(For candidates in The Gambia, Nigeria and Sierra-Leone only)

### **PREAMBLE**

This syllabus has been designed to portray Agricultural Science as an applied science with emphasis on the acquisition of knowledge and skills associated with the content. A general review of the Junior Secondary School Agricultural Science Syllabus is presumed.

Candidates will be expected to answer questions on all the topics set out in the column headed *syllabus*. The *notes* therein are intended to indicate the scope of the questions which will be set, but they are not to be considered as an exhaustive list of limitations and illustrations.

Schools must keep school farms where crops are grown with at least one species of livestock from each of the following two groups:

- (i) pigs, rabbit and poultry,
- (ii) goat, sheep and cattle and where feasible, fish pond.

The practical notebooks of candidates should contain records of individual activities based on laboratory and individual observations carried out in the school farms, field trips and also records of specimens collected. In order to enhance effective teaching/learning process and better performance by candidates, continuous assessment of candidates is recommended.

Since the main objectives of the Senior Secondary School Agricultural Science syllabus are to

- (i) stimulate and sustain students' interest in agriculture,
- (ii) enable students acquire basic knowledge and practical skills to prepare them for further studies and occupation in agriculture,

it is recommended that the study of Agriculture Science in the Senior Secondary School be supplemented by visits to well established government and private experimental and commercial farms, agricultural research institutes and other institutions related to agriculture.

### **EXAMINATION SCHEME**

There will be two papers both of which must be taken.

- PAPER I This will be a 1½ hour practical paper with a total score of 60 marks. This paper will consist of four questions all of which must be answered. This will be for school candidates only.
- PAPER 2 This will be a 3-hour theory paper consisting of two parts:
  - Part I This will consist of sixty (60) multiple choice objective questions with a total score of 60 marks and of 1 hour duration.

Part II Will consist of ten essay-type questions contained in five sections, A,B,C, D, and E. There will be two questions in each section.

Section A will contain questions drawn from Basic Concepts and Farm Mechanization while questions contained in Sections B, C, D and E will be drawn from Agricultural Ecology, Crop Production, Animal Production and Agricultural Economics and Extension respectively.

Candidates will be required to answer one question from each section. Each question carries a score of 16 marks. Thus the total score for Part II will be 80 marks. The duration is 2 hours.

PAPER 3: This will be a Test of Practical as an alternative to practical for private candidates only. The paper will consist of four questions for 1½ hours duration and carries 60 marks.

### **DETAILED SYLLABUS**

CONTENTS	NOTES
A. BASIC CONCEPTS  1. Agricultural Development in West Africa.	
Prospects and problems	
<ul> <li>(a) Importance of agriculture and agricultural development in the national economy.</li> <li>(b) Differences between subsistence and commercial agriculture.</li> <li>(c) Problems created by</li> </ul>	A review of the importance of agriculture is necessary.
(i) inadequate land; (ii) basic amenities-water, electricity, health care delivery; (iii) finance; (iv) transportation;	
(v) storage and processing facilities; (vi) agricultural education and extension; (vii) farm inputs; (viii) imperfect marketing system; (ix) environmental degradation; (x) abundance of diseases and pests;	Discussion to include the effect of land tenure system, inadequate communication systems, marketing system, farm inputs
<ul><li>(d) Possible solutions to these problems.</li><li>2. Agricultural laws and reforms</li></ul>	such as tools, machinery, labour and governmental attitudes.
<ul><li>(a) Land tenure systems in West Africa.</li><li>(b) Government laws on land use in West Africa.</li></ul>	
3. (a) Roles of Government in agricultural production: providing loans, credits and subsidies.	
(b) Role of non- governmental	Discussion should include roles of the government, Nongovernmental organizations (NGOs),

organisations.

### B. AGRICULTURAL ECOLOGY

- 1. Land and its Uses
  - (a) Uses of land for agricultural and non-agricultural purposes: Uses of land for agriculture, forestry and wildlife conservation.
  - (b) Factors affecting land availability and use:
    - (i) Physical factors e.g., soil type, topography etc.,
    - (ii) Socio-economic factors e.g., population pressure.
- 2. Environmental factors affecting agricultural production:
  - (a) Climatic factors: rainfall, temperature, light and wind
  - (b) Biotic factors: predators, parasites, soil microorganisms, pests and diseases.
  - (c) Edaphic factors: soil pH, soil texture and soil structure.
- 3. Rock formation
  - (a) rock types: igneous, sedimentary and metamorphic;
  - (b) rock formation processes.
- 4. Formation, composition and properties of soil
  - (a) Factors of soil formation: parent rock, topography, organisms, climate, vegetation and time
  - (b) Processes of soil formation: physical, chemical and biological processes.

private farmers etc.

