



Republic of Zambia

MINISTRY OF EDUCATION, SCIENCE, VOCATIONAL, TRAINING AND EARLY EDUCATION

AGRICULTURAL SCIENCE SYLLABUS GRADES 10 – 12



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VISION

Quality, life-long education for all which is accessible, inclusive and relevant to individual, national and global needs and value systems.

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Preface

The syllabus was produced as a result of the Curriculum review process carried out by the Ministry of Education, Science, Vocational Training and Early Education under the auspices of the Curriculum Development Centre (CDC). The curriculum reform process started way back in 1999 when the Ministry of Education commissioned five (5) curriculum studies which were conducted by the University of Zambia. These studies were followed by a review of the lower and middle basic and primary teacher education curriculum. In 2005 the upper basic education National survey was conducted and information from learners, parents, teachers, school managers, educational administrators, tertiary institutions traditional leader's civic leaders and various stakeholders in education was collected to help design a relevant curriculum.

The recommendations provided by various stakeholders during the Upper Basic Education National survey of 2005 and National symposium on curriculum held in June 2009 guided the review process.

The review was necessitated by the need to provide an education system that would not only incorporate latest social, economic, technological and political developments but also equip learners with vital knowledge, skills and values that are necessary to contribute to the attainment of Vision 2030.

The syllabus has been reviewed in line with the Outcome Based Education principles which seek to link education to real life experiences that give learners skills to access, criticize analyze and practically apply knowledge that help them gain life skills. Its competences and general outcomes are the expected outcomes to be attained by the learners through the acquisition of knowledge, skills, techniques and values which are very important for the total development of the individual and the nation as a whole.

Effective implementation of Outcome Based Education requires that the following principles be observed: clarity of focus, Reflective designing, setting high expectations for all learners and appropriate opportunities.

It is my sincere hope that this Outcome Based syllabus will greatly improve the quality of education provided at Grade 8 and 9 as defined and recommended in various policy documents including Educating Our Future`1996 and the `Zambia Education Curriculum Framework `2013.

Chishimba Nkocha
Permanent Secretary

MINISTRY OF EDUCATION, SCIENCE, VOCATIONAL, TRAINING AND EARLY EDUCATION.

Acknowledgements

The syllabus presented here is a result of broad-based consultation involving several stakeholders within and outside the education system.

Many individuals, institutions and organizations were consulted to gather their views on the existing syllabus and to accord them an opportunity to make suggestions for the new syllabus. The Ministry of Education wishes to express heartfelt gratitude to all those who participated for their valuable contributions, which resulted in the development of this syllabus.

The Curriculum Development Centre worked closely with other sister departments and institutions to create this document. We sincerely thank the Directorate of Teacher Education and Specialized Services, the Directorate of Planning and Information, the Directorate of Human Resource and Administration, the Directorate of Open and Distance Education, the Examinations Council of Zambia, the University of Zambia, the Natural Resources Development College (NRDC), schools and other institutions too numerous to mention, for their steadfast support.

We pay special tribute to co-operating partners especially JICA in collaboration with Hiroshima University and UNICEF for rendering financial and technical support in the production of the syllabus.

C.N.M Sakala (Mrs.)

Director-Standard and Curriculum

MINISTRY OF EDUCATION, SCIENCE, VOCATIONAL TRAINING AND EARLY EDUCATION

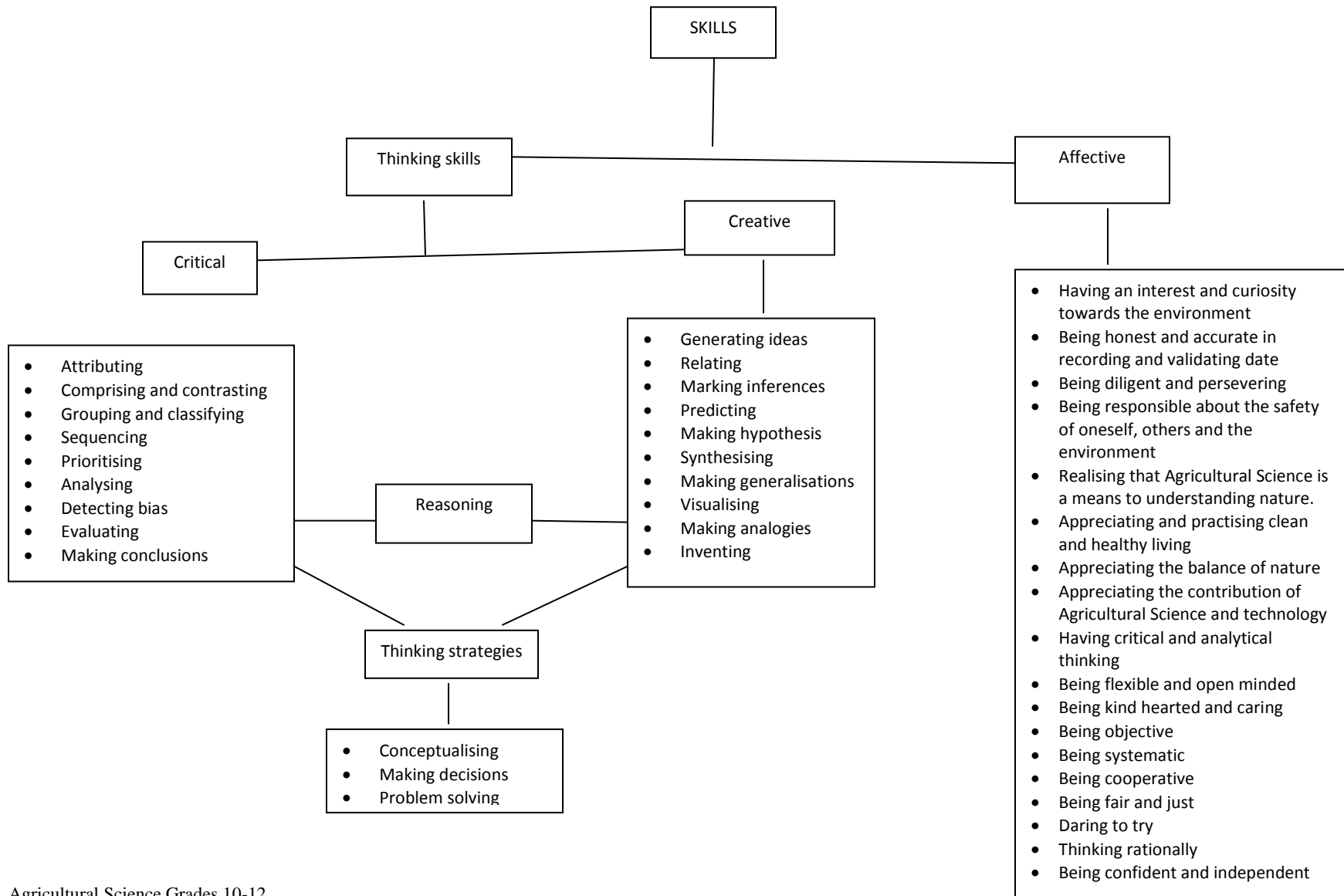
Introduction

Agricultural Science includes cross-cutting issues such as Environment, Reproductive Health, HIV and AIDS, Hygiene, Nutrition, Substance Abuse, Water and Sanitation.

Methodology

The success of Agricultural Science can be achieved by maximum participation by learners. This subject, that enhances creativity, analysis, problem-solving and an investigative approach, can be taught effectively using a variety of methods (techniques) both in the classroom and outside. It is advisable that these are integrated however, possible. Learners are expected to conduct experiments, study tours, field work and project work.

Through this syllabus the learners are required to acquire knowledge, values and develop positive attitudes and skills.



Manipulative Skills

These enable learners to:

- Use and handle Agricultural Science apparatus and materials correctly;
- Handle specimens correctly and carefully;
- Draw specimens, apparatus and substances accurately;
- Clean apparatus correctly;
- Store apparatus, tools and substances correctly and safely
- Store apparatus, tools and substances correctly and safely.

This syllabus therefore:

1. promotes an appreciation of Agricultural Science as an applied science;
2. demonstrates the value of Agriculture to the family and the community, so as to show that improved Agriculture can contribute to the World-wide Campaign for freedom from hunger;
3. encourages the teaching, in a practical manner, of basic principles and skills in Agriculture and of efficient farm business management.
4. stimulate an interest in, and create an awareness of, existing problems and opportunities in farming;
5. develops initiative, problem-solving abilities, scientific methods and self-education so as to encourage resourcefulness and self-reliance;
6. provides a basis, together with the basic Sciences and Mathematics, for more advanced studies in Agriculture or for becoming a self-supporting worker;
7. stimulating positive attitudes by showing that efficient farming can be both a profitable and rewarding occupation; and
8. develops positive attitudes towards Zambia's natural resources so as to conserve and use them sustainably.

These will be achieved by enabling learners to demonstrate the following competences:

1. Knowledge with understanding

- use of terms, symbols, quantities and units of measure;
- reference to facts, concepts and principles;

2. Ideas and information – handling information (writing, graphs, diagrams, tables etc.)

- (i) organise and present information from various sources;

- (ii) present information given in one form (numerical data) in another form (graph);
- (iii) use information to observe trends and draw conclusions.
 - **Solving problems** – use knowledge to:
 - (i) present explanations for observed facts, and notice connections between them;
 - (ii) make predictions based on observations; and
 - (iii) solve problems.

3. Practical activities

- (i) following instructions;
- (ii) choosing suitable techniques, equipment and materials;
- (iii) using equipment and materials safely and correctly;
- (iv) making and recording observations, measurements and estimates.

- **Investigations**

- (i) identify problems and plan an investigation;
- (ii) organise and carry out an investigation in a systematic way;
- (iii) interpret and evaluate observations and experimental data;
- (iv) evaluate methods and suggest improvements.

- **Skills and techniques in livestock production**

- (i) handling a single/group of farm animals in a safe and correct manner;
- (ii) maintaining the health of farm animals;
- (iii) calculating maintenance and production rations of farm animals;
- (iv) planning, managing and implementing a feeding programme for the life-cycle of a farm animals;
- (v) identifying breeds and types of animals;
- (vi) marketing farm animals and their products;
- (vii) maintaining accurate physical and financial records on an enterprise.

- **Skills and techniques in crop production**

- (i) identifying cultivars and varieties of crops;
- (ii) calculating fertiliser/manure requirements of a crop and estimate crop yield;
- (iii) planning, implementing and managing a cropping programme;
- (iv) harvesting and marketing a crop; and
- (v) maintaining accurate physical and financial records on a crop enterprise.

Each unit of this syllabus is introduced with a list of specific outcomes that are an interpretation of the general outcome for each of the units. These specific outcomes are included and each of them states what the learner should do during and after the course. Therefore, the content of this syllabus is described in terms of learner performance and gives further guidance on what is expected of the learners at each stage of the unit.

Furthermore, during the study of Agricultural Science, many opportunities will arise for quantitative work including appropriate calculations. The mathematical requirements that are likely to be encountered are listed below:

- add, subtract, multiply and divide whole numbers;
- recognise and use expressions in decimal form;
- make approximations and estimates to obtain reasonable answers;
- undertake measurement of triangles, rectangles and cuboids;
- understand and use averages;
- read, interpret and draw simple inferences from tables and statistical diagrams;
- find fractions or percentages of quantities;
- construct and interpret pie charts;
- construct bar charts;
- interpret and use graphs;
- plot graphs from data provided, given the axes and scales;
- select appropriate axes and scales for graph plotting.

Each unit of this syllabus is introduced with a list of specific outcomes that are an interpretation of the general outcomes for each of the units. These specific outcomes are included and each of them states what the learner should do during and after the course. Therefore, the content of this syllabus is described in terms of learner performance and gives further guidance on what is expected of the learners at each stage of the unit.

Organisation

The materials in this syllabus have been selected from all major areas of Agriculture. It is divided into nine units. At the end of the course the learners should be able to demonstrate an achievement of the general outcomes of learning Agricultural Science at this level.

Assessment

Continuous assessment will be emphasised by using various methods of testing according to topics and themes at various levels. The examinations council of Zambia will prepare detailed procedures on how continuous assessment will be conducted by the teachers. The examination council will also develop examination syllabus to provide teachers with guidelines on the objectives to be tested. The scheme of assessment will consist of school based assessment and final examination that will be conducted by the examinations council of Zambia.

School based assessment will be in the form of tests. Tests will be in the form of diagnostic, aptitude, achievement, oral, practice attitude and performance, learners.

