Republic of Zambia

MINISTRY OF EDUCATION, SCIENCE, VOCATIONAL TRAINING AND EARLY EDUCATION

AGRICULTURAL SCIENCE SYLLABUS

TEACHER EDUCATION - DIPLOMA

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INTRODUCTION

Agricultural Science includes cross-cutting issues affecting humanity. Agricultural production is now characterised by the use of modern technology. It is the Government policy to adopt a technology-based approach to render the local agricultural sector more productive, service-oriented, sustainable and competitive whilst responding to the environmental and ethical standards demanded by society.

The development of agriculture and its related industries is challenging and requires appropriate knowledge and skills to keep pace with agricultural technological developments. This has led to the need for well-trained Agricultural Science teachers who have the technical and practical skills in addition to in-depth knowledge of the science to meet the challenges facing agriculture in Zambia. With the increasing complexity of agricultural practices, there is a need for enhanced capacity in technology transfer from teachers to learners. This programme fills this requirement. The programme is designed to develop technology transfer and entrepreneurial skills in student teachers in the area of agriculture.

RATIONALE

Agriculture is the main stay of development in Zambia. Therefore, there is need for basic principles of Agriculture to be taught to pupils in schools in order for them to acquire appropriate knowledge, skills and attitudes. This is in line with the Zambia Education Curriculum Framework 2013 that advocates for vocational career pathways which includes agriculture among other subjects. It is a requirement that pupils be taught useful and relevant survival skills in agriculture and entrepreneurship as a way of job creation. To meet this need it is necessary to train teachers in Agricultural Science who will in turn pass the knowledge, skills and values. The teaching of agriculture science will enhance existing agricultural production units in schools and colleges.

AIM

The programme is designed to equip agricultural science teachers with knowledge, skills and values that will enable them teach effectively in secondary schools.

METHODOLOGY

The success of teaching Agricultural Science in secondary schools can be achieved by the use of learner - centered pedagogies. This subject, that enhances learner 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 pedagogies are integrated however possible. Learners are expected to conduct experiments, practicals, field trips, field work and project work in order to enhance the acquisition of the desired knowledge, skills and values.

GENERAL OUTCOMES

- ✓ 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.

COMPETENCES

- Knowledge with understanding:
  - ✓ Use of terms, symbols, quantities and units of measure;
  - ✓ Reference to facts, concepts and principles;

- Ideas and information:
  - ✓ Organise and present information from various sources;
  - ✓ Present information given in one form (numerical data) in another form (graph);
  - ✓ Use information to observe trends and draw conclusions.

- Solving problems:
  - ✓ Present explanations for observed facts, and notice connections between them;
  - ✓ Make predictions based on observations; and
  - ✓ Solve problems.

- Practical activities:
  - ✓ Following instructions;
  - ✓ Choosing suitable techniques, equipment and materials;
  - ✓ Using equipment and materials safely and correctly;
  - ✓ Making and recording observations, measurements and estimates.

- Investigations:
  - ✓ Identify problems and plan an investigation;
  - ✓ Organise and carry out an investigation in a systematic way;
  - ✓ Interpret and evaluate observations and experimental data;
  - ✓ Evaluate methods and suggest improvements.

- Skills and techniques in livestock production:
  - ✓ Handling a single/group of farm animals in a safe and correct manner;
  - ✓ Maintaining the health of farm animals;
  - ✓ Calculating maintenance and production rations of farm animals;
  - ✓ Planning, managing and implementing a feeding programme for the life-cycle of a farm animals;
  - ✓ Identifying breeds and types of animals;
  - ✓ Marketing farm animals and their products;
  - ✓ Maintaining accurate physical and financial records on an enterprise.

- Skills and techniques in crop production:
  - ✓ Identifying cultivars and varieties of crops;
  - ✓ Calculating fertiliser/manure requirements of a crop and estimate crop yield;
  - ✓ Planning, implementing and managing a cropping programme;
  - ✓ Harvesting and marketing a crop; and
  - ✓ Maintaining accurate physical and financial records on a crop enterprise.

