



REPUBLIC OF BOTSWANA

**BOTSWANA GENERAL CERTIFICATE
OF
SECONDARY EDUCATION**

TEACHING SYLLABUS

AGRICULTURE

**Ministry of Education
Department of Curriculum Development and Evaluation**

FOREWORD

The Ministry of Education is pleased to authorise the publication of this senior secondary syllabus which marks a watershed in the development of the public education system in Botswana and signals another milestone of progress in fulfilment of the goals set by the Revised National Policy on Education, Government Paper No. 2 of 1994.

In this era of widespread and rapid technological change and an increasingly inter-dependent global economy, it is essential that all countries foster human resources by preparing children adequately for their future. Survival in the coming millennium will depend on the ability to accommodate change and to adapt to environmental needs and emerging socio-economic trends. It is the wish of government to prepare Botswana for future growth and adaptation to ongoing change in the socio-economic context; specifically the transition from an agro-based economy to the more broadly based industrial economy which we are aiming at.

The senior secondary programme builds on the Ten Year Basic Education programme and seeks to provide quality learning experiences. It aims to prepare our students for the world of work, further education and lifelong learning. However, secondary education must also pay attention to the all round development of the individual. It should provide not only for the acquisition of those skills needed for economic, scientific and technological advancement. It should also provide for the development of cultural and national identity and the inculcation of attitudes and values which nurture respect for one's self and for others.

Critical to the success of our secondary education programme is the recognition of individual talents, needs and learning styles. Hence, the role of the teacher in the classroom has changed. S/he must be a proficient manager and facilitator; a director of learning activities. S/he should be conscious of students' needs to take on board a measure of accountability and responsibility for their own learning. S/he must also take into account the widening range of ability of the student body and the different levels of achievement which they aspire to. This means active participation for all and the creation of rich and diverse learning environments.

It is important then that we value the students' own experiences, build upon what they know and reward them for positive achievement. At the same time, we must be prepared to offer them guidance and counselling at all levels; assisting them to make the best decisions in keeping with their own interests, career prospects and preferences. In that way we shall prevail in nurturing at the roots of our system, the national ideals of democracy, development, self-reliance, unity and social harmony.

This syllabus document is the outcome of a great deal of professional consultation and collaboration. On behalf of the Ministry, I wish to record my appreciation and thank sincerely those who contributed to and were involved in the production of this syllabus.



P. T. Ramatsui
Permanent Secretary
Ministry of Education

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The Curriculum Development Division served as secretariat to the Task Force.

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TABLE OF CONTENTS

Content	Page
Introduction	i
Rationale.....	i
Aims of Senior Secondary Programme	ii
Aims of Senior Secondary Agriculture Programme.....	ii
Recommended Teaching Methods	iii
Assessment Objectives	iii
Assessment.....	iv
General Agriculture	1
Crop Husbandry... ..	3
Ornamentals, Lawn Management and Landscaping.....	10
Livestock Husbandry	12
Crop and Livestock Improvement.....	16
Agricultural Economics	17
Agricultural Engineering.....	19

A. Introduction

The two-year Senior Secondary Agricultural Programme builds upon the foundation laid by the three-year Junior Secondary Agricultural Education Programme. This syllabus will impart to learners certain psychomotor, cognitive and affective skills, therefore preparing them for tertiary institutions and self-employment so as to be productive citizens of Botswana.

The major aim of this syllabus is to promote an appreciation of Agriculture as an Applied Science. It is offered under the optional group of creative, technical and vocational subjects.

The subject should be treated as **practically** as is possible. The teaching approach should be learner centered.

The syllabus content is divided into broad content areas subdivided into topics.. Each topic consists of general which give rise to specific objectives. The specific objectives describe what learners are expected to do. Instructional time for implementation of this syllabus is four (4) periods per week on a 40 period by 40 minute per week timetable.