Time and Period allocation

Time allocation for this syllabus will require at least six-40 minutes periods per week

Learners will be required to use the knowledge, skills and understanding specified by this syllabus to plan and carry out investigations in which they:

- ask questions, plan, predict and hypothesise;
- observe, measure and record;
- interpret their results and evaluate evidence;
- follow instructions accurately for the safe conduct of experiments and practical tasks.

Furthermore, the following practical skills should be achieved. The learner should be able to:

- follow written, diagrammatic or oral instructions to perform a single practical operation;
- use familiar apparatus and materials adequately, needing reminders on points of practice and safety;

- use familiar apparatus, materials and techniques adequately and safely;
- follow written, diagrammatic or oral instructions to perform a task involving a series of practical operations where there may be a need to modify or adjust one step in the light of the effect of a previous step; and
- use familiar apparatus, materials and techniques with due care and attention for the crop or animal safety, correctly and methodically;

Finally, each school should incorporate as much practical work as possible into their scheme of work and lesson plans, although this need not necessarily be confined to areas covered by the syllabus. It is imperative that practical work remains a method of teaching that should be encouraged in schools. However, it is important that teachers, assess and record skills that are learned during practical work.

Crops and livestock to be studied

Learners should also study crops and animals from the following groups:

Crops

Group 1 Cereals	Group 2 Oil seed	Group 3 Tubers	Group 4 Vegetables	Group 5 Fruits	Group 6 Miscellaneous	Group 7 Beverages
rice millet sorghum wheat	soya beans sunflower	cassava carrots sweet potatoes irish potatoes	cabbage beans onions tomatoes melons pumpkins okra cucumber	pawpaw avocado peaches bananas apples guavas pineapples	cotton sugarcane sisal caster oil kenaf	tea coffee

Livestock

Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
sheep goats	rabbits	pigs	ducks turkeys	fish	bees

A. Grade 10

Crops

Two crops must be studied:

- maize; and
- groundnuts.

Livestock

Two types of animals must be studied:

- Cattle (Beef and Dairy)
- Chicken (broilers or Layers)

B. Grade 11

Crops

Two crops should be studied, each crop should be chosen from a different group.

Group 1 Cereals	Group 2 Oil seed	Group 3 Tubers	Group 4 Vegetables	Group 5 Fruits	Group 6 Miscellaneous	Group 7 Beverages
sorghum wheat	soya beans	cassava carrots sweet potatoes	cabbage beans onions tomatoes	paw paws avocado peaches bananas	cotton sugarcane	tea

Livestock

Two types of animals should be studied from the groups in the table. The chosen animals should not come from the same group.

Group 1	Group 2	Group 4	Group 6
sheep	rabbits	ducks	bees

C. Grade 12

Crops

One crop should be studied and should not come from the groups from which the previous crops studied were taken.

Group 1 Cereals	Group 2 Oil seed	Group 3 Tubers	Group 4 Vegetables	Group 5 Fruits	Group 6 Miscellaneous	Group 7 Beverages
rice millet	sunflower	irish potatoes	melons pumpkins okra cucumber	guavas pineapples	caster oil kenaf	coffee

Livestock

One animal should be studied and should not come from the groups from which the previous animals studied were taken.

Group 1	Group 3	Group 4	Group 5
goats	pigs	turkeys	fish

GRADE 10

General Outcomes	Key Competences
<ul style="list-style-type: none">• Demonstrate an understanding of Agriculture in Zambia.• Develop investigative skills• Recognise the importance of soil management for sustainable crop production• Develop investigative skills• Develop knowledge of crops and their sustainable production.• Develop investigative skills.• Demonstrate knowledge and understanding of the importance of plants and the need for their sustainable utilisation.• Develop knowledge and understanding of conservation farming• Develop knowledge of livestock and their production.• Acquire knowledge for farms structures and maintenance.• Acquire knowledge of farm machinery and maintenance.• Acquire knowledge and understanding of farm management.	<ul style="list-style-type: none">• Show ability to propagate crops using vegetative methods• Demonstrate the ability to sow and grow legumes and cereals• Demonstrate the different methods of applying fertilisers to crops Establish and manage an apiary.• Demonstrate the ability to Establish and manage an apiary.

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
10.1 AGRICULTURE IN ZAMBIA	10.1.1 Importance of Agriculture	10.1.1.1 State the importance of agriculture. 10.1.1.2 Classify agriculture as an applied science or as a technology. 10.1.1.3 Explain why the knowledge and skills of people trained in agriculture are needed.	<ul style="list-style-type: none"> • Food security, raw materials • E.g. Ranching, artificial insemination, crop rotation • High production, quality produce and environmental sustainability. 	<ul style="list-style-type: none"> • Analysing the importance of agriculture • Classifying agriculture as an applied science or as a technology. 	<ul style="list-style-type: none"> • Appreciating the importance of agriculture. • Cooperating in groups.
	10.1.2 Importance of the Farmer	10.1.2.1 Explain the importance of a farmer in a nation.	<ul style="list-style-type: none"> • Importance of a farmer: Food production, economical development, foreign exchange 	<ul style="list-style-type: none"> • Evaluating the importance of a farmer in a nation. 	<ul style="list-style-type: none"> • Appreciating the farmer.

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
	10.1.3 Environmental Influences of Agriculture.	10.1.3.1 Explain the Agro-ecological zones of Zambia. 10.1.3.2 State the duration of rainfall in Zambia. 10.1.3.3 Describe the annual rainfall for each of the Agro-ecological zones of Zambia. 10.1.3.4 Describe the mean annual temperatures of the three Agro-ecological zones in Zambia. 10.1.3.5 Explain the importance of day length to crop growth. 10.1.3.6 Classify crops according to day length. 10.1.3.7 State rainfall and temperature requirements of crops.	<ul style="list-style-type: none"> • Three Agro-ecological zones of Zambia. • Duration of rainfall in Zambia. • Annual rainfall for Agro-ecological zones • Mean annual temperatures in the Agro-ecological zones of Zambia. • Day length and crop growth. • Classification of crops according to length of day. • Rainfall and temperature requirements of crops. 	<ul style="list-style-type: none"> • Identifying the agro-ecological zones of Zambia. • Analysing the importance of day length to crop growth. • Classifying crops according to day length. • Communicating rainfall and temperature requirements for crops. 	<ul style="list-style-type: none"> • Cooperating in groups. • Being aware the effects of different ecological zones on the choice of crops to be grown.

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
10.2 SOIL SCIENCE	10.2.1 Types of rocks and minerals.	10.2.1.1 Identify different types of rocks. 10.2.1.2 List some minerals found in different rocks.	<ul style="list-style-type: none"> • Sedimentary, igneous and metamorphic rocks • E.g. potassium, phosphorus, iron, calcium. 	<ul style="list-style-type: none"> • Analysing the mineral content of different rocks. • Identifying different types of rocks. 	<ul style="list-style-type: none"> • Being aware of the types of rocks and their mineral composition.
	10.2.2 Soil Formation and Weathering	10.2.2.1 Describe soil formation from parent rocks. 10.2.2.2 Explain the effects of weathering.	<ul style="list-style-type: none"> • Soil formation: Refer to Chemical, physical and biological weathering • Effects of weathering: Release of minerals into soil 	<ul style="list-style-type: none"> • Analysing types of weathering. • Communicating the effects of weathering 	<ul style="list-style-type: none"> • Appreciating types of weathering. • Asking questions for more understanding

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
10.3 CROP PRODUCTION	10.3.1 Crop Plants	10.3.1.1 Identify different types of crop	Types of crop: Annuals, biennials and perennials crops (Include the characteristics of the crops)	<ul style="list-style-type: none"> Classifying crops as annuals, biennials and perennial 	<ul style="list-style-type: none"> Cooperating in groups. Developing curiosity and interest in different crops.
	10.3.2 External and Internal Morphology of Plants.	10.3.2.1 Describe the external and internal morphology of plants. 10.3.2.2 Relate the structure of the parts of the crop to their functions.	<ul style="list-style-type: none"> External and internal morphology of plants: refer to roots, stems and leaves of monocots and dicots. Roots: Absorption of nutrients, water, storage, anchorage. Stems: conduct nutrients, water, dissolved salts. Leaves: Photosynthesis, diffusion of gases, transpiration 	<ul style="list-style-type: none"> Identifying the internal and external structures of plant. Relating the functions of different parts to the structures 	<ul style="list-style-type: none"> Being aware of the differences in structures and functions of plant parts.
	10.3.3 The Flower and Pollination	10.3.3.1 Describe the functions of parts of a flower. 10.3.3.2 Identify parts of a seed. 10.3.3.3 Explain the advantages and disadvantages of using hybrid seeds.	<ul style="list-style-type: none"> Functions of parts of a flower: Refer to functions of stamens and carpels. Parts of a seed: Plumule, radical, testa, micropile, cotyledon Advantages: crop yield, resistance to pests. Disadvantages: pesticide residues, modified genes might get into the wild. 	<ul style="list-style-type: none"> Observing parts of a flower. Observing parts of a seed. Evaluating the advantages and disadvantages of hybrid seeds 	<ul style="list-style-type: none"> Being aware of the differences in structure and functions of flower parts. Cooperating in groups. Developing curiosity in hybrid seeds.

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
	10.3.4 Vegetative Propagation	10.3.4.1 Describe different methods of vegetative propagation. 10.3.4.2 Demonstrate vegetative propagation of different crops.	<ul style="list-style-type: none"> E.g. Cutting, tissue culture and Grafting(Artificial);Stolons, rhizomes, Bulbs and Corms(Natural) E.g. cassava, onions, strawberry, potatoes Advantages and disadvantages of vegetative propagation 	<ul style="list-style-type: none"> Demonstrating vegetative propagation of different crop. 	<ul style="list-style-type: none"> Appreciating different methods of vegetative propagation.
	10.3.5 Distribution of Crops	10.3.5.1 Explain the difficulties limiting the growing of certain crops in some parts of Zambia. 10.3.5.2 Compare the climatic requirements of various Crops. 10.3.5.3 Describe the characteristics of soil suitable for the production of crops. 10.3.5.4 Explain the factors affecting crop growth. 10.3.5.5 Grow the crops studied.	<ul style="list-style-type: none"> Refer to climate, soils, demand for crops for food and cash Refer to rainfall, temperature and wind Physical and chemical characteristics of soils(tilth, mineral content, depth of roots of plant) Factors: Light, water, air, temperature, altitude Growing the crops studied: Land preparation, sowing the seed, application of fertilisers, harvesting 	<ul style="list-style-type: none"> Analysing the difficulties limiting the growing of certain crops in some parts of Zambia. Comparing the climatic requirements of various crops. Demonstrating the growing of crops studied Observing the growth of the crop. 	<ul style="list-style-type: none"> Cooperating in groups. Appreciating the factors affecting crop growth.

