

CARIBBEAN EXAMINATIONS COUNCIL

**REPORT ON CANDIDATES' WORK IN THE
SECONDARY EDUCATION CERTIFICATE EXAMINATION**

MAY/JUNE 2009

**AGRICULTURAL SCIENCE
SINGLE AWARD AND DOUBLE AWARD**

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**AGRICULTURAL SCIENCE
SINGLE AWARD AND DOUBLE AWARD
GENERAL PROFICIENCY EXAMINATION
JUNE 2009**

The Structure of the Examination

The Agricultural Science syllabus comprises the Single Award and the Double Award. Three Units of the content are common for both Awards, namely:

- A – The Business of Farming
- B – Crop Production
- C – Animal Production.

The Double Award consists of two additional Units:

- D – Horticulture
- E – Animal Husbandry

The examination consisted of two external papers for the Single Award. Paper 01 consisted of 60 Multiple Choice items, 20 each from Units A, B and C of the syllabus. Paper 02 consisted of six structured questions, two from each Unit, and three extended essay questions, one from each Unit. The structured questions were worth 4 marks each and the extended essay questions were worth 12 marks each. All questions were compulsory.

Paper 03 was the School-Based Assessment, worth 80 marks. This consisted of two cost analyses, one each on Crop Production and Animal Production, and 10 practical skills based on field work.

The Double Award consisted of Paper 01 and Paper 02, common papers for the Double Award and the Single Award. Paper 03 consisted of two compulsory extended essay questions based on Section D and two compulsory extended essay questions based on Section E of the syllabus. Each question was worth 15 marks.

Paper 04 was the School-Based Assessment worth 120 marks. It consisted of three cost analyses, 10 practical skills, and a research project.

GENERAL COMMENTS

A total of 7,522 candidates were entered for the examination, 5,712 for the Single Award, and 1,811 for the Double Award.

Candidate overall performance was good. Approximately 87 per cent of the candidates achieved acceptable grades, Grades I – III for the Single Award, and 89 per cent for the Double Award. Performance on Paper 01 remained steady for the Single Award, and improved for the Double Award. Performance on Paper 02 and Paper 03 was acceptable.

DETAILED COMMENTS

PAPER 01 – Multiple Choice

This paper consisted of 60 Multiple Choice items distributed as follows:

Business of Agriculture	20
Crops and Soils	20
Animal Science	20

Table 1 shows the number of questions per unit, the difficulty index, mean and standard deviation (SD) for candidates for the Single and Double Awards.

Performance of Candidates in the Multiple Choice Paper by Units

UNITS	Number of Question	Difficulty Index	
		Single Award	Double Award
Business of Agriculture	20	.64	.65
Crops and Soils	20	.62	.64
Animal Science	20	.52	.55
TOTAL	60	.52	.55
OTHER PARAMETERS – Paper 01			
MEAN		38.24	40.18
STD. DEV		8.39	8.71
MEAN %		63.73	66.97
MODE		43	44
RANGE		10-57	8-58

The Single Award and Double Award candidates experienced difficulties with the following topics:

- Organic farming
- Materials used for mulch
- Causative agent of mosaic disease
- Meaning of 'phenotype'

Paper 02 – Structured and Extended Essay Questions

Section A consisted of six questions, each worth four marks.

Question 1

	Mean	Std .dev.
Single Award	1.09	1.00
Double Award	1.26	1.05

This question tested candidates' knowledge and understanding of non-conventional farming systems when faced with difficult situations, and the advantages associated with the use of these methods.

Responses to Part (a) were generally good with many candidates identifying container planting and hydroponics as alternatives to the farmer who was interested in home gardening and had soil that was rocky and unsuitable for growing crops around her home. Correct but less popular responses were grow box and trough culture. Some candidates seemed to have misinterpreted the question and incorrectly stated, "ploughing", "mulching", "crop rotation", and "sexual/asexual reproduction", answers which were inappropriate as methods used to grow crops.

For Part (b), many candidates identified the method but were not able to correctly identify an advantage. Some good responses to Part (b) included "better control of pests and diseases", "reduced leaching of plant nutrients", "easier weed control" and "better control of availability of plant nutrients". Poor responses to this part of the question included "planting indoors", "closer to home" and "moving around pots".

