C A R I B B E A N E X A M I N A T I O N C O U N C I L

REPORT ON CANDIDATES' WORK IN THE SECONDARY EDUCATION CERTIFICATE EXAMINATION

MAY/JUNE 2011

AGRICULTURAL SCIENCE GENERAL PROFIENCY EXAMINATION

GENERAL COMMENTS

Agricultural Science offers the Caribbean student a choice between two options, the Single Award (SA) and the Double Award (DA) option.

The examination comprised two written papers for the Single Award and three written papers for the Double Award, as well as a practical component called the School-Based Assessment (SBA), for both the SA and DA.

Paper 01 comprised 60 multiple-choices items. Paper 02 comprised nine compulsory structured-type questions. These two papers were common to the SA and DA. Paper 03, written by Double Award candidates only, was a compulsory paper with four structured essay questions. The SBA component was conducted in the school and the school farm environment. Candidates were tested on a number of skill objectives set out in the syllabus, and on cost analyses based on their crop and animal production activities. The DA required candidates to conduct a research project, in addition to the other SBA requirements.

This report outlines candidates' overall achievements and achievement on content profiles, namely:
Profile 1 – The Business of Farming
Profile 2 – Crop Production
Profile 3 – Animal Production

DETAILED COMMENTS

Paper 01 – Multiple Choice

This paper consisted of 60 multiple-choice items, each worth one mark. Candidate performance was good, with a mean of 64 per cent for the DA and 56 per cent for the SA.

Candidates had difficulty with questions that were based on the following topics:

- Produce consumed by the farm family being considered as an income
- Identifying a partial budget from the information given
- The function of potassium in plants
- The use of a chisel plough
- Spraying crops with a knapsack sprayer should be done in the direction of the prevailing wind
- Plant tissue culture
- Characteristics of zero-grazing
- Embryo transfer
- Day-old chicks should be kept at a temperature of 36.7 °C

Paper 02 – Structured Questions

This paper consisted of two sections. Section I comprised six questions, each worth four marks. Section II comprised three longer response questions, each worth 12 marks.

<u>Question 1</u>

Candidates were informed that a farmer obtained ten hectares of arable land for the purpose of Agriculture.

Part (a) required that candidates state two factors of production that this farmer must consider. This part of the question was well answered with responses such as *labour*, *capital* and *management*. However, some candidates offered 'land' as a response even though it was stated in the stem of the question.

Part (b) informed candidates that the farmer completed a loan application form, but was unsuccessful in obtaining the loan. They were required to suggest two criteria that are necessary to obtain a loan. Candidates responded well to this part and many of them scored maximum marks. Some correct responses included *collateral*, *ability to repay*, *records and project proposal*. Some poor responses that were not credited were 'possession of an ID card', 'be a member of a farmers' group' and 'farmers must be educated'.

Question 2

The preamble to this question stated that Caribbean agriculture is affected by many constraints (challenges) one of which is a negative attitude towards agriculture. Many candidates failed to offer any response, while a few candidates failed to score any mark even though they responded to both sections.

Part (a) required candidates to name two other constraints that affect agriculture in the Caribbean. Some candidates responded well and scored maximum marks. However, some candidates suggested 'negative attitude towards agriculture', even though this was stated in the question. Popular correct responses included *praedial larceny*, *capital* and *land tenure*.

Part (b) asked candidates to provide two arguments to convince their fellow students to become involved in agriculture. Some candidates misinterpreted the word *arguments* and presented dialogues as their response. A few candidates offered a definition of the word agriculture and as such this response was not credited.

Responses that were considered too vague included 'GDP', 'provide for basic needs' and 'decrease, global warming'. Those candidates who gained marks gave responses such as *agriculture provides for wide range of career options*, *leisure activities*, *a source of income*, *a source of food* and *a foreign exchange earner*.

It is suggested that teachers make use of correct terminology (*challenges*, *constraints*, and *arguments*) as outlined in the syllabus so that students may be more exposed to these terms and can interpret them correctly.

