• agricultural health
• organic agriculture.

The Food and Agriculture Organisation

The Food and Agriculture Organisation (FAO) of the United Nations leads international efforts to defeat hunger. It helps countries to modernise and improve agriculture, forestry and fisheries practices and ensures good nutrition for all.

Within the organisation, there are departments for:
• agriculture and consumer protection
• economic and social development
• fisheries and aquaculture
• forestry
• natural resources management and environment
• technical co-operation.

There are regional, sub-regional, country and liaison offices worldwide. There is a sub-regional office for the Caribbean in Barbados and country offices in many Caribbean countries.

The Organisation of American States

The Organisation of American States (OAS) is made up of 35 independent nations of the Americas. It was founded in 1948 with 21 members, but expanded to include the independent Caribbean nations. The goal of member nations was to ‘achieve an order of peace and justice, to promote solidarity, to strengthen collaboration, and to defend sovereignty, territorial integrity and independence’. It seeks to promote economic, social and cultural development and to eradicate extreme poverty.
The Inter-American Development Bank
The Inter-American Development Bank (IDB) is an international organisation established to support Latin American and Caribbean economic and social development and regional integration. It is the largest multilateral source of financing and lends money mainly to governments and government agencies. The bank is owned by 47 member states of which 26, including the Caribbean countries, can borrow money and 21 others cannot. There are some criticisms of the way in which it works. Some of the projects are considered to be damaging to local environments and local people.

The Canadian International Development Agency
The Canadian International Development Agency (CIDA) is the federal body that funds assistance to developing countries in the form of goods, services, the transfer of knowledge and skills, and humanitarian relief in emergencies and for natural disasters.

CIDA advises on many topics including:
- food
- agriculture
- co-operatives
- forestry
- the environment
- nutrition
- rural development
- fisheries
- water management
- health and population.

Experts broaden the scope of the CIDA beyond financial support and help developing countries to take charge of their own economies. In addition, skilled workers and technicians are sent to developing countries. Trainees may also take up scholarships in Canada.

CIDA funds many projects, such as:
- providing supplements to children with vitamin A deficiency
- global immunisation programmes

Summary
- Agriculture covers a wide range of subject areas and is therefore a ‘multi-faceted discipline’.
- Agriculture is a key sector of the Caribbean economy. It makes a significant contribution to the GNP and to foreign exchange earnings.
- The production of food locally is encouraged so that more opportunities for employment are created.
- Careful planning is needed to bring about agricultural development and boost the national economy and regional economy.
- Global trade liberalisation encourages improvement in agricultural productivity, greater efficiency in marketing and fair trade for goods and services.
- There are many career choices in the agricultural sector; there are employment opportunities for skilled and unskilled people in all aspects of food production and marketing.
- The Ministry of Agriculture in each Caribbean country, together with other agencies and institutions, provides support services for agricultural development.
- In the Caribbean, there are institutions providing advice and support to the agricultural sector, as well as some which provide specialised careers training.
- Caribbean countries are part of the global economy; their agricultural development depends on contributions from international organisations.
‘Agriculture’ is the general term used for food production and its associated activities. Traditionally, the term was used to describe the tilling of the soil, but it now includes the cultivation of crops, the rearing of livestock and related industries such as technology, processing and marketing. ‘Farming’ is also used as a general term, but is usually qualified to describe the type of farming: dairy farming, organic farming, mixed farming. ‘Husbandry’ describes a specialisation in growing crops (crop husbandry) or raising animals (livestock husbandry).

This list can be extensive: bananas, maize, sugar cane, etc. It would be useful to make a list for your area of the Caribbean.

The major roles of agriculture in the economy of a country are: food security, foreign exchange earnings, contribution to GNP, employment, trade liberalisation.

Food security is encouraging self-sufficiency by promoting and improving food production and marketing. This will expand trade opportunities, increase the national income and improve nutrition. Food security should reduce dependence on imported foods by promoting the development of food production locally.

Growing food locally reduces the need for imported foods. It provides employment for farmers, labourers, engineers and in agro-processing. Importing food cuts down on the number of jobs in farming and associated industries.

Running a retail outlet selling agricultural produce will require: a manager, an accountant, cashiers, sales assistants, cleaners and drivers.

Supplying a supermarket chain with salad vegetables would involve: labourers to harvest vegetables, personnel to sort, clean and grade the produce, packers, drivers to transport the produce, engineers to service the vehicles and machinery needed, office personnel to take and process the orders.

The Forestry Division manages forest reserves, carries out reafforestation, issues permits for hunting, sells forest plants and harvested timber, provides technical advice and information to farmers.

The Extension Training and Information Division runs agricultural courses at Farmers’ Training Centres, provides technical advice to farmers, and publishes technical information bulletins and factsheets on crops and livestock.

The University of the West Indies provides a number of courses which lead to qualifications in agriculture and agricultural development. It trains scientists and engineers and there are research units investigating problems relating to crop and livestock production.

IICA is the Inter-American Institute for Co-operation on Agriculture. It carries out agricultural research and graduate training in tropical agriculture.

FAO is the Food and Agriculture Organisation of the United Nations. It helps countries to improve their agriculture, forestry and fisheries.

CIDA is the Canadian International Development Agency which funds assistance to developing countries. It provides technical assistance and advice on a wide range of issues.

The European Union has an agreement with 15 Caribbean nations (the EPA or Economic Partnership Agreement) to stimulate trade. It should open up markets for produce from the Caribbean countries by removing tariffs and encouraging trade liberalisation.
Multiple Choice Questions
Write down the number of the question followed by the letter of the correct answer. You can check your answers on page 372.

1. An extension officer:
   A carries out research on new pesticides
   B treats sick animals
   C is a direct link between the farmer and the agricultural research centre
   D cultivates land for growing crops

2. An example of agro-processing is:
   A the manufacture of new fertilisers
   B producing jam from fruit
   C ploughing the land
   D the butchering of domestic livestock

3. Trade liberalisation means that:
   A fair trade in goods and services is encouraged
   B market access is restricted
   C local farmers produce fewer crops
   D more people are buying locally produced crops

4. The movement of goods and services from the agricultural producer to the consumer is:
   A transportation
   B marketing
   C export
   D management

Short answer and essay-type questions

5. Explain how foreign exchange can be earned from agriculture in the Caribbean.

6. Describe the job of a farmer and outline the desirable qualifications.

7. Explain why food inspection and quality control are important aspects of food production.

8. Outline the work of the Animal Production and Health Division of the Ministry of Agriculture.

9. What are the functions of CARICOM?

10. Describe how regional agricultural projects are funded.