

**CARIBBEAN EXAMINATIONS COUNCIL**

**REPORT ON CANDIDATES' WORK IN THE  
SECONDARY EDUCATION CERTIFICATE EXAMINATIONS  
JUNE 2005**

**AGRICULTURAL SCIENCE  
(DOUBLE-AWARD)**

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## **AGRICULTURAL SCIENCE (DOUBLE AWARD)**

### **GENERAL PROFICIENCY EXAMINATION JUNE 2005**

This is a report on the Agricultural Science General Proficiency (Double Award) examination conducted by the Caribbean Examinations Council in May/June 2005.

The examination is intended to assess and evaluate the extent to which the syllabus objectives of the programme have been achieved.

Candidate performance is examined through four written papers, and a practical School-Based Assessment exercise conducted by the teachers themselves on the school farm. This last component carries 25 per cent of the total marks.

### **GENERAL COMMENTS**

The overall performance of the candidates in 2005 was fair and stable when compared with the results of 2004.

Hereunder are some comments on candidate performance in the four written papers.

#### **PAPER 01 – Multiple Choice**

The 60 Multiple Choice items, worth 60 marks, covered General and Specific Objectives distributed over the four profiles of the syllabus.

Candidates performed best in Crops and Soils and Agricultural Economics, but were weakest in Profile 3, Agricultural Mechanisation.

A comparison of the available statistics on the mean and standard deviation of the performances of the candidates of Year 2004 with Year 2005, shows that the general level of performance of the Year 2005 cohort was just marginally lower than that of 2004, while the statistics on the Equating items indicate that the difficulty level of Year 2005 items was very similar.

#### **PAPER 02 – Structured Questions**

##### **Question 1**

This question sought to determine the characteristics to be considered when spacing a crop, problems that may be encountered when plants are spaced too closely, and to determine the number of plants when the land area and spacing are given.

Candidates were able to score between two and four marks.

There appeared to be a general understanding of a few concepts as demonstrated by popular correct responses.

- Most candidates appreciated that the crop type and overall size of the matured plant had an influence on spacing.
- Most candidates realized that competition for sunlight and nutrients would have been increased.
- Very few candidates could correctly calculate the number of plants for the spacing specified.

Incorrect responses included the following:

- Space; soil type; spacing; root type; plant width.
- Overcrowding; less root room; damaged fruits; plants will not bear; not sufficient air spaces; space.
- Numerous incorrect calculations were done by candidates.

With regards to Part (c), it appears that teachers do not teach students when doing such calculations that the first and last rows should also be considered.

Examples of correct responses included:

- (a) Crop types; growth habit; topography; variety; and soil fertility.
- (b) Competition for nutrients/sunlight; increased incidence of pests and diseases; lower yields; photosynthesis may be hindered; reduced production.

## Question 2

This question tested candidates' knowledge of asexual reproduction. Candidates were required to identify the techniques used in asexually propagating a plant, explain the phenomenon where a grafted or budded plant bears a fruit other than what should be produced by the scion and to outline after-care procedures for budded and grafted plants.

Many candidates were able to score full marks in Part (a).

In Part (b), most candidates were unaware of the variety of rootstock used (sour orange), and seemed to think that sour orange resulted from the technique used.

Examples of incorrect responses:

- The scion came from another orange plant.
- The sour orange gene was dominant and the lime was recessive.
- Grafting and budding was not done well.
- The lime may have been pollinated with oranges.
- Graft an orange so it may be sour.

Examples of correct responses:

- Budding: grafting, simple layering; air layering; cuttings
- Shoot grew from the scion orange rootstock
- Cut off shoot from sour orange part of plant.

### Question 3

This question tested candidates' knowledge of photoperiodism. They were required to identify the groups into which plants are classified based on photoperiodism and explain the difference in the time of flowering of certain pigeon pea plants.

Parts (a) and (b) of this question were better answered than Part (c).

For Part (a), most candidates demonstrated an understanding of the concept of photoperiodism and were able to give correct responses.

Many candidates were able to give at least one of the following correct responses in Part (b): short-day plants, long-day plants, day-neutral or photo-insensitive plants.