YEAR ONE

TOPIC	SUBTOPIC	SPECIFIC OUTCOMES	SUGGESTED INSTRUCTIONAL PEDAGOGY
1.1 Introduction to Agriculture	1.1.1 Agriculture science as a subject.	1.1.1.1. Explain the importance of agriculture. 1.1.1.2. Classify agriculture as an applied science or as a technology. 1.1.1.3. Justify why knowledge and skills of people trained in agriculture are needed.	• Brainstorm on the importance of agriculture.
	1.1.2 Agriculture in Zambia.	1.1.2.1. Discuss the factors that influence the development of agriculture. 1.1.2.2. Analyse the types of farmers. 1.1.2.3. Evaluate the need for farmers to diversify the production of crops and livestock. 1.1.2.4. Describe the different cropping practices (monocropping, mixed cropping, Inter cropping, mixed farming, continuous cropping, and crop rotation) and farming systems	• Focus group discussion • Field Trips to near-by farms. • Field Trip to Small scales farmers and commercial farmers.

TOPIC	SUBTOPIC	SPECIFIC OUTCOMES	SUGGESTED INSTRUCTIONAL PEDAGOGY
		(ranching, shifting cultivation, subsistence farming and commercial farming).	
		1.1.2.5. Explore agencies and organisations that assist farmers in input procurement, marketing and agriculture extension.	• Focus group discussion: Invite personnel/Tour to visit local agencies and organizations that support farmers such as ZNFU. • Field visit to an agro processing industry
		1.1.2.6. Discuss the main commercial farming areas in Zambia.	• Group work: mapping of main commercial farming areas.
		1.1.2.7. Describe the agro-ecological zones in Zambia.	• Group work: mapping Specific Agriculture activities based on Agro-ecological Zones.
1.2 Soil science	1.2.1. Introduction to Soil science	1.2.1.1. Describe the process of soil formation.	• Demonstration: – models of soil formation – sedimentation
		1.2.1.2. Examine the soil profile.	• Field trip/ experiment. – Dig a pit to illustrate the soil horizons.
		1.2.1.3. Explain the physical and chemical properties of soil.	• Experiment – Soil mechanical composition. – Soil components.

TOPIC	SUBTOPIC	SPECIFIC OUTCOMES	SUGGESTED INSTRUCTIONAL PEDAGOGY
			– Soil pH. • Field practical on compost making and fertilizer blending. • Brainstorm the differences between organic and inorganic fertilizers.
		1.2.1.4. Compare and contrast organic (manures) and chemical (inorganic or artificial) fertilizers.	
		1.2.1.5. Distinguish the importance of plant nutrients.	• Experiment: Growth media culture.
		1.2.1.6. Discuss the aspects of soil fertility.	• Brainstorming: characterize fertile soils.
		1.2.1.7. Explain soil – water – plant relations.	• Demonstration: effect of different soil samples and moisture content on plant growth.
		1.2.1.8. Discuss the effects of soil erosion and its control.	• Field trip: Walk around to places where erosion is taking place.
		1.2.1.9. Discuss soil degradation and reclamation.	
1.3 Crop Science	1.3.1. Introduction to plant science	1.3.1.1. Identify the major plant families of agricultural importance. 1.3.1.2. Compare and contrast the	

TOPIC	SUBTOPIC	SPECIFIC OUTCOMES	SUGGESTED INSTRUCTIONAL PEDAGOGY
		characteristics of plants, algae and fungi. 1.3.1.3. Describe the morphology of plants. 1.3.1.4. Differentiate between the anatomy of monocots and dicots. 1.3.1.5. Explain the physiology of plants. 1.3.1.6. Examine plant breeding methods. 1.3.1.7. Apply plant breeding methods to improve crop performance.	
1.4 Livestock Production	1.4.1. Introduction to Animal science	1.4.1.1. Discuss the importance of livestock. 1.4.1.2. Describe the anatomy and physiology of farm animals. 1.4.1.3. Examine livestock breeding	• Field trip to the school garden where manure is applied, livestock farm, industries where livestock products are processed • Practical: – Learners to Dissect a non-ruminant and a ruminant to expose their digestive and reproductive systems, • Simulations • Material Production: Charts/ models for respiratory, circulatory, excretory, digestive, and reproductive systems.

