AGRICULTURE

GENERAL OBJECTIVES

The aim of the Unified Tertiary Matriculation Examination syllabus in Agriculture is to prepare the candidates for the Board's examination. It is designed to test their achievement of the course objectives, which are to:

1. stimulate and sustain their interest in Agriculture;
2. acquire basic knowledge and practical skills in Agriculture;
3. acquire the knowledge of interpretation and the use of data;
4. stimulate their ability to make deductions using the acquired knowledge in Agriculture.

The syllabus is divided into five sections as given below:

A. General Agriculture
B. Agronomy
C. Animal Production
D. Agricultural Economics and Extension
E. Agricultural Technology

DETAILED SYLLABUS

SECTION A: General Agriculture

TOPICS/CONTENTS/NOTES	OBJECTIVES
1. Meaning and Scope of Agriculture	Candidates should be able to:
a. Definition of Agriculture	use the definition of Agriculture in modern terms as it relates to production, processing and marketing.
b. Branches of Agriculture	differentiate between the various branches of Agriculture.
c. Types of Agriculture i.e subsistence and commercial	differentiate between the various types of Agriculture.
2. Importance of Agriculture i. Provision of raw materials for agro-allied industries ii. Provision of employment iii. Development of rural areas, etc.	Candidates should be able to: relate agro-allied industries to their respective raw materials relate the various contributions of Agriculture to economic development in West Africa.
3. Agricultural Ecology	Candidates should be able to:
a. Ecological zones of West Africa	differentiate between the features of the ecological zones in West Africa
b. Agricultural products of each ecological	classify agricultural products according to each

TOPICS/CONTENTS/NOTES	OBJECTIVES
zone	ecological zone.
c. Environmental factors and their effects on crop and livestock production	differentiate abiotic from biotic factors affecting agricultural production.
4. Genetics	Candidates should be able to:
a. First and second laws of Mendel	apply the first and second laws of Mendel to genetics.
b. Cell division	differentiate between the types of cell division.
c. Terminologies e.g. locus, alleles, genotype, dominance	i. determine the outcome of genetic crossing involving homozygous and heterozygous traits. ii. compute simple probability ratios.
5. Farm Inputs	Candidates should be able to:
e.g. planting materials, agrochemicals, etc.	classify different types of farm inputs and their uses.
6. History of Agricultural Development in West Africa	Candidates should be able to:
a. Agricultural systems e.g. shifting cultivation, bush fallowing, etc.	compare various agricultural systems.
b. Problems of Agricultural development e.g. land tenure systems, inadequate infrastructures, finance for agriculture, pollution, etc.	identify the problems and proffer solutions
c. Establishment of national research institutes e.g. NCRI, IAR, IAR&T, CRIN, NIFOR, FRIN, RRI, NRCRI, NIHORT, LCRI, etc. and international research institutes e.g. IITA, ILRI, ICRISAT, WARDA, etc., leading to increased application of science to the development of agriculture.	i. trace the history of research institutes from past to present. ii. assess their role in the development of agriculture.
d. Agricultural Development Projects (ADPs) e.g. RTEP, FADAMA etc.	give reasons for the establishment of ADPs.
e. National agricultural programmes such as OFN, NAFPP, NALDA, Green Revolution, NCRPs, NARP, Project Coordinating Unit (PCU) etc.	evaluate the contributions of national agricultural programmes.

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7. Roles of Government and NGOs in Agricultural Development	Candidates should be able to:
a. Development of fiscal policies favourable to agricultural production e.g. import duties, ban on importation, e.t.c.	evaluate the effects of government policies on agricultural development.
b. Agricultural laws and reforms e.g Land Use Act.	identify agricultural laws and their effect on agricultural production
c. Government programmes aimed at agricultural development e.g. subsidies, credit facilities, e.t.c.	i. identify the various agricultural incentives provided by the government. ii. assess their effects on agricultural development.
d. Provision of infrastructures e.g. transport systems, communication systems, e.t.c.	compare the various infrastructural facilities provided by government and their uses.
e. Contribution of NGOs to agricultural development	examine the roles of NGOs in the development of agriculture.