In Part (c), candidates were unable to explain that some pigeon pea plants flower throughout the year because they are day neutral plants, and others start flowering in November because they are short-day plants.

### Question 4

The purpose of this question was to test candidates' knowledge of factors affecting the development of fertilizer programmes for a crop and methods of fertilizer application.

Many candidates scored well on the question with (a) and (b) being better answered than (c).

Examples of correct responses for Part (a), factors in developing a crop fertilizer programme are:

- Nutrient requirement
- Crop type
- Soil type
- Cost of fertilizer
- Availability of fertilizer

Some correct responses for Part (b), disadvantages of applying fertilizer in an unscientific manner are:

- Fertilizer wastage
- Environmental pollution
- Soil acidity
- Soil alkalinity
- Reduced fruit quality

Recommended methods of applying fertilisers to an orchard crop (Part (c)) are:

- Phosphorus – basal or direct application
- Nitrogen – ring application

### Question 5

This question tested candidates' knowledge of cross pollination of food plants.

Most candidates identified cross pollination as being responsible for the observed changes in Part (a).

Most candidates correctly identified the following as the best ways to avoid a recurrence of the problem in Part (b):

- Plant hot peppers and sweet peppers at different times of the year
- Plant hot peppers and sweet peppers in different fields/parts of the farm

### Question 6

This question tested candidates' knowledge of the management practices which must be carried out during the first four weeks in preparing a litter of piglets for the meat market. Candidates' ability to calculate "dressing percentage" was also tested.

This question was fairly well answered.

In Part (a), most candidates were able to identify management practices such as:

- Proper housing
- Weaning
- Feeding colostrum
- Supplying iron
- Castrating
- Cutting the umbilical cord and treating with iodine

### Question 7

The purpose of this question was to examine candidates' knowledge of formulation of a balanced ration for livestock and their knowledge of the nutrients in different types of feeds.

Most candidates were able to correctly identify the nutrients in the three feeds mentioned in Part (a).

In Part (b), many candidates were unable to give a full explanation for the ration not being balanced. Too many candidates limited their response to stating that the ration "did not contain all the nutrients needed for a balanced diet". Candidates should have stated that the ration would contain too much carbohydrate, while vitamins, minerals, fats and protein would be deficient.

Few candidates were able to give a correct ingredient needed to satisfy the requirements for a balanced diet in Part (c). Candidates should have named, among others, fish meal, soyabean meal, cotton seed meal.

### Question 8

This question tested candidates' knowledge of poultry management practices in relation to cannibalism, its causes and methods of prevention.

In Part (a), most candidates were able to state that "cannibalism" was the observed behaviour. Some candidates identified it as "scours", "animal in heat", and "feathering".

Candidates correctly identified the causes of the behaviour as "lack of debeaking" and "overcrowding" in Part (b), and that debeaking and proper space requirements were the correct management practices.

### Question 9

This question tested candidates' knowledge of the implications and importance of "day-old weaning" in dairy animals and the type of farming system to which this practice relates.

In terms of advantages in Part (a), many candidates were able to state that "more milk will be provided for the market". A few also mentioned the fact that "the cow was likely to come back on heat early". Correct responses which were mentioned by very few candidates were that this practice "assists in the planning of production" and "facilitates mechanization on the farm".

Incorrect responses in this section included: "calves will grow faster", "higher quality milk" and "better meat production".

In terms of disadvantages, popular correct responses in this section included the problem of lack of colostrum and its consequences in terms of the health of the calves. A less popular correct response was that "more time and attention would be required in the management of the calves".

Incorrect responses included: "lack of calcium", "calves may die", "mother not able to teach them the ropes".

In Part (b), many candidates were able to correctly identify the system associated with "day-old weaning" as "intensive system". Incorrect responses included: "Dairy farming", "livestock farming", "aquaculture" and "battery system".

Part (c) was the most poorly answered part of the question, with very few candidates being able to state correctly that intensive farming makes more use of available resources.

### Question 10

The purpose of this question was to test candidates' knowledge of artificial incubation and artificial brooding procedures.