TOPIC	SUBTOPIC	SPECIFIC OUTCOMES	SUGGESTED INSTRUCTIONAL PEDAGOGY
		methods.	
	1.4.2. Animal Nutrition	1.4.2.1. Characterize the different categories of feedstuffs and their chemical components. 1.4.2.2. Explain the concept of ration formulation. 1.4.2.3. Identify different types of livestock rations.	• Research: Trainees to carry out a research on chemical components of feedstuffs. • Practical: Trainees to mix different rations for cattle and chickens.
1.5 Agribusiness Management	1.5.1. Farm accounts	1.5.1.1. Discuss the different types of farm records. 1.5.1.2. Describe the value of keeping records. 1.5.1.3. Analyse the Cash flow	• Field trip: Groups to visit local business organizations and collect financial documents such as; invoices, receipts, delivery note, production sheet. • Focus group discussion: Educational talk. • Practical: trainees to collect data

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		statement, Income Statement, and Balance Sheet as management tools.	from various enterprises within the institution and formulate statements.
	1.5.2. Agricultural Economics	1.5.2.1. Describe agricultural economics. 1.5.2.2. Outline the factors of production. 1.5.2.3. Discuss the production decision and the law of diminishing returns. 1.5.2.4. Illustrate the laws of demand and supply. 1.5.2.5. Explain the concept of opportunity cost.	• Group work: making charts on – – Law of diminishing returns. – Laws of demand and supply.

YEAR TWO

TOPIC	SUBTOPIC	SPECIFIC OUTCOMES	SUGGESTED INSTRUCTIONAL PEDAGOGY
2.1.Crop Production	2.1.1. Horticulture	2.1.1.1. Explain the importance of horticulture.	
	2.1.2. Vegetable production	2.1.2.1. Discuss the importance of vegetables. 2.1.2.2. Explain the types of vegetables and their varieties. 2.1.2.3. Outline the ecological requirements for each of the named vegetable. 2.1.2.4. Describe the factors to consider when selecting a site for vegetable production. 2.1.2.5. Select a site for a seedbed. 2.1.2.6. Draw a four crop rotational plan.	• Collecting and sorting various vegetables from a School garden/local market/ Visiting a nearby vegetable shop. • Brainstorming: Ecological requirements for various crops grown. • Practical: – Survey available land at school in order to select site suitable for vegetable growing. – Draw plan on paper demarcating portions on selected site. – Implement a rotational plan for the site selected by planting different vegetable crops and monitoring performance.

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		2.1.2.7. Prepare a seedbed.	– Cultivate the piece of land. – Prepare seed bed 1 metre wide and a suitable 10 metres long. – Calculate and apply recommended quantities of manures/basal chemical fertilizers to be used for a particular vegetable.
		2.1.2.8. Explain the importance of a nursery.	• Brainstorming: The need for a nursery.
		2.1.2.9. Determine the recommended seed rate and plant population of a named crop.	• Practical: – Calculate the seed rate and plant population.
		2.1.2.10. Explain methods of sowing.	– Sow seeds in a nursery bed.
		2.1.2.11. Outline the management practices of a nursery.	– Weeding, watering, aeration, thinning, fertilizer application, spraying.
		2.1.2.12. Describe the process of transplanting.	– Transplant seedlings from nursery.
		2.1.2.13. Outline the management practices for vegetables in the main field.	– Carry out routine management practices (Weeding, watering, aeration, gaping, fertilizer

TOPIC	SUBTOPIC	SPECIFIC OUTCOMES	SUGGESTED INSTRUCTIONAL PEDAGOGY
			application, spraying crop). – Carry out the recommended practices of harvesting. – Trainees to make yield estimations and make comparison with a standard. • Brainstorming: Determine the relevant packaging, pricing, and place for marketing the product and storage techniques. • Practical: – Carry out the 4Ps of market research. – Grading/sorting and standardization of products.
	2.1.3. Fruit production	2.1.3.1. Discuss the importance of fruits. 2.1.3.2. Outline the classes of fruit crops. 2.1.3.3. Describe factors to consider when selecting a site for an orchard. 2.1.3.4. Design a plan and layout of an orchard. 2.1.3.5. Apply propagation methods.	