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
	10.3.6 Seed Planting	<p>10.3.6.1 Describe the process of land preparation for crop production.</p> <p>10.3.6.2 Identify conditions necessary for germination of seeds.</p> <p>10.3.6.3 Prepare seedbeds suitable for germination of seeds.</p> <p>10.3.6.4 Practice planting for the crop studied</p> <p>10.3.6.5 Practice crop rotation.</p>	<ul style="list-style-type: none"> • Land preparation: Clearing the site, spreading manure, burying weeds, digging • Conditions for germination: Temperature, water and air • Preparation of seedbeds. • Sowing/planting a cereal and legume • Crop rotation of cereals and legumes 	<ul style="list-style-type: none"> • Demonstrating the process of land preparation for crop production. • Investigating condition necessary for seed germination. 	<ul style="list-style-type: none"> • Being aware of the conditions necessary for seed germination. • Appreciating the conditions necessary for seed germination.
	10.3.7 Fertiliser application	<p>10.3.7.1 Describe the different methods of applying fertilisers for crops studied</p> <p>10.3.7.2 Calculate the quantity of fertiliser for crops studied.</p> <p>10.3.7.3 State the particular types of fertilisers recommended for crops.</p> <p>10.3.7.4 Explain the effect of fertiliser on the environment.</p> <p>10.3.7.5 Explain how to minimise negative effects of fertilisers on the</p>	<ul style="list-style-type: none"> • E.g. Broadcasting, band placement, ring method. • Quantities of fertilisers for crops. • Fertilisers containing NPK in the right proportions as recommended by National Standards e.g. ZABS. • Effects: Eutrophication, soil acidity, leaching • Minimising effects of 	<ul style="list-style-type: none"> • Identifying the methods of applying fertilisers for crops studied. • Calculating the quantities of fertiliser for crops studied. • Analysing the effects of fertiliser on the environment. <p>Applying organic farming in order to minimise the effects</p>	<ul style="list-style-type: none"> • Cooperating in groups. • Being aware of the types of fertiliser used in crop production. • Being aware of the effect of fertilisers on the environment. • Appreciating

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
		environment.	fertilisers: Refer to organic farming	of inorganic fertilisers on the environment.	organic farming
	10.3.8 Weed control	<p>10.3.8.1 Identify various methods of weed control in the crops studied.</p> <p>10.3.8.2 Describe ways in which different chemicals control weeds in the crops studied.</p> <p>10.3.8.3 state the advantages and disadvantages of using herbicides and mechanical weed control.</p> <p>10.3.8.4 Identify the negative effects of herbicides on the environment.</p> <p>10.3.8.5 Explain how to minimise negative effects of herbicides on the environment.</p>	<ul style="list-style-type: none"> • Weed control: Mechanical and Chemical methods • Selective and Non-selective herbicides; systemic and contact herbicides • Advantages and disadvantages of using herbicides and mechanical weed control. • Negative effects of herbicides on the environment: E.g. killing organisms, affect natural balance of organisms, • Refer to organic farming 	<ul style="list-style-type: none"> • Identifying various methods of weed control. • Analysing ways in which different chemicals control weeds. • Identifying the negative effects of herbicides on the environment. • Problem Solving • Analysing the advantages and disadvantages of chemical and mechanical weed control. 	<ul style="list-style-type: none"> • Being aware of the advantages and disadvantages of chemical and mechanical weed control.
	10.3.9 Pests and Diseases of Crops	<p>10.3.9.1 State the characteristics of common pests of crops.</p> <p>10.3.9.2 Identify signs of pest attack in crops.</p> <p>10.3.9.3 Identify signs of disease attack on crops.</p>	<ul style="list-style-type: none"> • Refer to mobility, mouth parts, reproductive cycle, and metamorphosis. • Signs of pest attack in crops. • Signs of common diseases (Rust of maize, Leaf spot in groundnuts) 	<ul style="list-style-type: none"> • Analysing the characteristics of common pests of crops. • Identifying signs of attack by diseases and pests. 	<ul style="list-style-type: none"> • Being aware of signs of diseases and pest attack. • Caring for the crops.

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
	10.3.10 Prevention and Control of Pests on Crops.	10.3.10.1 Describe the life cycle of one insect that carries crop/plant diseases. 10.3.10.2 Describe various methods of preventing and controlling pests and diseases on crops. 10.3.10.3 State advantages and disadvantages of biological pest control.	<ul style="list-style-type: none"> • Life history of insect (Aphids, mealy bug, banana borer) • Pesticides and fungicides • Preventive measures of pests. • Advantages and disadvantages of biological pest control. 	<ul style="list-style-type: none"> • Analysing the life cycle of an insect carrier of crop diseases. • Identifying various methods of preventing and controlling diseases and pests. 	<ul style="list-style-type: none"> • Being aware of the life cycle of an insect carrier of plant diseases. • Caring for crops.
	10.3.11 Harvesting	10.3.11.1 Identify crops that are ready for harvesting. 10.3.11.2 Harvesting the crop studied correctly. 10.3.11.3 Describe various methods of storing the crop studied.	<ul style="list-style-type: none"> • Signs of crops ready for harvesting. • Harvesting crops • Methods of crop storage 	<ul style="list-style-type: none"> • Observing crops that are ready for harvesting and how they are stored • Communicating various methods of harvesting. 	<ul style="list-style-type: none"> • Appreciating various methods of storing the crop.

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
10.4 FORESTRY	10.4.1 Trees	10.4.1.1 Describe forestry 10.4.1.2 Identify the role played by trees in the environment	<ul style="list-style-type: none"> • Tree farming(nursery, weeding, prune) • Maintaining balance of nature, controlling soil erosion, reservoir for water, wind breaker. 	<ul style="list-style-type: none"> • Analysing tree farming • Analysing the role of trees in the environment. 	<ul style="list-style-type: none"> • Appreciating the role of trees in the environment
	10.4.2Uses of wood	10.4.2.1 State the different uses of wood.	<ul style="list-style-type: none"> • Hard and softwood. • Uses of soft and hard wood 	<ul style="list-style-type: none"> • Investigating the uses of wood. 	<ul style="list-style-type: none"> • Appreciating wood products.
	10.4.3Agro-forestry	10.4.3.1 Explain the meaning of agro-forestry. 10.4.3.2 Identify various tree species that will improve soil fertility. 10.4.3.3 Plant appropriate trees to improve soil fertility and reduce soil erosion. 10.4.3.4 State the advantages and disadvantages of Agro- forestry.	<ul style="list-style-type: none"> • Interplanting of trees and crops • Trees which improve fertility: Sesban Tephrosia , Pigeon pea • Improving soil fertility and reducing soil erosion by planting trees. • Advantages and disadvantages of Agro-forestry. 	<ul style="list-style-type: none"> • Communicating agro-forestry • Identifying tree species that will improve soil fertility. • Demonstrating the planting of tree to improve soil fertility and reduce soil erosion. 	<ul style="list-style-type: none"> • Caring for the soil. • Cooperating in groups. • Appreciating agro-forestry

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
10.5 CONSERVATION FARMING	10.5.1 Organic farming and Soil Fertility	<p>10.5.1.1 Describe organic farming.</p> <p>10.5.1.2 Explain the role of organic farming in soil fertility.</p>	<ul style="list-style-type: none"> Organic farming: Farming without use of industrially made fertilisers Role of organic farming in soil fertility: Supplying air, water, mineral nutrients, space, pH, anchorage 	<ul style="list-style-type: none"> Communicating organic farming and its importance to soil fertility. 	<ul style="list-style-type: none"> Appreciating organic farming.
	10.5.2 Organic and Conventional methods of farming	<p>10.5.2.1 Explain the meaning of term organic matter.</p> <p>10.5.2.2 Explain the importance of maintaining or increasing organic matter for crops.</p> <p>10.5.3.1 Describe conventional farming methods.</p> <p>10.5.3.2 Explain the importance of organic methods of farming.</p>	<ul style="list-style-type: none"> Decomposed once lived matter Maintaining Humus in the soil Conventional farming methods. Organic method of farming. 	<ul style="list-style-type: none"> Communicating various methods of organic and conventional farming. 	<ul style="list-style-type: none"> Appreciating organic farming and conventional farming.

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
	10.5.4 Conservation Farming and Crop Rotation	<p>10.5.4.1 Investigate what successful conservation farming methods can achieve.</p> <p>10.5.4.2 Explain when conservation methods of farming should be used.</p> <p>10.5.4.3 Describe the meaning of crop rotation.</p> <p>10.5.4.4 Explain why crop rotation is important.</p>	<ul style="list-style-type: none"> • Achievement of organic farming methods. • When conservation methods of farming are applied. • Crop rotation. • Importance of crop rotation. 	<ul style="list-style-type: none"> • Investigating the benefits of successful conservation farming methods. • Applying conservation farming methods correctly • Analysing the importance of crop rotation. 	<ul style="list-style-type: none"> • Appreciating the benefits of conservation farming.
	10.5.5 Intercropping	<p>10.5.5.1 Explain the importance of including legumes in crop rotation.</p> <p>10.5.5.2 Explain the importance of Intercropping crops.</p> <p>10.5.5.3 Explain what a farmer considers when Intercropping crops.</p> <p>10.5.5.4 Demonstrate intercropping of crops.</p>	<ul style="list-style-type: none"> • Importance of legumes in crop rotation. • Importance of intercropping crops. • What to consider when carrying out intercropping. • Intercropping crops. 	<ul style="list-style-type: none"> • Communicating intercropping and the use of legumes in intercropping • Demonstrating the use of intercropping when growing crops. 	<ul style="list-style-type: none"> • Appreciating importance of intercropping • Applying the principles of intercropping

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
	10.5.6 Conservation Tillage	10.5.6.1 Explain the meaning of conservation tillage. 10.5.6.2 Explain the benefits of no tillage or conservation tillage.	<ul style="list-style-type: none"> • Conservation tillage. • Benefits of conservation tillage. 	Communicating the meaning and benefits of conservation tillage.	<ul style="list-style-type: none"> • Asking questions for a better understanding. • Cooperating in groups.
	10.5.7 Green Manure	10.5.7.1 State the meaning of Green manure. 10.5.7.2 Explain the importance of green manure. 10.5.7.3 Use green manure to grow Crops.	<ul style="list-style-type: none"> • Green manure. • Importance of green manure. • Using green manure. 	<ul style="list-style-type: none"> • Communicating green manure and its importance • Demonstrating the use of green manure to grow crops. 	<ul style="list-style-type: none"> • Cooperating in groups. • Being aware of the importance of green manure. • Appreciating the importance of green manure.

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
10.6 LIVESTOCK PRODUCTION	10.6.1 Economic Importance of Livestock	10.6.1.1 State the economic importance of the types of livestock studied.	<ul style="list-style-type: none"> Economic importance of livestock. 	<ul style="list-style-type: none"> Communicating the economic importance of livestock. 	<ul style="list-style-type: none"> Appreciating the importance of livestock.
	10.6.2 Anatomy and Physiology of Livestock	10.6.2.1 Explain digestion in a ruminant, non ruminant and bird. 10.6.2.2 Describe the structural function of the circulatory system of animals. 10.6.2.3 Describe the storage of energy in animal bodies. 10.6.2.4 Explain the energy release and utilisation in the body of animals. 10.6.2.5 Identify breeding cycles of various farm animals. 10.6.2.6 Describe the characteristics of breeds of farm animals studied. 10.6.2.7 Explain the criteria used for selecting breeding animals. 10.6.2.8 Explain the importance of cross breeding and in breeding in livestock production. 10.6.2.9 Describe the process of	<ul style="list-style-type: none"> Digestion in a ruminant, non ruminant and bird. Structural function of the circulatory system of animals. Storage of energy in animal bodies. Energy release in the body of an animal. Breeding cycles of farm animals. Characteristics of breeds of farm animals studied. Selecting breeding animals. Cross breeding and In-breeding in livestock Artificial Insemination. 	<ul style="list-style-type: none"> Communicating relevant anatomic structures of an animal's body in relation to their physiological functions. Communicating energy storage, release and utilisation in animal body. Observing breeds and breeding cycles of farm animals. Demonstrating cross breeding and artificial insemination. 	<ul style="list-style-type: none"> Being aware of the general anatomy and physiology of farm animals. Asking questions in order to understand energy flow in animals. Appreciation of cross breeding and artificial insemination

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
		<p>artificial insemination.</p> <p>10.6.2.10 State the advantages and disadvantages of Artificial Insemination in livestock production.</p> <p>10.6.2.11 Describe development of the foetus.</p> <p>10.6.2.12 Describe the structure and functions of mammary glands.</p> <p>10.6.2.13 Explain the process of milk let-down and milk hold-up in lactating animals.</p>	<ul style="list-style-type: none"> • Advantages and disadvantages of Artificial Insemination. • Development of foetus. • Structure and functions of mammary glands. • Milk let-down and milk hold-up in lactating animals. 	<ul style="list-style-type: none"> • Communicating advantages and disadvantages of artificial insemination • Communicating the development of foetus in the uterus of animals. • Investigating the process of milk let-down and milk hold-up in lactating mammals. 	<ul style="list-style-type: none"> • Being aware of the development of the foetus in the uterus. • Developing curiosity in the milk let-down and milk hold-up process
	10.6.3 Health in livestock	<p>10.6.3.1 Identify signs of good and poor health in livestock.</p> <p>10.6.3.2 Describe the nutritive value of livestock feed.</p> <p>10.6.3.3 Determine the presence of various types of nutrients in animal feeds.</p>	<ul style="list-style-type: none"> • Good and Poor Health in livestock • Nutritive value of livestock feed in the recommended proportions by National Standards bodies e.g. ZABS 	<ul style="list-style-type: none"> • Identifying signs of good and poor health in livestock. • Investigating the presence of various types of nutrients in animal foods. 	<ul style="list-style-type: none"> • Cooperating in groups. • Appreciating types of nutrients for livestock.