SECTION B: Agronomy

TOPICS/CONTENTS/NOTES	OBJECTIVES
1. Rocks and Soil formation	Candidates should be able to:
a. Factors affecting rock weathering and soil formation	identify major types and properties of rocks and soils; factors and processes of soil formation.
b. Physical properties of soil i. Soil profile	differentiate between the horizons in a soil profile.
ii. Soil texture and structure	i. differentiate between the components of soil. ii. compute the proportion of soil constituents. iii. analyse soil into its constituents parts. iv. determine the water-holding capacity of soil.
c. Chemical properties of soil i. Soil acidity and alkalinity ii. Chemical components of soil e.g. silicate	determine the soil pH.
2. Soil Water and Soil Conservation	Candidates should be able to:
a. Soil water: its importance, sources, movement, management and conservation.	i. compare capillary, gravitational and hygroscopic water. ii. determine water-holding capacity, wilting points and plant available/unavailable water.

TOPICS/CONTENTS/NOTES	OBJECTIVES
b. Soil conservation: meaning and importance, causes, effects, prevention and control of leaching, erosion, continuous cropping, burning and oxidation of organic matter.	i. identify the causes of erosion and leaching. ii. determine control methods.
c. Irrigation and drainage methods.	i. classify irrigation and drainage systems. ii. examine the importance and challenges of irrigation and drainage.
3. Soil Fertility	Candidates should be able to:
a. Macro and micro-nutrients and their roles in plant nutrition: carbon, water and nitrogen cycles	i. classify plant nutrients. ii. identify factors affecting their availability.
b. The living population of the soil (flora and fauna), and their roles in soil fertility	examine the roles of soil flora and fauna in maintaining soil fertility.
c. Maintenance of soil fertility: Methods of maintaining soil fertility e.g. use of cover crops, application of organic manures, etc.	i. compare the different methods of maintaining soil fertility. ii. differentiate between organic and inorganic fertilizer, and their methods of application. iii. determine common fertilizer ratios.
d. Nutrient deficiency symptoms e.g. chlorosis, sickle leaves, stunting, apical necrosis etc.	i. identify the deficiency symptoms and their causes. ii. suggest remedies.
4. Land Preparation and Soil Tillage	Candidates should be able to:
a. Principles and practices of land preparation and soil tillage	i. compare the different methods of land preparation and soil tillage in relation to different groups of crops. ii. give reasons for the advantages and the disadvantages of land preparation and soil tillage.
b. Factors affecting choice of tillage methods: Zero tillage, minimum tillage, etc.	give reasons for the choice of tillage methods.
5. Plant Forms and Functions	Candidates should be able to:
a. Parts of monocot and dicot crop plants and their functions	i. identify crop plant parts and their functions. ii. distinguish between monocot and dicot crop plants
b. The anatomy and morphology of the storage organs of common crop plants	differentiate the various storage organs of crop plants

TOPICS/CONTENTS/NOTES		OBJECTIVES
6.	**Growth, Development and Reproduction**	Candidates should be able to:
	a. Gametogenesis	examine the process of gamete formation.
	b. Pollination	give reasons for different types of pollination.
	c. Fertilization	analyse the process of fertilization.
	d. Embryo formation and development	trace the process of embryo formation and development to the formation of seeds and fruits.
7.	**Plant Propagation Methods**	Candidates should be able to:
	a. Sexual: the use of seeds, seed viability, viability test, seed rate and seed germination	i. classify crops propagated by sexual methods. ii. determine seed viability and seed rate. iii. differentiate between types of seed germination. iv. examine the conditions for seed germination.
	b. Asexual (vegetative propagation) e.g. cutting, budding, grafting, layering, e.t.c.	classify crops into different vegetative propagation methods.
	c. Nursery and nursery management	i. determine appropriate nursery sites, types; their advantages and disadvantages. ii. apply the techniques of transplanting seedlings
8.	**Cropping Systems, Planting Patterns and Plant Densities**	Candidates should be able to:
	a. Cropping systems: Monocropping, mixed-, multiple-, inter-, relay-, strip- and rotational cropping	i. compare cropping systems. ii. apply different cropping systems to solve problems in agriculture.
	b. Planting patterns: Broadcasting, row spacing and drilling	differentiate between the various planting patterns.
	c. Plant densities: single, double and multiple stands	i. examine the various types of plant densities and their effects on crop yield. ii. compute plant density per hectare.
9.	**Crop Husbandry**	Candidates should be able to:
	Common and scientific names, gross morphology, anatomy of storage organs, methods of propagation, husbandry practices, harvesting, processing and storage, common diseases and pests, economic importance of the following groups of crops.	i. apply the different methods of crop propagation, husbandry, harvesting, processing and storage for each crop. ii. identify common diseases and pests and their effects on crop yield. iii. determine the economic importance of each of the crops.
	Group 1: Cereals e.g maize, guinea corn,	