TOPIC	SUBTOPIC	SPECIFIC OUTCOMES	SUGGESTED INSTRUCTIONAL PEDAGOGY
		2.1.3.6. Outline the management practices of an orchard. 2.1.3.7. Describe the storage and marketing strategies for fruits	
	2.1.4. Field crop production	2.1.4.1. Discuss the importance of field crops.	• Brainstorming: The importance of field crops. • Focus group discussion: Invite/visit a reputable local farmer to come and motivate trainees on the economic importance of field crops.
		2.1.4.2. Explain the types of field crops and their varieties.	• Practical: Identify the different types of field crop and their varieties
		2.1.4.3. Outline the ecological requirements for each of the named field crop.	• Brainstorming: Ecological requirements for various crops grown.
		2.1.4.4. Describe the factors to consider when selecting a site for growing a field crop.	• Practical: – Survey available land at school in order to select site suitable for field crops.
		2.1.4.5. Prepare a field in readiness for sowing.	– Cultivate the piece of land. – Prepare the seed beds.

TOPIC	SUBTOPIC	SPECIFIC OUTCOMES	SUGGESTED INSTRUCTIONAL PEDAGOGY
		2.1.4.6. Determine the recommended seed rate and plant population of a named field crop.	– Calculate the seed rate and plant population.
		2.1.4.7. Explain the various methods for sowing/ planting the selected field crops.	– Apply different methods for sowing seeds as per recommended spacing.
		2.1.4.8. Outline the management practices for field crops.	– Carry out routine management practices (Weeding, watering, aeration, thinning, gaping, fertilizer application, spraying crop).
		2.1.4.9. Describe the process of harvesting and post-harvest preparation.	– Carry out the recommended practices of harvesting. – Apply post-harvest preparations (shelling, shredding, winnowing, and cleaning).
		2.1.4.10. State the expected yield.	– Trainees to make yield estimations and make comparison with a standard.
		2.1.4.11. Describe the storage and marketing strategies.	• Brainstorming: Determine the relevant packaging, pricing, and place for marketing the product and storage techniques.

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			• Practical: – Carry out the 4Ps of market research. – Grading/sorting and standardization of products
2.2.Livestock Production	2.2.1. Poultry production	2.2.1.1. Discuss the importance of poultry.	• Brainstorming: the importance of poultry. • Focus group discussion: Invite/visit a reputable local farmer to come and motivate trainees on the economic importance of poultry. • Field trip: visit to any garden where manure is applied, livestock farm, industries where livestock products are processed.
		2.2.1.2. Identify the classes of poultry.	• Brainstorming: Identify the different types of poultry and their breeds.
		2.2.1.3. Describe the rearing systems for each class of poultry identified.	• Field trip: – Visit to farms where different rearing systems are employed.
		2.2.1.4. Explain the main features of poultry housing.	– Visit to a local poultry house to

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			assess characteristics and features of a poultry house.
		2.2.1.5. Apply management practices in poultry.	• Practical: Poultry rearing. – Prepare a poultry house for stocking (cleaning, disinfection, litter placement, arrangement of drinkers and feeders, and sources of heat and lighting.) – Make a simple incubator brooder. – Place eggs in the incubator brooder and candle eggs using natural or artificial methods. – Vaccinate and treat birds. – Prepare record cards (feed, vaccinations and production records).
	2.2.2. Pig production	2.2.2.1. Discuss the importance of pigs. 2.2.2.2. Describe the pig breeds.	
		2.2.2.3. Explain the main features of a piggery.	• Field trip: Assessment of the main features of a piggery (boar pen, farrowing pen, growing pens).
		2.2.2.4. Apply management practices	• Focus group discussion: Invite/visit

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		in pig production.	a veterinary officer to demonstrate to trainees on teeth clipping, iron injection, castration, deworming, tail docking, and ear notching). • Practical: Pig rearing – Feeding. – Cleaning. – Disinfecting.
	2.2.3. Pasture and range management	2.2.3.1. Describe the importance of rangelands. 2.2.3.2. Classify pasture grasses. 2.2.3.3. Outline methods of range improvement. 2.2.3.4. Discuss causes of range degradation. 2.2.3.5. Compare and contrast the types of grazing systems.	
2.3.Agribusiness Management	2.3.1. Farm management	2.3.1.1. Describe farm management. 2.3.1.2. Outline the types of credit. 2.3.1.3. Distinguish the types of co-operatives.	• Focus group discussion: Invite an officer from a financial/lending institution to highlight different types of credit available in agriculture. • Undertake education tour locally and gather information about local cooperatives.