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
	10.6.4 Nutritional Deficiencies	10.6.4.1 Identify symptoms of nutritional deficiencies in livestock studied. 10.6.4.2 Identify suitable species of pasture for livestock production in Zambia. 10.6.4.3 State sustainable utilisation of pastures and the consequences of overgrazing.	<ul style="list-style-type: none"> • Symptoms of nutritional deficiencies in livestock. • Suitable Species of pasture. • Utilisation of pasture and consequences of overgrazing. 	<ul style="list-style-type: none"> • Observing the nutritional deficiencies in livestock studied. • Identifying suitable species of pasture for livestock. 	<ul style="list-style-type: none"> • Being aware of nutritional deficiencies in livestock. • Conserving pasture for sustainable animal husbandry
	10.6.5 Pests of Livestock	10.6.5.1 Explain the effects of pests on livestock. 10.6.5.2 Describe the life cycles of ecto-parasite and endo parasite of farm animals 10.6.5.3 Investigate methods of preventing and controlling pests of farm animals studied.	<ul style="list-style-type: none"> • Effects of pests on livestock. • Cycles of two ecto-parasites and two endo parasite of farm animals studied. • Methods of preventing and controlling pests. 	<ul style="list-style-type: none"> • Communicating the life cycles of ecto-parasite and one endo-parasite. • Inquiring the methods of preventing and controlling pests. 	<ul style="list-style-type: none"> • Caring for the health of animals. • Participating actively in group activities
	10.6.6 Diseases	10.6.6.1 Identify methods of preventing and controlling diseases of animals.	<ul style="list-style-type: none"> • Methods of preventing and controlling diseases. 	<ul style="list-style-type: none"> • Communicating methods of preventing and controlling diseases. 	<ul style="list-style-type: none"> • Being aware of various methods of preventing and controlling diseases.

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
	10.6.7 Housing and Marketing	<p>10.6.7.1 Explain the suitability and maintenance of various types of livestock housing.</p> <p>10.6.7.2 Describe the preparation of livestock and livestock products for marketing.</p> <p>10.6.7.3 Identify organisations in Zambia that process and market livestock products.</p>	<ul style="list-style-type: none"> Maintenance of houses. Preparing livestock and products for marketing. Refer to organisations such as Zambeef, Kachema, Master pork 	<ul style="list-style-type: none"> Communicating the suitability and maintenance livestock housing and the preparation of livestock and livestock products for marketing. Communicating organisations that prepare and market livestock and their products for marketing. 	<ul style="list-style-type: none"> Cooperating in groups. Appreciating organisations that prepare and market livestock and their products for marketing.

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
10.7 FARM STRUCTURES	10.7.1 Farm Buildings	<p>10.7.1.1 Select a site for farm buildings.</p> <p>10.7.1.2 Prepare a simple plan for a farm building.</p> <p>10.7.1.3 Describe different farm structures.</p> <p>10.7.1.4 Construct an improved farm structure using local materials.</p> <p>10.7.1.5 Explain the importance of maintaining farm structures.</p>	<ul style="list-style-type: none"> Site for farm buildings. Planning for farm building. Types of Farm structures. Constructing a farm structure. Maintaining farm structures. 	<ul style="list-style-type: none"> Identifying a suitable site for farm buildings. Demonstrating the construction of farm structures. Communicating the importance of maintaining farm structures. 	<ul style="list-style-type: none"> Participating actively in group activities. Appreciating different types of farm structures Caring and maintaining of farm structures.

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
10.8 FARM MACHINERY	10.8.1 Work and Power	10.8.1.1 Describe when a machine is doing work on a farm. 10.8.1.2 Explain the meaning of horse power. 10.8.1.3 Explain the importance of knowledge of horse power on a farm.	<ul style="list-style-type: none"> • Machine doing work. • Horse power. • Importance of horse power. 	<ul style="list-style-type: none"> • Communicating the concept of work and horse power. • Analysing the importance of horse power 	<ul style="list-style-type: none"> • Developing curiosity and interest in farm machinery • Appreciating the application of power in farm machinery
	10.8.2 Levers, Pulleys and Screws	10.8.2.1 Explain the use of various tools on the farm. 10.8.2.2 Calculate velocity ratio and mechanical advantage. 10.8.2.3 Identify the main parts of mould-board plough, cultivator, harrow, planter and ridger 10.8.2.4 Demonstrate understanding and practical application of centre of gravity.	<ul style="list-style-type: none"> • Use of levers, screws, pulleys and hydraulic jack. • Calculating velocity ratio and mechanical advantage. • Main parts of mould-board plough, cultivator, harrow, planter and ridger. • Applying centre of gravity. 	<ul style="list-style-type: none"> • Demonstrating the use of levers, pulleys, screws and hydraulic jack on the farm. • Calculating velocity ratio and mechanical advantages. • Applying the principles of centre of gravity. 	<ul style="list-style-type: none"> • Participating actively in group activities. • Appreciating pulleys, levers and screws. • Being aware of the practical application of centre of gravity
	10.8.3 Maintenance of Farm Implements.	10.8.3.1 Demonstrate the maintenance of farm implements.	Maintenance of farm implements.	<ul style="list-style-type: none"> • Demonstrating the maintenance of farm implements. 	<ul style="list-style-type: none"> • Caring for farm implements properly.

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
10.9 FARM MANAGEMENT	10.9.1 Factors of production	<p>10.9.1.1 State factors of production in agriculture.</p> <p>10.9.1.2 Suggest ways of improving production.</p> <p>10.9.1.3 Explain the law of diminishing returns.</p> <p>10.9.1.4 Explain the law of supply and demand.</p> <p>10.9.1.5 Explain the effects of controlling prices of agricultural inputs and products on demand and supply.</p>	<ul style="list-style-type: none"> • Factors of production. • Improving production. • Law of diminishing returns. • Law of supply and demand. • Effects of controlling prices 	<ul style="list-style-type: none"> • Communicating of production and factors that affect production. • Analysing the law of supply and demand 	<ul style="list-style-type: none"> • Appreciating various factors of production. • Asking questions in order to understand the law of supply and demand.
	10.9.2 Marketing of Agricultural Products	<p>10.9.2.1 Suggest ways of increasing sales of agricultural products in the local area.</p> <p>10.9.2.2 Describe the effect of production distribution on marketing of farm produce.</p> <p>10.9.2.3 Explain the effects of agricultural marketing policies on the development of agriculture.</p> <p>10.9.2.4 Identify advantages and disadvantages of liberalising marketing of agricultural input and products.</p>	<ul style="list-style-type: none"> • Increasing sales of products. • Effects of production distribution on marketing. • Effects of agricultural marketing policies on development of agriculture. • Advantages and disadvantages of liberalising marketing inputs and products. 	<ul style="list-style-type: none"> • Communicating various marketing policies for agricultural products. • Evaluating the advantages and disadvantages of liberalising marketing of agricultural inputs and products. 	<ul style="list-style-type: none"> • Cooperating in group activities • Appreciating liberalisation of marketing policies.

GRADE 11

<p>General Outcomes:</p> <ul style="list-style-type: none">• Demonstrate an understanding of Agriculture in Zambia.• Develop investigative skills• Recognise the importance of soil management for sustainable crop production.• Develop knowledge of crops and their sustainable production.• Demonstrate knowledge and understanding of the forest and the need for their sustainable utilisation.• Develop knowledge of crops and understanding of conservation farming.• Develop knowledge of livestock and their production.• Acquire knowledge of farm structures and maintenance.• Acquire knowledge of farm machinery and maintenance.• Acquire knowledge and understanding of farm management.	<p>Key Competences:</p> <ul style="list-style-type: none">• Demonstrate the ability to handle and use farm implements and equipment• Demonstrate the ability to Fence an area on the farm.• Demonstrate the ability to practice animal husbandry by raring chickens and cattle• Demonstrate the ability to grow, manage and market vegetables and fruits.
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TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
11.1 AGRICULTURE IN ZAMBIA	11.1.1 Land use	<p>11.1.1.1 Explain ways in which some factors limit the use of land in different areas of Zambia.</p> <p>11.1.1.2 Describe different forms of land use, including different agricultural systems and farming practices</p> <p>11.1.1.3 State land classification.</p>	<ul style="list-style-type: none"> • Factors that limit the use of land: e.g. topography, climate • Farming practices: Rotations, mixed farming, Mono culture. • Land classification. 	<ul style="list-style-type: none"> • Communicating ways in which land use is limited in Zambia. • Classifying land. 	<ul style="list-style-type: none"> • Appreciating land use in Zambia. • Being aware of the different forms of land use in Zambia
	11.1.2 Development of Agriculture	<p>11.1.2.1 Explain some factors that affect agricultural development in a nation.</p> <p>11.1.2.2 Explain the effects of land tenure on agriculture</p>	<ul style="list-style-type: none"> • Factors: capital, labour, policy, market. • Free hold, loose hold, communal. 	<ul style="list-style-type: none"> • Analysing factors affecting agricultural development in Zambia. 	<ul style="list-style-type: none"> • Being aware of the factors affecting agricultural development in Zambia.

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
11.2 SOIL SCIENCE	11.2.1 Soil Profiles and Classification	11.2.1.1 Compare and contrast the various layers of a soil profile in the school garden. 11.2.1.2 Explain the importance of a soil profile. 11.2.1.3 Classify soil samples	<ul style="list-style-type: none"> • Soil profile: Refer to top soil, sub soil, gravel • Importance of a soil profile. • Sand, loam, clay 	<ul style="list-style-type: none"> • Comparing the various layers of a soil profile. • Classifying different layers of a soil profile. 	<ul style="list-style-type: none"> • Being aware of the different layers of a soil profile. • Appreciating the importance of layers of a soil profile.
	11.2.2 Composition and Properties of Soil	11.2.2.1 Determine the constituents of soil. 11.2.2.2 Explain the importance of constituents of soil. 11.2.2.3 Determine physical and chemical characteristics of different soils.	<ul style="list-style-type: none"> • Air, water, organic matter, mineral matter and living organism • Importance of constituents of soil. • Physical and chemical characteristics of different soils. 	<ul style="list-style-type: none"> • Analysing the constituents of soil. • Investigating the importance of soil constituents. 	<ul style="list-style-type: none"> • Appreciating the importance of soil constituents. • Understanding characteristics of different types of soil through investigations.

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
11.3 CROP PRODUCTION	11.3.1 Site for a Crop	11.3.1.1 Prepare a site for growing a crop studied.	<ul style="list-style-type: none"> • Site for a crop. • Clearing a site for a crop studied. 	<ul style="list-style-type: none"> • Demonstrating the clearing of the site for growing crops. • Identifying a suitable site for a crop. 	<ul style="list-style-type: none"> • Appreciating a site suitable for a crop.
	11.3.2 Seedbed Preparation and Sowing/Planting	11.3.2.1 Describe the process of land preparation for crop rotation. 11.3.2.2 State the advantages and disadvantages of various forms of land preparation. 11.3.2.3 Prepare seedbeds suitable for germination of seeds. 11.3.2.4 Practice sowing/planting of crops studied.	<ul style="list-style-type: none"> • Land preparation. • Forms of land preparation. • Seedbed preparation. • Sowing/planting. 	<ul style="list-style-type: none"> • Communicating preparation of land for growing a crop. • Demonstrating preparation of seedbed for sowing or planting of crops. 	<ul style="list-style-type: none"> • Cooperating in groups. • Appreciating land preparation.
	11.3.3 Fertiliser Application	11.3.3.1 Describe the different methods of applying fertilisers for the crops studied. 11.3.3.2 Calculate the quantity of fertiliser for the crop studied. 11.3.3.3 Explain why particular types of fertiliser are recommended for the crop studied.	<ul style="list-style-type: none"> • Applying fertiliser. • Calculating quantities of fertiliser for crops. • Refer to mineral requirements of the crop 	<ul style="list-style-type: none"> • Communicating different methods of fertiliser application. • Calculating the appropriate quantities of fertiliser for a crop. 	<ul style="list-style-type: none"> • Appreciating the correct quantities of fertiliser for a crop. • Being aware of the correct quantities of fertiliser for a crop.
	11.3.4 Weed Control	11.3.4.1 State various methods of weed control in the crops studied. 11.3.4.2 Describe ways in which different chemicals control weeds in the crops studied.	<ul style="list-style-type: none"> • Methods of weed control. • Refer to different chemical control of weeds. 	<ul style="list-style-type: none"> • Communicating methods of weed control. • Investigating various ways of chemical control of 	<ul style="list-style-type: none"> • Being aware of various methods of weed control. • Appreciating various methods of weed control.