An over-view of the different land tenure systems in West Africa.
Discussion should include Land Use Act (Decree), Land Reforms etc. in West Africa.

Study should include government agricultural programmes like Farm Settlement schemes, Co-operative farming, Farm Insurance Scheme, OFN, River Basin Authorities, Green Revolution. Agricultural **Development Projects** (ADP), TESITO (Do it yourself), Agric. Sect. Rehabilitation Project, (A.S.R.P.). National Aids Coordination secretariat.

Examples of NGOs
West African Rice
Development Agency
(WARDA),
International Institute
of Tropical
Agriculture (IITA),
International
Livestock Centre for
Africa (ILCA),
(IFAD), International
Crop Research
Institute for Semi-Arid
Tropics (ICRISAT).

(c) Composition, types and properties of soil: sand, clay, loam, organic matter, soil water, soil air, soil living organisms, soil texture, soil structure, soil pH and their importance.

5. Plant nutrients and nutrient cycles

- (a) Macro and micro-nutrients, their functions and deficiency symptoms, factors influencing nutrients availability in the soil.
- (b) Methods of replenishing lost nutrients: soil rotation, organic manuring, inorganic fertilization, fallowing, liming, cover cropping.
- (c) Nitrogen, Carbon and Water cycles.
- 6. Effects of the following farming practices on the soil: bush burning, grazing/overgrazing, clean clearing, fertilizer application, organic manuring, crop rotation, continuous cropping, flooding.

7. Irrigation and Drainage

- (a) Irrigation: definition and its importance in Agriculture. Irrigation systems: overhead e.g., sprinkler, water can, etc. surface-flooding channel/furrow, underground e.g., perforated pipes, drips, etc., their advantages and disadvantages. Problems associated with irrigation e.g., maintenance, water availability, pests and diseases.
- (b) Drainage: definition and its importance: drainage systems: surface, e.g., channel: furrow and underground pipes, advantages and disadvantages.

### C. FARM MECHANIZATION

- 1. Sources of farm power including advantages and disadvantages of type: human, animal, mechanical, solar, wind, water, biogas, electricity.
- 2. Farm machinery and implements: Tractor, bull-dozers, shellers, dryers, incubators, milking machines and tractor-coupled implements like ploughs, harrows, ridgers, planters, harvesters, sprayers.

Discussion on agricultural use of land should include uses of land for crop and animal production. Non-agricultural uses of land to include building of industries, roads and new towns, recreational centres, etc.

Effects of the extension and expansion of industries, road rehabilitation and reconstruction should be mentioned.

Discussion should include the effects of these factors on distribution and production of crops and animals in West Africa.

Discussion on biotic factors should include competition, parasitism and symbiosis.

- 3. Prospects and problems of mechanisation: Meaning, advantages, disadvantages and limitations of mechanization.
- 4. Surveying and planning of farmstead
  - (a) Meaning and importance of farm surveying: Common survey equipment: ranging poles, Gunters chain, measuring tape, prismatic compass, theodolite, offset staff, plumb bob, pins, arrows.
  - (b) Meaning and importance of farm planning, principles of farmstead outlay.

Candidates should be able to describe, identify rock types and give examples.

Formation of various types of rocks should be explained.

The role played by each factor should be emphasized.

Soil formation as a result of weathering of parent material through physical, chemical and biological weathering; transportation of the fragmented materials and the deposition and conversion of transported sediments into soil. Study of soil profile and identification of the stages of soil formation.

rice,

Students are expected to study different types of soil and their separation into sand, silt and clay fractions. Study should also include water-holding capacity and drainage while causes, determination and correction of soil pH

### D. CROP PRODUCTION

- 1. Husbandry of selected crops: Methods of propagation, climatic and soil requirements, land preparation: planting date, seed rate, spacing, sowing date, nursery requirement, manuring and fertilizer requirement and application, harvesting, processing and storage of at least one representative crop from each of the following crop groupings:
  - (a) Cereals : maize, guinea corn, etc
  - (b) Pulses (grain legumes) cowpea, soya bean, etc
  - (c) Roots and tubers: cassava, yam, potatoes, etc
  - (d) Vegetable : tomatoes, onion, amaranthus, okro, cauliflower and spinach, etc
  - (e) Fruits: citrus, banana, pineapple, etc
  - (f) Beverages: cocoa, tea and coffee, etc
  - (g) Spices: pepper, ginger, etc
  - (h) Oils: groundnut sheabutter, sunflower, etc
  - (i) Fibres: cotton, jute, sisal hemp, etc
  - (j) Others: rubber, sugarcane, etc.
- 2. Pasture and forage crops
  - (a) Types of pastures: (Natural and established) morphology of common grass and legume species in West Africa pastures.