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		2.3.1.4. Describe the different types of budgets (Enterprise Budgeting, Partial Budgeting, and Whole Farm Budgeting.) 2.3.1.5. Describe grading and standardization of enterprise produce. 2.3.1.6. Describe Risk and Uncertainty (Sources/Types of Risks, Measuring Risk, Methods used to counter Risk and Uncertainty).	• Group work: Activity on budgeting for an enterprise of choice. • Practical: – Grading/sorting and standardization of products.
2.4.Agricultural Engineering	2.4.1. Introduction to farm tools and implements.	2.4.1.1. Discuss the importance of Agricultural engineering. 2.4.1.2. Describe the sources of farm power. 2.4.1.3. Describe the principles underlying levers, pulleys and screws in relation to work.	• Brainstorming: Importance of agricultural engineering.
	2.4.2. Hand tools	2.4.2.1. Describe different categories of hand tools. 2.4.2.2. Discuss the maintenance and storage of hand tools.	• Practical: – Use various hand tools (carpentry, garden, bricklaying, plumbing, and mechanical tools).

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			– Care for hand tools. – Safety when using hand tools. – Identifying major parts of a hand sprayer.
	2.4.3. Animal Drawn Implements	2.4.3.1. Explain the different categories of animal drawn implements.	• Practical: – Categorise animal drawn implement. – Identification of major parts of animal drawn implements. – Using animal drawn implements.
		2.4.3.2. Describe the maintenance and storage of animal drawn implements.	• Brainstorming: Maintenance and storage techniques • Field trip: visit to a storage facility for farm implements.
	2.4.4. Tractor drawn implements	2.4.4.1. Outline the different categories of tractor drawn implements.	• Field trip: – Tour to a nearby farm/institution to identify tractor drawn implements for soil preparation, sowing and planting.
		2.4.4.2. Discuss the maintenance and storage of tractor drawn implements.	– Tour to a nearby farm to identify facilities for storage of farm machinery. • Practical: cleaning, oiling, greasing, painting and other methods of preventing rust.

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	2.4.5. Engines	2.4.5.1. Identify the parts of an engine and the function. 2.4.5.2. Describe the working of the two and four stroke internal petrol and diesel engines. 2.4.5.3. Outline the differences between petrol and diesel engines. 2.4.5.4. Describe the different systems of an Engine. 2.4.5.5. Explain the maintenance of the main system of an engine	
	2.4.6. Farm Mechanisation	2.4.6.1. Explain the categories of mechanisation. 2.4.6.2. Describe processes of agricultural production that may be mechanized. 2.4.6.3. Discuss the advantages and disadvantages of farm mechanisation.	
2.5.Practical Project	2.5.1. Practical project I	2.5.1.1. Describe the parts of a Project proposal. 2.5.1.2. Formulate a project proposal. 2.5.1.3. Project proposal presentation.	• Brainstorming. – Trainees to brainstorm the components of a project proposal. • Presentation.

TOPIC	SUBTOPIC	SPECIFIC OUTCOMES	SUGGESTED INSTRUCTIONAL PEDAGOGY
2.6. Agricultural Science Teaching Methods	2.6.1. Aims of teaching Agricultural sciences.	2.6.1.1. Discuss the aims of teaching agricultural science in Zambian secondary schools.	
	2.6.2. Syllabus	2.6.2.1. Describe the purpose and components of a syllabus.	
	2.6.3. Schemes of work	2.6.3.1. Outline the purpose and components of a scheme of work. 2.6.3.2. Prepare a scheme of work.	
	2.6.4. Lesson Plan	2.6.4.1. Explain the purpose and components of a Lesson plan. 2.6.4.2. Make a lesson plan.	
	2.6.5. Records of work	2.6.5.1. Describe the purpose and components of records of work. 2.6.5.2. Prepare records of work.	
	2.6.6. Assessment	2.6.6.1. Discuss the purpose of assessment. 2.6.6.2. Analyse the different types of assessment techniques (oral, written and practical).	
	2.6.7. Teaching Approaches and strategies	2.6.7.1. Analyse the different teaching approaches with respect to whole class, small group and individual. 2.6.7.2. Apply different teaching strategies such as lecture, question and answer,	