B. Rationale

Agriculture as a subject is an applied science and art which deals with farming. It is a multi disciplinary subject that will let students acquire knowledge and understanding of crop and animal production and storage, processing and marketing of agricultural produce. The subject will help learners to explore and apply the Agricultural / Scientific knowledge, skills and attitudes acquired to address environmental, social and economic issues in their day to day lives. Students will gain appreciation of Agriculture as an applied science, and will learn through extensive practical experience the basic principles and skills of Agriculture.

Students will also develop the ability to apply scientific attitudes and methods through the study of General Agriculture, Crop Husbandry, Livestock Husbandry, Ornamentals and Lawn Management, Crop and Livestock Improvement, Agriculture Engineering and Agriculture Economics.

This course will stimulate positive attitudes to farming and demonstrate that it is a beneficial and rewarding occupation of much value to the community. Students will become aware of the contribution which improved Agricultural practice can make to the problems of famine and undernourishment in Botswana. They will be equipped to take a resourceful approach to the opportunities and problems presented by Agriculture.

The people of Botswana need to be equipped with appropriate skills on food production for the country to be placed on a sound food security basis and therefore ensuring self-sufficiency.

At the end of the course, students should have acquired effective ways of being self sufficient within the prevailing climate and soil conditions, while at the same time protecting the environment.

C. Aims of Senior Secondary Programme

On completion of the two year secondary programme learners should have: -

1. acquired knowledge, developed confidence and ability to assess their personal strengths and weaknesses and be realistic in choosing appropriate career/employment opportunities and/or further education and training.
2. developed skills to assist them in solving technical and technological problems as they relate to day-to-day life situations.
3. developed desirable attitudes and behavioural patterns in interacting with the environment in a manner that is protective, preserving and nurturing.
4. acquired attitudes and values, developed basic skills and understanding to allow for execution of rights and responsibilities as good citizens of Botswana and the world.
5. developed information technology skills as well as an understanding and appreciation of their influence in day-to-day activities.
6. acquired knowledge, attitudes and practices that will ensure good family and health practices, including awareness and management of epidemics (such as HIV/AIDS), that prepare them for productive life.
7. developed pre-vocational knowledge and manipulative skills that will enable them to apply content learnt and attitudes and values developed to practical life situations in the world of work.
8. developed an understanding of and acquired basic skills in business, everyday commercial transactions and entrepreneurship.
9. developed foundation skills such as problem solving, critical thinking, communication, inquiring, team work / interpersonal to help them to be productive and adaptive to survive in a changing environment.

D. Aims of Senior Secondary Agriculture

On completion of the two year Senior Secondary School Agriculture; learners should have;

1. developed appreciation of Agriculture as an applied science.
2. developed interest and awareness of existing problems and opportunities in Agriculture in the context of rural development.
3. acquired skills to demonstrate the value of Agriculture to the family, community and the national and world economies.
4. developed initiative, problem solving abilities and scientific methods so as to encourage a spirit of resourcefulness and self-reliance.
5. developed a desirable behavioural pattern and frame of mind in interacting with the environment in a manner that is protective, preserving and nurturing.
6. acquired business and entrepreneurial skills necessary to develop and manage an Agricultural project.
7. developed skills that are relevant to Agriculture that include objectivity, precision, initiative, experimentation and research.
8. acquired knowledge and understanding about the efficient use of available government assistance programmes aimed at Agricultural development in Botswana.
9. acquired knowledge and understanding of the recent technological developments in areas of food production, storage, processing and marketing to ensure food security.

E. Recommended teaching methods

This syllabus encourages a learner-centred approach as emphasised in the curriculum blueprint. Teachers should approach the teaching-learning process in a learner-centred way. This means that the teacher should use a variety of methods, which include inquiry, demonstration, practical work, project work, case studies, field trips, discussions and computer-guided learning. Teaching methods should expose learners to practical applications of Agriculture in everyday life. Learners should be presented with opportunities to do practical work. Learners will be taught common content and differentiation will be achieved by task and outcome.