- (b) Factors affecting distribution; establishment and productivity of pastures.
- should also be studied.
- 3. Forest management: forest regulation, selective exploitation, deforestation, regeneration, afforestation and taungya system.
- 4. Floriculture: importance of ornamental trees, shrubs and flowers.

Macro-elements are N, P, K, Ca, Mg, S. Micro-elements include Zn, Fe, Mo, Co, Ba, Cu. Factors influencing nutrient availability include pH, excess of other nutrients, leaching, crop removal, oxidation, burning.

### 5. DISEASES AND PESTS OF CROPS

- (a) Diseases: causal organism, economic importance, transmission, symptoms, preventive and control measures of the diseases of the following crops:
  - (i) Cereals smut, rice blast, leaf rust, etc;
  - (ii) Legume Cercospora leaf spot, rosette etc;
  - (iii) Beverages cocoa blackpod, swollen shoot, coffee leaf rust etc.;
  - (iv) Tuber cassava mosaic, bacterial leaf blight etc.;
  - (v) Fibre black arm/bacterial blight of cotton, etc.,
  - (vi) Vegetables root knot of tomato or okro, damping off, onion twister, etc.;
  - (vii) Stored produce mould, etc.
- (b) Pests: important insect pests of major crops; field and storage pests, lifecycle, economic importance, nature of damage, preventive and control measures of the following major insect pests of crops:
  - (i) Cereals stem borer, army worm, ear worm, etc.,
  - (ii) Legume podborer, aphid, sucking bug and leaf beetle, etc
  - (iii) Beverages Cocoa myrid (capsids);
  - (iv) Tuber yam beetle, cassava mealybug, green spidermite, variegated grasshopper, etc
  - (v) Fibre cotton stainer, boll-worm;
  - (vi) Fruits and vegetable thrip,

Types of fertilizers and methods of fertilizer application should be treated.

Both the merits and demerits of the listed practices should be adequately treated.

grasshopper, leaf roller, leaf beetle, scale insect;

- (vii) Stored produce grain weevil, bean beetle.
- (c) Side effects of the various preventive and control methods: pollution, poisoning, disruption of ecosystem.
- 6. Common weeds found in farms
- 7. Crop improvement
  - (a) Meaning and aims
  - (b) Mendelian laws
  - (c) Processes of crop improvement, their advantages and disadvantages.

#### E. ANIMAL PRODUCTION

1. Anatomy and physiology

Identification of parts and important organs of farm animals and their functions – digestive (monogastric and ruminants), circulatory, reproductive, respiratory and nervous systems of farm animals.

- 2. Animal reproduction
  - (a) Explanation of the following: oestrus cycle, heat period, mating, gestation period, parturition, lactation and colostrum.
  - (b) Processes of egg formation in poultry.
  - (c) Main reproductive hormones and their functions.
- 3. Environmental physiology
- 4. Livestock Management: housing, feeding, hygiene and finishing of at least one ruminant and one non-ruminant animal from birth to market weight.
- 5. Animal nutrition
  - (a) Sources and functions of food nutrients:

Each source should be briefly explained. Safety precautions on the use of each farm power should be emphasized.

A review of simple farm tools is necessary. Study should include functions, care and maintenance of the machinery and implements as well as identifying the major parts of tractor and implements coupled to it and their functions. Engineering details are however not required.

Possible ways of improving agriculture through mechanization

carbohydrates, proteins, fats, minerals, vitamins and water.

should also be studied.