A high percentage of candidates were able to determine the expected date the chicks will hatch, based on the information provided in the question. However, some candidates instead of giving a date as requested, gave a period, for example, three weeks. Others gave incorrect dates which showed they did not know the incubation period of a hen's eggs.

In Part (b), many candidates were able to identify two advantages of artificial incubation, namely, large batches of eggs can be incubated at the same time and there is less breakage of eggs. Some candidates were of the mistaken impression that with artificial incubation “the eggs hatch faster”.

In Part (c), a high percentage of candidates confused artificial incubation with artificial brooding. Very few candidates stated that it was important to

- keep the floor dry
- place newspaper on the floor for the first few days
- control draughts
- supply adequate heat
- supply adequate fresh water and feed
- keep out pests and predators.

### Question 11

This question focused on rabbit breeds and parturition in rabbits.

In Part (a), many of the candidates knew at least two meat breeds. The most well-known meat breeds mentioned were the New Zealand White and the Flemish Giant. Less well-known breeds were the Chinchilla, New Zealand Red and California White. Some candidates were creative and named breeds such as “Bush Rabbit” and “Hamshers”. Other candidates named breeds of other classes of animals such as British Alpine and Holstein. Very few candidates could correctly identify the Angora as a fur breed of rabbit.

Only some candidates were aware that the act of giving birth in rabbits is referred to as “kindling” (Part b).

Part (c) required candidates to identify peculiar behaviors of female rabbits in preparation for giving birth. The most popular correct responses were “remove bits of fur from her body” and she “goes off feed”. A less popular response was that she “became aggressive to the male”, and “she isolates herself”.

### Question 12

This question tested candidates’ knowledge of housing of goats with respect to siting, roofing, ventilation and flooring. Their knowledge of the advantages of housing goats was also tested.

For Part (a) (i), many candidates confused “siting” with “sitting”. This section of the question was poorly done. Some candidates were able to correctly identify “east-west alignment”, “site on well-drained soil”. However, some candidates stated incorrect responses such as “space required for the animal to sit” and “site far from homestead”.

Part (a) (ii) on roofing was better answered. Candidates were able to state that galvanized sheeting should be used, and the roof should be sloping. Some candidates gave vague responses such as “durable material should be used” and “the roof should be high enough”.

Part (a) (iii) was generally well answered. However, some students confused ventilation with spacing.

Part (a) (iv) was fairly well answered. Candidates were able to identify the type of material and flooring required for goats. Some stated that “floors should not be slippery or wet”. A very popular correct answer was that the flooring should be made of wooden slats. Some candidates seemed to think that the floor should be “made of dry mud”.

For Part (b), most candidates could correctly state at least one advantage of housing goats. Correct answers included “protection from predators” and “better control of pests and diseases”.

### Question 13

This question tested candidates’ knowledge of the application and type of equipment used in the preparation of land.

In Part (a), although candidates could have identified the equipment that was used for clearing (bulldozer, brush cutter), in many cases they could not correctly state their use.

In Part (b), candidates seemed to be confused by the term “cultivation”, and many could not correctly name equipment used in land cultivation. Expected responses included “plough/fork, rotavator/harrow”.

Expected answers for Part (c), equipment for preparation of ridges and furrows, included “ridgers, drainers and the mouldboard plough”.

### Question 14

This question sought to test candidates’ knowledge of the important marketing factors to consider in the production of mangoes for a developed market economy, and to recall the meaning of an agricultural marketing acronym and the role of the organization in the sugar industry.

For Part (a), many candidates were able to mention required market information such as “variety; market price; fruit quality; transportation; packaging requirements”. Incorrect responses included “grading and handling; storage”.

In Part (b), the acronym ISA appeared to be unfamiliar to most of the candidates. In fact, less than ten candidates in the entire cohort knew that it represented the International Sugar Agreement. No candidate could identify any of the purposes of the agreement, such as, to ensure enhanced cooperation relating to world sugar matters, to provide a forum for inter-governmental consultation on sugar, to facilitate trade by collecting and providing information on world sugar market and to encourage increased demand for sugar.

