



BANANA

TEACHING AND LEARNING FRAMEWORK FOR SECONDARY SCHOOLS



Developed by Ministry of Education, Sport, Arts and Culture
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INTRODUCTION

This framework has been developed based on the premises that people in certain areas make a living of the farming of fruits. In this specific case it is bananas. While people are growing banana based on proven techniques, new methods and inputs can increase production and improve the quality of produce.

In the area where this framework was developed, new agronomic practices in banana farming were introduced to the farmers of today. Children were not included when these skills and knowledge were transferred, even though many will be the farmers of tomorrow.

This framework can be used to practically teach children new methods and skills in banana growing. Apart from developing this framework, a more detailed reference guide for the agricultural teachers and pupils on the specifics of the banana growing has been developed.

The present O-level Agriculture syllabus on Crop Management provides learners with the option as quoted from (Zimsec 2003:62) "One crops from each of the groups A, B, and C should be selected for study. Group A: Legumes...; Group B: Roots and Tubers... and Group C: Other Cash crops: cotton, sunflower and sugarcane. Bananas as a cash crop are absent. O-level candidates in banana growing areas like Honde or Rusitu Valleys may be encouraged to opt to study such cash crops as sunflowers which are irrelevant to local conditions.

AIMS AND OBJECTIVES

Aims of the Banana Course

- To develop a positive attitude towards banana growing, and to foster good banana growing practises in pupils.
- To help pupils appreciate the importance of bananas in their lives (economic, nutrition).
- To help pupils acquire basic conservation principles.
- To help pupils appreciate their environment in relation to banana production.
- To help pupils understand the science of the banana plant.

Objectives of the Banana course

Objectives were formulated per aim:

To develop a positive attitude towards banana growing, and to foster good banana growing practises in pupils. Pupils should be able to:

- identify suitable plots for planting bananas
- prepare land and banana planting stations
- plant and nurture a banana plantation
- demonstrate the activities involved in banana growing
- list and identify common pests and diseases that affect bananas

To help pupils appreciate the importance of bananas in their lives (economic, nutrition). Pupils should be able to:

- identify viable markets and products for the banana(plant)
- differentiate between different markets for bananas and their advantages
- calculate profitability and explain who to make money from bananas
- identify and prepare different banana dishes
- identify different benefits of the banana(plant)
- explain the nutritional value of bananas

To help pupils acquire basic conservation principles. Pupils should be able:

- identify and apply methods to control erosion in banana plantations
- identify and apply water conservation techniques

To help pupils appreciate their environment in relation to banana production. Pupils should be able to:

- identify and explain favourable conditions (season/geography, soil) for banana growing
- describe how the banana plant can conserve the environment
- decide on suitability of different areas for growing bananas

To help pupils understand the science of the banana plant. Pupils should be able to:

- identify different parts of the banana plant
- list functions of the different parts of the banana plant choose suitable varieties for different areas

TOPIC 1: OVERVIEW AND BOTANY OF BANANA PLANT

Objectives	Content	Activities/Notes
<p><i>Pupils should be able to:</i> Give an overview of the nature, origins and uses of the banana plant. Explain the origins of terms (a) banana and (b) plantains</p> <p>Examine the production of bananas in Zimbabwe</p>	<p>Tropical crop One of the tallest grasses Dessert bananas dominate world trade</p> <p>Arabic word 'banon' means finger.</p> <p>Zimbabwean experience of banana growing:</p> <ul style="list-style-type: none"> ▪ Smallholder production ▪ commercial plantation 	<p>Word banana has Arabic roots</p> <p>Origin believed to be in India and Malaysia</p> <p>The Spaniards used the term 'platano' from which the word plantain was derived</p> <p>Banana cultivation in Zimbabwe</p> <ul style="list-style-type: none"> ▪ Isolated and limited space. ▪ Plantations have tended to be on irrigable land.
<p>Give the botanical classification of bananas</p>	<p>Banana belong to the Musaceae family</p>	<ul style="list-style-type: none"> ▪ Bananas are in the same family with plantains
<p>Describe the structure of the banana plant</p>	<ul style="list-style-type: none"> ▪ A herb because it does not have a pithy stem. ▪ Leaves (6 to 7,6m tall and 1 to 2m wide) form a pseudo stem (false stem) ▪ A cross – section of the pseudo stem to show the arrangement of leaves. <p>Identification of the following parts of the banana plant</p> <ul style="list-style-type: none"> ▪ Corm ▪ Leaves ▪ Inflorescence ▪ Bract ▪ Male flowers 	<ul style="list-style-type: none"> ▪ The banana plant is the largest herbaceous flowering plant. ▪ Often mistaken for trees. ▪ But the main or upright stem is pseudo stem made. ▪ Up tightly spirally arranged leaves. ▪ New leaves are formed from the underground corm (the true stem) and push through the pseudo stem in a tightly rolled condition. ▪ The true stem bearing fruits only comes out 8-10 months when the banana plant starts fruitation. ▪ After producing a single bunch the banana plant dies.
<p>Describe the banana root system</p>	<p>No tap root Poor anchorage</p>	<ul style="list-style-type: none"> ▪ Root system is not extensively developed hence the plants are poorly anchored so protection from the wind is absolutely essential. ▪ Roots grow from the corm and occur in the top 30 – 50cm of