- (b) Types of ration/diet and their uses: components of a balanced diet; production and maintenance rations.
- (c) Causes and symptoms of malnutrition and their correction in farm animals.
- Uses, care and maintenance of these equipment should be discussed.
  Engineering details are not required.
- 6. Range and Pasture management and improvement
  - (a) Meaning and importance of rangeland and pasture to livestock and their characteristics.
  - (b) Methods of rangeland and pasture improvement: controlled stocking, rotational grazing, use of fertilizers, introduction of legumes and reseeding.
- 7. Principles of Animal Health Management
  - (a) Predisposing factors; causal organisms,. symptoms, transmission, effects, preventive and curative control of the following selected livestock diseases:
    - (i) Viral: foot and mouth disease, rinderpest, Newcastle disease,
    - (ii) Bacterial: anthrax, brucellosis, tuberculosis,
    - (iii) Fungal: aspergilosis, ring worm,
    - (iv) Protozoa: trypanosomiasis, coccidiosis, redwater.
  - (b) Life cycle, economic importance and control of the following selected livestock parasites:
    - (i) Endoparasites: tapeworm, liverfluke and roundworm.
    - (ii) Ectoparasites: ticks, lice etc.
- 8. Fish farming and fishery regulations
  - (a) Definition and importance of fish farming.
  - (b) Conditions necessary for sitting a fish pond.
  - (c) Establishment and maintenance of a fish pond or aquarium.

Discussion on farmstead outlay should include factors determining location of different farm buildings, orchards, vegetable garden/plot e.g., topography, location of water sources, type of soil, soil relief, direction of wind and sunshine etc. Methods of carrying out simple farm layout survey including e.g., the use of 3, 4, 5 method should be studied.

A general knowledge of husbandry of all the crops listed is presumed.

- (d) Fishery regulations.
- 9. Animal improvement
  - (a) Meaning and aims,
  - (b) Methods of animal improvement: introduction, selection, breeding and their effects.
  - (c) Artificial insemination.

### F. AGRICULTURAL ECONOMICS AND EXTENSION

- 1. Factors of production: land, labour, capital and management; functions of a farm manager.
- 2. Basic economic principles
  - (a) Principles of demand and supply,
  - (b) Effects of demand and supply on agricultural returns,
  - (c) Law of diminishing returns.
- 3. Agricultural Financing:

Sources of farm financing:

Agricultural banks, Commercial banks, Co-operative Societies, Money lenders, Credit and Thrift Societies, self-financing, Government agencies, N.G.Os, etc.

4. Farm Records and Accounts.

Importance and types of farm records and accounts, entries of sales and purchases, profit and loss accounts, inventories etc.

- 5. Marketing of Agricultural Produce
  - (a) Meaning and importance of marketing.
  - (b) Marketing agents: Marketing/Commodity Boards, Co-operative Societies, Middlemen/

Detailed botanical studies are not required. Study should also include harvesting, preservation and storage. Both the common and botanical names should be known. Study should include pasture and forage crop management.

Wholesalers and Producers.	
<ul><li>6. Agricultural Extension</li><li>(a) Meaning and importance of agricultural extension.</li></ul>	A review of the importance and uses of forests is necessary.
<ul><li>(b) Methods of disseminating new ideas and techniques to farmers.</li><li>(c) Agricultural Extension Programmes in West Africa.</li></ul>	Discussion should include uses of ornamentals for beautification of environment and landscaping, interior decoration, and their cultivation. Sources of planting material.
PRACTICAL AGRICULTURAL SCIENCE  A. AGRICULTURAL ECOLOGY  1. Soil	Studies to include at least two fungal, two viral, two bacterial and one nematode diseases of the crops chosen from the list.
2. Soil profile	
3. Rocks	