### Question 15

This question assessed candidates’ knowledge of the economic concepts of demand, supply and price. Their ability to use a graph to determine equilibrium quantity and price was also tested.

Part (a) was fairly well answered, as most candidates correctly identified the demand and supply curves, the equilibrium price and the quantity demanded at the equilibrium price.

For Part (b), candidates were able to sketch the curve to show an increase in demand to the right of the original demand curve, and to correctly state that an increase in the price of tomatoes would result.

### **PAPER 03 – Extended Response**

Candidates were required to respond to seven of ten essay-type questions based on three of the four profiles of the syllabus. The profile, Animal Mechanisation, is not tested in this paper.

Detailed comments on the questions of this paper follow.

#### **Question 1**

This question sought to ascertain candidates' knowledge and understanding of viral diseases in terms of (a) symptoms, (b) insect vectors, (c) other modes of infection and appropriate management practices.

Many candidates did not attempt this question.

In Part (a), candidates were able to state one typical symptom associated with viral diseases, such as stunted growth, yellowing of leaves, curling of leaves and leaf drop.

Most candidates who attempted the question could name one insect vector from the group, aphids, mites, mealy bugs, whiteflies. Mosquitoes, grasshoppers and bees were mentioned as vectors of plant viral diseases.

Candidates experienced difficulty in explaining two ways by which plant viral diseases are spread. Very few were able to identify even one way. Expected answers included transmission by means of infected tools and planting infected seeds.

In Part (d), candidates experienced difficulty in describing field sanitation practices such as the use of sanitized tools for pruning and harvesting, the use of clean ploughs and other implements, the removal, burning or burying of crop residue and infected plant material, and no smoking while conducting agricultural operations.

Other cultural practices required are roguing, removal of weeds, crop rotation, removal of infected plant parts.

#### **Question 2**

The intent of the question was to ascertain candidates' ability to recognize quality standards, the correct stage for harvesting and proper post-harvest handling practices for fruits and vegetables.

This was a very popular question.

For (a), most candidates were able to mention size/weight of fruit, shape, uniformity, colour, absence of physical damage and correct stage of maturity as features used to determine the quality of fruits and vegetables.

For (b), most candidates scored above average marks in this section. Expected answers included cleaning, wiping, sorting, storage, and packaging. Incorrect answers given by candidates included processing and preservation.

Most candidates also scored above average in Part (c). Correct responses included: at correct stage of maturity; under cool conditions; avoid physical injury; use clean sharp knife; pack large heavy fruit in single layer. Incorrect responses included “drain soil; apply fertilizer and apply pesticide”.

Most candidates had difficulty answering Part (d) of the question. Most responses were related to time of harvest in terms of weeks and did not focus on the stage of maturity of the fruit or vegetable. For example, instead of stating that bananas should be harvested at the 3/4 full mature stage, candidates wrote “harvest fruits when yellow/ripe”. Field handling practices include placing fruits on a soft pad not bare ground, heavy fruits should be packed in single layers, well ventilated containers or baskets needed, fruits should be put in a cool dry place while awaiting transportation.

### Question 3

Candidates were required to demonstrate knowledge of soil components, fertility and management.

This was a high response question.

Most candidates were able to identify at least one soil component for Part (a).

In Part (b) many candidates could not explain the relationship between soil fertility and structure, pH and nutrient status of a soil. There was confusion between soil structure and soil texture. Many candidates were able to show how the nutrient status of the soil impacted on plant growth.

For Part (c), a high percentage of candidates were able to identify poor soil structure, soil crusting and soil compaction as possible problems, when water puddles over the surface of the soil. The candidates were generally able to identify at least one soil management practice in solving the problem under “soil cultivation”. However, candidates had some difficulty in understanding the concept of soil amendments namely, to apply organic matter and limestone to the soil.

### Question 4

This question tested the candidates’ knowledge of the care of seedlings and the problems associated with production of seedlings. They were also asked to identify correct management techniques to ensure the success of the crop.

The majority of candidates answered this question.

Generally marks scored in both sections of this question were above average.