Students could benefit from a problem-solving approach that would allow them to apply their acquired knowledge to practical situations in agriculture. Even though many candidates could identify a suitable alternative to conventional gardening several did not consider the "rocky" nature of the soil in identifying an advantage of the chosen method.

Question 2

	Mean	Std. Dev.
Single Award	2.06	1.18
Double Award	2.34	1.13

This question focused on candidates' knowledge of constraints to Caribbean Agriculture and their ability to make practical suggestions to overcome these constraints.

Part (a) required the naming of two constraints to Caribbean Agriculture, apart from marketing and rural infrastructure. This question was generally well answered.

Good responses to Part (a) included "praedial larceny", "climatic conditions", "land tenure", "availability of labour", "topography" and "obtaining credit". Other acceptable but less popular responses were "trade barriers" and "accessibility of land". Some poor responses included "CARDI", "RADA", "CARICOM", and "technology"

Part (b) required that candidates suggest two ways in which a farmer could overcome a problem of getting farm workers. Candidates were credited for responses such as "cultivate crops that were less labour intensive", "get machinery" "cultivate small areas that she could manage by herself at any one time", "get assistance from family members", "increase wages offered", "advertise for workers" and "join a co-operative". Asking government for assistance was an incorrect response that was very popular in this section.

Question 3

	Mean	Std. Dev.
Single Award	1.37	1.12
Double Award	1.72	1.08

This question tested candidates' understanding of the pH scale as it relates to soil acidity, the identification of one amendment applied to an acid soil and how the selected amendment could be applied.

Part (a) required that candidates identify the pH range that would indicate that the soil was acid. Too many candidates included pH 7 in the range they suggested. All pH values under pH 7 were credited.

In Part (b), the most popular correct response was "add limestone" to correct the soil acidity. Some candidates were able to name specific liming materials such as calcium carbonate, calcium oxide and calcium hydroxide. A few candidates correctly identified "filter press mud" a by-product of the sugar industry as a suitable liming material. Some responses that were not credited were "lime juice", "sodium chloride", "urea" and "fertilizer".

Part (c) was the most poorly done section of the question. The expected response was to either broadcast (scatter) or incorporate (mix in) the liming material in the soil. Some candidates, even though they correctly identified a liming material in Part (b), stated that it should be dissolved and applied to the soil in liquid form.

Candidates' responses indicated some level of coverage of this aspect of the syllabus. However, teachers need to pay attention to detail in terms of the method of application of soil amendments.

Question 4

	Mean	Std. Dev.
Single Award	1.80	0.97
Double Award	2.09	1.04

This question required that candidates identify common machinery and equipment used on the farm and explain their benefits to crop production. The question was generally well done.

Part (a) required that candidates identify from photographs a disc plough and a hand sprayer. Many candidates had difficulty identifying the disc plough but most were able to correctly identify the sprayer. Some candidates recognized the equipment as a plough but could not specify its type and were not credited. Other responses that were not credited were "digger", "backhoe", "bulldozer",

In Part (b), candidates' knowledge of how the use of the disc plough contributed positively to crop production was sought. Candidates' responses indicated the use of machinery in general and not the use of the disc plough. Responses credited were "increases soil aeration", "breaks up or loosens soil for roots to grow deeper", "more water enters the soil/infiltration better and better movement of water

down the soil profile/better percolation”. Responses that were not credited included “reduces labour costs”, “fewer workers needed”, and “land prepared faster”.

In cases where schools do not have certain equipment as part of their agricultural programme, students should be exposed to such equipment by means of field trips to farms or agricultural stations. Teachers can also use the Internet to provide photographs or give students projects which require that they do relevant research. Also, focus should be placed on accepted names for specific equipment, and not just the names given to them locally.

Question 5

	Mean	Std. Dev.
Single Award	1.54	1.03
Double Award	1.94	1.08

This question focused on objectives related to digestion and nutrient requirements of mono gastric and ruminant animals. Most candidates were able to score at least 50 per cent of the marks allocated to this question.

Part (a) required that candidates name the enzyme responsible for protein breakdown in the proventriculus. However, many candidates could not correctly identify pepsin as the required answer. Incorrect responses included saliva, chime, and amylase.