4. Laboratory work on physical

properties of soil

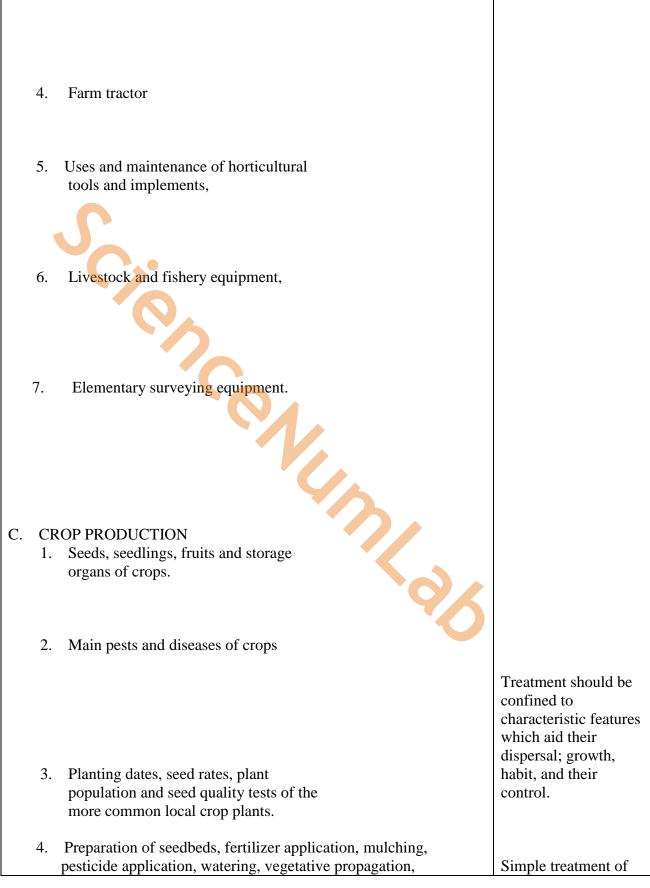
- (a) mechanical analysis by sedimentation and also by the use of hydrometer method or sieves,
- (b) determination of bulk density and total pore space,
- (c) determination of moisture content of a moist soil sample,
- (d) determination of maximum water holding capacity,
- (e) determination of wilting point to be demonstrated,
- (f) determination of capillary action.
- 5. Laboratory work on chemical properties of soil.
  - (a) demonstration of soil acidity using pH meter and/or any other gadget or simple equipment,
  - (b) demonstration of the phenomenon of cation exchange capacity,
  - (c) identification of common types of chemical fertilizers.
  - (d) Organic manure.
- 6. Irrigation and drainage
- B. FARM MECHANIZATION
  - Farm tools and equipment

Tractor and animal drawn implements

Harvesting, processing and storage equipment.

Studies to include at least one example of biting and chewing, piercing and sucking and boring insect pests. A brief mentioning of major groups of insecticides/pesticidespowder, liquid, granules and tablet is required. Other important pests of crops, e.g., birds, rodents, man, nematodes, their importance and control should also be studied.

Cultural, biological and chemical methods of control are required.



germination tests etc.	Mendelian laws of inheritance required.
<ul><li>5. Forest products and by-products in the locality.</li><li>6. Methods of propagation of horticultural plants</li></ul>	Introduction, selection and breeding should be studied.
7. Common weeds  D. ANIMAL PRODUCTION	Minute details are not required. Study of the monogastric digestive system must include that of the birds.
Common breeds of animals and types of animals available in the locality.	Differences between the monogastric and ruminant animals' digestive systems should be emphasized.
2. Major internal organs of farm animals, e.g., organs of the digestive system, reproductory and excretory systems.	
<ul><li>3. Animal by-products</li><li>4. Animal feeds and feeding stuffs and</li></ul>	Studies to include mammary glands in lactation, signs of heat and ovulation, oestrus
their local sources.	cycle and a brief mentioning of artificial insemination.
5. Main pests and parasites of farm animals.	
	These should be simply treated.
6. Diseases of farm animals, their prevention and control	
	Emphasis should be placed on the effects of changes in climate on growth,

7. Routine management practices in farm animals, e.g., selection of livestock and poultry for breeding, culling, ear-norching, tattooing, horn or skin branding, debeaking, dehorning, castration.

reproduction, milk and egg production.

8. Fish harvesting and preservation.

Discussion should include the extensive, intensive and semi-intensive systems of management.

Study of the biochemical details of the nutrients is not required. Hay and silage should be mentioned.