TOPICS/CONTENTS/NOTES	OBJECTIVES
rice Group 2: Legumes e.g. cowpea, groundnut, soyabean Group 3: Tubers e.g. yam, cassava, sweet potatoes Group 4: Vegetables and Spices e.g. tomatoes, egg plant, pepper, onions, okra, cabbage, A*maranthus sp.* Group 5: Fruits e.g. citrus, pineapple, pawpaw Group 6: Beverages e.g. cocoa, kola, coffee Group 7: Oils e.g. oil palm, coconut, shea butter Group 8: Latex e.g. para rubber, gum arabic Group 9: Fibres e.g jute, cotton, sisal hemp Group 10: Sugars e.g sugarcane, beet	iv. relate their importance to national economic development.
10. Pasture and Forage Crops	Candidates should be able to:
a. Study of gross morphology, methods of propagation and husbandry of common pasture grasses and legumes. Establishment, maintenance, conservation and uses of pastures and forage crops.	i. classify common grasses and legumes used as pastures and forage ii. differentiate between pasture and forage crops by their common and scientific names. iii. distinguish between the various methods of conserving pastures e.g. hay- and silage-making.
b. Study of natural grasslands and their distribution in West Africa	relate different vegetational zones to their dominant pasture species.
c. Range management	determine range types and utilization of range resources in Nigeria
11. Floriculture	Candidates should be able to:
Identification, establishment, maintenance and uses of ornamental trees, shrubs and flowers	i. distinguish between common ornamental trees, shrubs and flowers. ii. determine their uses and maintenance.

TOPICS/CONTENTS/NOTES	OBJECTIVES
12. Weeds	Candidates should be able to:
a. Gross morphology, methods of reproduction, dispersal and effect of weeds	i. identify weeds with their common and scientific names. ii. classify weeds according to their mode of dispersal.
b. Weed control methods – weeding, mulching, cover cropping, tillage, herbicides and trap cropping	apply various weed control methods.
13. Crop Diseases	Candidates should be able to:
a. Identification of disease–causing organisms both in store and in the field.	distinguish between common store and field disease – causing organisms.
b. A simple account of diseases caused by fungi, bacteria, nematodes and viruses; the nature of the damage, methods of transmission and common methods of control.	i. relate various disease-causing organisms to the damage caused, symptoms and their mode of spread. ii. apply appropriate control methods.
c. Side effects of application of preventive and control methods e.g pollution, poisoning and distribution of ecosystem.	relate each control method to its side effect.
14. Crop Pests	Candidates should be able to:
a. General account of pests of agricultural plants both in the field and in the store, their types, importance, principles and methods of prevention and control	i. identify the various field and store pests. ii. assess their economic importance. iii. relate various prevention and control methods to different pests.
b. Life cycles of: biting insects e.g. grasshopper; boring insects e.g. weevils; sucking insects e.g. aphids and cotton strainer.	i. describe the life cycles of various insects. ii. apply the knowledge of the life cycles of insect pests to their prevention and control.
c. Common pesticides and their side effects	i. differentiate between common pesticides. ii. examine their mode of action on pests.
15. Forest Management (Silviculture)	Candidates should be able to:
a. Importance: Source of wood, pulp, fibre and other forest products	relate various forest products to their uses.
b. Conservation: regulation, exploitation, regeneration, afforestation, agro-forestry and taungya system	i. compare different forest conservation methods. ii. apply the various methods appropriately.

TOPICS/CONTENTS/NOTES		OBJECTIVES
16.	**Crop improvement** Methods of crop improvement e.g. introduction, selection, crossing, quarantine e.t.c.	Candidates should be able to: i. give reasons for crop improvement. ii. distinguish between various methods of crop improvement.