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		discussion, demonstration, laboratory/ practical, role-play, field trips, project, guest speaker/ resource persons, brainstorming, enquiry and discovery approach, problem solving, mastery learning, think – pair – share, think – write – pair - share, jigsaw.	
	2.6.8. Peer or Micro teaching.	2.6.8.1. Practice peer/ micro teaching.	
2.7.School Teaching Experience	2.7.1. Student Teaching Practice I	2.7.1.1. Practice teaching in a school environment.	
2.8.Entrepreneurship	2.8.1. Entrepreneurial Activities in Agricultural science.	2.8.1.1. Brainstorm/generate entrepreneurial activities in Agricultural science. 2.8.1.2. Discuss a number of career opportunities in Agricultural science. 2.8.1.3. Choose a career in business and justify this choice.	• Trainees to brainstorm and come up with entrepreneurial activities in Agricultural science in groups of five. • In groups of five, Trainees to come with career opportunities.

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		2.8.1.4. Demonstrate creativity and business opportunities identification.	• By brainstorming in groups of five Trainees should write down ways of developing creativity and business opportunity identification.
		2.8.1.5. Generate several Business ideas in Agricultural science.	• In groups of five, trainees should brainstorm and come up with several (atleast10) business.
		2.8.1.6. Assess your Business ideas.	• Trainees to assess all business ideas using PMI or SWOT and come up with one Business idea.
		2.8.1.7. Develop a business plan.	• In groups of five, trainees should come up with a Business plan bases on the chosen business idea.
		2.8.1.8. Implement your business plan.	• In Groups of Five, Trainees should conduct a business in their respective companies while in colleges

YEAR THREE

TOPIC	SUBTOPIC	SPECIFIC OUTCOMES	SUGGESTED INSTRUCTIONAL PEDAGOGY
3.1.Crop Science	3.1.1. Crop protection	3.1.1.1. Identify crop pests and disease.	• Practical: – Trainees to collect pests from the field, preserve them and prepare insect boxes. – Trainees to collect diseased plant materials from the field, preserve them in a folder. • Field trip: Visit the school garden/ nearby farm to observe signs/symptoms and relate them with to diseases that attach attack crops
		3.1.1.2. Analyse methods of controlling and preventing crop pests and diseases.	• Brainstorming: – Prevention and control methods for pests and diseases.
		3.1.1.3. Classify forms pesticides.	– Classification of pesticides. • Practical: – Extract and make natural pesticides using plant materials e.g. using Tephrosia, tobacco, neem tree, hot pepper and onion.

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		3.1.1.4. Calibrate pesticide application equipment. 3.1.1.5. Apply safety precautions when using chemicals. 3.1.1.6. Apply Integrated Pest Management techniques.	– Trainees to calibrate a sprayer. – Apply safety rules e.g. Label containers, Lock the storerooms, keep Chemicals in original containers. – Apply Integrated Pest Management: Chemical control, biological methods (use a red lady bird beetle for aphids), Cultural methods (e.g. crop rotation, timely planting, deep ploughing, winter ploughing, inter cropping, and Planting crops that produce scents which repel pests e.g. marigold, onion , garlic), Physical methods (hand picking, driving away animals) and mechanical methods (shredding of crop residues).
	3.1.2. Conservation Farming	3.1.2.1. Discuss the importance of conservation farming. 3.1.2.2. Demonstrate land clearing and preparation techniques in conservation farming.	• Brainstorming: The importance of conservation farming. • Practical: – Apply conservation methods in land clearing and cultivation,