<p>Explain the process of fruitation of the banana cultivar</p>	<p>Development of the banana fruit. Bunch Development</p>	<p>the soil. Roots are about pencil thickness and no tap root is formed.</p> <ul style="list-style-type: none"> ▪ The inflorescence bearing fruits is only formed when the following conditions have been met: ▪ At least between 20-50 leaves must have grown ▪ There should be a high rate of photosynthesis to form a bunch ▪ Application of nitrogen fertilizers is important in leaf development ▪ New leaves continuously grow up through the centre of the pseudostem with their laminas tightly rolled ▪ When the inflorescence is formed no more leaves develop ▪ After 10 months (from the time of planting) a large bud at the end of thick underground stem grows from the bundles of leaves ▪ The bud has purple leaves called bracts ▪ Underneath the bracts are clusters of female flowers ▪ These female flowers develop into tiny green bananas (without fertilization-parthenocarpically) ▪ Male flowers dry up and fall off, however the male bell remains at the end of the stalk ▪ This can weigh up to 30-50 kg ▪ Each individual fruit is known as a finger
<p>Explain the nutritional value of the banana plant</p>	<p>Nutrients found in the banana plant</p>	<ul style="list-style-type: none"> ▪ Ripen bananas contain many nourishing ingredients: carbohydrates, proteins vitamins and sugar ▪ <i>Water: 59.9%</i> ▪ <i>Sugar: 12,2 %</i> ▪ <i>Carbohydrates: 22.8 %</i> ▪ <i>Proteins : 1.1 %</i> ▪ <i>Others : 4%</i> ▪ A banana has energy value of 371 kJ(89kcal)
<p>Describe the common banana varieties</p>	<p>Banana varieties Zimbabwe –</p> <ul style="list-style-type: none"> ▪ Dwarf Cavendish. ▪ Williams 	<ul style="list-style-type: none"> ▪ Banana cultivars in Zimbabwe ▪ Dwarf Cavendish (DC) ▪ Average yield 40 t/ha/year. ▪ 3m high and throws bunches at about 2m. ▪ Less prone to wind damage. ▪ Works well with high density planting drip irrigation. ▪ Bunch weight 30 to 40 kg. ▪ Williams ▪ Average yield 50t /ha/year. ▪ Plants are bigger and will grow up to 5m. ▪ Throw bunches at height of 3,5m ▪ Average bunch weight of 100kg or more. ▪ Highly susceptible to wind damage because of its weight.

TOPIC 2: PROPAGATION OF THE BANANA PLANT

Objectives	Content	Activities/Notes
Explain the meaning of vegetative propagation	Vegetative propagation of the banana plant	<ul style="list-style-type: none"> ▪ Difference between sexual (seed grown) propagation and asexual/vegetative (none seed – grown propagation) ▪ Bananas are propagated vegetatively. ▪ This is the increase of plants using parts of the parent plant rather than seeds.
	Main methods of vegetative propagation	<ul style="list-style-type: none"> ▪ The main methods of vegetative propagation are separation and division of specialized stems and roots, cuttings, grafting, layering and budding.
Outline the advantages and disadvantages of vegetative propagation.	Advantages and disadvantages of vegetative propagation	<p>Advantages of vegetative propagation with reference to the banana plant</p> <ul style="list-style-type: none"> ▪ grows faster than seed grown plants ▪ Keeps good characteristics. ▪ Has same genetic constitution, hence it is easy to predict the yields per hectare. ▪ Fast growing e.g. they produce fruits in the first year of planting. <p>Disadvantages of vegetative propagation:</p> <ul style="list-style-type: none"> ▪ Poor anchorage because the root system has less time to develop ▪ Multiplication much slower than with seed propagation