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
				weeds.	
	11.3.5 Pests and Diseases of Crops	11.3.5.1 State the characteristics of common pests of crops. 11.3.14 Describe symptoms of common diseases of crops studied 11.3.15 Identify crops that have been attacked by diseases.	<ul style="list-style-type: none"> • Characteristics of pests for crops. • Symptoms of common diseases. • Identifying crops attacked by diseases. 	<ul style="list-style-type: none"> • Communicating the characteristics of pests and diseases. • Observing crops attacked by pests and diseases. 	<ul style="list-style-type: none"> • Being aware of characteristics of pests. • Appreciating symptoms of pest and disease attack..
	11.3.6 Prevention and Control of Pests and Diseases of Crops	11.3.6.1 Describe various methods of preventing and controlling pests and diseases on crops. 11.3.6.2 Carry out preventive measures of pests on crops studied.	<ul style="list-style-type: none"> • Preventing and controlling pests and diseases on crops. • Carrying out preventive measures of pests on crops studied. 	<ul style="list-style-type: none"> • Communicating various methods of prevention and control of pests and diseases. 	<ul style="list-style-type: none"> • Being aware of various ways of prevention and control of pests and diseases.
	11.3.7 Harvesting	11.3.7.1 Identify crops that are ready for harvesting. 11.3.7.2 Harvest the crop studied correctly.	<ul style="list-style-type: none"> • Signs of crops ready for harvesting. • Harvesting crops. 	<ul style="list-style-type: none"> • Identifying crops ready for harvesting • Demonstrating harvesting the crop correctly. 	<ul style="list-style-type: none"> • Being aware of a crop ready for harvesting.
	11.3.8 Storage	11.3.8.1 Describe various methods of storing crops studied. 11.3.8.2 Explain the advantages and disadvantages of various methods of crop storage.	<ul style="list-style-type: none"> • Methods of storage for crop studied. 	<ul style="list-style-type: none"> • Communicating ways of storing the harvested crop. 	<ul style="list-style-type: none"> • Cooperating in group activities. • Appreciating different methods of crop storage.

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
11.4 FORESTRY	11.4.1 Deforestation	11.4.1.1 Identify causes of deforestation. 11.4.1.2 State effects of deforestation.	<ul style="list-style-type: none"> • Causes of deforestation: logging, charcoal burning, construction industry • Effects of deforestation: climate change, nutrient cycles 	<ul style="list-style-type: none"> • Identifying the causes of deforestation. 	<ul style="list-style-type: none"> • Being aware of the effects of deforestation. • Cooperating in groups activities. • Conserving the trees.
	11.4.2 Measures to Control Deforestation	11.4.2.1 Formulate measures of preventing and controlling of deforestation.	<ul style="list-style-type: none"> • Measures of Preventing and controlling of deforestation. 	<ul style="list-style-type: none"> • Formulating measures of preventing and controlling deforestation. 	<ul style="list-style-type: none"> • Asking questions about measures of preventing and controlling deforestation.

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
11.5 CONSERVATION FARMING	11.5.1 Organic Matter and Fertiliser	11.5.1.1 State the advantages and disadvantages of using organic matter and artificial fertiliser to supply nutrients to crops.	Advantages and disadvantages of using organic matter and artificial fertiliser.	<ul style="list-style-type: none"> Communicating the advantages and disadvantages of using organic matter and fertiliser in agriculture. 	<ul style="list-style-type: none"> Being aware of the advantages and disadvantages of manures and fertilisers.
	11.5.2 Compost	11.5.2.1 Investigate the importance of compost to a crop. 11.5.2.2 Prepare a compost heap.	<ul style="list-style-type: none"> Importance of compost to a crop. Preparing a compost heap. 	<ul style="list-style-type: none"> Investigating the importance of compost. Demonstrating the preparation of a compost heap. 	<ul style="list-style-type: none"> Appreciating the importance of compost manure.
	11.5.3 Animal Manure	11.5.3.1 Explain the importance of using animal manure. 11.5.3.2 Identify the crop nutrients provided by various types of animal manure. 11.5.3.3 Describe the harvesting, handling and storage of animal manure.	<ul style="list-style-type: none"> Importance of using animal manure. Nutrients provided by manure. Harvesting, handling and storage of animal manure. 	<ul style="list-style-type: none"> Communicating the importance of using manures. Investigating nutrients contained in different manures 	<ul style="list-style-type: none"> Being aware of the importance of using manures. Appreciating the nutrients contained in manure.
	11.5.4 Soil Preparation	11.5.4.1 Prepare soil for growing a crop under organic farming	Refer to cabbage, beans, tomatoes, maize.	<ul style="list-style-type: none"> Demonstrating the preparation of soil for growing crops. 	<ul style="list-style-type: none"> Appreciating the preparation of soil for growing crops.
	11.5.5 Pests and Diseases	11.5.5.1 Prepare appropriate natural pesticides to control pests.	<ul style="list-style-type: none"> Preparing natural pesticides to control pests (e.g. chilli, ash) 	<ul style="list-style-type: none"> Demonstrating the preparation of natural pesticides. 	<ul style="list-style-type: none"> Appreciating the use of natural pesticides Cooperating in group activities.
	11.5.6 Role of Crop	11.5.6.1 Explain the role of crop	Role of crop rotation	<ul style="list-style-type: none"> Communicating the 	<ul style="list-style-type: none"> Appreciating

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
	Rotation in Pest and Disease Control	rotation in preventing pests and diseases in organic production.	in pest and disease control.	role of crop rotation in pest and disease control.	the role of crop rotation in pest and disease control.
	11.5.7 Cropping Systems and Pests and Disease Control	11.5.7.1 Describe companion planting. 11.5.7.2 Demonstrate companion planting when growing crops. 11.5.7.3 Use plants to attract predators and parasites.	<ul style="list-style-type: none"> • Companion planting. • Using companion planting. • Using plants to attract predators and parasites 	<ul style="list-style-type: none"> • Communicating the importance of intercropping in organic farming. • Demonstrating the attraction of parasites and predators to plants. 	<ul style="list-style-type: none"> • Appreciating the importance of intercropping in organic farming. • Seeking ways of eliminating pests and disease from crops.
	11.5.8 Barriers and Traps for Pests	11.5.8.1 Use barriers and traps to control crop pests.	<ul style="list-style-type: none"> • Using barriers and traps to control pests. 	<ul style="list-style-type: none"> • Demonstrating the use of barriers and traps to control crop pests. 	<ul style="list-style-type: none"> • Being aware of the use of barriers and traps to control crop pests. • Cooperating in group activities.
	11.5.9 Timing of Planting	11.5.9.1 Explain the importance of timing of planting in the reduction of pest attack.	<ul style="list-style-type: none"> • Importance of timing of planting. 	<ul style="list-style-type: none"> • Communicating the importance of timing of planting the reduction of pest attack. 	<ul style="list-style-type: none"> • Being aware of timing in crop growing.

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
11.6 LIVESTOCK PRODUCTION	11.6.1 Importance of Livestock	11.6.1.1 State the economic importance of the types of livestock studied.	<ul style="list-style-type: none"> Economic importance of livestock. 	<ul style="list-style-type: none"> Communicating the economic importance of livestock studied. 	<ul style="list-style-type: none"> Appreciating the importance of livestock studied. Listening to others with respect.
	11.6.2 Health in Livestock	11.6.2.1 Identify signs of good and poor health in livestock.	<ul style="list-style-type: none"> Signs of good and poor health in live stock 	<ul style="list-style-type: none"> Identifying signs of good and poor health in livestock. 	<ul style="list-style-type: none"> Being aware of signs of good and poor health in livestock.
	11.6.3 Livestock Feed	11.6.3.1 Describe the nutritive value of the livestock feed for the animals studied.	<ul style="list-style-type: none"> Nutritive values of feed for animals under study 	<ul style="list-style-type: none"> Communicating the nutritive value of livestock feed for animals studied 	<ul style="list-style-type: none"> Appreciating the nutritive value of livestock feed.
	11.6.4 Nutritional Deficiencies	11.6.4.1 Describe symptoms of nutritional deficiencies in livestock studied. 11.6.4.2 Identify suitable species of pasture for livestock studied.	<ul style="list-style-type: none"> Symptoms of nutritional deficiencies in livestock. Species of pasture for livestock e.g. Rhodes grass, elephant grass 	<ul style="list-style-type: none"> Communicating signs and symptoms of nutritional deficiencies in livestock. Identifying suitable pastures for livestock. 	<ul style="list-style-type: none"> Being aware of the signs and symptoms of nutritional deficiencies in livestock. Appreciating good pastures for livestock.
	11.6.5 Pests of Livestock	11.6.5.1 State the effects of pests on livestock. 11.6.5.2 Investigate methods of preventing and	<ul style="list-style-type: none"> Effects of Pests on livestock: Diseases, poor health, 	<ul style="list-style-type: none"> Communicating effects of pests on animals 	<ul style="list-style-type: none"> Being aware of effects of pests on livestock.

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
		controlling pests that attack animals studied.	<ul style="list-style-type: none"> • Methods of preventing and controlling pests: Spraying, dipping 	<p>studied.</p> <ul style="list-style-type: none"> • Investigating methods of preventing and controlling pests. 	<ul style="list-style-type: none"> • Seeking ways of preventing and controlling pests.
	11.6.6 Diseases	11.6.6.1 State methods of preventing and controlling diseases on animals studied.	<ul style="list-style-type: none"> • Refer to vaccination, dipping, medication, 	<ul style="list-style-type: none"> • Communicating the effects of diseases on animals studied. 	<ul style="list-style-type: none"> • Being aware of the effects of diseases on animals studied
	11.6.7 Housing	11.6.7.1 Describe the suitability and maintenance of various types of livestock housing.	<ul style="list-style-type: none"> • Maintenance of houses and structures. 	<ul style="list-style-type: none"> • Communicating the suitability for housing in livestock. 	<ul style="list-style-type: none"> • Developing interest in the housing structures of livestock.
	11.6.8 Marketing	<p>11.6.8.1 Describe the preparation of livestock and livestock products for marketing.</p> <p>11.6.8.2 Identify organisations in Zambia that process and market the livestock products.</p>	<ul style="list-style-type: none"> • Preparing livestock/Products for marketing. • Refer to organisations such as Parmalat, Zambeef 	<ul style="list-style-type: none"> • Communicating the preparation of livestock and livestock products for marketing. • Identifying organisations that process and market livestock and livestock products. 	<ul style="list-style-type: none"> • Appreciating marketing livestock and livestock products. • Being aware of organisations that process and market livestock and livestock products.

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
	11.6.9 Bee Farming	11.6.9.1 Describe common methods of bee farming.	<ul style="list-style-type: none"> • Common methods of bee farming 	<ul style="list-style-type: none"> • Communicating common methods of bee farming. • Demonstrating the construction of a framed bee hive. 	<ul style="list-style-type: none"> • Being aware of common methods of bee farming. • Appreciating the value of bees to man's livelihood.
		11.6.9.2 Construct a framed bee hive.	<ul style="list-style-type: none"> • Framed bee hive. 		
		11.6.9.3 Establish and manage an apiary.	<ul style="list-style-type: none"> • Managing the Apiary. 		
		11.6.9.4 State methods of harvesting honey.	<ul style="list-style-type: none"> • Methods of harvesting honey: Smoking, harvesting gear. 		
		11.6.9.5 Process and grade honey and honey products for marketing.	<ul style="list-style-type: none"> • Process, grade honey and honey products for marketing according to recommended National bodies and Standards e.g. ZABS 		

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
11.7 FARM STRUCTURES	11.7.1 Fencing	11.7.1.1 Describe the different types and uses of fences. 11.7.1.2 Fence an area on the farm. 11.7.1.3 Explain advantages and disadvantages of fences on a farm.	<ul style="list-style-type: none"> • Types and uses of fences. • Fencing. • Advantages and disadvantages of fences. 	<ul style="list-style-type: none"> • Communicating types of fences, advantages and disadvantages of fences on the farm. • Demonstrating fencing an area on the farm. 	<ul style="list-style-type: none"> • Being aware of types of fences. • Actively participating in group activities.
	11.7.2 Hedges	11.7.2.1 Explain uses of hedges. 11.7.2.2 Establish and maintain a hedge. 11.7.2.3 State advantages and disadvantages of hedges on a farm.	<ul style="list-style-type: none"> • Uses of hedges. • Establishing and maintaining hedges. • Advantages and disadvantages of hedges. 	<ul style="list-style-type: none"> • Communicating uses and establishment of hedges. • Demonstrating the establishment and maintenance of hedges 	<ul style="list-style-type: none"> • Appreciating uses, establishment and maintenance of hedges. • Actively participating in group activities.
	11.7.3 Green Houses	11.7.3.1 Describe a green house. 11.7.3.2 Explain the advantages and disadvantages of a green house 11.7.3.3 Make a green house..	<ul style="list-style-type: none"> • Green house. • Advantages and disadvantages of a green house. • Making a green house. 	<ul style="list-style-type: none"> • Communicating the advantages and disadvantages of a green house. • Demonstrating the construction of a green house. 	<ul style="list-style-type: none"> • Appreciating a green house. • Asking questions in order to understand green houses.