F. Assessment Objectives

The following are the assessment objectives covered in Agriculture to be tested by the examination:

Dimension 1 Knowledge with understanding

Students should be able to demonstrate knowledge and understanding of Agriculture in this syllabus in relation to:

- correct use of language, terms, symbols, quantities and units:
- correct reference to facts, concepts, principles, patterns, models and theories:
- the techniques, procedures and principles of safe Agricultural practice.

Dimension 2 Handling information and solving problems

Students should be able to use written, symbolic, graphical and numerical information to:

- organise and present information from a variety of sources:
- translate information from one form to another:
- use information to report trends and draw conclusions:
- present reasoned explanations for observed facts:
- make predictions and propose hypotheses:
- solve problems of a quantitative and qualitative nature.

Dimension 3 Practical skills and techniques

Students should be able to:

- a) Identify problems and plan an investigation:
- b) Use and organise techniques, apparatus and materials:
- c) Handle experimental observations and data:
- d) Interpret and evaluate observations and experimental data:
- e) Maintain accurate physical and financial records on an enterprise:

G. Assessment Procedures

The Botswana Senior Secondary Agriculture syllabus will be assessed using a variety of continuous assessment instruments in order to ensure that learners attain the set objectives. School based assessment in the form of projects, tests, assignments will be used.

A terminal examination will be administered at the end of the course. Continuous assessment in the form of coursework will contribute to certification. Alternative papers to coursework will be used in cases where it is not possible to offer coursework. The details of assessment of this syllabus will be provided by the examining body, Examinations Research and Testing Division in the Assessment Syllabus.

MODULE ONE

GENERAL AGRICULTURE

Topic	General Objective	Specific Objective
	Students should be able to:	Students should be able to:
Trends of Agriculture	acquire knowledge and understanding of the transition from hunting and gathering to commercial farming	- identify the developmental stages from hunting and gathering through domestication, shifting cultivation, settled agriculture to commercial farming - discuss the above developmental stages and their impact on the environment
Environmental influences	Understand how crops and animals are affected by the environment	- define the following terms ; Temperature, Humidity, Wind, Rainfall, Drought, Frost and Photoperiodism - describe how the above affect growth of plants and animals. - measure the environmental factors of light, temperature, rain, wind and evaporation using appropriate instruments - state the effects of day length on plant growth - suggest ways of modifying the effects of environmental factors - describe the water cycle
Principles of land use	Know the different forms of land use and the land tenure systems	- describe the various forms of land use - interpret soil and land capability maps - discuss soil surveys as a tool for land capability classification - list the eight classes of the USDA land capability classification - describe their characteristics - deduce the use of each class - define land tenure - describe the land tenure systems of Freehold, Stateland and Communal land - describe leasehold and inheritance with respect to freehold, stateland and communal land - discuss the environmental effects of land tenure
Available government Agricultural programmes	Acquire knowledge on the available agricultural programmes which assist in developing agricultural projects	- list the programmes available from Government, private sector and NGO's 1.4.1.2 outline the uses of two of these programmes 1.4.1.3 state the requirements to qualify for a named programme

Agricultural technology	Acquire knowledge on Agricultural technology and it's evolution	- define Agricultural technology and give examples - trace the development of technology over time (traditional, intermediate, advanced and appropriate technology) - compare and contrast the different technologies - discuss the effectiveness of farming system as a technology transfer approach
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MODULE TWO