In Part (b), candidates were asked to name one function of the rumen. This part of the question was well answered by most candidates, as answers such as storage of food and microbial fermentation were given by many candidates. Answers that were not credited in this section included digest food, absorption of water and excrete faeces.

Part (c) (i) was well answered as most candidates could correctly name a ruminant animal as an animal which would best utilize the feed (grass silage supplemented with wheat middling and molasses urea blocks). Some candidates,

Double Award

2.19

0.95

This question tested candidates' knowledge of the design of poultry pens as related to heat build-up and security. Most candidates were able to score at least 50 percent of the marks allocated. Candidates were presented with a labelled diagram of a poultry house and were required to answer the questions based on the diagram.

Part (a) (i) asked candidates to suggest one way of improving the design of the pen to reduce the build-up of heat in the pen. Many candidates were able to score the mark allocated to this part of the question by suggesting that the design of the pen could be improved by providing longer eaves, raising the roof higher, increasing the slope of the roof or insulating the roof. Some incorrect responses included suggestions to make holes in the roof, use a thatched roof, providing electric fans and even putting sprinklers on the roof.

Part (b) required candidates to prepare a complete budget for a poultry farm by using the projected income and expenditure figures provided. In preparing the budget candidates were asked to identify the two types of costs from the information provided. Some candidates obtained most of the marks for the budget preparation, whereas others obtained low scores because they did not identify which of the costs were fixed and which were variable. Problems in computation (addition and subtraction) were also evident.

The concepts of fixed and variable costs should be clearly understood before proceeding to the actual preparation of the budget, if it is to be prepared correctly. The layout or format of the budget should be emphasized, as this not only allows candidates to take an organized approach to preparing the budget but it also facilitates the computational aspect and reduces the computational errors made.

Question 8

	Mean	Std. Dev.
Single Award	3.11	2.28
Double Award	3.58	2.38

This question focused on the cultivation of a root crop (sweet potato) and a leaf crop (lettuce). Candidates were expected to demonstrate an understanding of the differences in land preparation, harvesting and post harvest handling of these two crops. They were also expected to demonstrate knowledge of the parts of each plant used for propagation and name one variety of sweet potato recommended for planting in the Caribbean.

In Part (a) (i), candidates were required to suggest the changes the farmer would have to make to his land preparation method if he switched from lettuce to sweet potato cultivation. This part of the question was fairly well done. Most candidates were able to identify such changes as converting flat top beds for lettuce to ridges and furrows for sweet potatoes, greater tilling depth for sweet potatoes than lettuce and the fact that the soil texture for sweet potato did not need to be as fine as for lettuce.

Part (a) (ii) required candidates to outline the difference in harvesting method. This part of the question was fairly well done also. Many candidates correctly stated that the harvesting of the sweet potato would take longer than the harvesting of the lettuce, and that digging of sweet potato tubers would be required instead of cutting of the stem as for lettuce. Additionally, the harvesting implement for lettuce is a knife, whereas it is a fork for the sweet potato; sweet potato could be harvested at any time of the day instead of early morning or late afternoon as for lettuce.

Changes in post-harvest handling were addressed by Part (a) (iii). This part was not as well done as the two previous sections. Candidates were expected to point out that potato tubers could be air-dried instead of washed as is required for lettuce leaves and that sweet potato could be stored at room temperature instead of under cool conditions as required for lettuce. Many candidates stated that the sweet potato tubers needed to be washed.

Part (b) required that candidates demonstrate knowledge of the parts of the sweet potato used for propagation. Most candidates correctly identified the sweet potato stem and root tuber as parts used for propagation. The most popular incorrect answer was stem tuber.

In Part (c), candidates were generally able to score the mark given for naming a sweet potato variety recommended for planting in the Caribbean.

When crop production is being taught, it should be emphasized that even though there are aspects of cultivation practices that are common to most crops, difference also exist. Once generalities have been addressed, factors specific to crop types (for example, root, fruit, leaf) should become the focus of preparing candidates.