TOPIC 3: SITE SELECTION AND LAND PREPARATION

Objectives	Content	Activities/Notes
<p><i>Pupils should be able to:</i></p> <p>Select a suitable site for banana production.</p>	<p>Soils suitable for banana production Collect soil samples and have them analysed and pH tested. describe the soil and climatic requirements of the banana</p> <p>Temperatures and water availability</p>	<ul style="list-style-type: none"> ▪ Select frost free area. ▪ Deep well drained soils. ▪ No previous banana growth – remove all roots and corms. ▪ optimum soil pH: 5,5 to 6,5. ▪ For acidic soils add lime or dolomite – 2 to 4 tonnes per ha.
<p>Describe the process of land preparation</p>	<p><i>Stages of land preparation</i> Stumping, clearing, ploughing, disking and harrowing Reasons</p>	<ul style="list-style-type: none"> ▪ High temperature are ideal being a tropical crop ▪ Water availability is a prerequisite since bananas are water loving plants <ul style="list-style-type: none"> ▪ Visit a banana plot ▪ Inviting Agritex Officers for demonstration on land preparation. ▪ Stumping and clearing may be adequate on sloped land to minimise erosion.

TOPIC 4: PLANTING AND MAINTENANCE

Objectives	Content	Activities/Notes
<p><i>Pupils should be able to:</i></p> <p>Select suitable varieties of bananas.</p> <p>Explain the recommended planting times and the planting procedures.</p> <p>Describe the processes of caring and maintenance of the banana plant</p> <p>Describe the pests and diseases in banana production.</p>	<p>Choice of suitable cultivars</p> <ul style="list-style-type: none"> ▪ Dwarf Cavendish ▪ Williams ▪ Nzarayapera <p>Planting time</p> <p>Planting holes and spacing</p> <p>Tools</p> <p>Watering by hose or basin irrigation</p> <ul style="list-style-type: none"> ▪ Weeding ▪ Fertilizer application ▪ De-suckering ▪ Follower sucker selection ▪ Leaf cutting ▪ Mulching ▪ Propping ▪ Stalk cutting ▪ Bell removal ▪ Petal removal ▪ Shading ▪ Wind breakers <p>Pests</p> <p>Diseases such as</p> <ul style="list-style-type: none"> ▪ viral disease ▪ fungal disease 	<ul style="list-style-type: none"> ▪ Choose cultivars that suit soil and climatic conditions as well as meeting yield expectations <ul style="list-style-type: none"> ▪ August –September As well as January- February are the most ideal planting times ▪ Avoid planting in November to avoid November dump ▪ Holes should be 45cm x 45cm x 45cm ▪ Plant spacing: 2,4 m x 2,1 m. ▪ Pick, spade, shovel, hoe, pegs, rope and measuring sticks 2,4m and 2,1m. ▪ 25 litres of water every 2 – 3 days depending on weather for the first six months. ▪ Avoid flooding on slopes – use of sprinkler irrigation. ▪ Remove weeds by hand or the use of herbicides – weeds compete for water and nutrients. ▪ Remove unwanted suckers for proper follower growth and increased bunch weight. ▪ Select one sword sucker at bunch emergence. ▪ Helps to conserve soil moisture and warmth, suppresses weeds and soil erosion. ▪ Use of wooden stakes to prevent weakly anchored plants from toppling under the weight of heavy banana bunches. ▪ Removal of dead leaves on the pseudo stem helps to combat diseases. ▪ Removal of the male floral part (bell) helps to increase the weight of the fingers. <ul style="list-style-type: none"> ▪ Nematodes (Radophilis similes) ▪ Mole rats ▪ Thrips ▪ Red spider mites ▪ Semi loopers <p>There are no serious diseases in banana production in Zimbabwe.</p>