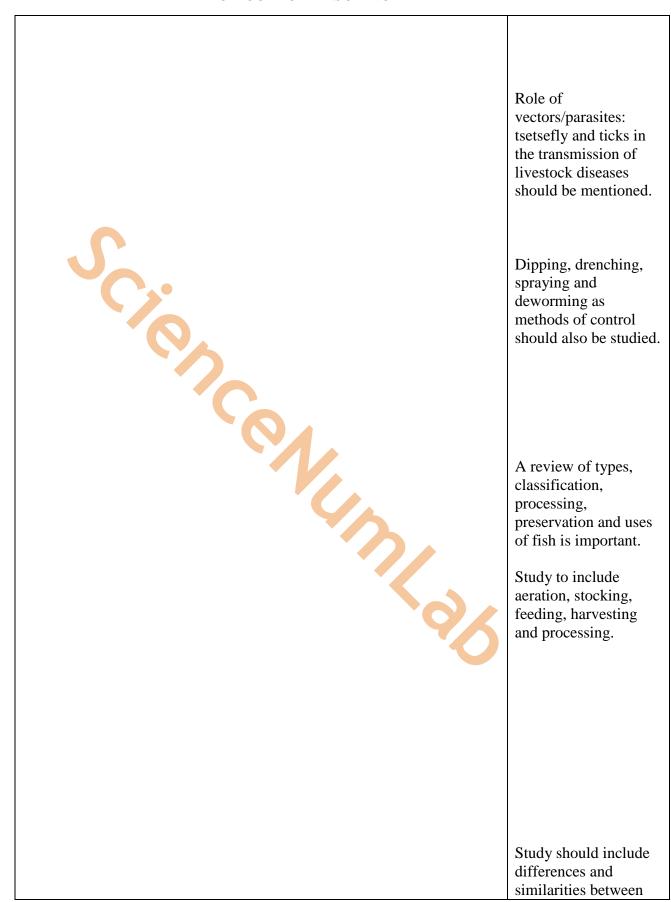
The types of diet for the various classes of animals and their characteristics should be studied. However minute details of ration formulation are not required. Concept of supplementary feeding/diet should be explained.

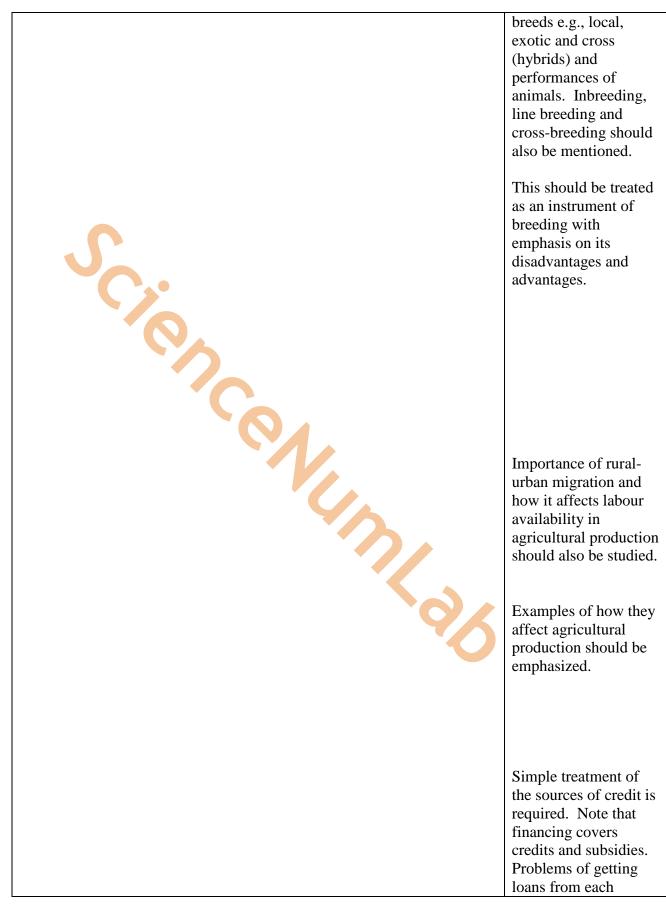
Malnutrition should be defined. Nutrient disorders such as ketosis and nutrient deficiency symptoms such as rickets and others should be simply covered.