CROP HUSBANDRY

Topic	General Objective	Specific Objective
	Students should be able to:	Students should be able to:
SOIL SCIENCE- Soil Formation	Acquire knowledge on the principles of soil formation.	- define the term soil - state the three types of rocks, giving at least one example of each. - discuss how these types of rocks are formed - outline the characteristics of each type of rock - define weathering of rocks - explain physical, chemical and biological weathering of rocks - describe the factors influencing soil formation
Soil Constituents	Understand the concept of soil constituents	- list the four constituents of soil - define mineral matter and state its importance - define organic component of soil (living and non living) - define humus - describe formation of humus - list the sources of organic matter - state the importance of organic matter in the soil - discuss characteristics of types of soil water - define field capacity - state the importance of water in the soil - explain <u>THREE (3)</u> ways of conserving soil moisture - demonstrate capillarity in sandy loam and clay soils - discuss the composition of soil air - describe the importance of soil air - discuss living organisms found in the soil
Soil Profile	Acquire knowledge on the soil profile	- state the importance of a soil profile - identify a typical soil profile in terms of the topsoil, subsoil and underlying material (include sub horizon O and transitional horizons) - give characteristics of each horizon - explain the concepts of eluviation and illuviation

Soil Texture	Understand the concept of soil texture	- define the term soil texture - distinguish the different sizes of soil particles in terms of sand, silt and clay - determine the soil texture of a given soil by the feel, sieve OR sedimentation method - determine five textural classes of sand, clay, loam, silt and sandy loam using the soil textural triangle. - describe the chemical, biological and physical properties of sand, clay, silt, loam and sandy loam.
Soil Structure	Acquire knowledge on soil structure	- define soil structure - describe the structure and characteristics of the following types of soil structure: Prism-like, Block-like, Plate-like, Crumb and Granular structures - list the characteristics of the types of structures detailed above - explain the effects of structure on crops, including soil capping, soil pans and compaction - explain how soil structure can be destroyed - explain how soil structure can be improved
Soil pH	Understand the concept of soil pH	- define soil pH - outline effects of soil pH on plant growth - describe and carry out soil sampling - describe and carry out a simple test to determine soil pH - state the factors affecting soil pH - describe how soil pH can be regulated

Soil Fertility	Acquire skills on fertility management of soil	- define soil fertility - discuss the ten (10) major plant nutrients with reference to the uses of these nutrients on crops, signs of deficiency, sources and loss from the soil - draw and label the Nitrogen cycle - describe the processes of nitrification, ammonification, denitrification and nitrogen fixation - discuss any three minor nutrients with reference to use of the nutrient on the crop, signs of deficiency, and oversupply. - carry out qualitative testing of the three (3) major nutrients of Nitrogen, Phosphorus and Potassium in the soil - discuss organic and inorganic manures/ fertilizers - distinguish between organic and inorganic manures. - describe different methods of application of fertilizers, including timing of application. - calculate the nutrient content of a compound fertilizer {2:3:2 (22)}
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Principles of Plant Growth	Acquire knowledge on the principles of plant growth in relation to plant structure and physiological processes	- state the conditions necessary for plant growth - explain with the aid of a diagram the internal structure of a leaf, stem and root for a monocotyledonous and a dicotyledonous plant - state the functions of the parts identified above - discuss with the aid of a diagram the longitudinal section of a root - explain the concepts of Translocation, Diffusion, Osmosis, Transpiration, Respiration and Photosynthesis - demonstrate Osmosis, Transpiration and Diffusion - discuss food storage in plants - describe the types of reproduction in plants - define asexual reproduction - list the parts used for asexual propagation in plants - demonstrate any two of the following methods of plant propagation- grafting, cutting, budding OR layering - state how plants react to the adverse environmental conditions - identify from specimens and diagrams the structure of the flower of a maize or bean plant - describe the functions of various parts of the flower described in 2.2.1.12, in sexual reproduction - describe the mechanism of pollination in maize (wind pollination) and bean (insect pollination) - define fertilisation - describe the process of fertilization in a named plant, including seed and fruit formation - define tropism - explain the following tropic movements of plant parts: Geotropism, Haptotropism, Phototropism and Hydrotropism
CROP PRODUCTION- Land Preparation	Gain skills on the pre-planting activities carried out in a farm	- state the reasons for clearing and stumping a farm - explain methods of soil preparation by ploughing, discing and harrowing - describe the undesirable effects of deforestation