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
11.8 MACHINERY	11.8.1 Friction	11.8.1.1 State the meaning of machine. 11.8.1.2 Explain the effects of friction on farm machinery. 11.8.1.3 State ways of increasing and overcoming friction.	<ul style="list-style-type: none"> • A machine. • Effects of friction on farm machinery. • Increasing and overcoming friction. 	<ul style="list-style-type: none"> • Communicating the importance of machines and overcoming friction. • Communicating ways of increasing and overcoming friction. 	<ul style="list-style-type: none"> • Appreciating the importance of machines and overcoming friction. • Being aware of parts on farm machinery where friction takes place
	11.8.2 Rusting	11.8.2.1 Identify conditions that encourage rusting. 11.8.2.2 Explain what happens during rusting. 11.8.2.3 Prevent rusting on farm machines.	<ul style="list-style-type: none"> • Conditions that encourage rusting: Refer to air, moisture. • The process of rusting • Preventing rusting: Oiling\ greasing, 	<ul style="list-style-type: none"> • Identifying conditions that favour rusting. • Communicating the effects of rusting on machines. • Demonstrating the prevention of rusting. 	<ul style="list-style-type: none"> • Being aware of the conditions that encourage rusting. • Seeking ways of protecting farm tools and machinery from rusting

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
11.9 FARM MANAGEMENT	11.9.1 Budgeting	11.9.1.1 Explain budgeting 11.9.1.2 Prepare a budget for an enterprise. 11.9.1.3 Prepare a cash flow budget for an enterprise.	<ul style="list-style-type: none"> • Budgeting. • Preparing a budget. • Preparing a cash flow budget. 	<ul style="list-style-type: none"> • Communicating what a budget is • Demonstrating the preparation of a budget. • Interpreting a budget. 	<ul style="list-style-type: none"> • Appreciating budgeting. • Participating in group activities.
	11.9.2 Costing and Accounting	11.9.2.1 Distinguish between direct enterprise costs and overhead costs. 11.9.2.2 State factors that determine prices of commodities. 11.9.2.3 Calculate gross margins of an enterprise. 11.9.2.4 Suggest ways of increasing gross margin of an enterprise. 11.9.2.5 Calculate profit of an enterprise.	<ul style="list-style-type: none"> • Direct enterprise and overhead costs. • Factors that determine prices of commodities. • Gross margin of an enterprise. • Calculating profit of an enterprise. 	<ul style="list-style-type: none"> • Classifying direct and overhead costs of an enterprise. • Communicating factors that determine pricing of commodities. • Calculating gross margin of enterprises. 	<ul style="list-style-type: none"> • Appreciating direct and over costs, pricing and high gross margin. • Making presentations on costing and accounting

GRADE 12

<p>General Outcomes:</p> <ul style="list-style-type: none">• Demonstrate an understanding of Agriculture in Zambia.• Develop investigative skills.• Recognise the importance of soil management for sustainable crop production.• Develop knowledge of crops and their sustainable production. • Demonstrate knowledge and understanding of the importance of plants and the need for their sustainable utilisation.• Develop knowledge and understanding of conservation farming.• Develop knowledge of livestock and their production.• Acquire knowledge of farm structures and maintenance.• Acquire knowledge of farm machinery and maintenance.• Acquire knowledge and understanding of farm management.	<p>Key competences:</p> <ul style="list-style-type: none">• Demonstrate the ability to practice animal husbandry by rearing pigs, goats and fish• Demonstrate the ability to practice crop husbandry by growing tubers and oil seeds.• Demonstrate the ability to practice conservation farming• Demonstrate understanding of the mechanism a four stroke internal petrol engine.
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TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
12.1 AGRICULTURE IN ZAMBIA	12.1.1 Modern Agriculture	12.1.1.1 Identify various enterprises farmers engage in on a farm. 12.1.1.2 Explain the advantages of having several enterprises on the farm 12.1.1.3 Explain the harm agriculture can cause to the environment.	<ul style="list-style-type: none"> • Different enterprises on the farm • Advantages of several enterprises on the farm. • Effects of agriculture on the environment: Pollution, soil erosion, deforestation 	<ul style="list-style-type: none"> • Identifying various farming enterprises • Evaluating the advantages of having several enterprises on the farm. • Investigating the harm agriculture causes on the environment. 	<ul style="list-style-type: none"> • Appreciating the importance of having several enterprises on the farm
	12.1.2 Farmer Experiments	12.1.2.1 Explain why farmers should carryout experiment with new and own technologies. 12.1.2.2 Explain how farmer experiments can be improved. 12.1.2.3 State the importance of disseminating farmer experimental results.	<ul style="list-style-type: none"> • Experimenting with new technologies. • Improving farmer experiments. • Disseminating farmer experimental results. 	<ul style="list-style-type: none"> • Experimenting with new technologies. • Communicating how farmer experiments can be improved 	<ul style="list-style-type: none"> • Appreciating the importance of farmer experiments. • Developing interest in agricultural innovations.

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
12.2 SOIL SCIENCE	12.2.1 Soil and Water	<p>12.2.1.1 Determine the capillarity of given soil samples.</p> <p>12.2.1.2 Determine the drainage rates of given soil samples.</p> <p>12.2.1.3 Explain different types of soil moisture and their significance to crop production.</p>	<ul style="list-style-type: none"> • Capillarity of soils. • Drainage rates of soils. • Types of soil moisture. 	<ul style="list-style-type: none"> • Experimenting on the capillarity of different soils • Demonstrating the drainage and moisture content of different soils. 	<ul style="list-style-type: none"> • Being aware of capillarity in different soils. • Appreciating the significance of different soil types to crop production.
	12.2.2 Soil Fertility	<p>12.2.2.1 Identify factors that determine the fertility of soil.</p> <p>12.2.2.2 Describe the role of the nitrogen cycle in soil fertility.</p> <p>12.2.2.3 Describe the role of the carbon cycle in soil fertility.</p> <p>12.2.2.4 Describe maintenance of soil fertility.</p> <p>12.2.2.5 Describe improvement of soil fertility.</p> <p>12.2.2.6 Determine radicals and minerals contained in a sample of fertiliser.</p>	<ul style="list-style-type: none"> • Factors that determine soil fertility: e.g. humus • Role of Nitrogen cycle in soil fertility. • Carbon cycle and its role in soil fertility. • Maintenance of soil fertility. • Improvement of soil fertility • Radicals and minerals: Refer to CO₃, NO₃, SO₄, NH₄, Ca, Na, K. 	<ul style="list-style-type: none"> • Identifying the factors that determine soil fertility. • Analysing the factors that affect soil fertility. • Demonstrating such methods of improving soil fertility as liming and application of fertilisers. 	<ul style="list-style-type: none"> • Cooperating in groups. • Appreciating the role of the nitrogen and carbon cycles in soil fertility. • Appreciating inorganic fertilisers in improving soil fertility

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
	12.2.3 Soil Acidity and Alkalinity	12.2.3.1 Explain the uses of acids, bases and salts in agriculture.	<ul style="list-style-type: none"> • Uses of: Acids, bases and salts. 	<ul style="list-style-type: none"> • Communicating the uses of acids, bases and salts in agriculture. • Applying agriculture lime to neutralise acids in the soil. 	<ul style="list-style-type: none"> • Being aware of the effects of acids, bases and salts to the soil
		12.2.3.2 Explain the effects of acids, bases and salts on crop and soil organisms.	<ul style="list-style-type: none"> • Effects of acids, bases and salts on crop and soil organisms. 		
		12.2.3.3 State effects of excessive use of fertilisers.	<ul style="list-style-type: none"> • Effects of excessive use of fertilisers: Refer to soil acidity and alkalinity. 		
		12.2.3.4 Describe the neutralisation of soil acids.	<ul style="list-style-type: none"> • Neutralisation of soil acids: Refer to the use of agriculture lime 		
		12.2.3.5 Apply lime to a piece of land.	<ul style="list-style-type: none"> • Lime application. 		

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
12.3 CROP PRODUCTION	12.3.1 Site for a crop	12.3.1.1 Clear the site for growing a crop studied	<ul style="list-style-type: none"> Clearing a site for a crop. 	<ul style="list-style-type: none"> Demonstrating the clearing of a site for growing a crop studied. 	<ul style="list-style-type: none"> Cooperating in groups.
	12.3.2 Seedbeds Preparation and Sowing/ planting	12.3.2.1 Describe the process of land preparation for crop production. 12.3.2.2 State the disadvantages and advantages of various forms of land preparation. 12.3.2.3 Prepare seedbeds suitable for germination of seeds. 12.3.2.4 Practice sowing/ planting of crops studied.	<ul style="list-style-type: none"> Land preparation. Advantages and disadvantages of various forms of land preparation. Preparing seedbeds for germination Sowing/planting crops 	<ul style="list-style-type: none"> Demonstrating the process of land preparation for crop production. Sowing or planting crops correctly 	<ul style="list-style-type: none"> Actively participating in group activities. Developing interest in preparing good seedbeds
	12.3.3 Fertiliser Application	12.3.3.1 Describe the different methods of applying fertiliser for the crops studied. 12.3.3.2 Calculate the quantity of fertilisers recommended for the crops studied. 12.3.3.3 Explain why particular types of fertilisers are recommended for the crops studied.	<ul style="list-style-type: none"> Methods of applying fertiliser. Quantity of fertilisers for crops. Fertilisers recommended for crops. 	<ul style="list-style-type: none"> Calculating the recommended quantities of fertilisers for the crops studied. Analysing fertilisers that are recommended for the crops studied. Communicating the methods of applying fertilisers to crops. 	<ul style="list-style-type: none"> Cooperating in group activities Asking questions for better understanding of fertilisers and the quantities needed by crops

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
	12.3.4 Weed Control	12.3.4.1 State various methods of weed control in the crops studied. 12.3.4.2 Describe ways in which different chemicals control weeds in the crops studied.	<ul style="list-style-type: none"> • Methods of weed control. • Chemical control of weeds. 	<ul style="list-style-type: none"> • Analysing various methods of weed control in the crops studied. 	<ul style="list-style-type: none"> • Appreciating various methods of weed control.
	12.3.5 Pests and Diseases of Crops	12.3.5.1 State the characteristics of common pests of crops. 12.3.5.2 Describe symptoms of common diseases of crops. 12.3.5.3 Identify pests that attack crops.	<ul style="list-style-type: none"> • Refer to biting and chewing pests, sucking and piercing pests, and boring pests • Symptoms of common diseases of crops. • Fungal, viral and bacterial diseases 	<ul style="list-style-type: none"> • Analysing characteristics of common crop pests. • Identifying pests and diseases of crops. 	<ul style="list-style-type: none"> • Caring for crops. • Cooperating in groups.
	12.3.6 Prevention and Control of Pests and Diseases on Crops	12.3.6.1 Describe various methods of preventing and controlling pests and diseases on crops. 12.3.6.2 Carryout preventive measures of pests and diseases on crops studied.	<ul style="list-style-type: none"> • Mechanical, chemical and biological methods. • Preventive measures of pests. 	<ul style="list-style-type: none"> • Applying various methods of pest and disease control in crops. • Demonstrating preventive measures of pests and diseases on crops. 	<ul style="list-style-type: none"> • Appreciating various methods of preventing and controlling pests and diseases on crops.