Discussion should include factors

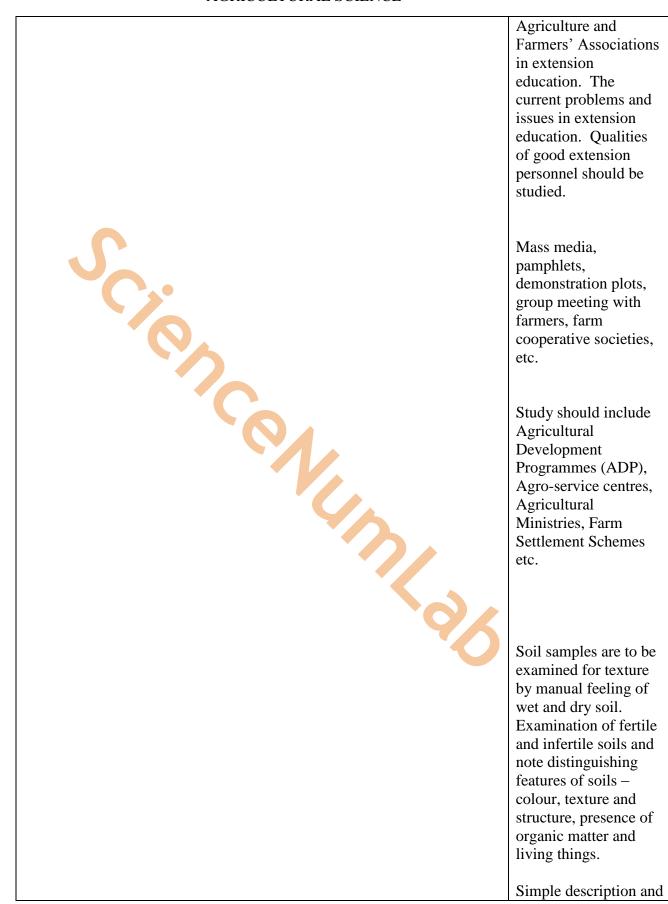


affecting level of production of herbage: rainfall, grass/legume composition and grazing. Study to include weeds removal and burning. Pest and disease control etc. Discussion should include importance of quarantine, immunization, hygiene, breeding for resistance. The economic importance of all the diseases should be studied.