Main types of crops found locally	Acquire the necessary skills required to raise one vegetable and one field crop	- study practically <u>ONE</u> legume, fruit, root <u>OR</u> leafy vegetable from the list given in 2.3.1.3 below - study practically <u>ONE</u> field crop (maize, sorghum <u>OR</u> millet) • The selected vegetable <u>AND</u> field crop should be grown in the school and studied under the following objectives: a) soil and climatic requirements b) seed bed preparation c) sowing or planting time and method d) choice of suitable cultivars e) seed rate, spacing f) inorganic, organic manures and fertilizers and rates of application g) prevention and control of common pests, weeds and diseases h) recognition of crop maturity i) harvesting of yield and storage methods j) marketing k) uses of the crop and it's by products m) relevant legislation n) record keeping, including a diary of events o) production and financial records - The list of vegetable to choose from is as follows: • Root/Tuber-onion, beetroot, carrot, irish potato or sweet potato • Legume- green beans, green peas or cowpeas • Leafy vegetable- spinach, kale, cabbage, lettuce or rape • Fruit- Tomato, eggplant or green pepper - Only <u>ONE</u> vegetable from the above list should be selected, studied according to the above objectives and grown by the student.
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CROP PROTECTION-Weeds	Show understanding of the principles underlying crop protection.	- explain principles underlying crop protection - define weeds - explain the negative and positive effects of weeds on crops - identify four weeds found in Botswana - collect and preserve for display some local weeds found in Botswana (English common names and Scientific names to be used for identification) - state the different ways of classifying weeds as in length of growing period, morphology and method of dispersal - describe biological, cultural, mechanical and chemical weed control - discuss advantages and disadvantages of each of the weed control methods
Pests	Acquire knowledge on the common pests affecting crops and their control methods	- define pests - classify pests according to mode of feeding - identify at least one pest from each of the groups of pests of biting and chewing, piercing and sucking as well as boring pests. - identify and preserve for display local insects and other pests - describe <u>ONE</u> pest from each of the biting and chewing pests, piercing and sucking pests and boring pests , under the following objectives: a) life cycle b) method of control c) host crop d) damage caused to crops The list of pests to choose from is as follows: • Biting and chewing: grasshopper, loopers and locusts • Piercing and sucking: aphids, bagrada bug or mielie bug • Boring pests: stalkborer, weevil or american bollworm - discuss damage caused and control of nematodes and rodents

Diseases	Acquire knowledge on crop diseases, their modes of infection and control	- define a disease - classify, with examples, crop diseases on the basis of their causative agents - identify major diseases of economic crops (maize, sorghum, groundnuts) - describe the mode of infection, harmful effects, prevention and control of one plant disease from each of the Bacterial, Fungal and Viral diseases
Farm Chemicals-Pesticides	Acquire knowledge on the use of pesticides	- classify pesticides according to what they control - define contact, systemic, and stomach insecticides
Herbicides	Acquire knowledge on the various herbicides	- describe with examples selective herbicides and non selective herbicides
Use of farm chemicals	Acquire skills on the care and safe use of handling farm chemicals	- define active ingredients and inert material found in chemicals - discuss the formulation of farm chemicals with examples - demonstrate the proper use of a knapsack sprayer including it's calibration - explain how chemicals can be stored safely - describe the necessary precautions taken when handling farm chemicals to minimize pollution and poisoning - list possible environmental hazards of farm chemicals.

MODULE THREE:

ORNAMENTALS, LAWN MANAGEMENT AND LANDSCAPING

Topic	General Objective	Specific Objective
	Students should be able to:	Students should be able to:
Ornamentals	Acquire the required skills necessary to manage and grow ornamental crops	- identify two (2) plant species each for potting, bedding and flower cutting - choose only ONE form 3.1.1.1 and study practically - demonstrate the proper use of pots, seed beds and seed boxes including the importance of cleanliness of equipment as a precaution against disease - prepare potting soils using the appropriate material/ media - practice the following activities: pricking out of seedlings, timing of planting, transplanting , suitable spacing, apply suitable fertilizers - identify and demonstrate two methods of irrigation suitable for use in ornamental plants - state timing and the required frequency of irrigation - demonstrate the hardening of seedlings - discuss the control of one common pest and one common disease of ornamentals - discuss pruning and topiary of ornamentals - discuss the preparation and marketing of ornamentals
Lawn management	Acquire skills necessary to grow and manage lawns.	- define lawn - state the importance of lawns - explain the preparation of land into a tilth suitable for lawn - demonstrate proper use of fertilizers and manures - identify three species of lawn - demonstrate planting and the use of planting material for lawns - practice appropriate management of lawns in relation to timing of planting, weed control, mowing, edging, spiking, scarification, irrigation, pest and disease control - identify appropriate equipment for use in lawn management

Landscape Design	Show understanding and acquire skills on principles of landscape designing	- define landscaping - describe the different kinds of landscapes - explain the use of different materials in landscaping - describe the use of the various aspects of landscaping - explain the use of plant life in landscape design - describe the environmental impacts of landscape design - observe existing examples of built landscapes through the use of field trips
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MODULE FOUR:

LIVESTOCK HUSBANDRY

Topic	General Objective	Specific Objective
	Students should be able to:	Students should be able to:
Livestock Management	Understand essential aspects of livestock housing and general well being	- discuss the general principles of livestock management - outline reasons for housing livestock - describe type of housing needed for ONE type of livestock (broilers, layers, rabbits, cattle, sheep, goats or pigs) - describe qualities of a good house
	Understand the proper handling and stockmanship in livestock	- define stockmanship - explain stockmanship in the following areas for the livestock chosen in 4.1.1.3 above: a) animal handling b) record keeping c) rearing of young stock d) nutrition and feeding practices
	Know and understand livestock health and diseases	- describe characteristics of healthy animals - outline general methods of prevention of livestock diseases - classify coccidiosis, trypanosomiasis, fowl typhoid, tuberculosis, mastitis, botulism, anthrax, contagious abortus, foot and mouth, swine fever, newcastle, heartwater, rabies, rickets, piglet anaemia, aphosphorisis and contagious bovine pleuro pneumonia (CBPP) on the basis of causative agent and host animal(s) affected. - choose ONE disease from above and describe the etiology, symptoms, prevention and control of the disease. - classify round worms, tape worms, liver fluke, ticks, flies, mites, lice and tsetsefly into internal or external parasites. - describe the host, life cycle and control of ONE internal and ONE external parasite from 4.1.3.5 above

Anatomy and physiology	Acquire understanding of the farm animal anatomy and physiology of digestion and reproduction	- describe the digestion of a ruminant and non-ruminant animal including enzymatic action. - describe structure and function of the male and female reproductive systems of cattle and chickens - specify at least four signs of heat in a cow - state the relevance of signs of heat for breeding - describe oestrous cycle of a cow - state the relationship between oestrous cycle and pregnancy - state the roles of oestrogen, progesterone, follicle stimulating hormone, corpus luteum, leutinising hormone and testosterone in the reproductive system of a ruminant
Game farming	Acquire skills on the principles of game farming	- define game farming - name at least five game animals - outline feeding habits of the different types of animals found with respect to grazers, browsers and scavengers - explain at least four importance's of game farming - outline efforts by government towards game farming development in Botswana - outline the legislative measures ensuring sustainable use of game, especially endangered species
Range and Pasture Management	Acquire an understanding of range and pasture management principles	- explain the concepts of range, pasture rangeland, and range/pasture management - state the factors affecting range management in Botswana - describe the types of natural vegetation found in Botswana with reference to grass and woody plant species - describe the composition of rangelands - identify at least five range plants - suggest ways by which destruction of range and rangelands can be avoided