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
	12.3.7 Harvesting	12.3.7.1 Identify crops that are ready for harvesting. 12.3.7.2 Harvest the crop correctly.	<ul style="list-style-type: none"> • Signs of crops ready for harvesting. • Harvesting crops correctly. 	<ul style="list-style-type: none"> • Identifying crops that are ready for harvesting. • Demonstrating correct harvesting of crops. 	<ul style="list-style-type: none"> • Cooperating in groups.
	12.3.8 Storage	12.3.8.1 Describe various methods of storing crops studied. 12.3.8.2 Explain the advantages and disadvantages of various methods of crop storage	<ul style="list-style-type: none"> • Methods of storing crops. • Advantages and disadvantages of methods of crop storage. 	<ul style="list-style-type: none"> • Analysing various methods of storing crops studied. 	<ul style="list-style-type: none"> • Being aware of various methods of storing crops studied.
	12.3.9 Irrigation	12.3.9.1 Explain the need for irrigation. 12.3.9.2 Describe the different methods of irrigating crops. 12.3.9.3 Suggest suitable methods of irrigation on a given piece of landscape. 12.3.9.4 Identify the effects of irrigation on the environment. 12.3.9.5 Explain reduction of salinity. 12.3.9.6 Explain the significance of the water cycle and ground water resources.	<ul style="list-style-type: none"> • Need for irrigation. • Methods of irrigation • Suitable methods of irrigation according to the landscape • Effects of irrigation on the environment. • Salinity. • Water cycle and ground water resources 	<ul style="list-style-type: none"> • Communicating the different methods of irrigation and the significance of the water cycle. • Interpreting the effects of irrigation on the environment. 	<ul style="list-style-type: none"> • Appreciating the importance of water in crop production. • Being aware of the different methods of irrigation.

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
12.4 FORESTRY	12.4.1 Site for trees	12.4.1.1 Choose a site suitable for growing trees. 12.4.1.2 Prepare a site for growing trees.	<ul style="list-style-type: none"> • Site for growing tree. • Preparing a site for growing trees. 	<ul style="list-style-type: none"> • Identifying a site suitable for growing trees. • Preparing a site for growing trees. 	<ul style="list-style-type: none"> • Appreciating forest farming.
	12.4.2 Establishment and Management of Trees	12.4.2.1 Establish and manage an indigenous and exotic tree nursery. 12.4.2.2 State the management of a woodlot.	<ul style="list-style-type: none"> • Establishing and managing a nursery for exotic trees. • Management of a woodlot. 	<ul style="list-style-type: none"> • Demonstrating the establishment and management of trees. • Communicating the management of a woodlot. 	<ul style="list-style-type: none"> • Caring for trees. • Developing interest in establishing and managing of tree nurseries.
	12.4.3 Improved Fallow	12.4.3.1 Distinguish between fallow and improved fallow.	<ul style="list-style-type: none"> • Fallow and improved fallow. • Advantages and disadvantages of improved fallow. 	<ul style="list-style-type: none"> • Comparing fallow and improved fallow. 	<ul style="list-style-type: none"> • Being aware of fallow and improved fallow. • Participating in group activities.

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
12.5 CONSERVATION AGRICULTURE	12.5.1 Importance of Conservation Agriculture	12.5.1.1 Describe conservation agriculture. 12.5.1.2 Explain the importance of conservation agriculture. 12.5.1.3 Explain the importance of soil factors that are recognised in conservation agriculture	<ul style="list-style-type: none"> • Conservation agriculture: Refer to practices which aim to conserve soil and water by using surface cover(mulch) • Importance of conservation agriculture: Refer to improved soil structure, health, and nutrient retention • Soil, organic matter, nutrients 	<ul style="list-style-type: none"> • Communicating the meaning of conservation agriculture • Analysing the importance of soil factors that are recognised in conservation agriculture. 	<ul style="list-style-type: none"> • Appreciating conservation agriculture. • Being aware of the soil factors that are recognised in conservation agriculture.
	12.5.2 Agricultural Techniques	12.5.2.1 Describe how sustainable agriculture can provide adequate nutrient availability in the soil.	<ul style="list-style-type: none"> • Goal of conservation agriculture. • Sustainable agriculture and availability of nutrients. 	<ul style="list-style-type: none"> • Analysing the provision of adequate nutrients in the soil through sustainable agriculture. 	<ul style="list-style-type: none"> • Appreciating the importance of sustainable agriculture.
	12.5.3 Organic Matter in the Soil	12.5.3.1 Explain the importance of organic matter in the soil. 12.5.3.2 Explain how organic matter is reduced in the soil. 12.5.3.3 State ways to increase organic matter in the soil.	<ul style="list-style-type: none"> • Importance of organic matter: Refer to humus content • Reduction of organic matter in soil. • Plant residues, agro forestry, soil life, soil conditions and soil acidity and alkalinity. 	<ul style="list-style-type: none"> • Communicating the role of organic matter in improving soil fertility. • Inquiring ways of increasing organic matter in soil. 	<ul style="list-style-type: none"> • Appreciating the role of organic matter in improving soil fertility.

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
	12.5.4 Conservation Practices	<p>12.5.4.1 Describe how clearing plants from the field damages the soil.</p> <p>12.5.4.2 Plan for deep and shallow rooted crops.</p> <p>12.5.4.3 Explain how cropping practices can encourage water retention in the soil.</p> <p>12.5.4.4 Practice cropping systems that encourage water to remain in the soil.</p> <p>12.5.4.5 Explain why it is important to maintain a high cover on soil throughout the dry rain season.</p> <p>12.5.4.6 Maintain a high cover on soil throughout the dry and rain season.</p>	<ul style="list-style-type: none"> • Damaging soil by clearing the plants from the field. • Planning for deep and shallow rooted crops. • Retaining water in the soil through Cropping practices • Cropping systems that encourage soil and water retention. • Importance of maintaining a high cover on soil throughout the dry and rain season. • Maintaining a high cover on soil. 	<ul style="list-style-type: none"> • Communicating the damage caused to the soil by clearing plants from the field. • Applying conservation practices by planning for deep and shallow rooted crops. • Communicating conservation practices that encourage water retention in the soil. • Demonstrating water retention by practicing cropping systems. 	<ul style="list-style-type: none"> • Being aware of the damage caused to the soil by clearing plants and loosening the soil. • Appreciating the importance of retaining water in the soil. • Seeking ways of retaining water in the soil.
	12.5.5 Aeration of Soil	<p>12.5.5.1 Explain the importance of aeration.</p> <p>12.5.5.2 Describe how to improve soil aeration in a field.</p>	<ul style="list-style-type: none"> • Importance of soil aeration. • Improving soil aeration in the field 	<ul style="list-style-type: none"> • Communicating aeration and its improvement in a field. 	<ul style="list-style-type: none"> • Appreciating the importance of soil aeration.

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
12.6 LIVESTOCK PRODUCTION	12.6.1 Importance of Livestock	12.6.1 State the economic importance of types of livestock studied.	<ul style="list-style-type: none"> Economic importance of livestock. 	<ul style="list-style-type: none"> Communicating the economic importance of types of livestock studied. 	<ul style="list-style-type: none"> Being aware of the economic importance of livestock studied.
	12.6.2 Health in Livestock	12.6.2.1 Identify signs of good and poor health in livestock. 12.6.4.1 Describe symptoms of nutritional deficiencies in livestock studied. 12.6.4.2 Identify suitable species of pasture for livestock studied.	<ul style="list-style-type: none"> Good and poor health in livestock Symptoms of nutritional deficiencies. Suitable species of pasture. 	<ul style="list-style-type: none"> Observing signs of good and poor health in livestock. Analysing symptoms of nutritional deficiencies in livestock studied. Observing suitable pastures for livestock studied. 	<ul style="list-style-type: none"> Being aware of the signs of good health in livestock. Being aware of the symptoms of nutritional deficiencies in livestock. Making presentations on the findings
	12.6.3 Livestock Feed	12.6.3.1 Describe the nutritive value of the livestock feed for the animals studied.	<ul style="list-style-type: none"> Nutritive value of livestock feed in conformity with the Zambian Standards. 	<ul style="list-style-type: none"> Evaluating the nutritive value of livestock feed for the animals studied. 	<ul style="list-style-type: none"> Appreciating the nutritive value of livestock.

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
	12.6.4 Pests and Diseases of Livestock	<p>12.6.4.1 State the effect of pests on livestock.</p> <p>12.6.4.2 Describe methods of preventing and controlling pests that attack farm animals studied.</p> <p>12.6.4.3 Describe methods of preventing and controlling diseases on animals.</p>	<ul style="list-style-type: none"> • Mentioning the effects of pests on livestock. • Methods of preventing pests. • Methods of preventing and controlling diseases. 	<ul style="list-style-type: none"> • Identifying the effects of pests on livestock. • Analysing prevention and control methods for livestock pests and diseases. 	<ul style="list-style-type: none"> • Caring for livestock health. • Seeking ways of improving the health of livestock • Participating in class activities.
	12.6.5 Housing	12.6.5.1 State the suitability and maintenance of various types of livestock housing.	<ul style="list-style-type: none"> • Maintenance of livestock houses. 	<ul style="list-style-type: none"> • Identifying suitable housing for livestock studied. 	<ul style="list-style-type: none"> • Cooperating in groups.
	12.6.6 Livestock Marketing	<p>12.6.6.1 Describe the preparation of livestock and livestock products for marketing.</p> <p>12.6.6.2 Identify organisations in Zambia that process and market the livestock products.</p>	<ul style="list-style-type: none"> • Preparing livestock/livestock products for marketing. • Organisation that process and market livestock products. 	<ul style="list-style-type: none"> • Communicating on the preparation of livestock and livestock products for marketing. 	<ul style="list-style-type: none"> • Being aware of organisations that process and market livestock products in Zambia.
	12.6.7 Types of Fish in Zambia	<p>12.6.7.1 Identify common types of fish found in Zambia.</p> <p>12.6.7.2 Describe the foodstuffs for fish.</p>	<ul style="list-style-type: none"> • Types of fish in Zambia. • Foodstuffs for fish. 	<ul style="list-style-type: none"> • Investigating common types of fish in Zambia. • Analysing foodstuffs for fish. 	<ul style="list-style-type: none"> • Appreciating the types of fish found in Zambia. • Developing interest in fish farming.

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
	12.6.8 Methods of Fish Farming in Zambia	12.6.8.1 Identify common methods of fish farming in Zambia. 12.6.8.3 State advantages and disadvantages of integrated fish farming.	<ul style="list-style-type: none"> • Methods of fish farming in Zambia. • Advantages and disadvantages of integrated fish farming. 	<ul style="list-style-type: none"> • Observing common methods of fish farming. • Communicating advantages and disadvantages of integrated fish farming 	<ul style="list-style-type: none"> • Appreciating various methods of fish farming in Zambia.
	12.6.9 Fish Pond	12.6.9.1 Establish and manage fish pond. 12.6.9.2 Describe different ways of harvesting fish.	<ul style="list-style-type: none"> • Establish and manage a fish pond. • Harvesting fish. 	<ul style="list-style-type: none"> • Planning a fish pond • Demonstrating the establishment of a fish pond. • Demonstrating different ways of harvesting fish. 	<ul style="list-style-type: none"> • Developing interest in fish farming. • Actively participating in class activities.
	12.6.10 Fish Marketing	12.6.10.1 Prepare and market fish.	Preparing and marketing fish.	<ul style="list-style-type: none"> • Demonstrating the preparation of fish for marketing. 	<ul style="list-style-type: none"> • Developing interest in entrepreneurial activities.

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
12.7 FARM STRUCTURES	12.7.1 Structures for Water Supply	12.7.1.1 Describe different structures for water supply. 12.7.1.2 Describe methods of maintaining named water supply system.	<ul style="list-style-type: none"> Structures for water supply. Water supply systems. 	<ul style="list-style-type: none"> Communicating different structures of water supply. 	<ul style="list-style-type: none"> Appreciating different structures of water supply. Cooperating in group activities.
	12.7.2 Pollution of Water Supplies	12.7.2.1 Describe water pollution. 12.7.2.2 Describe ways in which water supplies on the farm may be polluted. 12.7.2.3 Describe ways of preventing and controlling pollution of water supplies on the farm.	<ul style="list-style-type: none"> Meaning of pollution. Pollution of water supplies on the farm. Preventing pollution of water supplies on the farm. 	<ul style="list-style-type: none"> Communicating water pollution on the farm and its prevention. 	<ul style="list-style-type: none"> Being aware of water pollution and its prevention. Caring for the environment on the farm.