SECTION C: Animal Production

TOPICS/CONTENTS/NOTES		OBJECTIVES
1.	**Forms and classification of major farm animals in West Africa**	Candidates should be able to:
	a. Species, breeds and distribution	i. classify various breeds of farm animals. ii. locate where they are found.
	b. External features of cattle, sheep, goat, pigs, rabbits and poultry	identify their features.
2.	**General terminology in animal production**	Candidates should be able to:
	Common terms used in animal husbandry, e.g. *calving, kidding, castrate, capon, veal, mutton,* e.t.c.	use various terms in animal husbandry.
3.	**Anatomy and physiology of farm animals**	Candidates should be able to:
	a. Functions of tissues and organs of farm animals	distinguish between various functions of tissues and organs of farm animals.
	b. Animal body systems e.g. digestive (ruminants and non-ruminants), reproductive, respiratory, urinary (excretory) and nervous systems.	compare different body systems in farm animals.
	c. Effect of environmental changes on physiological development of farm animals e.g climate change	determine the effects of climate change on farm animals
4.	**Reproduction in farm animals**	Candidates should be able to:
	a. Gametogenesis, oestrus cycle, signs of heat and heat periods, secondary sexual characters, gestation periods, parturition and the role of hormones in reproduction.	i. give an account of the process of reproduction in farm animals. ii. determine the role of hormones in reproduction.

TOPICS/CONTENTS/NOTES	OBJECTIVES
b. Development, nourishment and birth of the young. Mammary glands and lactation in farm animals.	trace the development in farm animals from fertilization to birth and care of the young.
c. Egg formation, incubation and hatching in poultry.	trace the process of egg formation and incubation in poultry.
5. Animal nutrition	Candidates should be able to:
a. Feed nutrients and functions	identify the various feed nutrients, their sources and functions.
b. Feeds and feeding: Simple ration formulation – balanced ration, common pasture/forage crops e.g. guinea grass, elephant grass, giant star grass. *Andropogon sp, Calopogonium sp*. Hay and silage preparation, different types of rations, namely maintenance ration and production ration.	i. differentiate between the types of animal feeds and their formulation. ii. relate the various types of rations to different classes of livestock.
c. Nutrient deficiencies: Causes and symptoms of malnutrition and their correction in farm animals.	i. trace symptoms to nutrient deficiencies in farm animals. ii. apply appropriate corrective measures to nutrient deficiencies in farm animals.
6. Livestock management	Candidates should be able to:
Housing, feeding, sanitation and veterinary care of ruminants, pigs, rabbits and poultry under intensive, semi-intensive and extensive systems of management from birth to slaughter.	apply the different management practices for farm animals.
7. Animal Health	Candidates should be able to:
a. Animal diseases (pathology) i. Environmental factors predisposing animals to diseases; causal organisms, symptoms, transmission and effects. ii. Preventive and curative methods for diseases caused by viruses, bacteria, fungi and protozoa.	i. identify diseases of farm animals and causative agents. ii. classify livestock diseases based on symptoms and mode of transmission. iii. apply appropriate preventive and curative measures against diseases caused by these pathogens.
b. Parasites (parasitology) i. Life cycles and economic importance of livestock parasites e.g. endoparasites, ectoparasites and disease vectors.	i. classify livestock parasites. ii. determine their role in disease transmission. iii. trace life cycles of parasites from egg to adult stage.

TOPICS/CONTENTS/NOTES	OBJECTIVES
ii. Prevention and control - dipping - spraying - deworming - sanitation	apply appropriate prevention and control methods against livestock parasites.
8. Fisheries and Wildlife	Candidates should be able to:
a. Fish culture systems; Common types of fishes e. g *Tilapia, Catfish,* etc.	i. identify the common types of fishes in West Africa.
i. Extensive systems: inland and deep sea fishing, lakes and rivers.	ii. differentiate between various systems of fish farming in West Africa.
ii. Semi-intensive systems: dams	iii. determine the factors to be considered in intensive fish farming.
iii. Intensive systems: fish ponds – Factors to consider in ponds establishment and pond management e.g. pond fertilization, liming and desilting.	
b. Fish harvesting and processing methods	i. assess the advantages and disadvantages of different fish harvesting and processing methods.
i. Use of drag nets, hook and line, etc.	ii. use the various methods of catching fish.
ii. Curing, sun-drying and smoking.	iii. apply the various methods of fish preservation.
iii. Fishery regulations	apply fishery regulations in Nigeria.
c. Wildlife management Habitat conservation, feeding, domestication, harvesting, processing and wildlife regulations.	i. identify animals found in West African game reserves. ii. give reasons for the establishment of game reserves. iii. apply common wildlife regulations.
9. Bee-keeping (Apiculture) a. Meaning and importance of apiculture	Candidates should be able to: relate bee-keeping to economic development
b. Types of bees e.g exotic and indigenous bees	differentiate between various types of bees
c. Methods of bee-keeping e.g traditional and modern bee-keeping	classify methods of bee-keeping
d. Equipment and safety measures in bee-keeping	identify bee-keeping equipment and their uses