Extensive range management	Acquire skills and knowledge on Extensive Range Management	- outline the characteristics of extensive management methods including the advantages and disadvantages - explain the use of indigenous plants to increase range productivity - explain the concepts of forage, stocking rate, carrying capacity, overstocking, overgrazing, mixed species grazing, grazing, decreasesers, increasers and invaders - calculate the stocking rate and carrying capacity of a given range land
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Intensive pasture management	Acquire knowledge and skills on Intensive Pasture Management	- explain at least FOUR (4) ways of improving range and pasture utilization - state the advantages and disadvantages of creep, rotational, strip and zero grazing. - describe ways in which fodder crops can be preserved for future use - describe pasture improvement practices - outline the causes of range and pasture deterioration - name at least TWO (2) poisonous plants found in Botswana - explain ways in which man can destroy range lands. - describe one grass and one legume species from the list given, under the following objectives: a) form and habit of growth b) soil and climatic requirements c) persistence (length of growth) d) fertilizer treatment e) planting time and method f) nutritional value The list of grasses and legumes to choose from is as follows: Grasses: 1. <i>Chloris gayana</i> (Rhodes grass) 2. <i>Kikuyu</i> 3. <i>Panicum maximum</i> (Guinea grass) 4. <i>Eragrostis curvula</i> (Weeping love grass) 5. <i>Eragrostis lemanniana</i> 6. <i>Eragrostis terf</i> 7. <i>Hyparrhenia sp</i> (Thatching grass) 8. <i>Cynodon dactylon</i> (Couch grass) 9. <i>Cenchrus ciliaris</i> (Buffel grass) Legumes: <i>Stylosanthes gracilis</i> <i>Medicago sativa</i> (Lucerne) <i>Leucaena leucephala</i> <i>Sesbania sp</i> <i>Lablab purpureum</i>
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MODULE FIVE:

CROP AND LIVESTOCK IMPROVEMENT

Topic	General Objective	Specific Objective
	Students should be able to:	Students should be able to:
Genetics	Acquire knowledge on the principles of genetic monohybrid inheritance	- define Genetics - define the terms: chromosomes, alleles, gene, homozygous, heterozygous, dominant, recessive, complete dominance and co-dominance - identify chromosomes, alleles and genes in a cell from a given diagram - describe meiosis and mitosis (specification of stages not required) - distinguish between phenotype and genotype - calculate and predict the results of a simple genetic cross involving 1:1 and 3:1 ratios - explain variation in terms of genetic and environmental factors
Breeding	Acquire knowledge on the reasons and importance of breeding and the different methods or types of breeding	- define breeding - explain the importance of breeding - describe cross-breeding, inbreeding, selection and upgrading - state the advantages and disadvantages of each - describe hybridization in plants and animals
Biotechnology	Appreciate biotechnology as an approach to crop and livestock improvement	- define biotechnology and genetic engineering - list at least <u>FIVE (5)</u> examples of Biotechnology - describe one example of Biotechnology as it applies to Agriculture. - state advantages and disadvantages of the use of Biotechnology in Agriculture

MODULE SIX:

AGRICULTURAL ECONOMICS

Topic	General Objective	Specific Objective
	Students should be able to:	Students should be able to:
Principles of Agricultural Economics	6.1.1 Understand the general principles of economics	- define the terms Agricultural Economics, demand, supply, and diminishing returns - describe the following: a) factors of production b) law of demand c) demand determination d) law of supply e) supply determination f) elasticity of demand and supply g) law of diminishing returns h) opportunity costs - describe price and its determination - distinguish between risk and uncertainty - list examples of risk and uncertainty
	6.1.2 Understand the concepts and uses of production and financial records	- state advantages of keeping farm records - differentiate between production and financial records - state the types of production records - state the types of financial records - define variable costs, fixed costs, total costs, total returns and depreciation - determine profit and loss of an enterprise and gross margin - prepare a balance sheet - prepare gross margin of an enterprise
Planning and Budgeting	6.2.1 Acquire skills on principles and practices of planning and budgeting	- define budgeting - explain the purpose of a farm budget - discuss partial and complete budgets - select the inputs required - estimate the cost of inputs and the expected returns - identify places where the material resources can be obtained - prepare partial and complete budgets
Project Appraisal	6.3.1 Acquire skills on project appraisal and why it has to be done	- define project appraisal - explain the need for appraisal - evaluate the goals of a project proposal - determine the viability of a project