In (a) most candidates were able to identify four likely causes of the problem. Correct responses included improper handling of seedlings, excess potassium, nitrogen deficiency. Incorrect responses included rich soil, sunlight, and spacing.

Responses to Part (b) were, for the most part, vague, for example, check the soil, nourish the soil and transplant at the right time.

### Question 5

This question sought to test candidates' knowledge of management of piglets and the methods and marketing with regards to marine fishing.

Only about one third of the candidates attempted this question.

In (a), most of the candidates who attempted the question were able to list at least two of the management practices related to piglets. Expected answers included: cut and treat umbilical cord, provide iron, allow each piglet to suckle to ensure they receive colostrum, clip needle teeth and castrate.

In (b), most of the candidates were able to correctly name two methods of marine fishing, especially hook and line, and seine. Incorrect responses included deep sea, off shore and aquaculture.

Most candidates were able to identify at least one problem associated with selling at roadside stalls and in the open market. The most common correct responses were spoilage of fish, unpleasant odour, loss of income to the vendor and insanitary conditions. Incorrect answers in this section included competition with one another and roadside accident.

### Question 6

This question tested candidates' knowledge of the approaches to rearing common/yard fowls and broilers and the advantages and disadvantages of each approach.

This question was generally well answered with candidates scoring fifty percent and above. Part (a) was better answered than (b). Some candidates stated that the common breed was more susceptible to diseases than broiler breeds. This was incorrect as even though common breeds are more exposed to pests and diseases they are less susceptible than broiler breeds.

### Question 7

This question tested candidates' knowledge of the management practices included in the rearing of honey bees. It also sought to test their knowledge of the social structure of a bee colony.

In (a), some candidates mistakenly interpreted the question to refer to bees in their natural habitat and not as being reared by a farmer. Most therefore gave general comments on the site rather than where the bees should be located but not on the physical structure of the hive.

Many candidates did not focus on feeding as a management practice carried out by the farmer in times of scarcity of nectar.

Candidates also had difficulty with pest and disease management, making general comments such as keep area clean, prevent insects and diseases. Foul brood disease was the most popular correct response.

Most candidates scored full marks on harvesting honey, with responses such as wear protective clothing, use a hive tool and a smoker being the most popular correct responses.

Most candidates were able to give the social structure of the hive and the functions of the queen, drone and worker. Some candidates were unable to name the drone as the male but were still able to give the correct function.

### Question 8

The purpose of this question was to test candidates' knowledge of trade recommendations to gain access to foreign markets, marketing strategies to gain profits and the possible resulting adverse effects on consumer health and the environment.

About fifty percent of the candidates attempted this question.

Part (a) was moderately well answered. Expected responses included adherence to international trade protocols/agreements, obtaining export license, reliable and timely supply of product, produce should meet the phytosanitary requirement of the market.

Most candidates were able to identify marketing strategies such as, advertising, attractive packaging, joining a producer's co-operative. Incorrect responses included, increase the price of ginger and proper fertilizing of crop.

For (c), many candidates were unable to identify ways in which pest management and fertilizer application could lead to adverse effects on the environment and have a negative impact on consumer health. Candidates responses should have included use of inappropriate pesticides, use of chemical method only, inappropriate method of application, and inappropriate disposal of excess chemicals.

### Question 9

The purpose of this question was to test candidates' knowledge and understanding of the role of agricultural co-operatives with reference to benefits to members, management structure and associated problems.

This was a very popular question and most candidates scored well.

One popular misconception, however, was that farmers obtained loans in the form of cash for co-operatives.

Management problems included financial mismanagement, failure of members to participate in meetings, lack of co-operative education among members, lack of trust among members, failure to hold meetings and improper use of government support.

### Question 10

The purpose of this question was to test candidates' ability to prepare an income and expenditure statement and calculate gross income, gross margin and profit.

Approximately fifty percent of the candidates attempted this question, and performance was average. Candidates must show all their working in questions of this nature. Gross margin refers to the income after the variable costs have been deducted.

### **PAPER 04 – Practical Paper**

This paper, a supporting element of Paper 05, the School-Based Assessment, is a substitute for a hands-on practical examination, and aims to assess the candidates' capability in the field / farm.