Question 3

This question tested candidates' knowledge of crop rotation. The opening statement mentioned the fact that crop rotation is often recommended to farmers because it reduces levels of pests and diseases. Performance was less than average.

Part (a) asked candidates to briefly explain how crop rotation reduced pests and diseases. Responses were satisfactory. Many candidates made the link between the different families of crops and the reduction in pests and diseases.

Part (b) indicated that a farmer wanted to grow corn, sweet potato, beans and lettuce. It was necessary that candidates complete a crop rotation sequence as given in the diagram, starting with corn. Responses were fair with many candidates demonstrating a good knowledge of the sequencing of crops in a rotation, and in particular that a leaf crop should follow the legume crop.

Question 4

This question dealt with soil compaction on tuber production of yam.

Part (a) required that candidates name the part of the plant that is used for propagating yam. The most common correct responses were *head*, *stem*, *tuber*, *bud* and *eye*. The most common incorrect response was the 'use of roots'.

Part (b) stated that the plot of yam became heavily infested with weeds. Candidates were required to state one effect that situation was likely to have on the production of yam. This was fairly well done with the common responses being *lack of/ competition for nutrients, reduction in quality and quantity of tubers*.

Part (c) showed a table demonstrating the effect of soil compaction on tuber yield in yam. This was not well done. Some candidates saw the inverse relationship between soil compaction and tuber yield but could not express that information properly, while others were simply unable to interpret the table.

Part (d) sought to test candidates' knowledge of the removal of soil compaction. Candidates were asked to recommend one piece of tillage equipment that could be used to break up the compacted layer of soil. Few candidates knew the correct response – *subsoiler* or *chisel plough*. Many candidates stated 'disc plough', 'fork, hoe' or 'tractor'; some of them even suggested wetting the soil, for which no marks were awarded.

Question 5

This question dealt with rabbit production. Candidates performed poorly.

Part (a) required candidates to state two breeding methods used in rabbit production. This was poorly answered by most candidates. Incorrect responses included 'artificial insemination', 'natural and artificial breeding', 'self-mating', 'genetic engineering'. Correct responses included *line breeding*, *pure breeding, upgrading* and *cross breeding*.

In Part (b), candidates were asked to suggest two qualities or traits, other than high growth rates, in the selection of rabbits to improve production. Performance was slightly better with some candidates being able to suggest desirable traits like *healthy animals*, *pedigree*, *conformation* and *performance*, *good FCR/DP*. Incorrect responses included 'location of the farm', 'improved housing', 'good eating habits', 'good sanitation' and 'wool and fur production'.

Question 6

This was a two-part question that tested candidates' knowledge and understanding of the structure of a ruminant and non-ruminant digestive tract and water conservation in a pond.

Part (a) showed two diagrams, one with the digestive tract of a goat and another with the digestive tract of a broiler bird, with a part labelled X on the goat and a part labelled Y on the broiler. Candidates were asked to identify the structures labelled X and Y. Most of them were able to correctly identify the *rumen* and the *proventriculus*. However, candidates had difficulty spelling these terms correctly.

Part (b) informed candidates that a farmer dug a shallow pond on a clayey soil. After filling the pond, the water almost completely drained out. Candidates were required to suggest the most likely cause of the problem and to recommend one solution to the problem. While many candidates were able to suggest that there might have been cracks in the pond, or that it was poorly compacted, several candidates were unable to offer correct responses.

Most candidates could not offer a solution such as *dig a deeper pond* or *line the pond with polythene*.

Question 7

This question tested concepts and skills critical to the business of farming, in particular the importance of keeping records and financial accounts. Candidate performance was average.

Part (a) presented an incomplete table showing the breeding record of a Doe. Candidates were required to fill in the missing data in the correct order using the information supplied. Most of them were able to give correct responses and so scored the maximum number of marks. The correct response was *Date mated*, *Date Kindled*, *Date Weaned*, in that order.