Question 9

	Mean	Std. Dev.
Single Award	3.15	1.78
Double Award	3.84	1.86

This question tested candidates' ability to identify equipment used in beekeeping (a smoker and a honey extractor), state the appropriate feed for one-day-old broilers, explain the term "feed conversion ratio" and calculate the feed conversion ratio of two groups of poultry. It also tested candidates' knowledge of disease control in poultry and maintaining feed quality in poultry rations.

In Part (a), more candidates correctly identified the smoker than the honey extractor.

In Part (b) (i), most candidates could correctly identify broiler starter as an appropriate feed for day-old broilers. Incorrect responses included colostrums, yolk, molasses and sugar water.

For Part (b) (ii) a), most candidates could not correctly define the term 'feed conversion ratio'.

Part (b) (ii) b) was also poorly done. Most candidates could not calculate the feed conversion ratios of the individual pens from the information given. The expected calculations were:

Feed Conversion Ratio (FCR) Formula

$FCR = \text{Total Feed Consumed} / \text{Total Live weight}$

Feed Conversion Ratio – Pen A

$550 \text{ kg} / 100 \text{ chickens} \times 2.2 \text{ kg}$

= 2.5:1

Feed Conversion Ratio – Pen B

$850 \text{ kg} / 200 \text{ chickens} \times 2.2 \text{ kg}$

= 1.93:1

From the above calculations, the pen with the better feed conversion ratio is Pen B.

Part (b) (iii) required that candidates recommend measures which a farmer could adopt to minimize the effects of bronchitis on the performance of chickens. This section was poorly answered.

Part (b) (iv) required that candidates recommend two measures that could be used to overcome a problem in the inconsistency of the protein quality of feed between batches of feed. This section was

not well understood as very few candidates attempted this section, and although they recognized that protein was important, many did not know of a solution for a poor quality feed.

Candidate performance in this question signals the need for opportunities to demonstrate understanding of concepts by exposure to practice.

PAPER 03 – Extended Essay Questions (Double Award Only)

This paper consisted of four essay-type questions, two questions from Section D (Horticulture) and two from Section E (Animal Husbandry).

Question 1

Mean	Std. Dev.
7.37	3.13

This question tested candidates' knowledge of horticulture with specific relevance to cut flower production, and its importance in Caribbean tourism.

In Part (a), candidates were simply required to define the term "horticulture" and name one example. Most candidates were correct in their definition of horticulture and had suitable examples, ""establishment", "care and maintenance", "harvesting" and "postharvest treatment" of plants were some of the correct responses given. Vague answers like "the study of plants", "the use of plants" or "the work of a horticulturist" was not accepted.

Part (b) required that candidates relate their knowledge of horticulture to how it could benefit the tourism industry in the Caribbean. This section was also well done, with many candidates recognizing its value as a foreign exchange earner, and also the therapeutic value of some horticulture plants.

Part (c) required candidates to identify the characteristics that should be used to select high-quality flowers for decorative purposes. This section was fairly well done, with candidates recognizing qualities such as "flower colour", "firmness", "length of pedicel" and "absence of blemishes and disease".

Part (d) focused on recommended harvesting and post-harvesting operations to ensure high-quality flowers. This section posed some difficulty for candidates, as many of them could not distinguish between management practices, harvesting and post-harvesting. Those who were correct recognized the need for sharp harvesting instruments, maturity, specific time of the day for harvesting, and grading, proper storage conditions and careful handling for post-harvest practices. Many candidates, however, included irrigation, fertilizing, and preparing the land under the two categories.

Question 2

Mean	Std. Dev.
7.02	2.85

This question required candidates to demonstrate and apply knowledge with regard to citrus production from budded plants, as compared to propagation from seeds and the cultivation of citrus plants on sloping land in terms of varieties, land preparation, planting time, planting and spacing, and weed control.

Part (a) asked candidates to list three problems that could arise from the use of seeds to propagate citrus plants. The better candidates provided the correct responses, namely, variability in fruit, longer time to bear, and variability in trees. Some candidates gave general responses not related to the question, for example, “seed planted too deep”, “lack of nutrients”, and “water washed away the seeds”.

Part (b) required the identification of two methods of asexual propagation other than budding; many candidates gave correct responses, namely, tissue culture, air layering and stem cuttings. Incorrect responses included “inverted T budding” and “artificial insemination”.