TOPIC	SUBTOPIC	SPECIFIC OUTCOMES	SUGGESTED INSTRUCTIONAL PEDAGOGY
			(Pot holing, ridging).
		3.1.2.3. Demonstrate sowing and planting techniques in conservation farming.	– Sowing and planting techniques in conservation farming.
		3.1.2.4. Apply conservation farming management practices (Chemical fertilizer and manure application, weed control, pest control, disease control, soil erosion control, soil aeration).	– Field application of the conservation farming management practices (.
		3.1.2.5. Apply the principles of organic farming and soil fertility.	• Brainstorming. • Field trip: to a farm practicing organic farming.
	3.1.3. Forestry	3.1.3.1. Describe the importance of trees in soil management.	• Brainstorming: – Importance of trees. – Classify and select trees suitable for making handles poles.
		3.1.3.2. Select a site for planting trees.	• Field trip: to a nearby forest/ forestry department to practice selection and planting of trees. – Plant appropriate trees to improve soil fertility and reduce soil erosion.

TOPIC	SUBTOPIC	SPECIFIC OUTCOMES	SUGGESTED INSTRUCTIONAL PEDAGOGY
		3.1.3.3. Discuss the effects of deforestation. 3.1.3.4. Formulate measures of preventing and controlling deforestation.	
	3.1.4. Agroforestry	3.1.4.1. Explain the meaning of Agro-forestry. 3.1.4.2. Identify various tree species that will improve soil fertility. 3.1.4.3. Plant appropriate trees to improve soil fertility and reduce soil erosion. 3.1.4.4. State the merits and demerits of agroforestry.	• Brainstorming: Important trees in soil fertility improvement.
3.2.Livestock Production	3.2.1. Beef and dairy	3.2.1.1. Describe the characteristics of beef and dairy breeds. 3.2.1.2. Describe the management practices of beef and dairy cow (Selection, Oestrus cycle, Replacements, mating methods, artificial insemination, pregnancy management, calving.)	• Demonstration. • Research. • Field trip: to a beef and/or dairy farm.

TOPIC	SUBTOPIC	SPECIFIC OUTCOMES	SUGGESTED INSTRUCTIONAL PEDAGOGY
		3.2.1.3. Explain the management practices of a lactating cow (milk synthesis and let down, feeding, milk handling and storage). 3.2.1.4. Describe the calf management practices (colostrum, feeding, identification, castration, dehorning, and weaning.) 3.2.1.5. Apply the methods of beef cattle improvement.	
	3.2.2. Sheep and Goat	3.2.2.1. Discuss the importance of sheep and goats. 3.2.2.2. Describe the classes of sheep and goats. 3.2.2.3. Outline the management practices (feeding, disease and pest control).	
	3.2.3. Fish farming	3.2.3.1. Discuss the significance of fish and fish farming. 3.2.3.2. Identify common types of fish farmed in Zambia.	

TOPIC	SUBTOPIC	SPECIFIC OUTCOMES	SUGGESTED INSTRUCTIONAL PEDAGOGY
		3.2.3.3. Identify methods of fish farming in Zambia. 3.2.3.4. State the advantages and disadvantages of integrated fish farming. 3.2.3.5. Establish and manage a fish pond. 3.2.3.6. Describe different ways of harvesting fish. 3.2.3.7. Explain the various methods of fish preservation 3.2.3.8. Discuss the marketing of fish.	
	3.2.4. Bee farming	3.2.4.1. Explain the importance of bee farming. 3.2.4.2. Identify the different types of bees. 3.2.4.3. Explain the common methods of bee keeping. 3.2.4.4. Discuss the techniques for establishing and management	

TOPIC	SUBTOPIC	SPECIFIC OUTCOMES	SUGGESTED INSTRUCTIONAL PEDAGOGY
		of an apiary. 3.2.4.5. State the methods of harvesting honey. 3.2.4.6. Discuss the techniques for processing and grading honey and honey products for marketing.	
3.3.Business Management	3.3.1. Business Environment and management	3.3.1.1. Discuss business environment. 3.3.1.2. Analyse the major environmental factors that affect business. 3.3.1.3. Manage small business. 3.3.1.4. Manage credit.	• By brainstorming let trainees find out about the definition of business environment. • In Groups of five trainees to discuss and come up with environmental factors. • Trainees to maintain creditors and debtors records. • Trainees to develop a debt serving plan.