Agro-business and entrepreneurship	6.4.1 Develop skills on the setting up and operation of an Agro-business	- list skills and resources necessary to start an Agro-business enterprise - discuss the common forms of business organisation of sole proprietorship, partnership and company - explain why businesses prepare businesses plans - describe the content of a business plan - explain capital, shares, financing a company and the organisational structure of a business - discuss financial assistance programmes which help in setting up agro-businesses
Marketing	6.5.1 Acquire skills on the different aspects of marketing	- explain marketing - discuss marketing related activities - explain market research and it's importance - explore different Agricultural products in the market and choose one (1) product to do a market research on - explain why businesses advertise - identify strategies used in promotion of sales

MODULE SEVEN:

AGRICULTURAL ENGINEERING

Topic	General Objective	Specific Objective
	Students should be able to:	Students should be able to:
Introduction to Agriculture Engineering	7.1.1 Acquire knowledge and understanding of Agricultural Engineering	- define Agricultural Engineering - state at least 4 importance's of Agricultural Engineering
Drainage	7.2.1 Acquire knowledge on drainage problems and how to solve them	- define drainage - describe advantages and disadvantages of drainage - explain the effect of waterlogged soils on crops - describe with diagrams methods used to drain soil
Irrigation	7.3.1 Acquire knowledge on Irrigation, it's effects on crops and various methods used	- define irrigation - state effects of irrigation on crop yield and quality - explain ONE type of irrigation from each of the following irrigation systems: a) Surface irrigation b) Subsurface irrigation c) Overhead irrigation - At least one method of irrigation should be set up and be in operation in the school.
Fencing	7.4.1 Acquire knowledge on the need for fencing as well as basic skills on fence construction	- state reasons for fencing - state the right types of fences for different purposes - list available materials for construction of fences - state the advantages and disadvantages of each material used - explain methods of treating fence posts - describe stages in the construction of a wire fence - draw the structure of a standard cattle wire fence, showing all features - demonstrate the construction of a corner

Farm roads and buildings	7.5.1 Appreciate the need for construction and maintenance of farm roads and buildings	- state the importance of farm roads - state the factors considered when siting farm roads - state materials used in earth road construction - describe construction of an earth road, with reference to grading, drainage and grids - describe the necessary road maintenance activities - explain factors considered when choosing a site for a farm building - explain importance of farm buildings - list materials required for construction of foundation, floor, wall and roof - state the advantages and disadvantages of each material used for farm buildings - describe with the aid of labelled diagrams the essential features of a building suitable for <u>ONE</u> stated farm purpose (storage, processing, housing for a named animal, farm workshop, tool room or any building in a farm) - explain regular maintenance of the selected building
Animal handling facilities	7.6.1 Acquire knowledge on crushes, pray races and a dip tank	- state importance of crushes - describe types of crushes - list at least five types of materials suitable for constructing crushes - describe the operation of a dip tank and spray race - state the advantages and disadvantages of using a dip tank and a spray race
Farm water supplies	7.7.1 Acquire knowledge on the various sources of water in the farm	- list at least five various sources of water in the farm - explain at least one method of treating farm water - explain at least three methods of farm water storage - describe with labelled diagrams the structure of an earth dam

Farm tools, implements and machinery	7.8.1 Understand the principles of operation and care of farm machinery	- differentiate farm tools, implements and machinery - identify parts of a knapsack sprayer - dismantle and reassemble a knapsack sprayer - wash and disinfect farm equipment and structures - explain with the aid of diagrams the mode of operation of a 4-stroke petrol and diesel engines - differentiate between petrol and diesel engines - describe: a) lubrication system of a 4-stroke engine AND b) electrical system of a petrol engine AND c) water cooling system of engines - list the necessary routine checks before and during operation of a tractor
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