In Part (b), there was a table showing the financial accounts of a mixed farm. Part (b) (i) required candidates to list variable and fixed costs. Some listed the items, some stated the value and some did both items and value. The correct responses for variable costs were: *cost of seeds = $5 000*; *cost of feed = $50 000*; *casual labour = $10 000*; *replacement does = $55 000*. For fixed costs, the correct responses were: *housing and equipment = $100 000*; *farm operator salary = $20 000*. Most candidates were able to identify two variable costs and at least one fixed cost.

Part (b) (ii) required candidates to calculate the gross income and net income, showing all working. This was poorly done. Many candidates added the expenditure items to the income items to get the gross income and net income, which was incorrect. Most candidates failed to recognize subsidy as an income item. The correct responses were: *gross income was the total income from the sale of goats and corn, as well as the subsidy*; *net income was determined by the gross income minus total costs*.

In Part (b) (iii), candidates were asked to state whether or not the farmer's business was successful and to explain their answer. Most of the responses were correct in that candidates saw the link between income, expenditure and profit, and so responded with *yes, the business was successful because it made a profit*.

Question 8

This question tested candidates' knowledge of fertilizers, mulch and cultivation practices of a leaf and a root crop. Candidates performed poorly.

Part (a) (i) asked candidates to state two effects that the overuse of fertilizers may have on the environment. Good responses included *burn the plants*, *pollution*, *soil acidity*.

Part (a) (ii) required candidates to state one benefit of mulching. Most candidates responded correctly to this part of the question. Correct responses included *reduces water loss*; *adds nutrients to the soil*; *controls weeds*.

Part (b) required candidates to compare (similarities and differences) the cultivation practices of a leaf crop and a root crop on flat land under the headings *land preparation*, *fertilizer application*, and *harvest and postharvest handling*. This was most challenging for candidates. They demonstrated some knowledge of the agronomy of the different crops but failed to compare the two crops.

For land preparation, correct responses were: *removing weeds and tilling the soil to a fine tilth, for both crops*; *make flat top beds for leaf crop, and ridges and furrows for root crop*.

For fertilizer application, *adding organic matter and nitrogenous fertilizer for leafy crop* (and in the early stages of growth for root crop), *and mixed fertilizer for root crop* were good responses.

Harvesting and postharvesting. Many candidates knew that the method of harvesting a leafy crop is by the use of a knife, and a fork or digging tool is used for a root crop. They also knew that the leafy crop is reaped earlier than the root crop. Some candidates, however, simply mentioned that when the crop is ready it should be harvested, which earned them no marks.

Question 9

This question assessed candidates' knowledge of breeds of animals, and diets and diseases of rabbits. Candidate performance was poor.

In Part (a), candidates were required to name a meat breed for each of the following classes of livestock: pig, goat and rabbit. Many candidates gave examples of classes and types of livestock and frequently, the names of any breed of livestock. Some correct responses included *Landrace and Large White (pig), Anglo Nubian and British Alpine (goat),* and *Flemish Giant and New Zealand White (rabbit).* However, most of the incorrect responses given were 'pork', 'bacon', 'Jersey' and 'Saanen'.

Part (b) presented a table on a feeding experiment on rabbits. This experiment was carried out over a four-week period to evaluate the performance of rabbits on a forage diet and on a concentrate diet. In Part (b) (i), candidates were asked on which of the diets the rabbits gained more weight. The correct response was *concentrate diet*. In Part (b) (ii), candidates were required to calculate the increase in average weight of the rabbits on the concentrate diet. The correct response was 1 kg which was found by using the formula, 1.4kg - 0.4kg.

In Part (b) (iii), candidates were informed that at the end of four weeks, an average of 4.2 kg of feed was consumed by each rabbit. Candidates were required to calculate the Feed Conversion Ratio on the concentrate diet, using the data presented in the table. Performance was poor. The correct response was 3, calculated by dividing 4.2 kg by 1.4 kg.