TOPIC	SUBTOPIC	SPECIFIC OUTCOMES	SUGGESTED INSTRUCTIONAL PEDAGOGY
			• Trainees to prepare trading and profit and loss account for the year. • Prepare balance sheet.
		3.3.1.5. Present final accounts for the Business.	• Trainees to end: - Production - Trading • Trainees close and balance all books of accounts. • Evaluation and sale of all assets. • Calculate profits or losses realized. • Write and submit liquidation report. • Award best enterprise.
		3.3.1.6. Liquidate student Enterprises	
3.4. Agricultural Engineering	3.4.1. Farm structures	3.4.1.1. Design the farm layout.	
		3.4.1.2. Explain the characteristics of crop storage facilities.	• Field trip: to farms with storage facilities for grains and fruits. • Practical: trainees make models for storage facilities for grains and fruits.
		3.4.1.3. Describe the characteristics of animal handling structures.	• Field trip: to a farm to view the characteristics of various animal

TOPIC	SUBTOPIC	SPECIFIC OUTCOMES	SUGGESTED INSTRUCTIONAL PEDAGOGY
			handling structures.
		3.4.1.4. Distinguish different structures for water supply. 3.4.1.5. Choose methods of maintaining named water supply systems.	
3.5. Practical Project	3.5.1. Practical project II	3.5.1.1. Implement the proposed projects. 3.5.1.2. Collect and analyse the data. 3.5.1.3. Present the project findings. 3.5.1.4. Compile the project report.	• Project method. – Individual trainees to execute their proposed projects. – Trainees to collect and analyse data. – Trainees to present their project findings. – Trainees to compile the project report in accordance with the format.
3.6. School Teaching Experience	3.6.1. Student Teaching Practice II	3.6.1.1. Practice teaching in a school environment.	

SCOPE AND SEQUENCE CHART

S/N	TOPIC	YEAR 1	YEAR 2	YEAR 3
1.0	INTRODUCTION TO AGRICULTURE	1.1.1 Agriculture science as a subject.		
		1.1.2 Agriculture in Zambia		
2.0	CROP SCIENCE	1.2.1 Introduction to plant science	2.1.1 Horticulture.	3.1.1 Crop protection
			2.1.2 Vegetable Production.	3.1.2 Conservation Farming
			2.1.3 Fruit production.	3.1.3 Forestry
			2.1.4 Field crop production.	3.1.4 Agroforestry
3.0	SOIL SCIENCE	1.3.1 Introduction to Soil science		
4.0	LIVESTOCK PRODUCTION	1.4.1 Introduction to Animal science	2.2.1 Poultry production.	3.2.1 Beef and dairy
		1.4.2 Animal nutrition	2.2.2 Pig production.	3.2.2 Sheep and Goat
			2.2.3 Pasture and range management.	3.2.3 Fish farming
				3.2.4 Bee keeping
5.0	AGRIBUSINESS MANAGEMENT	1.5.1 Farm accounts	2.3.1 Farm management	3.3.1. Business Environment and management
		1.5.2 Agricultural Economics		
6.0	AGRIC ENGINEERING		2.4.1 Introduction to farm tools and implements. 2.4.2 Hand tools. 2.4.3 Animal drawn implements. 2.4.4 Tractor drawn implements. 2.4.5 Engines. 2.4.6 Farm mechanisation.	3.4.1 Farm structures

S/N	TOPIC	YEAR 1	YEAR 2	YEAR 3
7.0	PRACTICAL PROJECT		2.5.1 Practical project I.	3.5.1 Practical project II
8.0	AGRICULTURAL SCIENCE TEACHING METHODOLOGY		2.6.1. Aims of teaching agricultural science. 2.6.2. Syllabus 2.6.3. Schemes of work 2.6.4. Lesson Plan 2.6.5. Records of work 2.6.6. Assessment 2.6.7. Teaching Approaches and strategies 2.6.8. Peer or Micro teaching.	
9.0	SCHOOL TEACHING EXPERIENCE		2.7.1 Student Teaching Practice I.	3.6.1 Student Teaching Practice II
10.0	2.9.ENTREPRENEURSHIP		2.8.1.Entrepreneurial Activities in Agricultural science.	