		<p>Viral diseases – keep plantations weed free and destroy affected plants.</p> <ul style="list-style-type: none"> ▪ Spray with fungicides like Dithane M 45 if there are any fungal infections e.g. Cigar end rot
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TOPIC 5: HARVESTING AND MARKETING		
Objectives	Content	Activities/Notes
<p><i>Pupils should be able to:</i></p> <p>Describe banana harvesting indicators</p> <p>Explain the process of harvesting bananas</p> <p>Describe the ripening process of the banana fruit.</p>	<p>Harvesting indicators</p> <p>Harvesting process</p> <p>Artificial ripening</p>	<p>Banana fruits harvested green will ripen after harvesting.</p> <ul style="list-style-type: none"> ▪ Normal to harvest the bunch while it is green just before yellow occurs because at the green stage it can stand rough handling. ▪ Of harvested for transport e.g. by ship, bunches cut even sooner when they are about $\frac{3}{4}$ full. ▪ To ascertain the stage to harvest for export – outer central finger of the second hand from the top of the bunch is carefully measured with calipers. Optimum diameter is about 3.37cm. <ul style="list-style-type: none"> ▪ Two people usually required pseudo stem is nicked with a cutlass and lowered and the bunch caught and cut enough to cause the crown of the leaves and fruit bend over gradually. ▪ As the fruit swings down within leach, a second worker catches the bunch, supporting it on his shoulder. ▪ Cutter then severs the fruit stalk from the plant with a machete and the bunch is carried away. ▪ Remaining stalk may then be cut off several feet above ground (at least 1.5m). ▪ In modern operations, a wire cable conveyor installed along the edge for transporting bunches to a collection point. ▪ A tractor is used to pull the bunches along the cable conveyor. ▪ Workers cut hands of bananas from the stalk then cut the hands into smaller groups called "cluster", after <ul style="list-style-type: none"> ▪ Artificial ripening – Bananas ripened artificially using ethylene. ▪ Bananas are placed in a small enclosed room or shed or covered with a polythene sheet and ethylene is introduced. ▪ Ethylene is generated by placing carbide in a tin half – covered with water under the polythene cover. ▪ Concentrations of 5p.p.m or less are adequate. Pleasing aroma of the fruit develops. ▪ Ripening accomplished at temps ranging from 14.4°C – 17.8°C. ▪ Relative humidity of 90 to 95%.

TOPIC 6: USES OF THE BANANA PLANT

Objectives	Content	Activities/Notes
<p><i>Pupils should be able to:</i></p> <p>Discuss the various uses of</p>	<p>Uses of Banana leaves</p> <p>Disposable container</p> <p>Wrapping for cooking n</p> <p>Good shade</p> <p>Fibre - Textile</p> <p>Paper making</p> <p>Cultural</p> <p>Symbols</p> <p>Religious</p> <p>Staple food</p> <p>Other Uses</p>	<ul style="list-style-type: none"> ▪ the leaves ▪ Used ecologically to make disposable containers and plates. ▪ Made into wrapping for grilling food where they protect food from burning. ▪ Provide a good shade for nursery. ▪ Textiles ▪ source of high quality textiles ▪ yarn – making is strong tradition in Japan ▪ Fibre extraction ▪ Fibre is used in the production of .paper. ▪ paper made from the bark from artistic papers. ▪ Arts the word banana has inspired many poetic writings, songs, novels (particularly in Japan) ▪ Symbols used as phallic symbol due to similarities in shape and size. ▪ Religion/Story Creation ▪ Koran alleges that this is the tree of paradise or the tree of knowledge from Biblical writings - “a tree” designed for human grasp and convenience by God. ▪ Staple food for Uganda, Burundi and Rwanda where per capita consumption has been estimated at 45kg per year ▪ Banana sap extracted from the pseudo stem is used as a adhesive. ▪ leaves have been used as “umbrellas”

TOPIC 7: BANANA AGRI-BUSINESS

Objectives	Content	Activities/Notes
<p><i>Pupils should be able to:</i></p> <p>Apply business skills in the production of bananas</p>	<p>Forecasting</p> <p>Business planning</p> <p>Budgeting</p> <p>Record keeping</p>	<ul style="list-style-type: none"> ▪ Sales forecasting ▪ Market forecasts ▪ Labour planning ▪ Operational plan ▪ Gross margin budget ▪ Records of operations ▪ Sales records ▪ Income statements