Part (b) (iv) required candidates to explain the importance of Feed Conversion Ratio in livestock production. Most candidates attempted this part and were able to give a correct answer, such as *to inform farmers of how well the rabbits were performing/converting food to meat*.

Part (c) stated that one rabbit in the experiment showed the following signs: frequent shaking of its head, scabs in the ear, and a foul-smelling substance oozing from the ear. Candidates were asked to suggest the likely cause of the condition and to state two methods of control. Candidates' ability to answer this question which required application of knowledge proved to be challenging. Most of the responses such as 'diseases', 'mastitis' and 'nutritional disorders' were incorrect. The correct response should have indicated an *ear infection*.

Because of the incorrect answers given above, the responses for the treatment followed the same pattern, for instance, 'take the animal to the VET', 'kill the animal', and 'administer antibiotics'. The correct response included *proper sanitation, use of acaricides* and *vegetable oil*.

Paper 03 – Structured Essay

This paper consisted of four compulsory structured essay questions, two from Section D (Horticulture) and two from Section E (Animal Husbandry) of the syllabus. Only candidates taking the Double Award option were required to write this paper.

Question 1

Knowledge of the cultivation of oranges was being assessed by this question. Candidate performance was average.
Part (a) required knowledge of the popular varieties of oranges in the Caribbean and two features that make them popular. Many of the candidates were able to address the first part correctly and most were able to identify the characteristics. The most popular variety named was *Valencia* and characteristics were *colour*, *size* and *juiciness*. Incorrect responses included different kinds of citrus, for example, 'lime', 'grapefruit and tangerine', and even 'sour' or 'sweet' oranges.

Part (b) tested the candidates' knowledge of the features of the oranges that would indicate that they were mature and ready for marketing. *Maturity*, *colour* and *size* were the most popular correct responses, while 'smell' and 'acidity' were popular incorrect responses.

In Part (c), candidates were given a diagram that indicated a farmer cultivating oranges on the windward side of a steep mountain. They were required to discuss two constraints (challenges) that the farmer was likely to encounter in cultivating oranges on that hillside and to suggest one strategy that he could use to overcome each constraint. Many candidates were able to correctly give the constraint but not the corresponding strategy. The most popular correct answers were *erosion*, *damage to trees* and *difficulty in transport*. For strategies, *contour farming*, *windbreaks* and *the use of animal transport* were accepted. Other correct responses included *lack of water*, *management difficulties* and *irrigation*.

Part (d) challenged candidates to describe how the farmer can improve the quality of his oranges for the market, through proper techniques of harvesting and transportation. Many candidates were able to give two correct responses for each of the techniques. The most popular were *hand picking*, *packing containers*, *harvesting at the right stage of maturity* and *during the cool periods of the day*.

Question 2

Establishing and managing a lawn was the focus of this question. Candidates did not perform very well.

Part (a) (i) asked candidates to identify three grasses which were recommended for establishing lawns in the Caribbean. Many candidates responded correctly with grasses such as *Bermuda* and *Turf*. In many instances, though, candidates suggested pasture grasses such as 'Elephant' and 'Pangola'.

Part (a) (ii) required candidates to identify two other methods of establishing a lawn except by the use of sod. Many candidates were able to identify correctly at least one method used, such as *seeds*, *cuttings* and *sprigs*.

For Part (b), candidates had to discuss the techniques of lawn establishment and maintenance on sandy soils under the following headings: *land preparation*; *planting and establishing*; *fertilizer* and *irrigation*; *pest and weed control*; and *mowing*.

For land preparation, most candidates had some knowledge of the operations involved. Some of the correct responses were *clear the land*, *till*, *incorporate organic matter*, *level and grade*.

For planting and establishing, correct responses included *prepare planting material*, *transport*, *dig holes/disperse seeds* and *irrigate*.