Part (c) required recommendations for the cultivation of a citrus orchard on sloping land. Many candidates gave recommendations rather than direct answers to the question. Candidates did not know the names of specific varieties, listing “sweet”, “juicy”, and “strong rooted oranges” as varieties. Candidates also struggled to give acceptable responses to the section dealing with land preparation. Some correct responses included “contour planting”, “planting on terraces”, and “practising minimum tillage”. Incorrect responses included “clear the land of all weeds”, “ploughing the land” and “incorporating manure into the land”. Few candidates responded to planting time, and many responded poorly regarding spacing requirements, confusing the metric and imperial systems, with examples ranging from trees “100 metres apart” to “trees one inch apart”. Weed control was the best answered part of this section, with all candidates giving at least one correct response.

Question 3

Mean	Std. Dev.
7.50	2.76

The question focused on the production of sheep and goats in the Caribbean, with emphasis on the Barbados Black Belly breed of sheep.

Part (a) (i) tested candidates’ knowledge of the origins of the Barbados Black Belly with regard to the breeds or breed types from which it was derived. This part was very poorly done, as most candidates did not know that the Barbados Black Belly was a cross between a hair sheep and a wool breed. The weaker candidates incorrectly stated other breeds of animals, for example, Landrace, Golden Comet, Anglo Nubian and Saanen.

Part (a) (ii) tested candidates’ knowledge of the physical characteristics of this breed of sheep. This section was fairly well done with many candidates correctly identifying its physical characteristics. The weaker candidates, however, confused physical characteristics with production characteristics. Correct responses for the physical characteristics included brown coat colour, black under belly, hair sheep, and polled.

Part (a) (iii) focused on candidates’ knowledge of the production characteristics that makes this breed suitable for the tropics. Good meat production, prolific, good mothering ability and disease resistant were some of the correct responses given.

Part (b) (i) tested candidates’ knowledge of practices which could lead to parasite (internal) infestation of goats. Most candidates correctly listed reasons why infestation persisted on a farm, for example, resistance by parasite, lack of a de-worming programme and unsanitary conditions.

Part (b) (ii) tested candidates' practical knowledge and understanding of procedures to control internal parasites in goats. The response was satisfactory in this section, with many candidates identifying de-worming the animals, sanitation and proper pasture management as possible answers. Some candidates, however, referred to worm medication as antibiotics.

Question 4

Mean	Std. Dev.
6.77	3.93

This question tested one of the new areas added to the syllabus, that of biotechnology, and consisted of four parts. The potential difficulty that could arise from a new area in the syllabus led to the question having key points to assist candidates in their answers.

Part (a) required a definition or explanation of the term 'biotechnology'. This was well done, as most candidates seemed to have encountered the term before and most were able to offer a simple definition.

Part (b) asked candidates to name two biotechnological processes other than embryo transfer. The example in the stem led candidates to suggest similar or related response. Some candidates, however, wrote "embryo transplant" which was similar to "embryo transfer" given in the stem.

Part (c) asked candidates to identify one value-added product obtained from animal waste other than biogas. Candidates also had little difficulty in this section because of the hint given in the stem.

Part (d) (i) tested candidates' knowledge and understanding of the advantages of biotechnology in animal production. Many candidates could not explain the use of biotechnology in animal production, with many of them giving the advantages of artificial Insemination, or listing the advantages of biotechnology in plants.

Part (d) (ii) sought candidates' understanding of how the movement of genetically engineered products could be monitored in the Caribbean. Many candidates did not know this topic, although it is around us all the time – legislation, quarantine, testing products, and traceability. This clearly shows the inability of candidates to relate real world events to concepts and content encountered in the school curriculum.

RECOMMENDATIONS TO TEACHERS

Based on its assessment of the candidates' performance during the 2009 examination, the Examining Committee wishes to make the following recommendations to teachers preparing students for future examinations.

- The emphasis in the new syllabus is on agriculture as a business, teachers should therefore place emphasis on methods that would add value to products, for example, harvesting and post-harvesting of crops and efficient production of livestock.
- Teachers should clearly distinguish between biotechnology and traditional techniques.
- Teachers should note that practice is necessary in aspects of the syllabus where students are required to perform calculations.