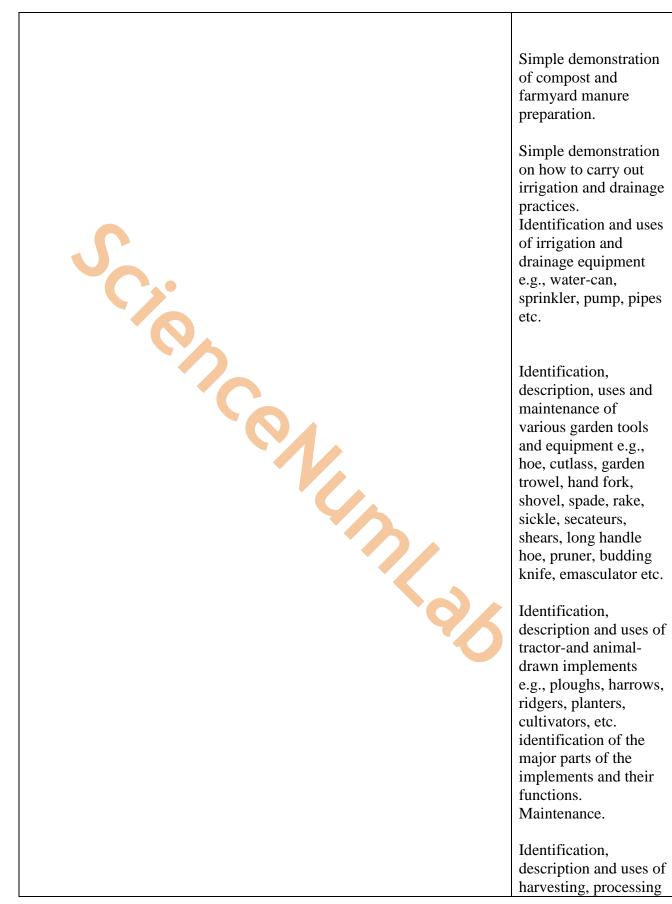


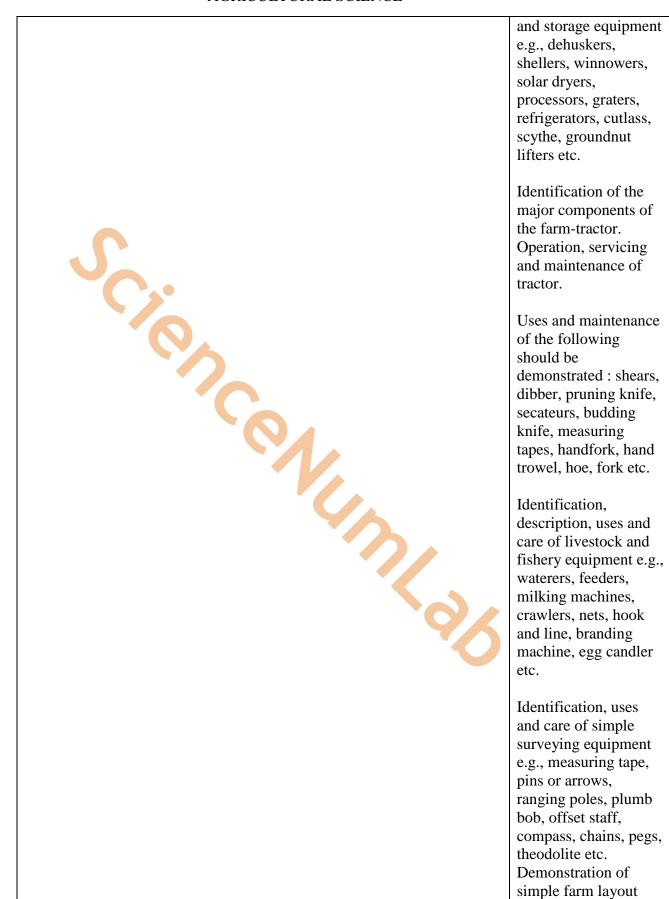


source should be explained e.g., collaterals, interest, payments etc. Discussion should include terms such as appreciation, farm budget, inventory, depreciation, salvage value; their importance and their uses in calculating profit and loss of farm items like crops, livestock, farm machinery and tools in the farm. Discussion to include merits and demerits of various agents. Marketing channels of farm produce and problems associated with them should be studied. Concepts, objectives and importance of extension in agriculture. The role of the Universities, Ministry of

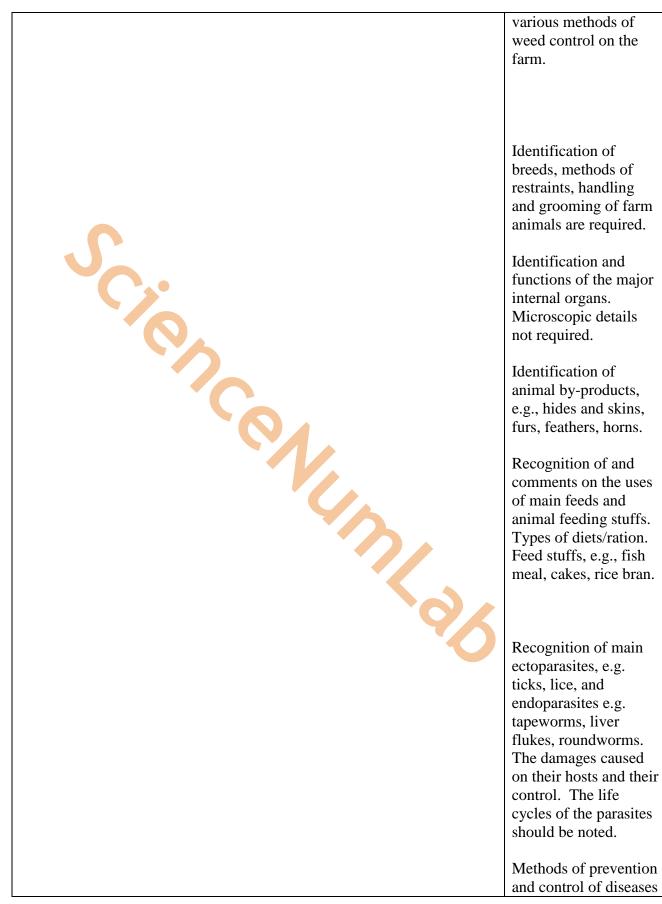


identification of soil profile and visits to excavation sites and dugout pits. Common rock types of igneous, sedimentary and metamorphic origins. Visits and collections of various types of rocks and their identification for laboratory use. Simple laboratory experiment required e.g., displacement of cation with potassium. Common types of nitrogen, phosphorus and potassium fertilizers. Candidates should know their rates and how N.P.K. can be compounded on the farm.





survey method. Identification of seeds, seedlings, fruits, storage organs and essential parts of the common crop plants, pasture grasses, legumes. Recognition of the main field and storage pests and the damage they do to crops e.g., cotton stainer, yam beetles, weevils etc. Recognition of main diseases of crops, their causal agents and characteristic symptoms, prevention and control. Activities should include the following propagation methods direct sowing, transplanting, layering, grafting and budding. Emphasis on external features and mode of dispersal. Demonstration of



of farm animals, e.g., drugging, drenching, dipping, spraying and simple methods of farm sanitation should be demonstrated. Students should be familiar with the equipment/tool used for these practices. Recognition of various methods of harvesting, processing and preservation of fish.