TOPICS/CONTENTS/NOTES	OBJECTIVES
10. Animal Improvement Methods of animal improvement e. g. introduction, breeding, quarantine and selection: Breeding systems – inbreeding, line-breeding, cross-breeding, artificial insemination	Candidates should be able to: i. give reasons for animal improvement. ii. differentiate between the various methods of animal improvement.

SECTION D: Agriculture Economics and Extension

TOPICS/CONTENTS/NOTES	OBJECTIVES
1. Factors of agricultural production	Candidates should be able to:
a. Land i. Types of land ownership in West Africa	i. understand the meaning of land and state its uses ii. identify the various forms of land ownership. iii. examine their effects of land ownership on agriculture. iv. differentiate between the various features of land and their effects on land use.
b. Labour	differentiate between the types and sources of labour and their effects on agricultural production.
c. Capital	compare the sources of capital and associated problems.
d. Management	determine the functions of a farm manager in an agricultural enterprise.
2. **Basic Economic Principles**	Candidates should be able to:
a. Demand and supply	i. relate demand to supply in agricultural production. ii. interpret geographical representation of demand and supply.
b. Production function: Input/input, Output/output Input/output relationships; stages of production, concepts of diminishing returns, scale of preference and choice.	i. relate input to output. ii. deduce economic concepts from graphic representation.

TOPICS/CONTENTS/NOTES	OBJECTIVES
3. Features of Agricultural Production Smallness of farm holdings: biological limits of farm production and susceptibility of farm production to climate, seasonality of farm productions, price elasticity in demand and supply of agricultural produce.	Candidates should be able to: i. distinguish between the common features of agricultural production and produce. ii. compute elasticity of demand and supply.
4. Labour Management a. Labour relations: Supervision, etc. b. Types of labour: Permanent labour etc. c. National labour laws and regulations.	Candidates should be able to: identify the various ways of achieving labour efficiency. differentiate between the various types and sources of labour. apply national labour laws and regulations.
5. Farm Management a. Qualities, functions and problems of a farm manager. b. Records and record-keeping: Types and importance of record-keeping – livestock records, profit and loss account book. c. Stock evaluation: i. gross and net profits in farm management. ii. Appreciation, depreciation and savage value d. Agricultural insurance: i. Meaning, importance and types of agricultural insurance ii. Problems of agricultural insurance	Candidates should be able to: identify the qualities, functions and problems of a farm manager. i. differentiate between the types of farm records. ii. give reasons for keeping farm records. determine gross and net margins, appreciation, depreciation and salvage value i. examine the relevance of agricultural insurance ii. determine the appropriate agricultural insurance scheme determine the problems associated with agricultural insurance.
6. Marketing of Agricultural Produce a. Importance of Marketing. b. Marketing channels.	Candidates should be able to: evaluate the importance of agricultural marketing i. classify marketing agents and their functions. ii. determine the various ways in which marketing channels pose problems in agricultural production.

TOPICS/CONTENTS/NOTES	OBJECTIVES
c. Characteristics of agricultural products affecting their marketing.	determine the characteristics of agricultural products affecting their marketing.
7. Agricultural Extension	Candidates should be able to:
a. Meaning and importance.	identify the importance of agricultural extension.
b. The role of Agricultural Development programmes, universities, research institutes and farmers' organizations (Cooperative societies).	analyse the roles of government and non-governmental organizations in agricultural extension education.
c. Extension methods including demonstration plots, use of visual aids, mass media, etc.	differentiate between the various extension methods.
d. Problems of agricultural extension in West Africa and possible solutions.	i. examine the problems of agricultural extension in West Africa. ii. provide possible solutions.