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
12.8 FARM MACHINERY	12.8.1Engines	<p>12.8.1.1 Identify the parts of an engine and the function.</p> <p>12.8.1.2 Explain the working of the two and the four stroke internal petrol engines.</p> <p>12.8.1.3 Explain the differences between petrol and diesel engines.</p>	<ul style="list-style-type: none"> • Cylinder, pistons, connecting rods, crankshaft, camshaft, valves and sparking plugs. • Working of a four and two stroke internal petrol engine • Differences between petrol and diesel engines. 	<ul style="list-style-type: none"> • Identifying parts of an engine • Communicating functions of the four and two stroke engines. • Comparing petrol and diesel engines. 	<ul style="list-style-type: none"> • Being aware of engine parts and differences between petrol and diesel engines. • Asking questions in order to understand the mechanisms of engines.
	12.8.2 Maintenance of Engines	<p>12.8.2.1 Describe maintenance of the main system of an engine.</p> <p>12.8.2.2 State the lubrication system of a four stroke petrol engine.</p> <p>12.8.2.3 Describe the electrical system of a petrol engine.</p> <p>12.8.2.4 Describe the water and air cooling system of engine.</p>	<ul style="list-style-type: none"> • Maintenance of the main system of an engine. • Lubrication system of a four stroke petrol engine. • Electrical system of a petrol engine. • Water and air cooling systems of engines. 	<ul style="list-style-type: none"> • Communicating maintenance of engines. • Communicating the lubrication, electrical and cooling systems of engines 	<ul style="list-style-type: none"> • Appreciating maintenance of engines. • Being aware of the importance of engine maintenance. • Participating in class activities.
	12.8.3 Farm Mechanisation	12.8.3.1 Explain the advantages and disadvantages of farm mechanisation.	Advantages and disadvantages of farm mechanisation.	<ul style="list-style-type: none"> • Communicating advantages and disadvantages of farm mechanisation 	<ul style="list-style-type: none"> • Being aware of the advantages and disadvantages of farm mechanisation • Cooperating in group activities.

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
12.9 FARM MANAGEMENT	12.9.1 Farm Valuation	<p>12.9.1.1 Prepare an inventory of assets on the farm.</p> <p>12.9.1.2 Prepare an opening and closing valuation on a farm.</p> <p>12.9.1.3 Describe the various methods of calculating depreciation of farm machinery.</p>	<ul style="list-style-type: none"> • Inventory of assets on a farm. • Opening and closing valuations on a farm. • Depreciation of farm machinery. 	<ul style="list-style-type: none"> • Demonstrating the preparation of an inventory, opening and closing evaluation. • Communicating various methods of calculating depreciation. 	<ul style="list-style-type: none"> • Appreciating inventory, opening and closing evaluation. • Being aware of depreciation of farm machinery.
	12.9.2 Insurance	<p>12.9.2.1 Explain the difference between risks and uncertainties.</p> <p>12.9.2.2 State the importance of insurance policies in agriculture.</p> <p>12.9.2.3 Describe various types of insurance in agriculture.</p>	<ul style="list-style-type: none"> • Risks and uncertainties • Importance of insurance policies in agriculture • Types of insurance in agriculture. 	<ul style="list-style-type: none"> • Comparing risks and uncertainties in agriculture. • Communicating the importance of insurance policies in agriculture. • Classifying insurances 	<ul style="list-style-type: none"> • Being aware of uncertainties, risks and insurance policies in agriculture.
	12.9.3 Cooperatives	<p>12.9.3.1 Describe how cooperatives are organised.</p> <p>12.9.3.2 Explain the common interest of farmers in a cooperative.</p>	<ul style="list-style-type: none"> • Organisation of cooperatives. • Common interest of farmers in a cooperative. 	<ul style="list-style-type: none"> • Communicating the organisation of cooperatives. 	<ul style="list-style-type: none"> • Appreciating the contributions of cooperatives towards the development of agriculture.

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILLS	VALUES
	12.9.4 Entrepreneurship	12.9.4.1 Describe different kinds of agricultural enterprises 12.9.4.2 Explain what makes an agricultural enterprise successful. 12.9.4.3 Explain why market research is important. 12.9.4.4 Explain how to cost and price a product.	<ul style="list-style-type: none"> • Kinds of agricultural businesses. • Successful agricultural enterprises. • Market research. • Costing and pricing a product. 	<ul style="list-style-type: none"> • Communicating different agricultural enterprises. • Communicating costing and pricing a product. 	<ul style="list-style-type: none"> • Appreciating agriculture as a business. • Making presentations on market research, costing and pricing a product • Listening to others with respect.

APPENDIX I - SCOPE and SEQUENCE chart

The following table shows the Scope and Sequence of agricultural science syllabus from G10 to G12.

GRADE 10		GRADE 11	GRADE 12
TOPIC	SUB-TOPIC	SUB-TOPIC	SUB-TOPIC
Agriculture in Zambia	<ul style="list-style-type: none"> • Importance of Agriculture • Importance of the farmer • Environmental influences of Agriculture. 	<ul style="list-style-type: none"> • Land Use • Development of agriculture 	<ul style="list-style-type: none"> • Modern Agriculture • Farmer Experiments
Soil Science	<ul style="list-style-type: none"> • Types of rocks and minerals. • Soil formation and Weathering 	<ul style="list-style-type: none"> • Soil Profile and Classification • Composition and Properties of Soil 	<ul style="list-style-type: none"> • Soil and water • Soil Fertility • Soil acidity and Alkalinity
Crop production	<ul style="list-style-type: none"> • Crop plants • External and internal morphology of plants. • The flower and Pollination • Vegetative propagation • Distribution of crops • Planting seeds • Fertiliser application • Weed control • Pests and diseases of crops • Prevention and control of pests on crops. • Harvesting 	<ul style="list-style-type: none"> • Site for a Crop • Seedbed preparation and sowing/planting • Fertiliser Application • Weed Control • Pests and Diseases of Crops • Prevention and control of pests and diseases of crops • Harvesting • Storage 	<ul style="list-style-type: none"> • Site for a Crop • Seedbeds preparation and sowing/planting • Fertiliser Application • Weed Control • Pests and Diseases of Crops • Prevention and control of pests and diseases on crops • Harvesting • Storage • Irrigation
Forestry	<ul style="list-style-type: none"> • Trees • Uses of wood • Agro-forestry 	<ul style="list-style-type: none"> • Deforestation • Measures to control deforestation 	<ul style="list-style-type: none"> • Site for trees • Establishment and management of trees • Improved Fallow
Conservation farming	<ul style="list-style-type: none"> • Organic farming and soil Fertility • Organic and Conventional methods of 	<ul style="list-style-type: none"> • Organic matter and Fertiliser • Compost 	<ul style="list-style-type: none"> • Importance of conservation agriculture

GRADE 10		GRADE 11	GRADE 12
TOPIC	SUB-TOPIC	SUB-TOPIC	SUB-TOPIC
	farming <ul style="list-style-type: none"> • Conservation farming and Crop rotation • Intercropping • Conservation tillage • Green Manure 	<ul style="list-style-type: none"> • Animal manure • Soil Preparation • Pests and Diseases • Role of crop rotation in pest and disease control • Cropping systems and pests and disease control • Barriers and traps for pests • Timing of Planting 	<ul style="list-style-type: none"> • Agricultural Techniques • Organic matter in the soil • Conservation Practices • Aeration of Soil
Livestock Production	<ul style="list-style-type: none"> • Economic Importance of livestock • Anatomy and physiology of livestock • Health in Livestock • Nutritional Deficiencies • Pests of Livestock • Diseases • Housing and Marketing 	<ul style="list-style-type: none"> • Importance of Livestock • Health in Livestock • Livestock Feed • Nutritional deficiencies • Pests of Livestock • Diseases • Housing • Marketing • Bee Farming 	<ul style="list-style-type: none"> • Importance of livestock • Health in livestock • Livestock Feed • Pests and Diseases of Livestock • Housing • Livestock Marketing • Types of Fish in Zambia • Methods of Fish farming in Zambia • Fish Pond • Fish Marketing
Farm Structures	<ul style="list-style-type: none"> • Farm Buildings 	<ul style="list-style-type: none"> • Fencing • Hedges • Green House 	<ul style="list-style-type: none"> • Structures for water supply • Pollution of water supplies
Farm Machinery	<ul style="list-style-type: none"> • Work and Power • Levers, Pulleys and Screws • Maintenance of farm implements 	<ul style="list-style-type: none"> • Friction • Rustin 	<ul style="list-style-type: none"> • Engines • Maintenance of engines • Farm Mechanisation

GRADE 10		GRADE 11	GRADE 12
TOPIC	SUB-TOPIC	SUB-TOPIC	SUB-TOPIC
Farm Management	<ul style="list-style-type: none"> • Factors of Production • Marketing of agricultural products 	<ul style="list-style-type: none"> • Budgeting • Costing and Accounting 	<ul style="list-style-type: none"> • Farm Valuation • Insurance • Cooperatives • Entrepreneurship

Project Work

Planning and choice of projects – Project activities need planning and appropriate execution and therefore, teachers should guide the learners throughout. Learners can do project work individually or in groups but recording and reporting writing should be done individually.

The records should be available for inspection any time. Learners will choose **ONE** project for investigation from the suggested topics below.

Crops

1. Growth rates in crops

Compare and contrast the growth rate of crops grown using organic fertiliser(s) with those grown using inorganic fertiliser(s).

Suggested activities

- Land preparation
- Planting
- Management practices.

2. Germination percentage in crops

Compare and contrast the germination percentage between certified seed and recycled seed. The recycled seed should be from the harvest of the same certified seed planted earlier.

Suggested activities

- Land preparation
- Planting
- Management practices.

3. Choice of enterprise in crops

Suggested enterprises: Vegetable/maize/groundnuts.

Carryout an investigation to determine a viable enterprise for your area.

Suggested activities

1. Land preparation
2. Planting
3. Management practice

Animals

1. Growth rates in animals

Suggested type of animals: Pigs/broilers/rabbits.

Compare the growth rate of two different groups of animals of the same breed each fed on a different type of feed.

Suggested activities

- Management before animals arrive.
- Management after animals arrive.

2. Food conversion ratio in animals

Suggested type of animals: Pigs/broilers/rabbits/layers.

Compare the food conversion ratio of two different breeds of animals of the same species fed on the same type of feed.

Suggested activities

- Management before animals arrive.
- Management after animals arrive.

3. Choice of enterprise in crops

Suggested enterprises: Pigs/chickens/rabbits.

Carryout an investigation to determine a viable enterprise for your area.

Suggested activities

- Management before animals arrive.
- Management after animals arrive.

Data Collection

Data for analysis must come from the learner's personal observations and measurements i.e. should be collected in the field by the learner. The data the learner has collected should be a basis for analysis.

It is imperative that the learner collects sufficient data from the project to enable the learner carryout adequate analysis and interpretation.

The data collected by the learner from the project may not be enough to supply all the information required for some investigations and therefore 'secondary' data is important (secondary data involves gathering from sources that have already been compiled in written, statistical books etc).

Format

Suggested topic chosen

Is the name of the project on which investigation is to be done.

Aim(s)

Statement of that which is to be investigated.

Hypothesis(es)

Is the statement of the result that the learner expects to get at the end of the investigation.

Procedure

Description of the technique(s) used to carry out the project (techniques, methods or steps).

Observation/Recording

Written presentation of results in an integrated variety of graphs, tables and statements.

Analysis of Results

This will consist:

- Description of findings with reference to aim(s) and hypothesis(es).
- Provision of balanced and well reasoned arguments of findings.
- Explanation(s) of any anomalies in the findings

Conclusion

This is the section of the project in which the learner states if the results are as expected. Do the results of the project agree with the hypothesis(es)?

Recommendation

This section discusses limitations of investigations and suggestions for alternative approaches.

Appendix 2: Practical tests

Wet tests

Ion present	Test	Result
Carbonate ions	add dilute acid.	effervescence, carbon dioxide produced; turns lime water milky (white precipitate).
Nitrate ions	add aqueous sodium hydroxide, then aluminium foil, warm carefully.	ammonia produced; turns damp red litmus paper blue.
Sulphate ions	acidify, then add aqueous barium nitrate.	white precipitate.
Calcium ions	add aqueous sodium hydroxide; add aqueous ammonia.	white precipitate; insoluble in excess, no precipitate or very slight white precipitate.
Ammonium ions	add aqueous sodium hydroxide.	ammonia produced on warming; turns damp red litmus paper blue.
Phosphate ions	add dilute nitric acid then concentrated nitric acid and a large excess of ammonium molybdate solution.	yellow precipitate produced on warming.

Flame tests

Ion	Test	Result
Calcium	moisten a little of the substance with pure concentrated hydrochloric acid; heat a little of the substance on a clean platinum/nichrome wire.	red flame
Sodium	moisten a little of the substance with pure concentrated hydrochloric acid; heat a little of the substance on a clean platinum/nichrome wire.	brilliant yellow flame
Potassium	moisten a little of the substance with pure concentrated hydrochloric acid; heat a little of the substance on a clean platinum/nichrome wire.	violet (crimson through blue glass) flame.