For fertilizer and irrigation, there was some confusion, as candidates interchanged drainage with irrigation, and suggested that deep drains should be dug to get rid of excess water. The fact that the soil was sandy seemed to escape candidates and thus led to their false suggestion that it must not be irrigated regularly since it cannot hold water. Some of the correct responses were *incorporate high phosphorus fertilizer at planting time*, *apply high Nitrogen fertilizer at monthly intervals*, *irrigate immediately after planting*.

For pest and weed control, practices such as *identify the pests and weeds*, *use pesticides at recommended rates* and *integrated pest management (IPM)* were credited.

For mowing, most candidates correctly identified the use of the lawn mower but failed to mention the critical aspects of *height*, *regularity* and *removal of clippings*.

Question 3

Knowledge of dairy production was assessed by this question. Performance was below average.

In Part (a) (i), candidates were asked to identify two breeds of dairy cattle reared in the Caribbean. Accurate responses included *Jersey*, *Jamaica Hope* and *Holstein*. Some inaccurate responses were 'breeds of swine', 'sheep' and 'goat'.

Part (a) (ii) required candidates to identify three characteristics of a good dairy breed. Accurate responses included *wedge shape*, *high milk yield*, *docile and well-developed udder*.

Part (b) indicated that a cow died immediately after giving birth to a calf. Candidates were required to explain two management practices in caring for the calf up to weaning. Some correct responses included *use of artificial or substitute colostrums*, *bottle feed*, *fostering*, *isolate the calf*. However, candidates had difficulty explaining the practices.

Part (c) informed candidates that a cow on pasture showed signs of scouring, had a ruffled coat and distended abdomen. Candidates were asked to identify the organism that most likely caused the condition and to explain three management practices to prevent and control that condition. Few candidates were able to respond with the correct answer — roundworms. The most common incorrect answer given by the majority was 'bacteria'. Acceptable responses for the treatment and control of roundworms were *deworming*, *rotational grazing* and *proper sanitation*.

Part (d) stated that embryo transplant was a new technology being used in the dairy industry. Candidates were required to suggest two benefits of using that technology. Some candidates were able to respond with at least one benefit, such as *upgrading the herd* and *reducing the transfer of sexually transmitted infections*. Some candidates confused the process with artificial insemination.

Question 4

This question assessed candidates' practical knowledge of rearing poultry. Candidate performance was average.

Part (a) showed a diagram of the reproductive system of a hen with the infundibulum, shell gland and cloaca labelled, and two unidentified parts labelled X and Y. For Part (a) (i), candidates were required to label X and Y. The correct answers were *X as the ovary and Y as the magnum*.

Part (ii) required one function of each of the following parts: infundibulum (funnel), isthmus, and uterus. Candidates had difficulty stating the function of the parts. *The infundibulum is the site for fertilization, the isthmus is the site for shell membrane formation, and the uterus is the site for shell formation.* The reproductive tract was mistakenly identified as the digestive tract of the hen, hence, candidates named the parts of the reproductive tract as the proventriculus, duodenum and gizzard.

In Part (b) (i), candidates were asked to recommend an appropriate feeding regime for layers from day old to the time of laying. Correct responses were *starter from 1 to 6 weeks*, *grower from 6 to 17 weeks* and *layer ration after 17 weeks*.

Part (b) (ii) stated that some of the hens on the farm produced eggs with thin, soft shells. Candidates were required to suggest one way that that condition could be corrected. Correct responses were *add oyster shells or increase the calcium content of the feed*.

Part (b) (iii) required candidates to state the term used to describe *feather pecking* and to explain two management practices that could be used to correct it. Cannibalism was mistaken for the disease Coccidiosis. The management practices required for cannibalism were *adequate spacing, debeaking, proper ventilation* and *vision inhibitors*.

Part (c) showed a diagram of an egg grader and a diagram of a basket of eggs with the weight of each egg shown. Candidates were asked to identify the total number of eggs for <u>each</u> of the following categories: small, medium and large. Most candidates were able to use the egg grader to grade the eggs.