SECTION E: Agricultural Technology

TOPICS/CONTENTS/NOTES	OBJECTIVES
1. Farm surveying and farmstead planning	Candidates should be able to:
a. Meaning and importance	examine the relevance of farm surveying to agriculture.
b. Common surveying equipment, their uses and care	classify common surveying equipment, their uses and care.
c. Common survey methods	differentiate between the common survey methods.
d. Principles of farmstead outlay.	apply survey principles to farmstead outlay.
2. Simple farm tools	Candidates should be able to: i. identify simple farm tools. ii. use and maintain farm tools. iii. compare the advantages and disadvantages of simple farm tools.
3. Farm machinery and implements	Candidates should be able to:
a. Types i. Machinery e.g tractor, milking machine etc ii. Implements	identify common farm machinery and implements. i. classify farm machinery according to their uses. ii. apply appropriate maintenance routines on

TOPICS/CONTENTS/NOTES	OBJECTIVES
b. Uses and maintenance of farm machinery and implements	farm machines and implements. iii. operate farm machines and implements.
4. **Mechanization and sources of farm power**	Candidates should be able to:
a. Sources of farm power e. g. animal and machines	compare the advantages and disadvantages of various sources of farm power and their application.
b. Advantages and disadvantages of agricultural mechanization	distinguish between the advantages and disadvantages of mechanization.
c. Problems and prospects of mechanized agriculture in West Africa	assess the problems and prospects of mechanized agriculture in West Africa.
5. Processing and storage	Candidates should be able to:
a. Processing: traditional and modern methods of food processing e.g. gari, rice and groundnut processing, etc.	i. identify the importance of agricultural processing. ii.differentiate between the various methods of processing agricultural produce.
b. Storage	i. compare different storage methods. ii.apply different storage methods.
6. Introduction to biotechnology	Candidates should be able to:
Basic terms, e.g. tissue and anther culture in vitro fertilization and genetic engineering	i. use basic terms in biotechnology. ii. provide reasons for the importance and application of biotechnology.
7. Application of ICT in agriculture	Candidates should be able to:
a. Features of computers	identify the various components of a computer.
b. Uses of computers in agriculture: disease and weather forecasting, ration formulation, database and simulation studies, etc.	use the computer to enhance agricultural practices.
c. Use of communication gadgets e.g mobile phone, internet, etc.	use communication gadgets to enhance agricultural production.

TOPICS/CONTENTS/NOTES	OBJECTIVES
8. Introduction to agricultural research and statistics a. Basic concepts in planning agricultural experiments e.g. hypothesis, treatment and control, etc. b. Interpretation of results, e.g. measures of central tendency and experimental errors.	Candidates should be able to: use basic concepts in agricultural experiments. i. draw inferences from experimental results. ii. compute simple measures of central tendency.

RECOMMENDED TEXTS

Adeniyi, M. O. et al (1999) *Countdown to Senior Secondary Certificate Examination Agricultural Science,* Ibadan: Evans

Akinsanmi, O. (2000) *Junior Secondary Agricultural Science*, Uk: Longman.

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Anthonio, Q. B. O. (1999) *General Agriculture for West Africa*, London: George Allen

Are, L. A. et al (2010) *Comprehensive Certificate Agricultural Science for Senior Secondary Schools,* University Press Plc.

Egbuna, C. K. et al (2014) *Extension Modern Agricultural Science for Senior Secondary Schools (2010),* Extension Publication

Emmanuel C. A. (2003) *A Dictionary of Agriculture*, Benue: Agitab Publisher Makurdi

Falusi, A. O. and Adeleye, I. O. A (2000) *Agricultural Science for Junior Secondary Schools Books 1- 3,* Ibadan: Onibonoje

Komolafe, M. F., Adegbola, A. A., Are, L. A. and Ashaye, T. I. (2004) *Agricultural Science for Senior Secondary Schools 1, 2 and 3,* Ibadan: University Press Ltd.

Philips T. A. (1986) *Agricultural Notebook,* Lagos: Longman

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