It attempts to transport actual and / or simulated agricultural field / farm situations indoors into the examination room, and then requires the candidates to make appropriate written responses to the stimuli presented.

Ten stations are set up, and the candidates are required to answer a given question on each.

All questions are compulsory, and the paper carries a total of 30 marks. Agricultural Economics is not tested in this paper.

Detailed comments on Paper 04 follow.

#### **Question 1**

This question tested candidates' ability to identify three insect pests of agricultural importance and to state their manner of feeding.

Most candidates were able to identify the pests as the mealy bug, mole-cricket and aphid respectively. Candidates, for the most part, were also able to state that mealy bug and aphids fed by piercing and sucking while the mole cricket fed by biting and chewing. Some candidates who could not correctly identify the pests by name were nevertheless able to state their method of feeding.

#### **Question 2**

This question required that candidates examine three drawings of patchoi plants used in a fertilizer experiment and answer questions based on the drawings.

Candidates did well on this question. However, some candidates gave general and vague responses such as "the plant looked better than the rest" and "the leaves were more upright".

#### **Question 3**

This question tested candidates' knowledge of symptoms of blossom-end rot, its causes, control measures required and crops which are prone to this condition.

The performance on this question was generally below average. The disease was variously identified as fruit rot, early blight, soft spot, among others.

#### Question 4

This question required that candidates classify the crop sugar cane, its by-products and use in livestock feed.

Candidates did very well in Parts (a) and (b) of the question. They generally had little difficulty in listing molasses, rum, juice, beverages and filter mud as by-products of sugar cane. Part (c) provided some difficulty as many candidates could not state the scientific name of sugar cane (Saccharum officinarum).

#### Question 5

This question tested “air layering” as a method of vegetative propagation, and the advantages and disadvantages of this method.

The response to Part (a) was good, about 60% of the candidates correctly named “air layering”. Parts (b) and (c) proved challenging with some candidates seeming to be unaware of the advantages and disadvantages of this practice.

Most candidates correctly named the material used as required by Part (c), that is, moss, soil, humus, a medium for plant growth.

#### Question 6

Here the extent to which candidates could recognise the conditions which cause foot rot in sheep was tested. It involved knowing the methods of prevention, treatment and the causative organism.

Most candidates demonstrated some knowledge of the conditions which lead to foot rot and thus how it can be prevented and treated. However, about 80% of them did not know the causative organism, some stated “virus”, “protozoa”, few correctly stated “fungus”.

#### Question 7

This question tested candidates’ knowledge of commercial production and grading of eggs.

Most identified the breed displayed as a layer and the system under which such birds must be raised for commercial egg production.

In excess of 90% of them know that weight is the factor used when grading eggs; few incorrectly stated “shape, colour and cracked shells”. These are factors used in the selection of eggs before grading is done.

### Question 8

In this question candidates' knowledge of "fresh-water fish" and the benefits of growing these commercially in the Caribbean was tested. Most correctly named the fish. They knew the correct terms used in in-land fishing, the techniques used in the harvesting of some and the benefits of in-land fishing. However, naming the young at various stages of their growth was challenging; some candidates wrote "larva, pupa, tadpoles, fishlets". "Fries" in (c) (i) and "fingerlings" in (c) (ii) were the accepted responses.

### Question 9

The candidates' knowledge of green succulent grass and hay was tested in this question, that is, the benefits of each as a feed and their suitability to livestock at various stages of growth.

Most candidates were able to identify the specimens, although some wrote "dry grass" for hay which is in fact dried grass. Also, they were unable to state correctly the conditions under which hay is produced and the benefits of this product. The methods used to encourage young animals to feed on hay also proved challenging.

### Question 10

This question tested whether candidates were able to identify the disc plough and its uses.

Most candidates were able to identify the plough but were unable to name the labelled parts. In addition, many seem not to know the soil type and conditions under which this plough is most effective. Some wrote "loams or virgin soils or clumpy soils", whereas disc ploughs are best suited to clay soils or soils which stick together easily. In naming the parts of the plough, the furrow wheel proved the easiest to be identified.